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DEVELOPMENT AND VALIDATION OF AN INSPECTION AND COMPLIANCE TOOL FOR SANITARY REQUIREMENTS APPLIED TO CACAO PROCESSING CENTERS IN THE DEPARTMENT OF HUILA

Desarrollo y validación de una herramienta de inspección y cumplimiento de requisitos sanitarios aplicado a centrales de beneficio de cacao en el departamento del Huila

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ABSTRACT

Background: Cocoa production has gained strategic importance in the context of international markets, where bean quality is a key attribute for commercialization. However, post-harvest processes such as fermentation, drying, and storage still lack standardization in many producing regions, which negatively affects the final product quality and limits its competitiveness. This issue is also evident in the department of Huila, Colombia, where the absence of tools adapted to local conditions has hindered sanitary control and continuous improvement in cocoa processing centers. **Objectives:** the design of a tool for the inspection and evaluation of sanitary requirements adapted to the cocoa processing plants of the department of Huila with applicability at the national and international levels was proposed to carry out a diagnosis and monitoring to establish a quality assurance system under the hazard analysis and critical control points (HACCP) approach. **Methods:** Within the research framework, the GHYCAL methodology was followed, addressing seven phases: Scientific surveillance, establishing a baseline, preliminary development, validation, consolidation and approval, application, and reliability estimation. **Results:** The sanitary requirements inspection list was validated with 50 criteria and a Likert-type scale. It was subjected to a Delphi session with experts, finding that its application and evaluation through Cronbach's alpha results in high reliability (α>0.90). **Conclusions:** The feasibility of the evaluation list to be used in cacao processing plants was guaranteed, and, with it, establish basic guidelines for improving grain quality through an assurance system managed from it.

Keywords: *assurance system, continuous improvement, post-harvest, quality*

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RESUMEN

Antecedentes: La producción de cacao ha cobrado relevancia estratégica en el contexto de los mercados internacionales, donde la calidad del grano es un atributo clave para su comercialización. No obstante, los procesos de poscosecha como la fermentación, el secado y el almacenamiento aún presentan baja estandarización en muchas regiones productoras, lo cual repercute negativamente en la calidad del producto final y limita su competitividad. Esta problemática se evidencia también en el departamento del Huila, Colombia, donde la falta de herramientas adaptadas a las condiciones locales ha dificultado el control sanitario y la mejora continua en las centrales de beneficio de cacao. **Objetivos:** Con la finalidad de realizar el diagnóstico y seguimiento para el establecimiento de un sistema de aseguramiento de calidad bajo el enfoque de análisis de peligros y puntos críticos de control (APPCC), se propuso el diseño de una herramienta para la inspección y evaluación de requisitos sanitarios adaptada a las centrales de beneficio de cacao del departamento del Huila con aplicabilidad a nivel nacional e internacional. **Métodos:** En el marco de la investigación, se siguió la metodología GHYCAL, abordando siete fases: Vigilancia científica, establecimiento de línea base, desarrollo preliminar, validación, consolidación y aprobación, aplicación y estimación de confiabilidad. **Resultados:** La lista de inspección de requisitos sanitarios con 50 criterios y escala tipo Likert fue validada. Sometida a sesión Delphi con expertos, su aplicación y evaluación mediante estimación del alfa de Cronbach, dio como resultado alta confiabilidad (α>0.90). **Conclusiones:** Se garantizó la factibilidad de la lista de avaluación, para ser empleada en centrales de beneficio de cacao y con ella, establecer lineamientos base para el mejoramiento en la calidad del grano a través de un sistema de aseguramiento gestionado a partir de ella.

Palabras clave: calidad, mejora continua, postcosecha, sistema de aseguramiento

INTRODUCTION

Since the First and Second World Wars, globalization has been driven by treaties and alliances that mutually benefit different populations, creating new trade relations between countries and strengthening existing ones (1). These agreements involve setting prices and profits and guaranteeing that the goods or services exchanged meet the minimum requirements of acceptance and competitiveness, facilitating market penetration (2).

Quality is understood as a property inherent to the needs of the client or buyer and aimed at promoting standardization that leads to satisfaction. Since ancient times, it has been well-known as added value (3), but its current evolution has turned it into a vital commercial requirement in all areas of human interaction focused on planning on doing, verifying, and acting (4). These quality management and assurance systems constitute a powerful tool that supports the processes by executing properly documented activities, providing traceable information that allows the implementation of continuous improvement methods at the forefront of the industry, and following market needs (5).

