

Minimum List of Descriptors for Plantains

Developed by the MusaNet Taxonomic Advisory Group– version September 2019

INTRODUCTION

This **Minimum List of Descriptors for Plantains** was developed for the *West and Central African Regional Workshop on Plantain Characterization* at CARBAP, Cameroon in May 2015, and further fine-tuned after the workshop. It is a compilation of descriptors from the Minimum List of Descriptors for *Musa* plus several descriptors from the 1996 Descriptors for Banana book that are highly discriminating for plantains as identified by the Expert Team of the Organization Committee of the workshop. For any question, remark and feedback on these guidelines, please contact Rachel Chase (r.chase@cgiar.org) or Nicolas Roux (n.roux@cgiar.org).

THE APPROPRIATE DEVELOPMENT STAGE FOR OBSERVATION

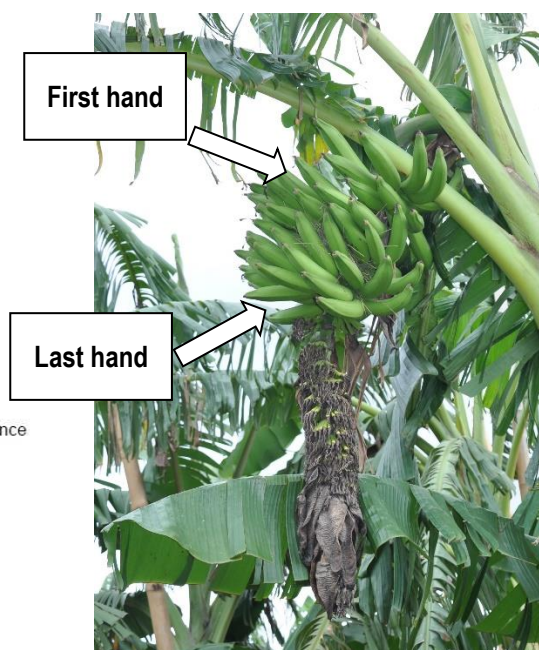
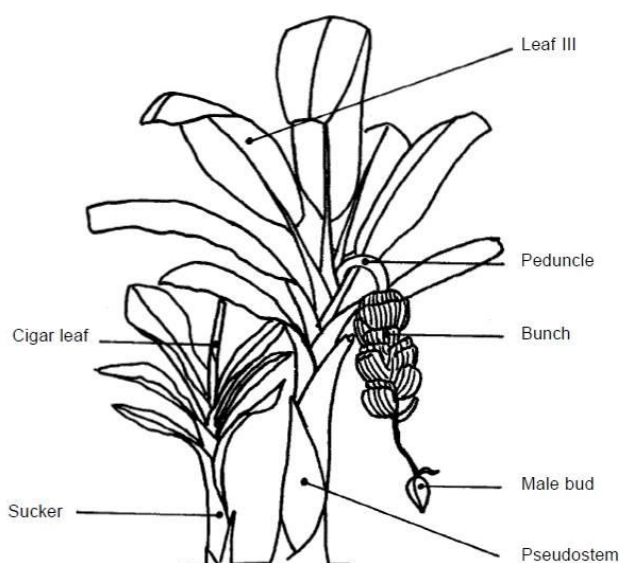
The best time to take photos and document the descriptors is when the fruit are green-ripe or yellowing (“harvest time”), and the rachis is at least 45 cm long (15 inches). This is separate from the instance of a single ripe fruit generally observed on the first or the second hand of the bunch. Also, do not confuse harvest time with ripe fruit affected by diseases, insect bites or birds. All descriptors should be scored at harvest **except** for descriptors 6.3.1, 6.3.3, 6.3.4b, 6.3.6, that should be recorded at flowering time (emergence of the inflorescence) to avoid the desiccation of the petiole margin that often occurs at harvest time.

For all **colour descriptors**, colour should be determined with the appropriate colour chart and out of direct sunlight. The best time to observe colour descriptors is in the morning when the light is clearer than in the afternoon. Score the closest colour to the choices given (e.g. if dark green is not given as a choice, choose green).

