CORDILLERA

SINCE 1920

SUSTAINABLE LATINAMERICAN CHOCOLATE

AGRICULTURAL INNOVATIONS

Theobroma cacao L. *CNCH12 & CNCH13*

CHARACTERISTICS

Genealogy: these clones were selected from open-pollinated trees from cacao farms located in San Vicente de Chucurí, Santander, at a altitude of 910 meters above sea level (masl) with an average temperature of 25°C. This selection was done by researchers from the Sales and Agricultural Development Area at Compañía Nacional de Chocolates CNCH.

These clones have the Colombian Agricultural Institute (ICA) registration numbers ICA 081657 (CNCH12) and ICA 081658 (CNCH13) for the Caribbean subregion and the ICA 013728 (CNCH 12) and ICA 013729 (CNCH 13) registrations for the Amazon, Andean (<1,800 masl), Orinoquía, Pacific, and Inter Andean Valley regions.

Compañia Nacional de Chocolates

CACAO LIQUOR
FLAVOR PROFILE

CNCH 12

CNCH 13

PERFORMANCE

COMPATIBILITY	SELF-COMPATIBLE	
Dry bean yield (kg/ha/year) *	2,876	2,309
Bean Index**	1.73	1.74
Pod Index***	17	13
Pods/tree/year	49	30
	CNCH 12	CNCH 13

* 1,000 plants/ha
** Dry bean weight
*** Pod index is the number of pods needed to produce one kilogram of dry cocoa beans

TREE AND LEAF

	CNCH 12	CNCH 13
Architecture	Erect	Erect
Leaf length (cm)	31,57 ± 2,36	29,89 ±2,64
Leaf width (cm)	11,03 ± 0,85	11,71± 1,28
Length from leaf base to the widest point (cm)	17,48 ± 1,89	15,68 ± 2,18
Leaf length-width ratio	1,82 ± 0,19	1,92 ± 0,15
Petiole length (mm)	23,35 ± 3,34	22,12 ± 2,57
Leaf shape	Oblong	Oblong
Petiole color	Green	Green
Leaf color	Green	Green
Shape of leaf base	Obtuse	Obtuse
Shape of leaf apex	Acuminate	Acuminate
Pulvinus in leaf	Present	Present
Leaf texture	Leathery	Leathery
Emerging cacao leaves color	Bright red	Deep red
Trichomes in emerging leaves	Present	Present

POD

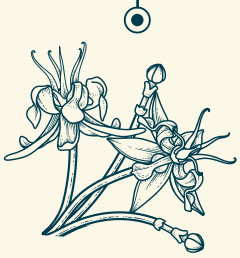
QUALITATIVE MORPHOLOGICAL DESCRIPTORS

	CNCH 12	CNCH 13
Color of immature pod	*Reddish green*	*Light green*
Color of mature pod	*Yellow-orange*	*Light yellow*
Shape of apex	*Acute*	*Attenuate*
Basal constriction	*Intermediate*	*Intense*
Pod shape	*Elliptical*	*Oblong*
Surface texture-roughness	*Smooth*	*Intense*
Anthocyanin in ridge from immature pods	*Minor*	*Absent*
Anthocyanin in ridge from mature pods	*Minor*	*Absent*
Anthocyanin in ridge separation from immature pods	*Minor*	*Absent*
Anthocyanin in ridge separation from mature pods	*Minor*	*Absent*
Primary ridge separation	*Merged*	*Slight*

QUANTITATIVE MORPHOLOGICAL DESCRIPTORS

	CNCH 12	CNCH 13
Pod length (cm)	*18,72 ± 1,83*	*23,14 ± 2,24*
Pod weight (g)	*755,64 ± 198,5*	*859,31 ± 215,4*
Pod width (cm)	*9,79 ± 0,83*	*9,41 ± 0,86*
Pod length-width ratio	*1,92 ± 0,21*	*2,48 ± 0,25*
Inner diameter (mm)	*65,80 ± 5,25*	*63,49 ± 5,74*
Depth primary furrow (mm)	*12,36 ± 1,85*	*11,17 ± 1,95*
Depth secondary furrow (mm)	*13,23 ± 2,32*	*12,30 ± 5,48*
Number of complete seeds per pod	*35 ± 6*	*46 ± 8*
Number of defective seeds per pod	*2 ± 1*	*2 ± 2*
Wet weight (g) of 100 seeds	*430,30 ± 82,99*	*476,96 ± 62,94*
Dry weight (g) of 100 seeds	*173,24 ± 25,01*	*174,51 ± 20,52*
Estimated dry weight (g) per fruit	*60,85*	*80,69*
Number of seeds per pod	*37*	*48*

