
Descriptors for

Yam

(*Dioscorea* spp.)



International Plant Genetic Resources Institute
IPGRI

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Yam
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PREFACE

Descriptors for Yam (*Dioscorea* spp.) is a revision of the original IPGRI publication **Descriptors for Yam** (IBPGR 1980). The 1980 list was based upon the work of the Regional Committee in Southeast Asia and its descriptor numbers are given in parentheses beside the present descriptors for cross-referencing purposes. This descriptor list was revised by Dr Perla Hamon and Dr Grahame Jackson and includes extensive modification specific to both African, Asian and Pacific yams. A draft version prepared in the internationally accepted IPGRI format for descriptor lists was subsequently sent to a number of experts for their comments and amendments. A full list of the names and addresses of those involved is given in 'Contributors'.

IPGRI encourages the collection of data for descriptors on the first four categories of this list – *Passport, Management, Environment and Site, Characterization* – and endorses data in these categories as those that should be available for any accession. However, the number of each of the site and environment descriptor types used will depend on the crop and their importance to the crop's description. Descriptors listed under *Evaluation* allow for a more detailed description of the accession's characters, but generally require replicated site and time trials.

For the most important edible yams, minimum highly discriminating descriptors for characterization are given in Annex I. These will assist curators to detect duplicates in large collections. They are not meant as a substitute for the completion of all relevant descriptors in sections 7 and 8.

Although the suggested coding should not be regarded as the definitive scheme, this format represents an important tool for a standardized characterization system and it is promoted by IPGRI throughout the world.

This descriptor list is intended to be comprehensive for the descriptors that it contains. This approach assists with the standardization of descriptor definitions. IPGRI does not, however, assume that each curator will characterize accessions of their collection utilizing all descriptors given. Descriptors should be used when they are useful to the curator for the management and maintenance of the collection and/or to the users of the plant genetic resources.

This descriptor list provides an international format and thereby produces a universally understood 'language' for plant genetic resources data. The adoption of this scheme for data encoding, or at least the production of a transformation method to convert other schemes into the IPGRI format, will produce a rapid, reliable and efficient means for information storage, retrieval and communication, and will assist with the utilization of germplasm. It is recommended, therefore, that information should be produced by closely following the descriptor list with regard to: ordering and numbering descriptors, using the descriptors specified, and using the descriptor states recommended.

In most instances, curators of collections will be aware of the differences between yam species and will be able to group the accessions accordingly. Where this is not the case, botanical keys will be needed. A key for the most important edible yams is given in Annex II; this is based on that published previously by Purseglove (1972), and also on a practical guide to identifying the species of the Pacific islands by Wilson (1988).

Annex III contains multicrop passport descriptors developed jointly by IPGRI and FAO, to provide consistent coding schemes for common passport descriptors across crops and aim to be compatible with both future IPGRI crop descriptor lists and the FAO World Information and Early Warning System (WIEWS) on plant genetic resources.

Any suggestions for improvement on the Descriptors for Yam will be highly appreciated by IPGRI and IITA.

DEFINITIONS AND USE OF THE DESCRIPTORS

IPGRI now uses the following definitions in genetic resources documentation:

Passport descriptors: These provide the basic information used for the general management of the accession (including the registration at the genebank and other identification information) and describe parameters that should be observed when the accession is originally collected.

Management descriptors: These provide the basis for the management of accessions in the genebank and assist with their multiplication and regeneration.

Environment and site descriptors: These describe the environmental and site-specific parameters that are important when characterization and evaluation trials are held. They can be important for the interpretation of the results of those trials. Site descriptors for germplasm collecting are also included here.

Characterization descriptors: These enable an easy and quick discrimination between phenotypes. They are generally highly heritable, can be easily seen by the eye and are equally expressed in all environments. In addition, these may include a limited number of additional traits thought desirable by a consensus of users of the particular crop.

Evaluation descriptors: Many of the descriptors in this category are susceptible to environmental differences but are generally useful in crop improvement and others may involve complex biochemical or molecular characterization. They include yield, agronomic performance, stress susceptibilities and biochemical and cytological traits.

Characterization will normally be the responsibility of genebank curators, while evaluation will typically be carried out elsewhere (possibly by a multidisciplinary team of scientists). The evaluation data should be fed back to the genebank which will maintain a data file.

The following internationally accepted norms for the scoring, coding and recording of descriptor states should be followed:

- (a) the Système International d'Unités (SI system) is used;
- (b) the units to be applied are given in square brackets following the descriptor name;
- (c) standard colour charts, e.g. Royal Horticultural Society Colour Chart, Methuen Handbook of Colour, or Munsell Color Chart for Plant Tissues, are strongly recommended for all ungraded colour characters (the precise chart used should be specified in the section where it is used);

2 Descriptors for Yam

- (d) many quantitative characters which are continuously variable are recorded on a 1-9 scale, where:

1	Very low	6	Intermediate to high
2	Very low to low	7	High
3	Low	8	High to very high
4	Low to intermediate	9	Very high
5	Intermediate		

is the expression of a character. The authors of this list have sometimes described only a selection of the states, e.g. 3, 5 and 7 for such descriptors. Where this has occurred, the full range of codes is available for use by extension of the codes given or by interpolation between them, e.g. in Section 10 (Biotic stress susceptibility) 1 = very low susceptibility and 10 = very high susceptibility;

- (e) when a descriptor is scored using a 1-9 scale, such as in (d), '0' would be scored when (i) the character is not expressed; (ii) a descriptor is inapplicable. In the following example, '0' will be recorded if an accession does not have a central leaf lobe:

Shape of central leaf lobe

3	Toothed
5	Elliptic
7	Linear

- (f) absence/presence of characters is scored as in the following example:

Absence/presence of terminal leaflet

0	Absent
1 (or +)	Present

- (g) blanks are used for information not yet available;
- (h) for accessions which are not generally uniform for a descriptor (e.g. mixed collection, genetic segregation), the mean and standard deviation could be reported where the descriptor is continuous. Where the descriptor is discontinuous, several codes in the order of frequency could be recorded; or other publicized methods can be utilized, such as Rana *et al.* (1991) or van Hintum (1993), that clearly state a method for scoring heterogeneous accessions;
- (i) dates should be expressed numerically in the format YYYYMMDD, where

YYYY	- 4 digits to represent the year
MM	- 2 digits to represent the month
DD	- 2 digits to represent the day.

PASSPORT

1. Accession descriptors

1.1 Accession number

This number serves as a unique identifier for accessions and is assigned when an accession is entered into the collection. Once assigned this number should never be reassigned to another accession in the collection. Even if an accession is lost, its assigned number should never be re-used. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system).

1.2 Donor name

Name of institution or individual responsible for donating the germplasm

1.3 Donor number

Number assigned to an accession by the donor

1.4 Other number(s) associated with the accession

Any other identification number known to exist in other collections for this accession, e.g. USDA Plant Inventory number (not Collecting number, see descriptor 2.3). Other numbers can be added as 1.4.3, etc.

1.4.1 Other number 1

1.4.2 Other number 2

1.5. Scientific name (2.1)

1.5.1 Genus

1.5.2 Species

1.5.3 Subspecies

1.5.4 Botanical variety

1.6 Pedigree

Parentage or nomenclature, and designations assigned to breeders' material

1.7 Accession

1.7.1 Accession name

Either a registered or other formal designation given to the accession

1.7.2 Local language

Language in which the accession name is given

1.7.3 Translation/Transliteration

Provide translation of the local accession name into English

1.7.4 Synonyms

Include here any previous identification other than the current name. Collecting number or newly assigned station name are frequently used as identifiers.

1.8 Acquisition date [YYYYMMDD]

Date on which the accession entered the collection

1.9 Accession size

Approximate number or weight of tubers, seeds, tissue cultures, etc. of an accession in the genebank

1.10 Type of material received

- 1 Zygotic embryo
- 2 Seed
- 3 Plant (including seedling)
- 4 Shoot/bud/stem cutting
- 5 Pollen
- 6 Root/tuber
- 7 Aerial bulbil/tuber
- 8 *In vitro* culture
- 99 Other (specify in descriptor **1.11 Notes**)

1.11 Notes

Any additional information may be specified here

2. Collecting descriptors

2.1 Collecting institute(s)

Name and address of the institute(s) and individuals collecting/sponsoring the collection of the sample(s)

2.2 Site number

Number assigned to the physical site by the collector

2.3 Collecting number

(1.1)

Original number assigned by the collector(s) of the sample, normally composed of the name or initials of the collector(s) followed by a number. This item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent.

2.4 Collecting date of original sample [YYYYMMDD] (1.3)

2.5 Country of collecting (1.4)

Name of the country in which the sample was collected. Use the three-letter abbreviations from the *International Standard (ISO) Codes for the representation of names of countries*, No. 3166, 4th Edition. Copies of these are available from DIN: Deutsche Institut für Normung e.V., D-10772 Berlin, Germany; Tel. 30-2601-2860; Fax 30-2601-1231, Tlx. 184 273-din-d.

2.6 Province/State (1.5)

Name of the primary administrative subdivision of the country in which the sample was collected

2.7 Department/County

Name of the secondary administrative subdivision (within a Province/State) of the country in which the sample was collected

2.8 Location of collecting site (1.6)

Distance in kilometers and direction from the nearest town, village or map grid reference point (e.g. CURITIBA 7S means 7 km south of Curitiba)

2.9 Latitude of collecting site (1.9)

Degrees and minutes followed by N (North) or S (South) (e.g. 1030S). Missing data (minutes) should be indicated with hyphen (e.g. 10—S).

2.10 Longitude of collecting site (1.8)

Degrees and minutes followed by E (East) or W (West) (e.g. 07625W). Missing data (minutes) should be indicated with hyphen (e.g. 076—W).