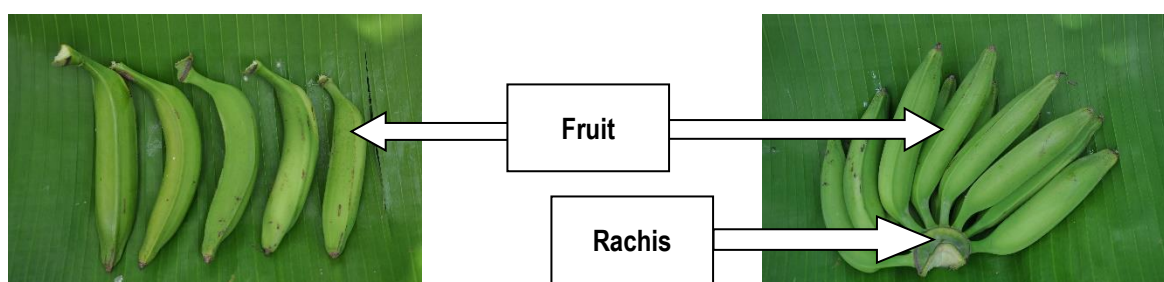
For all **flower descriptors** (6.6.2 - 6.6.13) the material should be fresh as it oxidizes and changes colour rather quickly.

For the **fruit descriptors** (6.7.1 - 6.7.19) observation must be done on several fruits in order to reflect the dominant case.

THE BANANA PLANT



The individual **fruits** also called “fingers” in the **bunch** (photo top-right) are arranged in clusters called “**hands**” along the **rachis** (photo bottom-right)



DESCRIPTORS FOR PLANTAINS

6.2.1. Pseudostem height (m)

Recorded from the base of the pseudostem to emerging point of the peduncle.

1. ≤ 2
2. 2.1 to 2.9
3. ≥ 2.9

6.2.1c Total number of emitted foliage leaves

Measured by the number of emitted foliage leaves (or their scars) that are at least 10 cm wide. The scars are the dried-up bases of the petioles of past leaves. Along the pseudostem, the leaves are arranged in two spirals. Count the number along one spiral and multiply by 2. **Tip:** Mark the number of leaves on the pseudostem as it grows to avoid having to count scars since planting.

1. <32 = Small
2. 32-38 = Medium
3. >38 = Giant

6.2.3 Pseudostem colour

Use colour chart A. Observe the general colour of the upper part of the pseudostem. Record without removing the external sheaths. The colour of the oldest dry sheaths should not be considered.

- | | |
|----------------|--------------|
| 1 Green-yellow | 6 Red |
| 2 Medium green | 7 Red-purple |
| 3 Green | 8 Blue |
| 4 Dark green | 9 Chimerical |
| 5 Green-red | 10 Other |

6.2.10 Development of suckers

Height in relation to the parent plant. Observe the tallest sucker for each mat and consider all mats to take an average score.

1. Taller than parent plant
2. More than 3/4 of the height of the parent plant
3. Between 1/4 and 3/4 of the height of the parent plant
4. Inhibited (poor capacity to develop suckers)

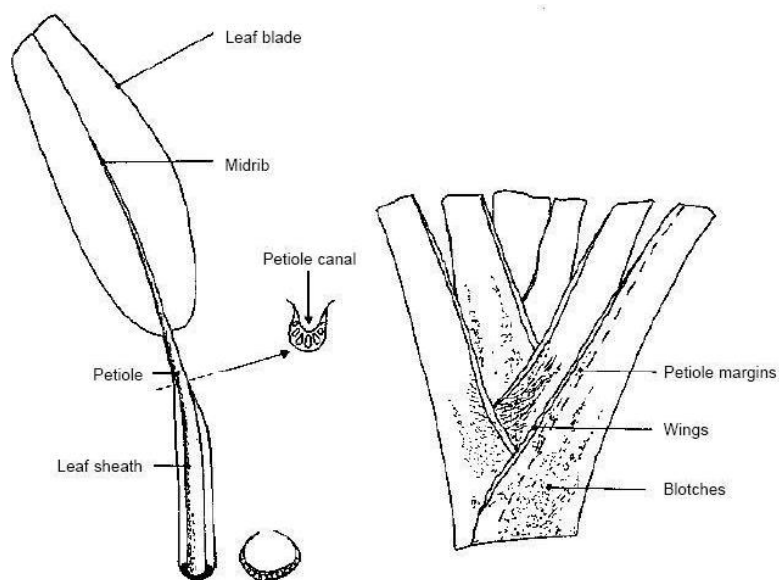


Figure 1. Petiole/midrib/leaf (from Champion 1963 (left), De Langhe 1961 (right)).

6.3.1 Blotches at the petiole base

Record the relative surface area coverage by blotches. Look at several plants if possible to get an overall idea. Observe at flowering time.

