PLANTATION

Tissue cultured banana plant

This first phase of a banana plantation is essential and must be carefully managed because it largely determines the economic viability of the crop.

1. SOIL PREPARATION

Conduct your soil preparation according to the soil type and its physical condition.

Banana plant has a poor penetrating root system. All tillage, superficial and/or deep, are designed to:

- loosen and aerate the soil in depth, in order to allow better root exploration,
- promote water flow to prevent waterlogging and root asphyxiation,
- limit the risk of erosion when planting.

Soil preparation must be preceded by a fallow period of at least 12 months or crop rotation (cf. FALLOW MANAGEMENT sheet).

With a grassy fallow, the final preparation of the soil must be done before the fallow period to enable direct replanting on the established mulch.

Soil preparation can be either manual or mechanical depending on the situation of the plot.

1.1- Manual soil preparation

Conduct manual soil preparation in areas where the soil structure and the topography do not allow the use of tractors. When the slope of the plot is too steep, practice pitting to reduce the risk of erosion: dig a square hole of 0.5m x 0.5m x 0.5m.

1.2- Mechanical soil preparation

Conduct a cross subsoiling at 60 cm: it will break up the soil and subsoil, improving their permeability.

Make a passage with a disc harrow or spading machine in order to homogenize the surface layer (40 cm thick, richer in humus) without looking for a fine structure as it will harden very quickly thereafter.

Paddle disc - Photo IT²

Soil preparation with a disc harrow - Photo IT²

1.3- Drainage

Under asphyxiated conditions, because of related to hydromorphy (water logging), banana cannot express its production potential (usually roots and sometimes corms rotting). It is necessary to manage the water flow in the plot through canals, in order to quickly evacuate excess and stagnant water or those related to flooding rivers:

- create secondary canals with medium slope, draining into ditch collectors that carry the water to an outfall,
- create curved tiles.

Digging of drainage canals - Photos IT²

Drainage canals on a vertisol - Photo IT²

Important: drainage and anti-erosion canals must be established before planting.

2. PLANTING

2.1- Selection of planting material

The use of tissue culture plantlets (in vitro) guarantees material free from parasites and viruses. The tissue cultured plantlets planted on healthy soils bring good agronomic performance and the planting work is simplified. Any other planting material (sword suckers, bullhead with bud or with sword sucker, bullhead section) from areas infested with nematodes, weevils and other pests should be avoided.

2.2- Selection of the plot

Replanting is required only when production drops significantly due to density loss and/or poor sanitary condition of the plot. Replanting should not be a systematic operation nor should its frequency be determined ahead of time. This decision should be made depending on the overall condition of the plot and its yield.

Often, good homogeneity and good health can prolong the plantation life, lowering production costs and limiting the impact on the environment.

2.3- Planting date

Planting date allows to plan the production in a period when market prices are the most interesting (usually January to May). In order to harvest at the right time, you must know the duration of the banana cycle which is specific to each region. It depends on altitude and climatic conditions.

To choose the planting date, also consider that the climatic conditions have to be optimal for a quick growth. The first semester is the most favourable period. Always avoid planting during periods of heavy rain or drought if the plantation is not irrigated.

2.4- Planting density

Establish planting density according to altitude, irrigation possibilities and variety, as banana growth depends on temperature, sunlight and water availability. Planting densities are generally lower when altitude increases and when the plot is irrigated.

In the West Indies recommended densities for tissue culture plantlets are between 1650 and 1900 plants/ha. Low density planting - with 900 plants/ha - is increasingly used.

Usually, a lower plot density results in bigger bunches and a shorter second cycle. Too high densities may cause abnormal pseudo-stem elongations and encourage, by the humid microclimate that they create, the development of fungal diseases and insects (such as thrips and weevils).

DENSITIES WITH SIMPLE LINES: DENSITY/HA = 10 000/(R x S)

Rounded density (plants/ha)	Distance (meters)	
	R	S
1650	2,90	2,10
1700	2,95	2,00
1750	3,00	1,90
1800	2,90	1,90
1850	2,15	2,50
1900	2,10	2,50

R = Row, S = spacing on the line

DENSITIES WITH DOUBLE ROWS: DENSITY/HA = $\frac{10\,000 \times 2}{(R + r) \times S}$

Rounded density (plants/ha)	Distance (meters)		
	R	r	S
1700	3,90	1,95	2,00
1750	3,75	1,65	2,12
1800	3,80	1,90	1,95
1850	3,85	1,95	1,85
ou 1850	4,00	1,70	1,90
ou 1850	3,75	1,65	2,00
1900	3,70	1,80	1,90

R = Large row, r = narrow, S = spacing on the line

In case of mechanization, the spacing of the larger rows should not be less than 3.80 m.