2.11 Elevation of collecting site [m asl] (1.7)

2.12 Collecting source (1.10)

- 0 Unknown
- 1 Wild habitat
 - 1.1 Forest/woodland
 - 1.2 Shrubland
 - 1.3 Grasslands
 - 1.4 Desert/tundra
- 2 Farm
 - 2.1 Field
 - 2.2 Orchard
 - 2.3 Garden
 - 2.4 Fallow
 - 2.5 Pasture
 - 2.6 Store

- 3 Market
 - 3.1 Town
 - 3.2 Village
 - 3.3 Urban area (around city)
 - 3.4 Other exchange system
- 4 Institute/Research organization
- 99 Other (specify in descriptor **2.27 Collector's notes**)

2.13 Collecting source environment

Use descriptors **6.1.1** to **6.1.22** in section 6

2.14 Status of sample (1.11)

- 0 Unknown
- 1 Wild
- 2 Weedy
- 3 Traditional cultivar/Landrace
- 4 Breeder's line
- 5 Advanced cultivar
- 99 Other (specify in descriptor **2.27 Collector's notes**)

2.15 Type of sample (1.12)

Type of plant material collected. If different types of material were collected from the same source, each sample (type) should be designated with a unique collecting number and a corresponding unique accession number

- 1 Tuber
- 2 Aerial tuber
- 3 Seed
- 4 Stem/vine
- 5 Tuber and seed
- 6 Tuber and plant
- 7 Seed and plant
- 8 Tuber, seed and stem/vine
- 9 Rhizome
- 10 Bulb
- 99 Other (specify which part of the plant is used in **2.27 Collector's notes**)

2.16 Number of plants sampled

2.17 Weight of tuber/seed collected [g]

2.18 Associated flora

Other dominant crop/plant species, including other yam species, cultivated species, found in and around the collecting site

2.19 Cultural practices**2.19.1 Planting site**

- 1 Open flat land
- 2 Hill slope
- 3 Forest
- 4 River bank
- 5 Savannah
- 6 Cerrados (Brazil)
- 7 Home gardens
- 99 Other (specify in descriptor **2.27 Collector's notes**)

2.19.2 Watering

- 1 Rain-fed
- 2 Irrigated
- 3 Both/alternate

2.19.3 Planting method

- 1 Mound
- 2 Ridge
- 3 Trench

2.19.4 Plant population

State number of plants per hectare

- 1 <5000/ha
- 2 5000-10 000/ha
- 3 >10 000/ha

2.19.5 Staking

- 1 Stake
- 2 Branch
- 3 Living trees
- 4 Dead trees
- 5 Trellis
- 99 Other (specify in descriptor **2.27 Collector's notes**)

2.19.6 Harvests per year

- 1 One
- 2 Two

2.19.6.1 Type

- 1 Tuber
- 2 Bulbil
- 3 Both

2.20 Cropping system

- 1 Monoculture
- 2 Mixed with cereals
- 3 Mixed with legumes
- 4 Mixed with cereals and legumes
- 5 Mixed with fruit
- 99 Other (specify crop in descriptor **2.27 Collector's notes**)

2.21 Local/vernacular name (1.2)

Name given by farmer to crop and cultivar/landrace/clone/wild form. State language and dialect if the ethnic group is not provided

2.22 Ethnic group

Name of the ethnic group of the donor of the sample or of the people living in the area of collecting

2.23 Uses of the accession (2.15)

- 1 Staple food
- 2 Occasional food
- 3 Famine reserve food
- 4 Medicinal
- 5 Ceremonial
- 99 Other (specify in descriptor **2.27 Collector's notes**)

2.24 Photograph

Was a photograph(s) taken of the accession or habitat at the time of collecting? If so, provide an identification number(s) in descriptor **2.27 Collector's notes**.

- 0 No
- 1 Yes

2.25 Herbarium specimen

Was a herbarium specimen collected? If so, provide an identification number and indicate in which place (herbarium) the yam specimen was deposited, in descriptor **2.27 Collector's notes**.

- 0 No
- 1 Yes

2.26 Prevailing stresses

Information on associated biotic and abiotic stresses and the accession's reaction. Specify stresses in descriptor **2.27 Collector's notes**.

2.27 Collector's notes

Additional information recorded by the collector or any specific information on any state in any of the above descriptors

MANAGEMENT

3. Management descriptors

- 3.1 Accession number** (Passport 1.1)
- 3.2 Population identification** (Passport 2.3)
Collecting number, pedigree, cultivar name, etc., depending on the population type
- 3.3 Storage address**
(Building, room, shelf numbers/location in medium- and/or long-term storage)
- 3.4 Storage date** [YYYYMMDD]
- 3.5 Seed germination at storage (initial)** [%]
- 3.6 Date of last seed germination test** [YYYYMMDD]
- 3.7 Seed germination at the last test** [%]
- 3.8 Date of next test** [YYYYMMDD]
Estimated date when the accession should next be tested
- 3.9 Moisture content at harvest** [%]
- 3.10 Moisture content at storage (initial)** [%]
- 3.11 Number of tubers in storage(s)** (Passport 1.9)
- 3.12 Amount of seed in storage(s)** [g or number] (Passport 1.9)
- 3.13 Number of rhizomes in storage(s)**
- 3.14 Number of bulbils in storage(s)**
- 3.15 Duplication at other location(s)** (Passport 1.4)
- 3.16 *In vitro* conservation**

- 3.16.1 Type of explant**
 - 1 Apical or axillary meristem
 - 2 Nodal cutting
 - 3 Zygotic embryo
 - 4 Seed
 - 99 Other (specify in descriptor **4.15 Notes**)

- 3.16.2 Date of introduction** [YYYYMMDD]

- 3.16.3 Type of subcultured material**
 - 1 Axillary shoot
 - 2 Callus
 - 3 Cell suspension
 - 99 Other (specify in descriptor **4.15 Notes**)

- 3.16.4 Regeneration process**
 - 1 Organogenesis
 - 2 Somatic embryogenesis
 - 99 Other (specify in descriptor **4.15 Notes**)

- 3.16.5 Number of plants at the establishment**
(Number of replicates)

- 3.16.6 Last subculture date** [YYYYMMDD]

- 3.16.7 Medium used at the last subculture**

- 3.16.8 Number of plants at the last subculture**

- 3.16.9 Location after the last subculture**

4. Multiplication/regeneration descriptors

- 4.1 Accession number** (Passport 1.1)

- 4.2 Population identification** (Passport 2.3)
Collecting number, pedigree, cultivar name, etc., depending on the population type

- 4.3 Field plot number**

- 4.4 Multiplication/regeneration site location**

- 4.5 Collaborator**

4.6 Planting date [YYYYMMDD]

4.7 Cultural practices

4.7.1 Field spacing

4.7.1.1 Distance between plants [cm]

4.7.1.2 Distance between rows [cm]

4.7.1.3 Fertilizer application

4.8 Status of accession

1 Harvested every year

2 Maintained perennial

4.9 Plant/seedling vigour

Assessed at 45 days after emergence for seed crops and at 90 days for tuber/rhizome crop

3 Low

5 Medium

7 High

4.10 Number of plants established

4.11 Previous multiplication and/or regeneration

4.11.1 Location

4.11.2 Sowing/planting date [YYYYMMDD]

4.11.3 Plot number

4.12 Date of last regeneration or multiplication [YYYYMMDD]

4.13 Number of times accession regenerated

(Seeds, tubers, tissue cultures, bulbils and cryogenic storage). Since the date of acquisition

4.14 Number of plants used in each regeneration/multiplication

4.15 Notes

Any additional information may be specified here

ENVIRONMENT AND SITE

5. Characterization and/or evaluation site descriptors

5.1 Country of characterization and/or evaluation

(See instructions in descriptor 2.5 Country of collecting)

5.2 Site (research institute)

5.2.1 Latitude

Degrees and minutes followed by N (North) or S (South) (e.g. 1030S). Missing data (minutes) should be indicated with hyphen (e.g. 10—S).

5.2.2 Longitude

Degrees and minutes followed by E (East) or W (West) (e.g. 07625 W). Missing data (minutes) should be indicated with hyphen (e.g. 076—W).

5.2.3 Elevation [m asl]

5.2.4 Name and address of farm or institute

5.3 Evaluator's name and address

5.4 Planting date [YYYYMMDD]

5.5 Harvest date [YYYYMMDD]

5.6 Evaluation environment

Environment in which characterization/evaluation was carried out

- 1 Field
- 2 Screenhouse
- 3 Glasshouse
- 4 Laboratory
- 99 Other (specify in descriptor 5.14 Notes)

5.7 Type of planting material

- 1 Seed
- 2 Entire tuber
- 3 Tuber piece
- 4 Bulbil
- 5 Tissue culture plantlet (specify)
- 6 Stem cutting
- 7 Rhizome and bulb
- 99 Other (specify in descriptor 5.14 Notes)

5.8 Field establishment [%]

Percentage of plants established

5.8.1 Days to establishment [d]

Specify number of days from sowing/planting after which establishment is measured

5.9 Planting site in the field

Give block, strip and/or row/plot numbers as applicable, plants/plot, replication

5.10 Field spacing

- 1 Single hedge
- 2 Double/triple hedge

5.10.1 Distance between plants in a row [cm]

5.10.2 Distance between rows [cm]

5.11 Environmental characteristics of site

Use descriptors 6.1.1 to 6.1.22 in section 6

5.12 Fertilizer

Specify types, doses, frequency of each and method of application

5.13 Plant protection

Specify pesticides used, doses, frequency of each and method of application

5.14 Notes

Any other site-specific information

6. Collecting and/or characterization/evaluation site environment descriptors

6.1 Site environment

6.1.1 Topography

This refers to the profile in elevation of the land surface on a broad scale.

