Descriptors for
Yam
(Dioscorea spp.)
Descriptors for

Yam

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very low</td>
</tr>
<tr>
<td>2</td>
<td>Very low to low</td>
</tr>
<tr>
<td>3</td>
<td>Low</td>
</tr>
<tr>
<td>4</td>
<td>Low to intermediate</td>
</tr>
<tr>
<td>5</td>
<td>Intermediate</td>
</tr>
<tr>
<td>6</td>
<td>Intermediate to high</td>
</tr>
<tr>
<td>7</td>
<td>High</td>
</tr>
<tr>
<td>8</td>
<td>High to very high</td>
</tr>
<tr>
<td>9</td>
<td>Very high</td>
</tr>
</tbody>
</table>

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.
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
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
4 Descriptors for Yam

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
6 Descriptors for Yam

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
8 Descriptors for Yam

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

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3.1</strong></td>
<td>Accession number</td>
</tr>
<tr>
<td><strong>3.2</strong></td>
<td>Population identification</td>
</tr>
<tr>
<td><strong>3.3</strong></td>
<td>Storage address</td>
</tr>
<tr>
<td><strong>3.4</strong></td>
<td>Storage date</td>
</tr>
<tr>
<td><strong>3.5</strong></td>
<td>Seed germination at storage (initial)</td>
</tr>
<tr>
<td><strong>3.6</strong></td>
<td>Date of last seed germination test</td>
</tr>
<tr>
<td><strong>3.7</strong></td>
<td>Seed germination at the last test</td>
</tr>
<tr>
<td><strong>3.8</strong></td>
<td>Date of next test</td>
</tr>
<tr>
<td><strong>3.9</strong></td>
<td>Moisture content at harvest</td>
</tr>
<tr>
<td><strong>3.10</strong></td>
<td>Moisture content at storage (initial)</td>
</tr>
<tr>
<td><strong>3.11</strong></td>
<td>Number of tubers in storage(s)</td>
</tr>
<tr>
<td><strong>3.12</strong></td>
<td>Amount of seed in storage(s)</td>
</tr>
<tr>
<td><strong>3.13</strong></td>
<td>Number of rhizomes in storage(s)</td>
</tr>
<tr>
<td><strong>3.14</strong></td>
<td>Number of bulbils in storage(s)</td>
</tr>
<tr>
<td><strong>3.15</strong></td>
<td>Duplication at other location(s)</td>
</tr>
<tr>
<td><strong>3.16</strong></td>
<td><em>In vitro</em> conservation</td>
</tr>
</tbody>
</table>
10 Descriptors for Yam

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 Interfluve 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 [$^\circ$]
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 In situ 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
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
2. Loam
3. Clay loam
4. Silt
5. Silty clay
6. Silty clay loam
7. Silt loam
8. Sandy clay
9. Sandy clay loam
10. Sandy loam
11. Fine sandy loam
12. Coarse sandy loam
13. Loamy sand
14. Loamy very fine sand
15. Loamy fine sand
16. Loamy coarse sand
17. Very fine sand
18. Fine sand
19. Medium sand
20. Coarse sand
21. Sand, unsorted
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
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
1  Dwarf
2  Shrub-like
3  Climbing

7.1.13 Vigour
3  Low
5  Intermediate
7  High

7.1.14 Twining habit
0  No
1  Yes

7.1.15 Twining direction
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
24 Descriptors for Yam

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Green</td>
</tr>
<tr>
<td>2</td>
<td>Green with purple edge</td>
</tr>
<tr>
<td>3</td>
<td>Purple</td>
</tr>
<tr>
<td>99</td>
<td>Other (specify in descriptor 7.7 Notes)</td>
</tr>
</tbody>
</table>

### 7.1.28 Absence/presence of ridges

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Absent</td>
</tr>
<tr>
<td>1</td>
<td>Present</td>
</tr>
</tbody>
</table>

### 7.1.29 Hairiness

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Sparse</td>
</tr>
<tr>
<td>7</td>
<td>Dense</td>
</tr>
</tbody>
</table>

### 7.1.30 Shape of hair

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stellate</td>
</tr>
<tr>
<td>2</td>
<td>T-shaped</td>
</tr>
<tr>
<td>3</td>
<td>Simple</td>
</tr>
<tr>
<td>99</td>
<td>Other (specify in descriptor 7.7 Notes)</td>
</tr>
</tbody>
</table>

### 7.1.31 Wrinkled surface

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### 7.1.32 Absence/presence of scale leaves

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Absent</td>
</tr>
<tr>
<td>1</td>
<td>Present</td>
</tr>
</tbody>
</table>

### 7.1.33 Scale leaf position

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alternate</td>
</tr>
<tr>
<td>2</td>
<td>Opposite</td>
</tr>
<tr>
<td>3</td>
<td>Both</td>
</tr>
<tr>
<td>4</td>
<td>Verticillate</td>
</tr>
</tbody>
</table>