Low-density: when planting 900 plants/ha, spacing of 5.40m between rows and 2.06m on the lines.

On the first cycle, the bunch can be either cut or kept. 3 suckers per plant are selected.
On the second cycle, the harvest is done on 2700 plants/ha. Only 2 suckers are kept in order to go back to a double-row configuration.

		Low altitude	High altitude
Duration of the first cycle (reference)		9 Months	12 Months
Duration of the second cycle in low density (3 fruits harvest)	If the first fruit is un-harvested	+3 Months	+4 Months
	If the first fruit is harvested	+4 Months	+5 Months

Young plants at low density- Photo IT²

Low density banana plantation, third cycle; the 3 plants of the 2nd cycle have been harvested - Photo IT²

For subsequent cycles (3rd and above), double-row configuration is kept, with 1800 plants/ha.

2.5- Planting layout: double and single rows

Choose planting arrangement design according to cultivation techniques applied subsequently (mechanization, disease incidence, guying, etc.).

Double rows: the distance between the lines is different, which creates a ''wide lane" and a "narrow lane". Lines of the narrow lane form the “double row”.

Advantages :

- mechanization is possible in the large lane (fertilizer, pesticides, tillage),
- guying can be done without interfering with mechanization,
- bunch care is facilitated by the large lane.

Double row planting - Photo IT²

Disadvantages:

- distribution of banana plants is not optimal to capture sunlight,
- weed pressure is higher in the wide lane,
- roots exploration capacity is not optimized.

Single rows: they have a regular spacing between the lines. From one line to another, plants are disposed in a triangular pattern. Lines are further apart, banana plants make better use of solar radiation, and their roots have a better soil exploration. This layout is suitable for non-mechanized plots but guying is more difficult.

In vitro planting - Photo IT²

2.6- Planting

At planting time, the size of tissue-cultured plants should be as even as possible, as it is an essential element to the plantation's longevity. Smaller plants should be grouped in the same area.

Orientate the largest leaf with wind direction to avoid plant stress and promote the development of the early roots.

Do not plant too deep or too shallow: cover plants with a maximum of 5 cm of soil.

3. VARIETIES

The variety must be chosen depending on the environment, interacting with the chosen cropping system and the desired fruit characteristics.

Llinks to BANANAGAP frame of reference V5: AF 6.1.1 - CB 2.1 - CB 3.1 - CB 4.2 & 4.3.

CHARACTERISTICS OF VARIETIES BY SUPPLIERS, VITROPIC AND RAHAN MERISTEM (additional information is available at the nurseries' operators).

VARIETY	Height	Hardiness	Bunch shape	COMMENTS
902	3,3 m	Rustic	Cylindrical	▸ Rapid return on cycle ▸ Good productivity ▸ Long fingers
WILLIAMS	3,4 m	Very rustic	Conical	▸ Good adaptation to harsh production conditions (soil quality, water stress)
MA 13	3,3 m	Very little rustic	Cylindrical	▸ Rapid return on cycle ▸ Red pseudo stem ▸ More hands ▸ More fingers ▸ Good nematode tolerance ▸ Good behaviour at high altitude
BAMBOU (NORE3)	3,3 m	Average	Conical	▸ Good return on cycle ▸ Good productivity ▸ Less susceptible to Black Sigatoka
JOBO	3,2 m	Rustic	Cylindrical	▸ Quality identical to Williams ▸ More productive than Williams ▸ Higher potential in harsh agronomic conditions
ADI	1,9 à 2,3 m	Little rustic	Cylindrical	▸ Good return on cycle ▸ Small size facilitating field work ▸ Short distance between the hands, limited scratching ▸ Long fingers
GALL	2,8 à 3 m	Rustic	Cylindrical	▸ Variety more tolerant to stressful climatic conditions ▸ Good spacing of hands and fingers on the bunch
GRANDE NAINE FF	3 à 3,5 m	Average	Conical	▸ Good fruit classification ▸ High productivity under good agronomic condition, even at high altitude
JAFFA	3,2 à 3,5 m	Rustic	Cylindrical	▸ Late variety ▸ Homogeneous fruit length (minimum about 17 cm) ▸ Very productive variety
ZELIG	2,6 à 2,8 m	Very little rustic	Cylindrical	▸ Good return on cycle ▸ Very productive in good agronomic conditions ▸ Hands configuration avoiding fruit scratching

Most popular varieties in the French West Indies.