The reference is FAO (1990)

1	Flat	0 - 0.5%
2	Almost flat	0.6 - 2.9%
3	Gently undulating	3 - 5.9%
4	Undulating	6 - 10.9%
5	Rolling	11 - 15.9%
6	Hilly	16 - 30%
7	Steeply dissected	>30%, moderate elevation range
8	Mountainous	>30%, great elevation range (>300 m)
99	Other	(specify in appropriate section's Notes)

6.1.2 Higher level landform (general physiographic features)

The landform refers to the shape of the land surface in the area in which the site is located (adapted from FAO 1990)

1	Plain	5	Upland
2	Basin	6	Hill
3	Valley	7	Mountain
4	Plateau		

6.1.3 Land element and position

Description of the geomorphology of the immediate surroundings of the site (adapted from FAO 1990). (See Fig. 1)

1	Plain level	17	Interdunal depression
2	Escarpment	18	Mangrove
3	Interfluvium	19	Upper slope
4	Valley	20	Midslope
5	Valley floor	21	Lower slope
6	Channel	22	Ridge
7	Levee	23	Beach
8	Terrace	24	Beachridge
9	Floodplain	25	Rounded summit
10	Lagoon	26	Summit
11	Pan	27	Coral atoll
12	Caldera	28	Drainage line (bottom position in flat or almost-flat terrain)
13	Open depression	29	Coral reef
14	Closed depression	99	Other (specify in appropriate section's Notes)
15	Dune		
16	Longitudinal dune		

6.1.4 Slope [°]

Estimated slope of the site

6.1.5 Slope aspect

The direction that the slope on which the accession was collected faces. Describe the direction with symbols N, S, E, W (e.g. a slope that faces a southwestern direction has an aspect of SW)

6.1.6 Crop agriculture

(From FAO 1990)

- 1 Annual field cropping
- 2 Perennial field cropping

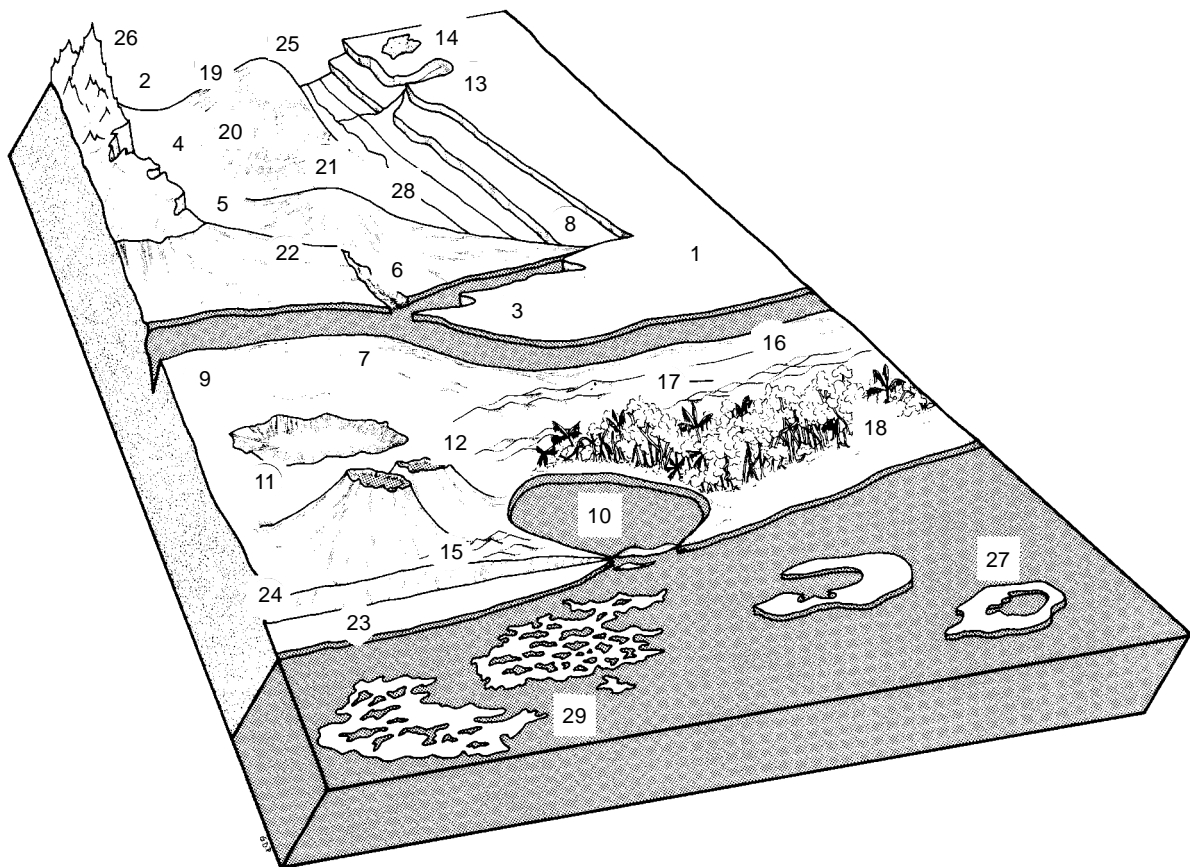


Fig. 1. Land element and position

6.1.7 Overall vegetation surrounding and at the site

(Adapted from FAO 1990)

- 1 Grassland (Grasses, subordinate forbs, no woody species)
- 2 Forbland (Herbaceous plants predominant)
- 3 Forest (Continuous tree layer, crowns overlapping, large number of tree and shrub species in distinct layers)
- 4 Woodland (Continuous tree layer, crowns usually not touching, understorey may be present)
- 5 Shrubland (Continuous layer of shrubs, crowns touching)
- 6 Savanna (Grasses with a discontinuous layer of trees or shrubs)
- 99 Other (specify in appropriate section's Notes)

6.1.8 Soil parent material

(Adapted from FAO 1990)

Two lists of examples of parent material and rock are given below. The reliability of the geological information and the knowledge of the local lithology will determine whether a general or a specific definition of the parent material can be given. Saprolite is used if the *in situ* weathered material is thoroughly decomposed, clay-rich but still showing rock structure. Alluvial deposits and colluvium derived from a single rock type may be further specified by that rock type.

6.1.8.1 Unconsolidated material

- | | |
|----------------------------------|---|
| 1 Aeolian deposits (unspecified) | 10 Volcanic ash |
| 2 Aeolian sand | 11 Loess |
| 3 Littoral deposits | 12 Pyroclastic deposits |
| 4 Lagoonal deposits | 13 Glacial deposits |
| 5 Marine deposits | 14 Organic deposits |
| 6 Lacustrine deposits | 15 Colluvial deposits |
| 7 Fluvial deposits | 16 <i>In situ</i> weathered |
| 8 Alluvial deposits | 17 Saprolite |
| 9 Unconsolidated (unspecified) | 99 Other (specify in appropriate section's Notes) |

6.1.8.2 Rock type

(Adapted from FAO 1990)

1	Acid igneous/ metamorphic rock	16	Limestone
2	Granite	17	Dolomite
3	Gneiss	18	Sandstone
4	Granite/gneiss	19	Quartzitic sandstone
5	Quartzite	20	Shale
6	Schist	21	Marl
7	Andesite	22	Travertine
8	Diorite	23	Conglomerate
9	Basic igneous/ metamorphic rock	24	Siltstone
10	Ultra basic rock	25	Tuff
11	Gabbro	26	Pyroclastic rock
12	Basalt	27	Evaporite
13	Dolerite	28	Gypsum rock
14	Volcanic rock	99	Other (specify in appropriate section's Notes)
15	Sedimentary rock	0	Not known

6.1.9 Stoniness/rockiness/hardpan/cementation

- 1 Tillage unaffected
- 2 Tillage affected
- 3 Tillage difficult
- 4 Tillage impossible
- 5 Essentially paved

6.1.10 Soil drainage

(Adapted from FAO 1990)

- 3 Poorly drained
- 5 Moderately drained
- 7 Well drained

6.1.11 Soil salinity

- 1 <160 ppm dissolved salts
- 2 160 - 240 ppm
- 3 241 - 480 ppm
- 4 >480 ppm

6.1.12 Soil depth to groundwater table

(Adapted from FAO 1990)

The depth to the groundwater table, if present, as well as an estimate of the approximate annual fluctuation, should be given. The maximum rise of the groundwater table can be inferred approximately from changes in profile colour in many, but not all, soils.

- 1 0 - 25 cm
- 2 25.1 - 50 cm
- 3 50.1 - 100 cm
- 4 100.1 - 150 cm
- 5 >150 cm

6.1.13 Soil matrix colour

(Adapted from FAO 1990)

The colour of the soil matrix material in the root zone around the accession is recorded in the moist condition (or both dry and moist condition, if possible) using the notation for hue, value and chroma as given in the Munsell Soil Color Charts (Munsell 1975). If there is no dominant soil matrix colour, the horizon is described as mottled and two or more colours are given and should be registered under uniform conditions. Early morning and late evening readings are not accurate. Provide depth of measurement (cm). If colour chart is not available, the following states may be used:

- | | | |
|-----------------|--------------------|-----------------|
| 1 White | 7 Reddish brown | 13 Greyish |
| 2 Red | 8 Yellowish brown | 14 Blue |
| 3 Reddish | 9 Yellow | 15 Bluish-black |
| 4 Yellowish red | 10 Reddish yellow | 16 Black |
| 5 Brown | 11 Greenish, green | |
| 6 Brownish | 12 Grey | |

6.1.14 Soil pH

Actual value of the soil within the following root depths around the accession

- 6.1.14.1 pH at 10-15 cm
- 6.1.14.2 pH at 16-30 cm
- 6.1.14.3 pH at 31-60 cm
- 6.1.14.4 pH at 61-90 cm

6.1.15 Soil erosion

- 3 Low
- 5 Intermediate
- 7 High

6.1.16 Rock fragments

(Adapted from FAO 1990)

Large rock and mineral fragments (>2 mm) are described according to abundance

- 1 0 - 2%
- 2 2.1 - 5%
- 3 5.1 - 15%
- 4 15.1 - 40%
- 5 40.1 - 80%
- 6 >80%

6.1.17 Soil texture classes

(Adapted from FAO 1990)

For convenience in determining the texture classes of the following list, particle size classes are given for each of the fine earth fractions below. (See Fig. 2)

- | | |
|--------------------|-------------------------|
| 1 Clay | 12 Coarse sandy loam |
| 2 Loam | 13 Loamy sand |
| 3 Clay loam | 14 Loamy very fine sand |
| 4 Silt | 15 Loamy fine sand |
| 5 Silty clay | 16 Loamy coarse sand |
| 6 Silty clay loam | 17 Very fine sand |
| 7 Silt loam | 18 Fine sand |
| 8 Sandy clay | 19 Medium sand |
| 9 Sandy clay loam | 20 Coarse sand |
| 10 Sandy loam | 21 Sand, unsorted |
| 11 Fine sandy loam | 22 Sand, unspecified |