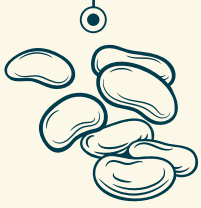
FLOWER



MORPHOLOGICAL DESCRIPTORS

	CNCH 12	CNCH 13
Color of peduncle	*Reddish*	*Reddish green*
Anthocyanin in sepals	*Minor*	*Absent*
Anthocyanin in stamen	*Intense*	*Intense*
Anthocyanin in filament	*Absente*	*Present*
Color of flower	*Pink*	*Cream*
Sepals orientation	*Semi pendant*	*Semi pendant*
Anthocyanin in the upper part of the ovary	*Absent*	*Absent*
Anthocyanin in petal	*Present*	*Absent*
Stamen length (mm)	*5,74 ± 0,36*	*7,12 ± 0,23*
Ovary length (mm)	*1,34 ± 0,13*	*1,46 ± 0,21*
Style length (mm)	*2,40 ± 0,14*	*2,16 ± 0,09*
Number of ovules per ovary	*45,80 ± 3,27*	*54,80 ± 3,49*

SEEDS



QUALITATIVE MORPHOLOGICAL DESCRIPTORS

	CNCH 12	CNCH 13
Seed shape in longitudinal section	*Oval*	*Oval*
Seed shape in cross section	*Flattened*	*Intermediate*
Color of cotyledons	*Purple*	*Purple*
Seed length (mm)	*29,05 ± 2,97*	*26,56 ± 2,71*
Seed diameter (mm)	*15,06 ± 1,61*	*13,82 ± 1,42*
Seed width (mm)	*8,99 ± 2,59*	*9,41 ± 1,42*

AGRONOMIC CROP MANAGEMENT

SITE CHARACTERISTICS

The optimal conditions for the cacao crop are: farm not above an altitude of 1,200 masl; average temperature between 23°C and 28°C; yearly average rainfall between 1,800 and 2,600 mm (rainfall evenly distributed is critical); average soil depth exceeds 1 meter.

PROPAGATION

Establish the crop using rootstock seeds obtained from clones recommended by the ICA resolution N° 3434 of 2005. The propagation of the clones is effective using any traditional grafting technique. Nonetheless, we have had great results using the top grafting of seedlings.

CROP ESTABLISHMENT

It is recommended to establish the clones in agroforestry systems. Due to the architecture of the clones, it is a good practice to have a distance between plants of 4m x 4m. The planting hole and the seedling bag should have equal dimensions.

PLANT NUTRITION

Soil analysis and foliar analysis are recommended to design a nutrition plan. Follow the recommendations of the technicians in terms of the dosage, method, and frequency of application.

WEED CONTROL

Several strategies could be implemented to reduce the negative effects caused by unwanted plant species: mechanical, chemical, cultural, and biological weed control are among those. Identifying the weed species is important as it will guide the weed control plan. It is important to consider the conservation of beneficial weeds that reduce soil erosion and limits the growth of unwanted plants. Weed controls must be done throughout the year, following a schedule.

Regardless of the weed control strategy implemented, it is important to manually pull out all the weeds around the trunk to avoid damaging the trees while implementing other weed control strategies.
Note: to favor the establishment of a cacao crop, weed control in the initial stages is critical. Hence, we recommend controlling weeds six times a year.

PRUNING

During the initial stages of the plantation, formative pruning is required to form the future architecture of the cacao tree. During productive stages, pruning should be done after the harvesting season, when the tree has few pods and flowers.

PHYTOSANITARY MANAGEMENT

The CNCH12 and CNCH13 cultivars have a positive response to cultural methods of disease control, in particular to Black pod (*Phytophtora* spp.), Witches´ Broom (*Moniliophthora perniciosa*), and Frosty Pod (*Moniliophthora roreri*). By doing weekly removals of the affected pods (cultural control), the average annual losses caused by Frosty Pod are lower than 5%.

Integrated crop management, together with favorable agroecological conditions is fundamental to obtaining the yields previously described.

CNCH 12 · · · CNCH 13

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Compañía Nacional de Chocolates

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