### 7.1.34 Spines on stem base

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Few</td>
</tr>
<tr>
<td>7</td>
<td>Many</td>
</tr>
</tbody>
</table>

### 7.1.35 Spines on stem above base

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Few</td>
</tr>
<tr>
<td>7</td>
<td>Many</td>
</tr>
</tbody>
</table>
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
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**
3. Sparse
7. Dense

7.2.20 **Hairiness of lower surface**
3. Sparse
7. Dense

7.2.21 **Waxiness of upper/lower surface**
1. Waxy upper surface
2. Waxy lower surface
3. Both

7.2.22 **Leaf shape**
(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
32  Descriptors for Yam

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 $\leq$ 10
2 11 - 29
3 $\geq$ 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 $\leq$ 5 cm
2 6 - 10 cm
3 11 - 15 cm
4 $\geq$ 16 cm
### Descriptors for Yam

#### 7.3.9 Number of inflorescences per internode

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≤10</td>
</tr>
<tr>
<td>2</td>
<td>11 - 25</td>
</tr>
<tr>
<td>3</td>
<td>26 - 100</td>
</tr>
<tr>
<td>4</td>
<td>≥101</td>
</tr>
</tbody>
</table>

#### 7.3.10 Number of female flowers per inflorescence

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≤2.5 cm</td>
</tr>
<tr>
<td>2</td>
<td>2.6 - 5 cm</td>
</tr>
<tr>
<td>3</td>
<td>≥5.1 cm</td>
</tr>
</tbody>
</table>

#### 7.3.11 Flower colour

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Purplish</td>
</tr>
<tr>
<td>2</td>
<td>White</td>
</tr>
<tr>
<td>3</td>
<td>Yellowish</td>
</tr>
<tr>
<td>99</td>
<td>Other (specify in descriptor 7.7 Notes)</td>
</tr>
</tbody>
</table>

#### 7.3.12 Female flower length [cm]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≤2.5 cm</td>
</tr>
<tr>
<td>2</td>
<td>2.6 - 5 cm</td>
</tr>
<tr>
<td>3</td>
<td>≥5.1 cm</td>
</tr>
</tbody>
</table>

#### 7.3.13 Female flower diameter [mm]

#### 7.3.14 Male flower diameter [mm]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>≤2 mm</td>
</tr>
<tr>
<td>2</td>
<td>3 - 5 mm</td>
</tr>
<tr>
<td>3</td>
<td>&gt;5 mm</td>
</tr>
</tbody>
</table>

#### 7.3.15 Male flower length [cm]

#### 7.4 Fruit

##### 7.4.1 Fruit formation

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Yes</td>
</tr>
</tbody>
</table>

##### 7.4.2 Fruit development

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mostly well developed</td>
</tr>
<tr>
<td>2</td>
<td>Mostly poorly developed</td>
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</tbody>
</table>

##### 7.4.3 Fruit position

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pointing upward</td>
</tr>
<tr>
<td>2</td>
<td>Pointing downward</td>
</tr>
</tbody>
</table>
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
### Descriptors for Yam

#### 7.5.2 Aerial tuber shape
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
1. Greyish
2. Light brown
3. Dark brown
99. Other (specify in descriptor 7.7 Notes)

#### 7.5.5 Surface texture
1. Smooth
2. Wrinkled
3. Rough

#### 7.5.6 Absence/presence of bumps
0. Absent
1. Present

#### 7.5.7 Skin thickness
3. Thin
7. Thick

#### 7.5.8 Flesh colour
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
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
1 Annual (tuber renewed every year)
2 Perennial (tuber increasing in size every year)

7.6.4 Number of tubers per hill
1 One
2 Few (2-5)
3 Several (>5)

7.6.5 Relationship of tubers
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
(In relation to tuber size)
1 Small
5 Intermediate
7 Large
### Descriptors for Yam

<table>
<thead>
<tr>
<th>7.6.8</th>
<th>Corm ability to be separated from tuber</th>
</tr>
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<tbody>
<tr>
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<td>No</td>
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<tr>
<td>1</td>
<td>Yes</td>
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<tr>
<td>1</td>
<td>Regular</td>
</tr>
<tr>
<td>2</td>
<td>Transversally elongated</td>
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<tr>
<td>3</td>
<td>Branched</td>
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<tr>
<th>7.6.10</th>
<th>Absence/presence of rhizome</th>
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<td>1</td>
<td>Present</td>
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<th>7.6.11</th>
<th>Spininess of roots</th>
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<tr>
<td>3</td>
<td>Sparse</td>
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<tr>
<td>7</td>
<td>Dense</td>
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<th>7.6.12</th>
<th>Absence/presence of anchor roots</th>
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<tbody>
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<tr>
<td>1</td>
<td>Present</td>
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<table>
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<tr>
<th>7.6.13</th>
<th>Sprouting at harvest</th>
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<tbody>
<tr>
<td>0</td>
<td>No</td>
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<td>1</td>
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The following descriptors will be recorded a few days after harvest