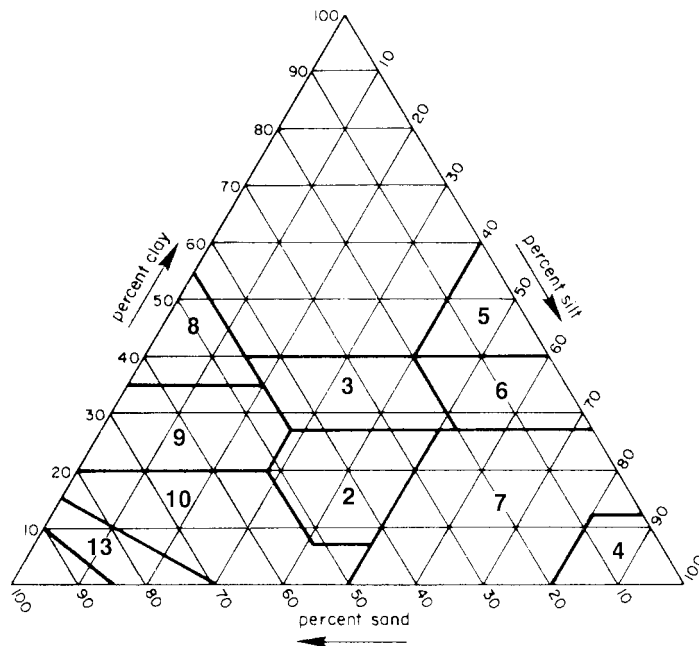


Fig. 2. Soil texture classes

6.1.17.1 Soil particle size classes

(Adapted from FAO 1990)

1	Clay	< 2 µm
2	Fine silt	2 - 20 µm
3	Coarse silt	21 - 63 µm
4	Very fine sand	64 - 125 µm
5	Fine sand	126 - 200 µm
6	Medium sand	201 - 630 µm
7	Coarse sand	631 - 1250 µm
8	Very coarse sand	1251 - 2000 µm

6.1.18 Soil organic matter content

- 1 Nil (as in arid zones)
- 2 Low (as in long-term cultivation in a tropical setting)
- 3 Medium (as in recently cultivated but not yet much depleted)
- 4 High (as in never cultivated, and in recently cleared from forest)
- 5 Peaty

6.1.19 Soil taxonomic classification

As detailed a classification as possible should be given. This may be taken from a soil survey map. State class (e.g. Alfisols, Spodosols, Vertisols, etc.).

6.1.20 Water availability

- 1 Rain-fed
- 2 Irrigated
- 3 Flooded
- 4 River banks
- 5 Sea coast
- 99 Other (specify in appropriate section's Notes)

6.1.21 Soil fertility

General assessment of the soil fertility based on existing vegetation

- 3 Low
- 5 Moderate
- 7 High

6.1.22 Climate of the site

Should be assessed as close to the site as possible

6.1.22.1 Temperature [°C]

Provide either the monthly (mean, maximum, minimum) or the seasonal (mean, maximum, minimum)

6.1.22.2 Dry season length [d]

6.1.22.3 Rainfall [mm]

Annual average (state number of recorded years)

6.1.22.4 Wind [km/s]

Annual average (state number of years recorded)

6.1.22.4.1 Frequency of typhoons or hurricane force winds

3 Low

5 Intermediate

7 High

6.1.22.4.2 Date of most recent typhoons or hurricane force winds [YYYYMMDD]

6.1.22.4.3 Annual maximum wind velocity [km/s]

6.1.22.5 Frost

6.1.22.5.1 Date of most recent frost [YYYYMMDD]

6.1.22.5.2 Minimum temperature [°C]

Specify seasonal average and minimum survival temperature

6.1.22.5.3 Duration of temperature below 0°C [d]

6.1.22.6 Relative humidity

6.1.22.6.1 Relative humidity diurnal range [%]

6.1.22.6.2 Relative humidity seasonal range [%]

6.1.22.7 Light

3 Shady

7 Sunny

6.1.22.8 Daylength [h]

Provide either the monthly (mean, maximum, minimum) or the seasonal (mean, maximum, minimum)

CHARACTERIZATION

7. Plant descriptors

7.1 Stem characteristics

(Young stem)

7.1.1 Days to emergence [d]

Number of days between planting and emergence

7.1.2 Stem length [cm]

Assessed at 20 days after emergence. Mean of 10 plants

7.1.3 Internode number [number]

Assessed at 20 days after emergence

7.1.4 Stem colour

(2.4.9)

Assessed at 20 days after emergence

- 1 Green
- 2 Purplish green
- 3 Brownish green
- 4 Dark brown
- 5 Purple
- 99 Other (specify in descriptor 7.7 Notes)

7.1.5 Absence/presence of waxiness

- 0 Absent
- 1 Present

7.1.6 Absence/presence of wings

- 0 Absent
- 1 Present

7.1.7 Wing colour

Assessed at 20 days after emergence

- 1 Green
- 2 Green with purple edges
- 3 Purple
- 99 Other (specify in descriptor 7.7 Notes)

7.1.8 Absence/presence of hairs

- 0 Absent
- 1 Present

7.1.9 Absence/presence of spines

- 0 Absent
- 1 Present

7.1.10 Absence/presence of coloured spot at spine base

Assessed at 30 days after emergence

- 0 Absent
- 1 Present

7.1.11 Absence/presence of barky patches

Assessed at 30 days after emergence

- 0 Absent
- 1 Present

(Mature stem - before senescence)**7.1.12 Plant type**

(2.4.3)

- 1 Dwarf
- 2 Shrub-like
- 3 Climbing

7.1.13 Vigour

- 3 Low
- 5 Intermediate
- 7 High

7.1.14 Twining habit

(2.4.1)

- 0 No
- 1 Yes

7.1.15 Twining direction

(2.4.2)

- 1 Clockwise (climbing to the left)
- 2 Anticlockwise (climbing to the right)

7.1.16 Stem height

- 1 <2 m
- 2 2-10 m
- 3 >10 m

7.1.17 Number of stems per plant

7.1.18 Stem colour

- 1 Green
- 2 Purplish green
- 3 Brownish green
- 4 Dark brown
- 5 Purple
- 99 Other (specify in descriptor 7.7 Notes)

7.1.19 Number of internodes to first branching

7.1.20 Branching

(2.4.4)

Record the number of branches above ground

7.1.21 Stem diameter [cm]

At 15 cm from the base of the plant

7.1.22 Stem cross-section shape at base

- 1 Square
- 2 Quadrangular
- 3 Octagonal
- 4 Round
- 99 Other (specify in descriptor 7.7 Notes)

7.1.23 Internode length [cm]

Recorded at 1 m height. Average of five plants

7.1.24 Absence/presence of waxiness

- 0 Absent
- 1 Present

7.1.25 Absence/presence of wings

- 0 Absent
- 1 Present

7.1.25.1 Wing position

- 1 At the base
- 2 Above base

7.1.26 Wing size

Recorded at 1 m height

- 1 <1 mm
- 2 1-2 mm
- 3 >2 mm

- 7.1.27 Wing colour**
1 Green
2 Green with purple edge
3 Purple
99 Other (specify in descriptor 7.7 Notes)
- 7.1.28 Absence/presence of ridges**
0 Absent
1 Present
- 7.1.29 Hairiness** (2.4.8)
3 Sparse
7 Dense
- 7.1.30 Shape of hair**
1 Stellate
2 T-shaped
3 Simple
99 Other (specify in descriptor 7.7 Notes)
- 7.1.31 Wrinkled surface**
0 No
1 Yes
- 7.1.32 Absence/presence of scale leaves**
0 Absent
1 Present
- 7.1.33 Scale leaf position**
1 Alternate
2 Opposite
3 Both
4 Verticillate
- 7.1.34 Spines on stem base** (2.4.6, 2.4.7)
3 Few
7 Many
- 7.1.35 Spines on stem above base**
3 Few
7 Many

7.1.36 Spine position

- 1 Wings
- 2 Ridges
- 3 Stem

7.1.37 Spine shape

- 1 Straight
- 2 Curved upwards
- 3 Curved downwards

7.1.38 Spine length

Mean of 20 spines located approximately between the first 0.5 to 1.5 m stem length

- 3 Short
- 5 Intermediate
- 7 Long

7.1.39 Absence/presence of coalescent spines

- 0 Absent
- 1 Present

7.1.40 Colour of spot at spine base

- 1 Red
- 2 Purple
- 3 Maroon
- 99 Other (specify in descriptor 7.7 Notes)

7.2 Leaves

(Young leaves)

7.2.1 First leaf emergence

(2.5.1)

- 1 Early
- 2 Late

7.2.2 Number of leaves

Recorded at 30 days after emergence

7.2.3 Leaf colour

- 1 Yellowish
- 2 Pale green
- 3 Dark green
- 3 Purplish green
- 4 Purple
- 99 Other (specify in descriptor 7.7 Notes)

- 7.2.4 Leaf margin colour**
1 Green
2 Purple
99 Other (specify in descriptor 7.7 Notes)
- 7.2.5 Vein colour**
1 Yellowish
2 Green
3 Pale purple
4 Purple
99 Other (specify in descriptor 7.7 Notes)
- 7.2.6 Petiole colour**
1 All green with purple base
2 All green with purple leaf junction
3 All green with purple at both ends
4 All purplish green with purple base
5 All purplish green with purple leaf junction
6 All purplish green with purple at both ends
7 Green
8 Purple
9 Brownish green
10 Brown
11 Dark brown
99 Other (specify in descriptor 7.7 Notes)
- 7.2.7 Petiole wing colour**
1 Green
2 Green with purple edges
3 Purple
99 Other (specify in descriptor 7.7 Notes)
- 7.2.8 Hairiness of upper/lower surface of leaf**
1 Upper surface
2 Lower surface
3 Both

(Mature leaves)

- 7.2.9 Position of leaves**
1 Alternate
2 Opposite
3 Alternate at base/opposite above
99 Other (specify in descriptor 7.7 Notes)

