



# TECHNICAL DATA SHEET

## COCOA

### Section A: Information on crop planting

<b>A.1</b>	<b>Main cocoa-producing areas in Costa Rica are as follows:</b>	<ol style="list-style-type: none"> <li>1. Caribbean Huetar</li> <li>2. North Huetar</li> <li>3. Brunca</li> </ol>			
<b>A.2</b>	<b>Main Uses:</b>	Foodstuffs, cosmetics, pharmaceuticals	<b>A.3</b>	<b>Main export destination:</b>	Netherlands, Belgium, Panama

### Section B: Agroclimatic Conditions

<b>B.1</b>	<b>Temperature</b>	The ideal average monthly temperature should be between 25 to 26°C.	
<b>B.2</b>	<b>Precipitation</b>	Between 1500 and 3000 mm annually distributed throughout the year, although this can vary depending on the general conditions of the site.	
<b>B.3</b>	<b>Wind</b>	Wind speeds less than 14 km/h	
<b>B.4</b>	<b>Altitude</b>	The most favorable conditions in Costa Rica are found between 0 and 900 meters above sea level (m.a.s.l).	
<b>B.5</b>	<b>Soil</b>	Depth: 1.5 m	Slope: flat, moderate, not exceeding 25%
		Texture: Loamy to clay-loam	pH: 6,0 a 7,5 being 6,5 the ideal
<b>B.6</b>	<b>Cocoa Varieties</b>	Some clones developed in Costa Rica are: CATIE-R1, CATIE-R4, CATIE-R6, CC-137, PMCT-58, and ICS-95 T1. Among the international clones are: IMC-67, TSH-565, ICS-1, ICS-6, ICS-39, ICS-60, Caucasia-39, UF-654, UF-29, CCN-51, UF 61.	
<b>B.7</b>	<b>Planting material</b>	The most advisable is the use of grafted plants of fine and aromatic varieties or clones, with characteristics of high production, resistance to diseases, high quality, and special flavors.	
<b>B.8</b>	<b>Planting distance</b>	The most commonly recommended planting distances are: 3 × 3 m; 2.5 × 2.5 m or 3 × 4 m; however, the planting density and distance should be defined based on the site's environmental conditions, the presence of diseases, and the terrain's topography.	
<b>B.9</b>	<b>Planting</b>	The ideal time to plant is once the rainy season has begun, which should last for the next two or three months. If there is no rain after planting, water should be provided through irrigation. Temporary and permanent shade should be planted at least 6 months before the cocoa planting.	
<b>B.10</b>	<b>Tipping</b>	It is done approximately 6 months after planting in the field when the graft measures between 70 cm and 1 m, cutting with pruning shears, approximately 20 cm from the tip of the main branch to stimulate the formation of secondary branches.	
<b>B.11</b>	<b>Pruning</b>	<ol style="list-style-type: none"> <li>a. Formation pruning: around 6 months after tipping, choose 3 to 4 vertical and equidistant branches, these are the ones kept so that the tree adopts the best shape. The rest of the branches are cut from the base of the trunk.</li> <li>b. Maintenance pruning: it is most advisable to do it every six months, immediately after the periods of the highest harvest, to promote the formation of new and well-distributed foliage, balanced vertical branches.</li> <li>c. Sanitary pruning: consists of removing diseased fruits and parts of the tree affected by pests and diseases. Diseased branches and leaves must be removed when detected using the appropriate and disinfected tools.</li> </ol>	
<b>B.13</b>	<b>Fertilization</b>	Satisfactory results have commonly been obtained with the complete fertilizer formulas: 18-5-15-6-2; 18-10-12-6-5; 20-7-12-3-2, among others similar. However, to establish a fertilization program, it is recommended to carry out a chemical analysis of the soils and from there plan the fertilization of the crop.	



## Section C: **Cocoa Harvest**

<b>C.1</b>	<b>Cosecha</b>	<p>The cocoa fruits or pods are formed from the pollination of the flowers. It is estimated that the time that elapses between this moment and when the fruit is ripe, ready to be harvested, varies between 5 and 7 months.</p> <p>An indicator for harvesting is the color of the pod, in which two main cocoa colors are recognized: green and red. Green fruits ripen to yellow, although some may remain lighter green, while red or purple ones tend to change color to orange, red, or purple when they are ripe.</p>
<b>C.2</b>	<b>Breaking and shelling of cocoa</b>	<p>It refers to the opening of the pods to extract the seeds with the pulp and take them to the fermentation process. It should be taken into account that when breaking the shell of the pod, the beans must not be damaged, as this affects the quality of the final product.</p> <p>When the pod is open, the beans are extracted by hand, sliding the fingers through the placenta to separate the seeds and not incorporate it into the fermentation mass. It is recommended to use gloves to avoid accidents and contamination of the cocoa beans. Once the breaking is finished, the wet cocoa must be transferred to the fermentation site.</p>

## Sección D: **Post-harvest management of cocoa**

<b>D.1</b>	<b>Fermentation</b>	
	This process triggers a series of biochemical reactions that give rise to the formation of the precursors of cocoa's characteristic flavor and aroma.	
	<b>1. Reception of fresh cocoa</b>	The quality of the cocoa in terms of uniformity and appearance should be checked, in addition to verifying the sugar content, for which the refractometer is used, which must register a minimum value of 15° Brix.
	<b>2. Weight and Control</b>	The net weight of the fresh cocoa should be recorded in an appropriate format that includes at least: producer's name, identity number, date, weight, and a brief note on the general observations of the quality of the delivered fresh cocoa.
	<b>3. Basic fermentation indicators record</b>	When filling the fresh cocoa to the selected fermentation system, this module becomes the monitoring and traceability unit of the process, so it is very important to carry out basic tests and document key indicators that ensure and guarantee the required quality. The most important indicator is the temperature record, which should be done at least every 12 hours and always at the same time.
<b>4. Turnovers and removals</b>	During the first hours, the beans should remain motionless and after 48 hours the first turnover should be carried out, as long as the temperature has drained sufficiently. Subsequently, removals are necessary every 24 hours until the fermentation is finished, bearing in mind that if there are pronounced decreases or increases in temperature, more or fewer turnovers or removals must be made.	
<b>D.2</b>	<b>Drying</b>	Process by which the excess internal moisture of the cocoa is removed until reaching a minimum of 6.5% and a maximum of 8.0%, which allows storage and prevents the proliferation of microorganisms that could deteriorate the good quality of the bean.
<b>D.3</b>	<b>Cleaning, classification, and storage</b>	For this, an adequate cleaning and selection of the cocoa is carried out, which allows removing or separating defective beans. Classification is carried out to meet the minimum allowed weight, 1.0 g per bean. Once the classification is done, clean cocoa is stored in natural fiber bags (jute) or completely new and dry food-grade bags that allow storing the grain until its commercialization.

## Section E: **Information about production costs**

The establishment costs for a cocoa plantation range from US\$ 4,500 to US\$ 5,000 per hectare during the first 3 years. After the first 3 years of establishment, the production cost is reduced to approximately US\$ 3,000 per hectare.

These costs have been determined by analyzing cocoa plantations using new clones and under diversified models with banana and shade from timber trees.