1. No pigmentation
2. Sparse blotching (<20%)
3. Moderate blotching (20%-50%)
4. Extensive pigmentation (>50%)



1.



2.



3.



4.

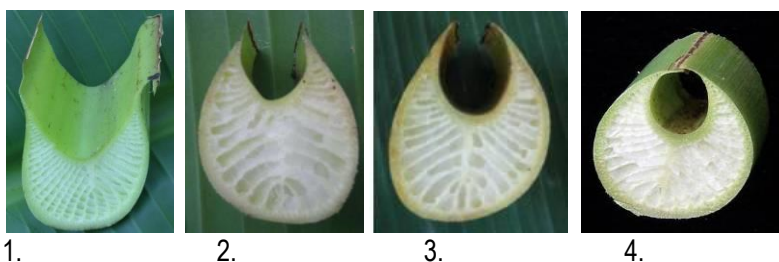
6.3.2 Blotches colour (petiole base) – scored on the upper leaf sheath

1. Orange-brown (like in Pisang Mas)
2. Brown
3. Black-purple
4. Other

6.3.3 Petiole canal of the third leaf

The third leaf (Leaf III) is counted from the last leaf produced before bunch emergence. Cut the petiole halfway between the pseudostem and the leaf blade and examine the cross section. Observe at flowering time.

1. Margins spreading
2. Margins erect
3. Margins curved inward
4. Margins overlapping



For descriptors **6.3.4 to 6.3.8** observations on the margins and petiole wings should be made where the petiole and pseudostem meet at shooting.

6.3.4.2 – Petiole margins clasping

Observation should be made on the neck, where the petiole and pseudostem meet. Margin is the part of the petiole that can be bent outwards/inwards. Observe at flowering time.

1. Clasping
2. Not clasping



6.3.6 Petiole margin colour

Use colour chart A and observe out of direct sunlight. Record the colour of the margin (general colour is below the rim). Observe at flowering time.

- | | |
|-----------------------|-------------------|
| 1. Green | 3. Purple to blue |
| 2. Pink-purple to red | 4. Other |

6.3.14 Colour of lower leaf surface

Use colour chart A. Wax removed.

- | | |
|-----------------|---------------|
| 1. Green yellow | 5. Blue |
| 2. Medium green | 6. Red-purple |
| 3. Green | 7. Other |
| 4. Dark green | |

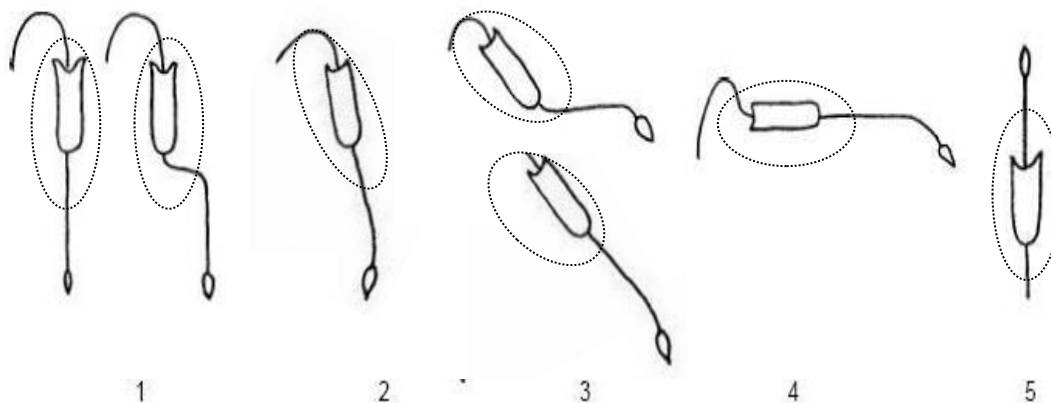
6.4.4 Peduncle colour

Use colour chart A. Record general colour of peduncle between scars (not the scar colour). Easily seen when still attached to the pseudostem.

- | | |
|----------------|--------------------------------------|
| 1. Light green | 4 Red or pink/purple |
| 2 Green | 5 With purple-brown to blue blotches |
| 3 Dark green | 6 Other |

6.4.6 Bunch position (Angle between the axis of the bunch and the vertical)

1. Hanging vertically
2. Slightly angled
3. Hanging at a 45° angle
4. Horizontal
5. Erect



6.4.7c Bunch shape

Score on a fully developed plant with no environmental stress.