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<tr>
<th>7.6.14</th>
<th>Tuber shape</th>
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<tr>
<td>1</td>
<td>Round</td>
</tr>
<tr>
<td>2</td>
<td>Oval</td>
</tr>
<tr>
<td>3</td>
<td>Oval-oblong</td>
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<tr>
<td>4</td>
<td>Cylindrical</td>
</tr>
<tr>
<td>5</td>
<td>Flattened</td>
</tr>
<tr>
<td>6</td>
<td>Irregular</td>
</tr>
<tr>
<td>99</td>
<td>Other (specify in descriptor 7.7 Notes)</td>
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<table>
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<tr>
<th>7.6.15</th>
<th>Tendency of tuber to branch</th>
</tr>
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<tbody>
<tr>
<td>3</td>
<td>Slightly branched</td>
</tr>
<tr>
<td>5</td>
<td>Branched</td>
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<tr>
<td>7</td>
<td>Highly branched</td>
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<tr>
<td>Section</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
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</tbody>
</table>
| 7.6.16 | **Place where tuber branches** | 1 Upper third  
2 Middle  
3 Lower third |
| 7.6.17 | **Tuber length** | 1 ≤20 cm  
2 21 - 40 cm  
3 ≥41 cm (2.10.6) |
| 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** | 3 Few  
7 Many (2.10.8) |
| 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 |
40 Descriptors for Yam

7.6.25 Tuber skin thickness
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
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)
42 Descriptors for Yam

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
2. Intermediate
3. Very high

8.3.5 **Appearance of tuber after cooking**
1. Poor
2. Fair
3. Good

8.3.6 **Colour of tuber after cooking**
1. White, not coloured
2. Highly coloured

8.3.7 **Attractiveness of cooked tuber**
(With respect to colour alone)
1. Low
2. Intermediate
3. High

8.3.8 **Erosion of tuber upon cooking**
1. No
2. 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**
1. Not acceptable
2. Acceptable
3. Very acceptable

8.3.12 **Absence/presence of moisture on cooked tuber**
1. Absent
2. Present
8.3.13 Bitterness of cooked tuber

- 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

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

3  Low
5  Intermediate
7  High

10.1.3 Fusarium spp.
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
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
48 Descriptors for Yam

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

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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Ms Adriana Alercia supervised and coordinated the production of the text up to the pre-publication stage and provided scientific and technical expertise. Ms Linda Sears edited the text, and Ms Patrizia Tazza drew the cover and the illustrations and prepared the layout. Mr Paul Stapleton managed the production of the publication. Mr Tom Hazekamp supervised the overall production.
Annex I. Basic list of descriptors for edible *Dioscorea* species

<table>
<thead>
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<th><em>Dioscorea</em> species</th>
<th>IPGRI descriptor</th>
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<th>Name</th>
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<td>7.1.4</td>
<td>Young stem - colour</td>
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<td>7.1.7</td>
<td>Young stem - wing colour</td>
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<td>7.1.18</td>
<td>Mature stem - colour</td>
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<td>7.1.21</td>
<td>Mature stem - diameter</td>
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<td>7.1.22</td>
<td>Mature stem - cross-section at base</td>
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<td>7.1.26</td>
<td>Mature stem - wing size</td>
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<td>Mature stem - wing colour</td>
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<td>7.1.28</td>
<td>Mature stem - Absence/presence of ridges</td>
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<td>7.1.34</td>
<td>Mature stem - spines on stem base</td>
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<tr>
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<td>7.1.35</td>
<td>Mature stem - spines on stem above base</td>
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<td>7.6.14</td>
<td>Tuber shape</td>
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<td>7.6.29</td>
<td>Skin colour at head of the tuber</td>
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<td>7.6.30</td>
<td>Flesh colour at central transverse cross-section</td>
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<td>7.6.31</td>
<td>Flesh colour of lower part of tuber</td>
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<td>Place of roots on the tuber surface</td>
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<td>7.6.24</td>
<td>Absence/presence of cracks on the tuber surface</td>
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<td>7.6.26</td>
<td>Tuber skin colour</td>
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*Note: pentaphylla*
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. Following abbreviation is allowed: “sp.”

6. **Subtaxa** *(SUBTAXA)*  
   Subtaxa can be used to store any additional taxonomic identifier plus authority. 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).

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1 Authority is only provided at the most detailed taxonomic level
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**FAO VIEWS DESCRIPTORS**

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<th></th>
<th><strong>Type of storage</strong> (STORTYPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Short-term</td>
</tr>
<tr>
<td>2</td>
<td>Medium-term</td>
</tr>
<tr>
<td>3</td>
<td>Long-term</td>
</tr>
<tr>
<td>4</td>
<td><em>In vitro</em> collection</td>
</tr>
<tr>
<td>5</td>
<td>Field genebank collection</td>
</tr>
<tr>
<td>6</td>
<td>Cryopreserved</td>
</tr>
</tbody>
</table>

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