FOOD WASTE IN COCOA INDUSTRY

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1 OBJECTIVES

1. To understand the situation of cocoa industry, both in Catalonia and Spain, in relation to production and waste.
2. To analyse cocoa production process by quantifying the losses that can be generated.
3. To evaluate the best techniques available in cocoa industry and to propose an improvement in the production process in the evaluated areas, in order to reduce the losses caused and to be more respectful of the environment.

2 VOLUME OF COCOA PRODUCTION

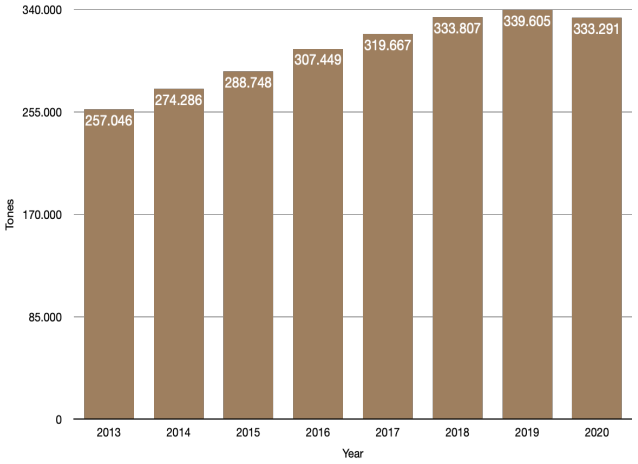

Figure 1: Annual evolution of the volume of industrial cocoa production in Spain from 2013 to 2020

3 COCOA PRODUCTION PROCESS

HARVESTING → FERMENTATION → DRYING → CLEANING → ROASTING → WINNOWING → NIBS GRINDING → ALKALIZATION → LIQUOR PRESSING → COCOA GRINDING → COCOA PROCESSING

4 BEST AVAILABLE TECHNOLOGY

Waste Volume Reduction: 19,2% → 63.991,8 T

CLEANING

- This machine uses artificial vision to replace mechanised systems.
- Efficiency approximately 99%.

Figure 2: Image of the machine *"Sortex B"* (Buhler, 2021)

NIBS GRINDING

- The use of this machine means an improvement in hygienic design and a reduction in energy consumption by using by-products as a source of fuel.
- Efficiency approximately 99%.

Figure 4: Image of the machine "Nova™S"(Buhler, 2021)

WINNOWING

- At this stage the conventional nib grinding mill is replaced by centrifugal crushers.
- Efficiency approximately 99%.

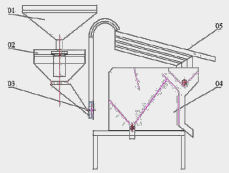

Figure 3: Image of the winnowing system using centrifugal crusher (Nguyen, Pham i Lanh, 2019)

LIQUOR PRESSING

- An alternative to hydraulic presses is the use of supercritical CO2 to reduce waste.
- Efficiency approximately 99%.

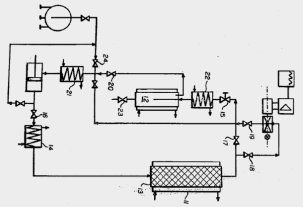

Figure 5: Image of the supercritical CO_2 extraction process (Roselius, Vitzthum i Hubert, 1975)

Waste Volume: 25.5% → 84.989,2T

5 YIELD COMPARISON CONVENTIONAL PROCESS VS B.A.T

Table 1: Comparison of the yields obtained in the conventional process and in Best Available Technology

Stage	Conventional Process Yield	B. A. T. Yield	Difference
Cleaning	97,8%	99%	1,2%
Winnowing	93%	99%	6%
Nibs Grinding	87%	92%	5%
Liquor Pressing	92%	99%	7%

6 CONCLUSIONS

- Cocoa sector in the area analysed shows a rising trend in consumption.
- Cocoa production process in the evaluated area has a percentage of losses of approximately 25.5%.
- Waste in cocoa production process can be reduced up to 19.2%, as well as its energy consumption, by the implementation of the best available technologies.
- There is still a long way to go in food waste but with the implementation of the best available technologies, the amount of waste generated and energy consumption can be reduced, making it more environmentally friendly.

7 BIBLIOGRAPHY

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-Roselius et al. (1975). *Methods of Producing Cocoa Butter*. https://patentimages.storage.googleapis.com/19/f7/d4/451ff9d45f8ffc/US3923847.pdf