- 7.2.10 **Leaf density**
 - 3 Low
 - 5 Intermediate
 - 7 High

- 7.2.11 **Internode number to fully expanded leaf** [number]

- 7.2.12 **Leaf type** (2.5.3)
 - 1 Simple
 - 2 Compound
 - 7.2.12.1 **Leaf margin**
 - 1 Entire
 - 2 Serrate

 - 7.2.12.2 **Leaf lobation**
 - 1 Shallowly lobed
 - 2 Deeply lobed

- 7.2.13 **Number of leaflets in compound leaf**
 - 1 Mainly 3 (trifoliate)
 - 2 Mainly 5 (quinate)
 - 3 More than 5

- 7.2.14 **Leatheriness**
 - 0 No
 - 1 Yes

- 7.2.15 **Leaf colour**
 - 1 Yellowish
 - 2 Pale green
 - 3 Dark green
 - 4 Purplish green
 - 5 Purple
 - 99 Other (specify in descriptor 7.7 **Notes**)

- 7.2.16 **Leaf vein colour (upper surface)**
 - 1 Yellowish
 - 2 Green
 - 3 Pale purple
 - 4 Purple
 - 99 Other (specify in descriptor 7.7 **Notes**)

- 7.2.17 Leaf vein colour (lower surface)**
- 1 Yellowish
 - 2 Green
 - 3 Pale purple
 - 4 Purple
 - 99 Other (specify in descriptor 7.7 Notes)
- 7.2.18 Leaf margin colour**
- 1 Green
 - 2 Purple
 - 99 Other (specify in descriptor 7.7 Notes)
- 7.2.19 Hairiness of upper surface** (2.5.6)
- 3 Sparse
 - 7 Dense
- 7.2.20 Hairiness of lower surface** (2.5.7)
- 3 Sparse
 - 7 Dense
- 7.2.21 Waxiness of upper/lower surface** (2.5.8, 2.5.9)
- 1 Waxy upper surface
 - 2 Waxy lower surface
 - 3 Both
- 7.2.22 Leaf shape** (2.5.5)
(See Fig. 3)
- 1 Ovate
 - 2 Cordate
 - 3 Cordate long
 - 4 Cordate broad
 - 5 Sagittate long
 - 6 Sagittate broad
 - 7 Hastate
 - 99 Other (specify in descriptor 7.7 Notes)

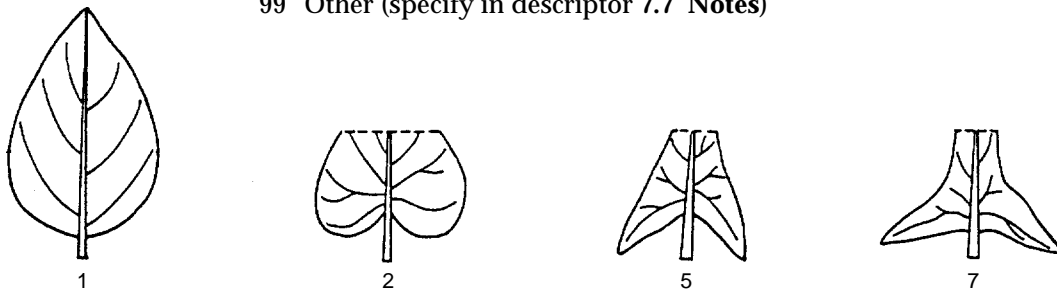


Fig. 3. Leaf shape

7.2.23 Leaf apex shape

(See Fig. 4)

- 1 Obtuse
- 2 Acute
- 3 Emarginate
- 99 Other (specify in descriptor 7.7 Notes)

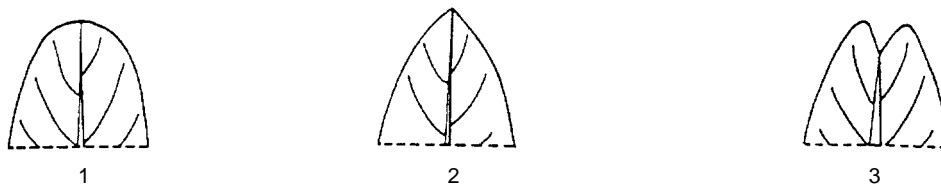


Fig. 4. Leaf apex shape

7.2.24 Undulation of leaf

- 3 Few
- 7 Many

7.2.25 Distance between lobes

(See Fig. 5)

- 1 No measurable distance
- 5 Intermediate
- 9 Very distant

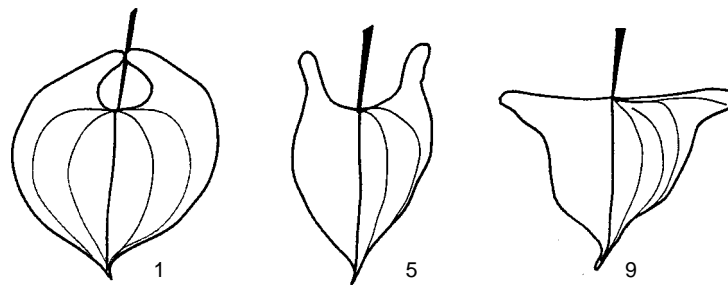


Fig. 5. Distance between lobes

7.2.26 Upward folding of leaf along main vein

- 3 Weak
- 7 Strong

7.2.27 Downward arching of leaf along main vein

- 0 No
- 1 Yes

7.2.28 Upward folding of leaf lobes to form a cup
 0 No
 1 Yes

7.2.29 Downward arching of leaf lobes
 0 No
 1 Yes

7.2.30 Leaf measurement [cm] (2.5.4)
 Observed on 20 adult leaves. (See Fig. 6)

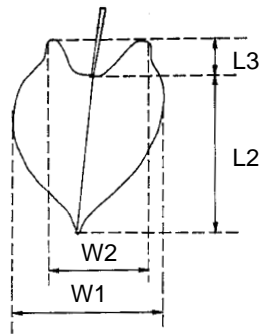


Fig. 6. Leaf measurement

7.2.31 Position of the widest part of the leaf
 1 Third upper
 2 Middle
 3 Third lower

7.2.32 Tip length (2.6.5)
 1 <2 mm
 2 2-5 mm
 3 >5 mm

7.2.33 Tip colour
 1 Light green
 2 Dark green
 3 Purple/green
 4 Red
 99 Other (specify in descriptor 7.7 Notes)

7.2.34 Petiole length
 1 ≤5 cm
 2 6-9 cm
 3 ≥10 cm

7.2.35 Petiole length in correlation to leaf blade

(See Fig. 6)

- 3 Short (<2 cm)
- 5 Medium (=2 cm)
- 7 Long (>2 cm)

7.2.36 Hairiness of petiole

- 3 Sparse
- 7 Dense

7.2.37 Petiole colour

- 1 All green with purple base
- 2 All green with purple leaf junction
- 3 All green with purple at both ends
- 4 All purplish green with purple base
- 5 All purplish green with purple leaf junction
- 6 All purplish green with purple at both ends
- 7 Green
- 8 Purple
- 9 Brownish green
- 10 Brown
- 11 Dark brown
- 99 Other (specify in descriptor 7.7 Notes)

7.2.38 Petiole wing colour

- 1 Green
- 2 Green with purple edges
- 3 Purple
- 99 Other (specify in descriptor 7.7 Notes)

7.2.39 Spininess of petiole

(2.5.13)

- 3 Sparse
- 7 Dense

7.2.40 Absence/presence of stipules

(2.6.1)

- 0 Absent
- 1 Present

7.3 Flowering

7.3.1 Flowering

(2.7.1)

- 0 No flowering
- 1 Flowering in some years
- 2 Every year

7.3.2 Days to flowering after emergence [d] (2.7.9)

7.3.3 Sex (2.7.2)

- 1 Female
- 2 Male
- 3 Female and male (predominantly female)
- 4 Male and female (predominantly male)

7.3.4 Inflorescence position

(In relation to branches)

- 1 Pointing upwards
- 2 Pointing downwards

7.3.5 Number of inflorescences per plant (2.7.4)

Observed on 10 plants

- 1 ≤ 10
- 2 11 - 29
- 3 ≥ 30

7.3.6 Inflorescence smell

- 0 Absent
- 1 Present

7.3.7 Inflorescence type

(See Fig. 7)

- 1 Spike
- 2 Raceme
- 3 Panicle
- 99 Other (specify in descriptor 7.7 Notes)

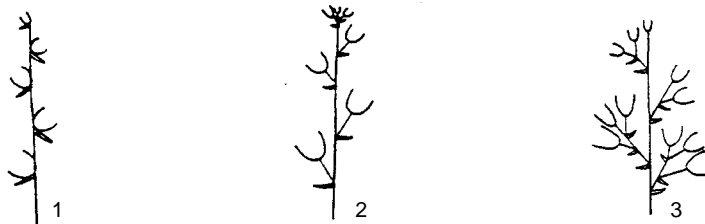


Fig. 7. Inflorescence type

7.3.8 Average length of inflorescence (2.7.3)

- 1 ≤ 5 cm
- 2 6 - 10 cm
- 3 11 - 15 cm
- 4 ≥ 16 cm

- 7.3.9 **Number of inflorescences per internode**
- 7.3.10 **Number of female flowers per inflorescence** (2.7.5)
 - 1 ≤10
 - 2 11 - 25
 - 3 26 - 100
 - 4 ≥101
- 7.3.11 **Flower colour** (2.7.6)
 - 1 Purplish
 - 2 White
 - 3 Yellowish
 - 99 Other (specify in descriptor 7.7 Notes)
- 7.3.12 **Female flower length** (2.7.7)
 - 1 ≤2.5 cm
 - 2 2.6 - 5 cm
 - 3 ≥5.1 cm
- 7.3.13 **Female flower diameter** [mm]
- 7.3.14 **Male flower diameter** (2.7.8)
 - 1 ≤2 mm
 - 2 3 - 5 mm
 - 3 >5 mm
- 7.3.15 **Male flower length** [cm]
- 7.4 **Fruit**
 - 7.4.1 **Fruit formation** (2.8.1)
 - 0 No
 - 1 Yes
 - 7.4.2 **Fruit development**
 - 1 Mostly well developed
 - 2 Mostly poorly developed
 - 7.4.3 **Fruit position**
 - 1 Pointing upward
 - 2 Pointing downward