1. Cylindrical
2. Truncate (= cone shaped)
3. Asymmetrical
4. Spiral (all fruit are attached to a unique crown coiled around the stalk)
5. Other



1.



2.



3.



4.

6.4.8c Bunch appearance

The bunch should still be on the plant.

1. Very Lax (one can easily place a hand horizontally between the hands of fruit)
2. Lax (one can easily place a hand obliquely between the hands of fruit)
3. Compact (one can place a finger, but not a hand, between the hands of fruit)
4. Very compact (one cannot place a finger between the hands of fruit)



1.



2.



3.

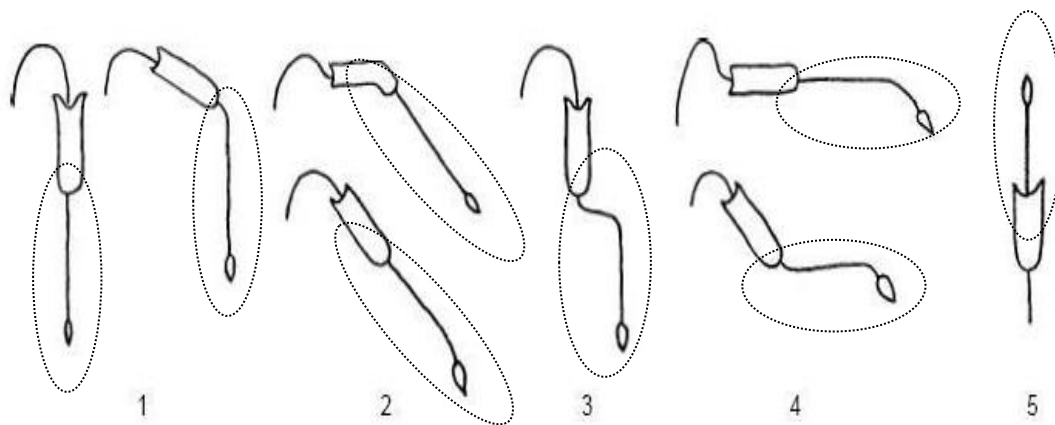


4.

6.4.12 Male rachis position

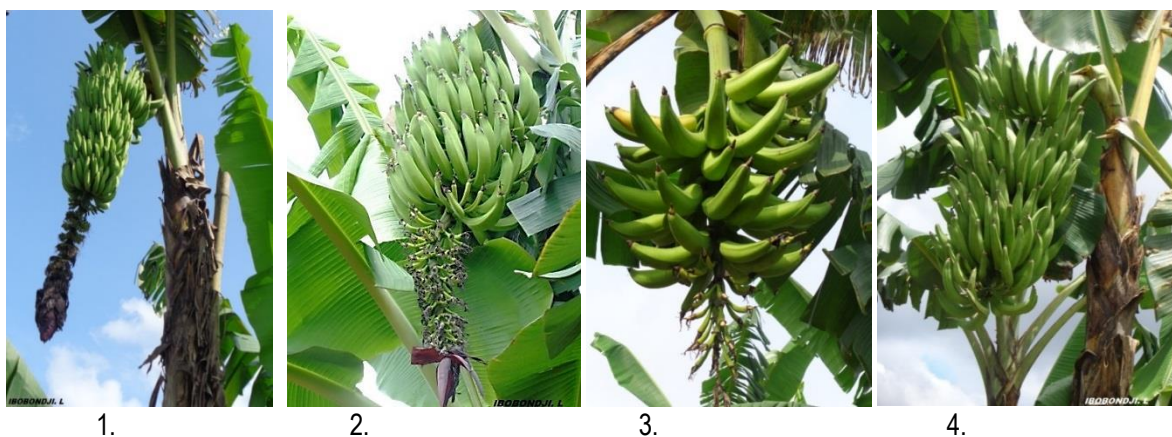
Observe only the part of the rachis between the last hand and the male bud.

1. Falling vertically
2. At an angle
3. With a curve
4. Horizontal or supra-horizontal
5. Erect
6. Other



6.4.13c Male rachis appearance

1. Male bud active at harvest time. The vestiges of neutral/male flowers and the withered bracts cover the whole rachis = French type
2. Male bud exhausted before harvest time, neutral flowers on the rachis, and very few withered bracts or no bracts at all = French-Horn (Batard)
3. Male bud exhausted before maturity, with or without neutral flowers on the rachis, and very few withered bracts or no bracts at all = False Horn
4. Truncated, no male rachis or flowers = Horn
5. Other



For the following descriptors, measure the values w, x, y.