-
- 7.4.4 **Fruit shape** (2.8.2)
1 Equal in length and width
2 Elongated
3 Trilobated capsule
- 7.4.5 **Fruit size** (2.8.3)
1 <3 cm
2 ≥3 cm
- 7.4.6 **Hairiness** (2.8.5)
3 Sparse
7 Dense
- 7.4.7 **Absence/presence of waxiness** (2.8.6)
0 Absent
1 Present
- 7.4.8 **Absence/presence of dark spot inside fruits**
0 Absent
1 Present
- 7.4.9 **Absence/presence of seeds**
0 Absent
1 Present
- 7.4.10 **Seed shape**
1 Elongate-oblong
2 Circular
99 Other (specify in descriptor 7.7 Notes)
- 7.4.11 **Seed wing structure** (2.8.7)
1 Wing all round embryo
2 Wing on either side of embryo
3 Wing on one side of embryo
- 7.4.12 **Number of fully developed seeds**
- 7.5 **Aerial tubers**
- 7.5.1 **Absence/presence of aerial tuber** (2.9.1)
0 Absent
1 Present

- 7.5.2 Aerial tuber shape** (2.9.2)
- 1 Round
 - 2 Oval
 - 3 Irregular (not uniform)
 - 4 Elongate
- 7.5.3 Aerial tuber diameter**
- 1 ≤1 cm
 - 2 2-5 cm
 - 3 6-10 cm
 - 4 >10 cm
- 7.5.4 Skin colour** (2.9.3)
- 1 Greyish
 - 2 Light brown
 - 3 Dark brown
 - 99 Other (specify in descriptor 7.7 Notes)
- 7.5.5 Surface texture** (2.9.5)
- 1 Smooth
 - 2 Wrinkled
 - 3 Rough
- 7.5.6 Absence/presence of bumps**
- 0 Absent
 - 1 Present
- 7.5.7 Skin thickness** (2.9.6)
- 3 Thin
 - 7 Thick
- 7.5.8 Flesh colour** (2.9.4)
- 1 White
 - 2 Yellowish white or off-white
 - 3 Yellow
 - 4 Orange
 - 5 Light purple
 - 6 Purple
 - 7 Purple with white
 - 8 White with purple
 - 9 Outer purple/inner yellowish
 - 99 Other (specify in descriptor 7.7 Notes)

7.6 Underground tubers

7.6.1 Absence/presence of underground tubers

- 0 Absent
- 1 Present

7.6.1.1 Type

- 1 Tuber
- 2 Rhizome

7.6.2 Maturity (tubers) after emergence (2.3.2)

Specify months

- 1 Up to 6 months
- 2 7-8 months
- 3 9-10 months

The following descriptors will be recorded at harvest time

7.6.3 Tuber growth (2.3.1)

- 1 Annual (tuber renewed every year)
- 2 Perennial (tuber increasing in size every year)

7.6.4 Number of tubers per hill (2.10.1)

- 1 One
- 2 Few (2-5)
- 3 Several (>5)

7.6.5 Relationship of tubers (2.10.2)

- 1 Completely separate and distant
- 2 Completely separate but close together
- 3 Fused at neck

7.6.6 Absence/presence of corms

- 0 Absent
- 1 Present

7.6.7 Corm size (2.10.4)

(In relation to tuber size)

- 3 Small
- 5 Intermediate
- 7 Large

- 7.6.8 Corm ability to be separated from tuber**
0 No
1 Yes
- 7.6.9 Corm type** (2.10.3)
1 Regular
2 Transversally elongated
3 Branched
- 7.6.10 Absence/presence of rhizome** (2.3.3)
0 Absent
1 Present
- 7.6.11 Spininess of roots** (2.11.1)
3 Sparse
7 Dense
- 7.6.12 Absence/presence of anchor roots** (2.11.2)
0 Absent
1 Present
- 7.6.13 Sprouting at harvest**
0 No
1 Yes

The following descriptors will be recorded a few days after harvest

- 7.6.14 Tuber shape** (2.10.5)
1 Round
2 Oval
3 Oval-oblong
4 Cylindrical
5 Flattened
6 Irregular
99 Other (specify in descriptor 7.7 Notes)
- 7.6.15 Tendency of tuber to branch**
3 Slightly branched
5 Branched
7 Highly branched

- 7.6.16 Place where tuber branches**
1 Upper third
2 Middle
3 Lower third
- 7.6.17 Tuber length** (2.10.6)
1 ≤20 cm
2 21 - 40 cm
3 ≥41 cm
- 7.6.18 Tuber width [cm]**
Recorded at the widest part
- 7.6.19 Roots on the tuber surface**
3 Few
7 Many
- 7.6.19.1 Spiny roots on the tuber surface**
3 Few
7 Many
- 7.6.20 Place of roots on the tuber**
1 Lower
2 Middle
3 Upper
4 Entire tuber
- 7.6.21 Prickly appearance of the tuber**
0 No
1 Yes
- 7.6.22 Wrinkles on tuber surface** (2.10.8)
3 Few
7 Many
- 7.6.23 Absence/presence of blisters on tuber surface**
Non-prickly blisters on the tuber surface (i.e. blisters appear different from those with a prickly appearance)
0 Absent
1 Present
- 7.6.24 Absence/presence of cracks on the tuber surface**
0 Absent
1 Present

- 7.6.25 Tuber skin thickness** (2.10.7)
1 <1 mm
2 ≥1 mm

- 7.6.26 Tuber skin colour (beneath the bark)**
1 Light maroon
2 Dark maroon
3 Greyish
99 Other (specify in descriptor 7.7 Notes)

- 7.6.27 Sprouting** [%]
Recorded after harvest

- 7.6.27.1 Number of months**
1 0 - 2 months
2 2 - 4 months
3 > 4 months

The following descriptors will be recorded at planting

- 7.6.28 Hardness of tuber**
(When cut with a knife)
1 Hard
2 Easy

- 7.6.29 Skin colour at head of the tuber** (2.10.10)
1 White
2 Yellowish white or off-white
3 Yellow
4 Orange
5 Light purple
6 Purple
7 Purple with white
8 White with purple
9 Outer purple/inner yellowish
99 Other (specify in descriptor 7.7 Notes)

- 7.6.30** **Flesh colour at central transverse cross-section** (2.10.11)
- 1 White
 - 2 Yellowish white or off-white
 - 3 Yellow
 - 4 Orange
 - 5 Light purple
 - 6 Purple
 - 7 Purple with white
 - 8 White with purple
 - 9 Outer purple/inner yellowish
 - 99 Other (specify in descriptor 7.7 Notes)
- 7.6.31** **Flesh colour of lower part of tuber**
- 1 White
 - 2 Yellowish white or off-white
 - 3 Yellow
 - 4 Orange
 - 5 Light purple
 - 6 Purple
 - 7 Purple with white
 - 8 White with purple
 - 9 Outer purple/inner yellowish
 - 99 Other (specify in descriptor 7.7 Notes)
- 7.6.32** **Uniformity of flesh colour in cross-section**
(From cortex to centre)
- 0 No
 - 1 Yes
- 7.6.33** **Texture of flesh**
- 1 Smooth
 - 2 Grainy
 - 3 Very grainy
- 7.6.34** **Time for flesh oxidation after cutting**
- 1 <1 min
 - 2 1-2 min
 - 3 >2 min
- 7.6.35** **Flesh oxidation colour**
- 1 Grey
 - 2 Purple
 - 3 Orange
 - 99 Other (specify in descriptor 7.7 Notes)

7.6.36 Amount of gum released by cut tuber

- 3 Low
- 5 Intermediate
- 7 High

7.6.37 Ability of cut tuber to irritate human skin

(When tuber is rubbed on the arm)

- 3 Low
- 7 High

7.7 Notes

Any additional information, especially in the category of 'other' under various descriptors above, may be specified here

EVALUATION

8. Plant descriptors

8.1 Yield

Specify if:

- 1 Underground tuber
- 2 Aerial tuber
- 3 Both

8.1.1 Total number of harvested tubers

Calculated on 10 plants per accession. At harvest

8.1.2 Total weight of harvested tubers [kg]

Calculated on 10 plants per accession. At harvest

8.1.3 Number of harvests per year

8.2 Chemical analysis

8.2.1 Ascorbic acid content [mg/100 g, FW]

Expressed as a percentage of fresh weight of tuber flesh

8.2.2 Alkaloid content [mg/100 g, DM]

8.3 Quality characteristics of tubers

(Aerial and underground)

8.3.1 Ease of peeling

- 1 Difficult
- 2 Easy
- 3 Usually eaten unpeeled

8.3.2 Preferred cooking method

- 1 Baked
- 2 Boiled
- 3 Roasted
- 99 Other (specify in descriptor 8.4 Notes)

8.3.2.1 Poundability of boiled tuber

- 1 Poor
- 2 Good

- 8.3.3 Cooking time to softness [min]**
- 8.3.4 Discolouration of cooking water**
1 Very low
5 Intermediate
9 Very high
- 8.3.5 Appearance of tuber after cooking**
3 Poor
5 Fair
7 Good
- 8.3.6 Colour of tuber after cooking**
1 White, not coloured
9 Highly coloured
- 8.3.7 Attractiveness of cooked tuber**
(With respect to colour alone)
3 Low
5 Intermediate
7 High
- 8.3.8 Erosion of tuber upon cooking**
0 No
1 Yes
- 8.3.9 Texture of cooked tuber**
1 Smooth
2 Grainy
3 Fibrous
- 8.3.10 Stickiness of cooked tuber**
1 Sticky
2 Very sticky
- 8.3.11 Flavour of cooked tuber**
0 Not acceptable
1 Acceptable
2 Very acceptable
- 8.3.12 Absence/presence of moisture on cooked tuber**
0 Absent
1 Present

- 8.3.13 Bitterness of cooked tuber** (2.10.18)
- 0 Not bitter
 - 1 Bitter
 - 2 Very bitter
- 8.3.14 Sweetness of cooked tuber**
- 0 Not sweet
 - 1 Sweet
 - 2 Very sweet
- 8.3.15 Overall assessment of cooked tuber**
- 3 Low
 - 5 Intermediate
 - 7 High

8.4 Notes

Specify here any other additional information

9. Abiotic stress susceptibility

Scored under artificial and/or natural conditions, which should be clearly specified. These are coded on a susceptibility scale from 1 to 9 viz.:

- 1 Very low or no visible sign of susceptibility
- 3 Low
- 5 Intermediate
- 7 High
- 9 Very high

9.1 Reaction to low temperature

9.1.1 Seed germination

9.1.2 *In vitro* development

9.2 Reaction to high temperature

9.3 Reaction to drought

9.4 Reaction to high soil moisture

9.5 Reaction to high salinity

9.6 Reaction to high acidity

9.7 Notes

Specify any additional information here

10. Biotic stress susceptibility

In each case, it is important to state the origin of the infestation or infection, i.e. natural, field inoculation, laboratory. Record such information in descriptor **10.4 Notes**. These are coded on a susceptibility scale from 1 to 9, viz.:

- 1 Very low or no visible sign of susceptibility
- 3 Low
- 5 Intermediate
- 7 High
- 9 Very high

10.1 Diseases

- 10.1.1 Yam viruses** (2.12.1)
 - 10.1.1.1 Cucumber mosaic cucumovirus (CMV)**
 - 10.1.1.2 *Dioscorea alata* ring mottle potyvirus (DaRMV)**
 - 10.1.1.3 Yam internal brown spot 'badnavirus' (*Dioscorea bacilliform* badnavirus, DBV)**
 - 10.1.1.4 Yam mosaic potyvirus (YMV)**
 - 10.1.1.5 Chinese yam necrotic mosaic 'carlavirus' (ChYNMV)**
 - 10.1.1.6 *Dioscorea latent* potexvirus (DLV)**
 - 10.1.1.7 *Dioscorea* green banding mosaic potyvirus (DGBV)**
 - 10.1.1.8 *Dioscorea trifida* potyvirus (DTV)**
 - 10.1.1.9 Other virus**
- 10.1.2 Anthracnose susceptibility** (2.12.2)
 - 3 Low
 - 5 Intermediate
 - 7 High
- 10.1.3 *Fusarium* spp.** (2.12.3)

10.2 Pests**10.2.1 Nematode attack (dry rot) on tubers at harvest**

- 3 Low
- 5 Intermediate
- 7 High

10.2.2 Nematode attack (dry rot) on tubers at planting

- 3 Low
- 5 Intermediate
- 7 High

10.2.3 Nematodes

(2.13.1)

10.2.3.1 *Scutellonema bradys***10.2.3.2 *Pratylenchus coffea*****10.2.3.3 *Radopholus similis*****10.2.4 Scale insects on tubers at harvest**

- 3 Few
- 7 Many

10.2.5 Scale insects on rhizomes at harvest

- 3 Few
- 7 Many

10.2.6 Scale insects on tubers at planting

- 3 Few
- 7 Many

10.2.7 Scale insects on rhizomes at planting

- 3 Few
- 7 Many

10.2.8 Yam beetle damage on leaves

- 3 Low
- 7 High

10.2.9 Yam beetle damage on tubers

- 3 Low
- 7 High

10.3 Other disorders

10.3.1 Chlorosis

10.4 Notes

Specify here any additional information

11. Biochemical markers

11.1 Isozyme

For each enzyme, indicate the tissue analyzed and the zymogram type. A particular enzyme can be recorded as 11.1.1; 11.1.2, etc. Examples include: Acid phosphatase (ACPH); Esterases α and β (EST A and B); Isocitrate dehydrogenase (ICD); Malate dehydrogenase (MDH); Phosphogluconate dehydrogenase (PGD); Phosphoglucose isomerase (PGI); Phosphoglucose mutase (PGM); Peroxidases

11.2 Other biochemical markers

(e.g. Polyphenol profile)

12. Molecular markers

Describe any specific discriminating or useful trait for this accession. Report probe-enzyme combination analyzed. Below are listed some of the basic methods most commonly used

12.1 Restriction fragment length polymorphism (RFLP)

Report probe/enzyme combination (approach can be used for nuclear, chloroplast or mitochondrial genomes)

12.2 Amplified fragment length polymorphism (AFLP)

Report primer pair combinations and accurate molecular size of products (used for nuclear genomes)

12.3 DNA amplification fingerprinting (DAF); random amplified polymorphic DNA (RAPD); AP-PCR

Accurately report experimental conditions and molecular size of products (used for nuclear genomes)

12.4 Sequence-tagged microsatellites (STMS)

Report primer sequences, and accurate product sizes (can be used for nuclear or chloroplast genomes)

12.5 PCR-sequencing

Report PCR primer sequences, and derived nucleotide sequence (can be used for single copy nuclear, chloroplast or mitochondrial genomes)

12.6 Other molecular markers

13. Cytological characters

13.1 Chromosome number (2.2)

13.2 Ploidy level
(2x, 3x, 4x, etc.)

13.3 Meiosis chromosome associations
Average of 50 microspore mother cells, observed during metaphase I

13.4 Other cytological characters

14. Identified genes

Describe any known specific mutant present in the accession

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Annex I. Basic list of descriptors for edible *Dioscorea* species

<i>Dioscorea</i> species	IPGRI descriptor		
	Number	Name	
<i>alata</i>	7.1.4	Young stem - colour	
	7.1.7	Young stem - wing colour	
	7.1.18	Mature stem - colour	
	7.1.21	Mature stem - diameter	
	7.1.22	Mature stem - cross-section at base	
	7.1.26	Mature stem - wing size	
	7.1.27	Mature stem - wing colour	
	7.1.28	Mature stem - Absence/presence of ridges	
	7.1.34	Mature stem - spines on stem base	
	7.1.35	Mature stem - spines on stem above base	
	7.2.3	Young leaf - colour	
	7.2.4	Young leaf - margin colour	
	7.2.5	Young leaf - vein colour	
	7.2.6	Young leaf - petiole colour	
	7.2.7	Young leaf - petiole wing colour	
	7.2.15	Mature leaf - colour	
	7.2.16	Mature leaf - vein colour (upper)	
	7.2.18	Mature leaf - margin colour	
	7.2.37	Mature leaf - petiole colour	
	7.2.38	Mature leaf - petiole wing colour	
	7.5.1	Absence/presence of aerial tubers	
	7.6.14	Tuber shape	
	7.6.29	Skin colour at head of the tuber	
	7.6.30	Flesh colour at central transverse cross-section	
	7.6.31	Flesh colour of lower part of tuber	
	10.1.2	Anthracnose susceptibility	
	<i>esculenta</i>	7.1.4	Young stem - colour
		7.1.18	Mature stem - colour
		7.2.3	Young leaf - colour
		7.2.4	Young leaf - margin colour
		7.2.6	Young leaf - petiole colour
		7.2.15	Mature leaf - colour
		7.2.16	Mature leaf - vein colour (upper)
7.2.17		Mature leaf - vein colour (lower)	
7.2.18		Mature leaf - margin colour	
7.2.37		Mature leaf - petiole colour	
7.6.11	Spininess of roots		
7.6.14	Tuber shape		

<i>Dioscorea</i> species	IPGRI descriptor		
	Number	Name	
<i>bulbifera</i>	7.6.17	Tuber length	
	7.6.18	Tuber width	
	7.6.20	Place of roots on the tuber surface	
	7.6.24	Absence/presence of cracks on the tuber surface	
	7.6.26	Tuber skin colour	
	7.6.30	Flesh colour at central transverse cross-section	
	7.1.4	Young stem - colour	
	7.1.18	Mature stem - colour	
	7.2.3	Young leaf - colour	
	7.2.6	Young leaf - petiole colour	
	7.2.15	Mature leaf - colour	
	7.2.16	Mature leaf - vein colour (upper)	
	7.2.17	Mature leaf - vein colour (lower)	
	7.2.37	Mature leaf - petiole colour	
	7.3.11	Flower colour	
	7.5.2	Aerial tuber shape	
	7.5.3	Aerial tuber diameter	
	7.5.4	Aerial tuber skin colour	
	7.5.5	Aerial tuber surface texture	
	7.5.6	Absence/presence of bumps on aerial tuber	
	7.5.7	Aerial tuber skin thickness	
	7.5.8	Aerial tuber flesh colour	
	7.6.14	Tuber shape	
	8.3.13	Bitterness of cooked (aerial) tuber	
	<i>nummularia</i>	7.1.28	Mature stem - absence/presence of ridges
		7.1.34	Mature stem - spines on stem base
7.2.5		Young leaf - vein colour	
7.2.15		Mature leaf - colour	
7.2.16		Mature leaf - vein colour (upper surface)	
7.2.33		Mature leaf - tip colour	
7.2.37		Mature leaf - petiole colour	
<i>cayenensis- rotundata</i>	7.6.14	Tuber shape	
	7.1.4	Young stem - colour	
	7.1.10	Young stem - Absence/presence of coloured spot at spine base	
	7.1.20	Mature stem - branching	
	7.1.24	Mature stem - absence/presence of waxiness	
	7.1.32	Mature stem - absence/presence of scale leaves	
	7.1.34	Mature stem - spines on stem base	
	7.1.35	Mature stem - spines on stem above base	