“w” is the broadest width of the male bud. “x” is the length from the base of the male bud to the point of broadest width ‘w’; “y” is the total length of the male bud. As the figure shows, these parameters express the profile of the bud. Do not measure the dimensions along the bud but rather on a projection/outline of the bud (e.g. trace the outline of the bud on paper).

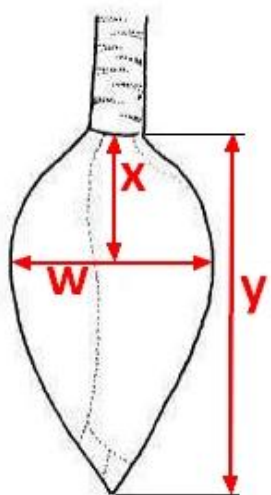


Figure 2. Male bud shape dimensions to be used in 6.4.15 and 6.4.17

6.4.15 Male bud shape

Calculate the ratio w/y (see figure 2 above).

1. Skinny ($w/y \leq 0.45$)
2. Medium ($0.45 < w/y < 0.55$)
3. Fat ($w/y \geq 0.55$)

6.4.17 Male bud shoulder

Calculate the ratio x/y (see figure 2 above).

1. High shouldered ($x/y \leq 0.28$)
2. Medium shouldered ($0.28 < x/y < 0.30$)
3. Low shouldered ($x/y \geq 0.30$)

6.5.2 Bract apex shape

Refers to the first external unlifted bract. Flatten bracts to determine shape.

1. Pointed
2. Intermediate
3. Obtuse
4. Obtuse and split



6.6.2 Compound tepal main colour

Look at backside middle of tepal. Use colour chart B and observe out of direct sunlight.

- | | |
|-----------|---------------------|
| 1. White | 4. Orange |
| 2. Cream | 5. Pink/pink-purple |
| 3. Yellow | 6. Other |

6.6.4 Lobe colour (tip of the tepal) of compound tepal

Use colour chart B and observe out of direct sunlight.

- | | |
|-----------|----------|
| 1. Cream | 4. Green |
| 2. Yellow | 5. Other |
| 3. Orange | |

6.6.13 Anther colour

Observe on the face opposite to the dehiscence split of the anther. Use colour chart B and observe out of direct sunlight.

- | | |
|-----------|----------------------------|
| 1. White | 5. Brown / rusty brown |
| 2. Cream | 6. Pink / pink-purple |
| 3. Yellow | 7. Black (anthers aborted) |
| 4. Grey | 8. Other |

6.4.1 Peduncle length (cm)

Cut the inflorescence at the “base” of the peduncle, i.e. at the point where the peduncle emerges from the pseudostem. Measure from where the peduncle emerges from the foliar leaves to the first hand along the lateral side.

1. ≤ 30 cm
2. 31 – 60 cm
3. ≥ 61 cm

6.7.1c Fruit position Recorded only on the fruits arranged symmetrically around the stalk.

1. Curved towards stalk
2. Parallel to the stalk
3. Curved upward (obliquely, at a 45° angle upward)
4. Perpendicular to the stalk
5. Pendant
6. Other



1.

2.

3.

4.

5.

7.10 Number of hands on the whole bunch

Exact value: ____

Tip: On a bunch with mostly hands of >10 fingers, a possible ultimate hand with 1-5 (rather smaller) fingers should not be counted.

6.7.2 Number of fruits on the mid-hand of the bunch

Count only fully developed fruit. If there is an even number of hands, there will be two middle hands. Count the middle hand that developed first.

1. ≤ 12
2. 13-16
3. ≥ 17

6.7.3 Fruit length (cm) at maturity

Measured as the internal arc of the fruit, without pedicel. Record on the inner fruit in the middle of the mid-hand of the bunch. If there is an even number of hands, there will be two middle hands. Count the middle hand that developed first. Record the exact value and range of one of the 2 middle fruits.

Exact value: _____

1. ≤ 15 cm
2. 16-20 cm
3. 21-25 cm
4. 26-30 cm
5. ≥ 31 cm

6.7.4c Fruit shape (longitudinal curvature)

Observe the inner fruit in the middle of the mid-hand of the bunch. In case of an asymmetric bunch that has straight and curved fruits, score the dominant fruit shape appearing in the bunch.