<i>Dioscorea</i> species	IPGRI descriptor	
	Number	Name
	7.1.36	Mature stem - spine position
	7.1.37	Mature stem - spine shape
	7.1.38	Mature stem - spine length
	7.1.39	Mature stem - absence/presence of coalescent spines
	7.1.40	Mature stem - colour of spot at spine base
	7.2.12	Mature leaf - leaf type
	7.2.14	Mature leaf - leatheriness
	7.2.15	Mature leaf - colour
	7.2.24	Mature leaf - undulation of leaf
	7.2.25	Mature leaf - distance between lobes
	7.2.26	Mature leaf - upward folding of leaf along main vein
	7.2.27	Mature leaf - downward arching of leaf along main vein
	7.2.28	Mature leaf - upward folding of leaf lobe to form a cup
	7.2.29	Mature leaf - downward arching of leaf lobes
	7.2.30	Mature leaf - measurement
	7.2.31	Mature leaf - position of the widest part of the leaf
	7.2.32	Mature leaf - tip length
	7.2.33	Mature leaf - tip colour
	7.2.34	Mature leaf - petiole length
	7.2.37	Mature leaf - petiole colour
	7.2.39	Mature leaf - spininess of petiole
	7.6.6	Absence/presence of corms
	7.6.7	Corm size
	7.6.8	Corm ability to be separated from tuber
	7.6.11	Spininess of roots
	7.6.12	Absence/presence of anchor roots
	7.6.14	Tuber shape
	7.6.19	Roots on the tuber surface
	7.6.19.1	Spiny roots on the tuber
	7.6.21	Prickly appearance of the tuber
	7.6.25	Tuber skin thickness
	7.6.26	Tuber skin colour (beneath the bark)
	7.6.34	Time for flesh oxidation after cutting
<i>pentaphylla</i>	7.2.12	Mature leaf - type
	7.2.13	Mature leaf - number of leaflets in compound leaf
	7.5.3	Aerial tuber diameter
	7.6.14	Tuber shape
	7.6.15	Tendency of tuber to branch
	7.6.30	Mature leaf - flesh colour at central transverse cross-section
	8.3.9	Texture of cooked tuber

Annex II. Key to the main *Dioscorea* species

- A Stems twining to the right
 - B Stems at top, winged or with 4 ridges; stems at base usually winged or with spines; occasionally aerial tubers *Dioscorea alata*
 - BB Stems at top, round or with >4 ridges
 - C Some spines at stem base; short lateral branches; tuber dormancy >2 months; aerial tubers absent or very rare; yams of African origin, unwinged, no hairiness on stem or leaves, entire leaves, aerial tubers absent or very rare *Dioscorea cayenensis-rotundata*
 - CC Many spines at base; long lateral branches; tuber dormancy <2 months; aerial tubers absent or very rare; yams of Pacific origin *Dioscorea nummularia*
- AA Stems twining to the left
 - B Stems without spines
 - C Large aerial tubers; large heart-shaped leaves *Dioscorea bulbifera*
 - CC Small aerial tubers; compound leaves, 3-7 leaflets *Dioscorea pentaphylla*
 - CCC No aerial tubers; deeply dissected leaves, 3-5 lobed; stems often winged; numerous small tubers *Dioscorea trifida*
 - BB Stems with spines
 - C No aerial tubers
 - CC Leaves heart-shaped; young leaves covered with hairs *Dioscorea esculenta*
 - CCC Compound leaves with 3 leaflets *Dioscorea hispida*

Annex III. Multicrop Passport Descriptors

This list of multicrop passport descriptors has been developed jointly by IPGRI and FAO to provide consistent coding schemes for common passport descriptors across crops. These descriptors aim to be compatible with future IPGRI crop descriptor lists and with the descriptors to be used for the FAO World Information and Early Warning System (WIEWS) on plant genetic resources.

The list should NOT be regarded as a minimum descriptor list, since many additional passport descriptors are essential for the description of crops and need to be recorded. This document lists an initial set of common passport descriptors at the multicrop level. At a later stage the list could be expanded with additional multicrop descriptors. For example, descriptors dealing with the use of germplasm are currently not included, but their suitability for inclusion at the multicrop level will be investigated. Future expansion could even result in the development of more specialized lists of common descriptors at the crop group level.

Printed here is the latest version of the list (1997) which contains two sections. The latter one (FAO WIEWS DESCRIPTORS) lists a number of optional descriptors used in the FAO WIEWS. The list provides descriptions of content and coding schemes, but also provides *suggested* fieldnames (in parentheses) that can assist in the computerized exchange of this type of data.

MULTICROP PASSPORT DESCRIPTORS	
1. Institute code	(INSTCODE)
Code of the institute where the accession is maintained. The codes consist of the 3-letter ISO 3166 country code of the country where the institute is located plus number or an acronym as specified in the Institute database that will be made available by FAO. Preliminary codes (i.e. codes not yet incorporated in the FAO Institute database) start with an asterisk followed by a 3-letter ISO 3166 country code and an acronym.	
2. Accession number	(ACCENUMB)
This number serves as a unique identifier for accessions and is assigned when an accession is entered into the collection. Once assigned this number should never be reassigned to another accession in the collection. Even if an accession is lost, its assigned number should never be reused. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system).	
3. Collecting number	(COLLNUMB)
Original number assigned by the collector(s) of the sample, normally composed of the name or initials of the collector(s) followed by a number. This item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent.	
4. Genus	(GENUS)
Genus name for taxon. Initial uppercase letter required.	
5. Species	(SPECIES)
Specific epithet portion of the scientific name in lowercase letters plus authority ¹ . Following abbreviation is allowed: "sp."	
6. Subtaxa	(SUBTAXA)
Subtaxa can be used to store any additional taxonomic identifier plus authority ¹ . Following abbreviations are allowed: "ssp." (for subspecies); "var." (for variety); "convar." (for convariety); "f." (for form).	
7. Accession name	(ACCNAME)
Either a registered or other formal designation given to the accession. First letter uppercase. Multiple names separated with semicolon.	
8. Country of origin	(ORIGCTY)
Name of the country in which the sample was originally collected or derived. Use the ISO 3166 extended codes, (i.e. current and old 3 letter ISO 3166 country codes)	
9. Location of collecting site	(COLLSITE)
Location information below the country level that describes where the accession was collected starting with the most detailed information. Might include the distance in kilometers and direction from the nearest town, village or map grid reference point, (e.g. CURITIBA 7S, PARANA means 7 km south of Curitiba in the state of Parana)	
10. Latitude of collecting site	(LATITUDE)
Degrees and minutes followed by N (North) or S (South) (e.g. 1030S). Missing data (minutes) should be indicated with hyphen (e.g. 10—S).	

¹ Authority is only provided at the most detailed taxonomic level

11. Longitude of collecting site		(LONGITUDE)	
Degrees and minutes followed by E (East) or W (West) (e.g. 07625W). Missing data (minutes) should be indicated with hyphen (e.g. 076—W).			
12. Elevation of collecting site [m asl]		(ELEVATION)	
Elevation of collecting site expressed in meters above sea level. Negative values allowed.			
13. Collecting date of original sample [YYYYMMDD]		(COLLDATE)	
Collecting date of the original sample where YYYY is the year, MM is the month and DD is the day.			
14. Status of sample		(SAMPSTAT)	
1	Wild	0	Unknown
2	Weedy		
3	Traditional cultivar/Landrace	99	Other (Elaborate in REMARKS field)
4	Breeder's line		
5	Advanced cultivar		
15. Collecting source		(COLLSRC)	
The coding scheme proposed can be used at 2 different levels of detail: Either by using the global codes such as 1, 2, 3, 4 or by using the more detailed coding such as 1.1, 1.2, 1.3 etc.			
1	Wild habitat	2	Farm
1.1	Forest/woodland	2.1	Field
1.2	Shrubland	2.2	Orchard
1.3	Grassland	2.3	Garden
1.4	Desert/tundra	2.4	Fallow
		2.5	Pasture
		2.6	Store
3	Market	4	Institute/ Research organization
3.1	Town	3.2	Village
3.3	Urban	0	Unknown
3.4	Other exchange system	99	Other (Elaborate in REMARKS field)
16. Donor institute code		(DONORCODE)	
Code for the donor institute. The codes consist of the 3-letter ISO 3166 country code of the country where the institute is located plus number or an acronym as specified in the Institute database that will be made available by FAO. Preliminary codes (i.e. codes not yet incorporated in the FAO Institute database) start with an asterisk followed by a 3-letter ISO 3166 country code and an acronym.			
17. Donor number		(DONORNUMB)	
Number assigned to an accession by the donor. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system)			
18. Other number(s) associated with the accession		(OTHERNUMB)	
Any other identification number known to exist in other collections for this accession. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system). Multiple numbers can be added and should be separated with a semicolon			
19. Remarks		(REMARKS)	
The remarks field is used to add notes or to elaborate on descriptors with value "99" (=Other). Prefix remarks with the field name they refer to and a colon (e.g. COLLSRC: roadside). Separate remarks referring to different fields are separated by semicolons.			

FAO WIEWS DESCRIPTORS

- | | | |
|---|--|---------------------------------------|
| 1. | Location of safety duplicates | (DUPLSITE) |
| Code of the institute where a safety duplicate of the accession is maintained. The codes consist of 3-letter ISO 3166 country code of the country where the institute is located plus number or an acronym as specified in the Institute database that will be made available by FAO. Preliminary codes (i.e. codes not yet incorporated in the FAO Institute database) start with an asterisk followed by a 3-letter ISO 3166 country code and an acronym. Multiple numbers can be added and should be separated with a semicolon. | | |
| 2. | Availability of passport data | (PASSAVAIL) |
| (i.e. in addition to what has been provided) | | |
| 0 | Not available | |
| 1 | Available | |
| 3. | Availability of characterization data | (CHARAVAIL) |
| 0 | Not available | |
| 1 | Available | |
| 4. | Availability of evaluation data | (EVALAVAIL) |
| 0 | Not available | |
| 1 | Available | |
| 5. | Acquisition type of the accession | (ACQTYPE) |
| 1 | Collected/bred originally by the institute | |
| 2 | Collected/bred originally by joint mission/institution | |
| 3 | Received as a secondary repository | |
| 6. | Type of storage | (STORATYPE) |
| Maintenance type of germplasm. If germplasm is maintained under different types of storage, multiple choices are allowed, separated by a semicolon (e.g. 2;3). (Refer to FAO/IPGRI Genebank Standards 1994 for details on storage type) | | |
| 1 | Short-term | 99 Other (elaborate in REMARKS field) |
| 2 | Medium-term | |
| 3 | Long-term | |
| 4 | <i>In vitro</i> collection | |
| 5 | Field genebank collection | |
| 6 | Cryopreserved | |

Please forward your feedback on the use of this list to:

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