1. Straight
2. Slightly curved
3. Straight in the distal part
4. Curved (sharp curve)
5. Curved in slight 'S' shape (double curvature)
6. Other



1.



2.



3.



4.



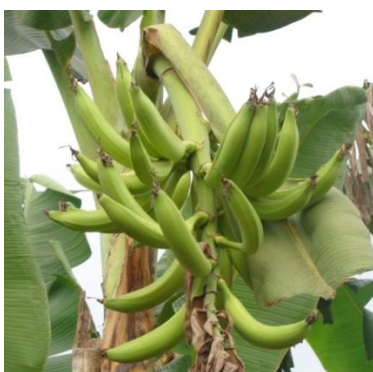
5.

6.7.7c Remains of flower relicts at fruit apex

1. Few flower relicts (<20% of the fruits with relicts)
2. Persistent flower relicts (>20% of the fruits with relicts)
3. Only base of the style persists



1.



2.



3.

6.7.8 Fruit pedicel length (mm).

Measure from the scar on the rachis until the beginning of the fruit. Record on the inner fruit in the middle of the mid-hand of the bunch. **Tip:** use string or measuring tape to measure or trace outline of fruit on paper. Record the exact value and range.

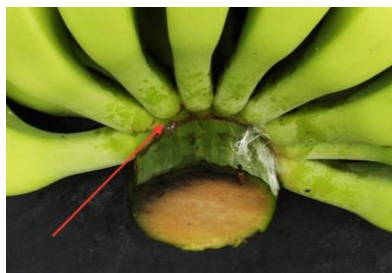
Exact value: _____

1. ≤ 10 mm
2. 11 to 20 mm
3. ≥ 21 mm

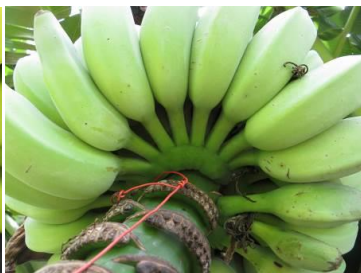
6.7.11 Fusion of pedicels

Observe where the pedicels join the rachis at the bract scar. Look up from bottom of bunch.

1. No visible sign of fusion
2. Partially fused (up to 50% of the length of the pedicel)
3. Totally fused (more than 50% of the length of the pedicel)



1.



2.



3.

6.7.13 Mature fruit peel colour

Use colour chart B. Recorded at fruit maturity (ripe, but not over-ripe). Choose a middle fruit of the second or third hand.

- | | |
|----------------------|--|
| 1. Yellow | 6. Orange red, red or pink/pink purple |
| 2. Bright yellow | 7. Red-purple |
| 3. Orange | 8. Black |
| 4. Grey spots | 9. Other |
| 5. Brown/rusty-brown | |

6.7.19 Pulp colour at maturity

Use colour chart B. Recorded at fruit maturity (ripe, but not over-ripe). Choose a middle fruit of the second or third hand.

- | | |
|-----------|---------------|
| 1. White | 5. Orange |
| 2. Cream | 6. Beige-pink |
| 3. Ivory | 7. Other |
| 4. Yellow | |

Glossary of terms

Anther – Pollen-bearing portion of stamen.

Apex – Bottom tip (of male bract in this case).

Bract - a leaf-like structure, usually different in form from the foliage leaves, associated with an inflorescence or flower.

Bunch – the descriptive term for all the fruits along the rachis. The individual fruit (also called fingers) are arranged in hands.

Clasping - Partly surrounding the stem.

Distal – Away from the point of origin or attachment.

Edge – outside rim of the petiole

Hand – Arrangement of the fruit in a bunch, previously clusters of flowers.

Male bud –The composite of male flowers and their bracts, in the form of a bud at the end of the growing male rachis.

Margin – area just below the edge of the petiole

Rachis – the stem of the entire inflorescence from the first hand to the male bud.

Sheath – the part of the leaf clasping or enveloping the pseudostem.

Pedicel - the stem which supports one flower or fruit.

Peduncle - the stem that supports the inflorescence and attaches it to the pseudostem.

Petiole - the stem of a leaf.

Pseudostem - a false stem made of the rolled bases of leaves.

Tepal - a segment of the outer whorl in a flower that has no differentiation between petals

Citation: Citation: Taxonomic Advisory Group (TAG) 2016. Minimum Descriptor List for Plantains. Bioversity International, Montpellier, France.