In the manufacturing industry and as part of it, in the food sector, multiple systems have been developed to guarantee the quality of products or services (6) from their physical, chemical, sensorial, microbiological, and other areas related to the nature of the same. (7) highlighted that those implemented by the International Organization for Standardization or ISO Standardization stand out internationally. Among them, ISO 9000:2015 and ISO 9001:2015 are the leading ones for the manufacturing sector (8) with a positive effect on consumer satisfaction (9), laying the foundation for other axes such as the environmental, safety and health at work and food safety. Of the latter, ISO 22000:2018 specifies the requirements to ensure food safety. Another important system in the agri-food sector is the Good Manufacturing Practices, which establishes the hygienic requirements for establishments or installations that involve any type of food in their production process (10), and the Hazard Analysis and Critical Control Points known as HACCP was developed to maintain a preventive approach with the establishment of immediate action measures in the event of unexpected deviations (11).

The cocoa sector at an international level focuses on strengthening the quality conditions to participate in globalized markets (12). Thus, producers must adjust their processes to guarantee this property and execute necessary actions leading to standardization and compliance with regulatory requirements established by national and international regulations (13). In the case of Colombia, being one of the 10 countries with the highest cocoa production worldwide (14), international cooperation agreements have been established, such as the one signed in 2010 in Geneva, approved by Law 2163 of 2021, as well as regulatory requirements for the chocolate sector through Resolution 1511 of 2011, to guarantee the minimum requirements for distribution of this type of products. However, no national guidelines

allowed the unification of criteria for the intermediate phase of the post-harvest processes, including fermentation, drying, and storage. Therefore, the Colombian Institute of Technical Standards and the ICONTEC Certification established the Colombian Technical Standard 1252:2021, where the quality requirements of cocoa beans were registered, classifying it into Regular, Standard, and Premium/ Special cocoa. As a general guideline for compliance for the industry, Resolution 2674 of 2013 applies, the evaluation list of risk-based sanitary inspections for food preparation zones (15), and resolution 2674/13, these establishing the basic hygiene conditions for food factories.

Cocoa in its post-harvest process does not have direct regulation that monitors and controls the conditions under which its processes must be carried out beyond the guides or methodologies of national or foreign research centers (16) because the fermentation and drying phases are carried out mainly on farms and, once these processes are completed, they market the grain as raw material for factories, who will obtain intermediate products and chocolate (17). Due to the associative strategies by regions or sectors in Colombia (18), the department of Huila, in turn, has adopted this system, and from 2015, collection centers managed by associations and cooperatives of cacao growers were established, and they carry out fermentation, drying, and storage on a larger scale (19). However, during the last years, the need to standardize techniques that guarantee the quality of the grain to be able to access international markets has arisen (20). As a solution to this, Instituto Colombiano de Investigación Agropecuaria (AGROSAVIA), in alliance with Universidad Surcolombiana (USCO) and Servicio Nacional de Aprendizaje (SENA), proposed as an alternative solution, the implementation of a quality assurance system under the approach of identifying critical control points designed and adjusted to the conditions of the processing plants (centrals) and taking as a starting point the progress made by AGROSAVIA, Federación Nacional de Cacaoteros (Fedecacao) and the Cocoa Network, entities of great relevance in the development of this productive chain that finance crop development projects in the country (21) and work in fruit enhancement as well as processing and quality improvement strategies (22).

Based on the above and in the absence of a diagnostic instrument adapted to the conditions and requirements of cocoa community processing plants, which impact quality by estimating the base conditions, it is necessary to build a diagnostic tool, validated and implemented, to allow the development of a continuous improvement plan as a starting point for the implementation of quality assurance systems, whose focus is the identification of hazards and critical control points that lead to obtaining standardized quality cocoa.

MATERIALS AND METHODS

The GHYCAL methodology was addressed for the development of the tool. This methodology was proposed by Castro and Ramirez (23) and Gutierrez et al. (24) and replicated by Osorio and Sanchez (25) and Siancas and Quiñones (26) and comprises seven stages: 1) scientific surveillance, 2) establishment of a baseline, 3) preliminary development, 4) validation, 5) consolidation and approval, 6) application, and 7) reliability estimation.

According to the approaches of Van der Spiegel in 2003 (27), *scientific surveillance* as an assurance system must be adjusted to the conditions of the productive activity; therefore, for the construction of the evaluation and inspection tool, the search for information regarding the subject that will be used as a starting point for the design and management of the same with direct influence on cocoa processing plants was carried out. For this, a search for previous research and applications was carried out in databases such as SCOPUS, ScienceDirect, and Google Scholar, as well as health regulations in Colombia proposed by government and private entities, among others.

After the literary review and identification of the strategies processes were carried out i.e., the *baseline was established*, it was found that although previous research has been developed in countries such as Peru (28), the technological conditions and regulations differ. Therefore, the need to create an instrument for evaluating sanitary requirements adapted for the processing plants of the department of Huila arose, taking as a baseline relevant information from the cocoa sector to carry out a successful approach according to the establishments or installations and their related activities.

Based on secondary information, how the evaluation list of risk-based sanitary inspections for food preparation zones (15), the *preliminary development* of the checklist-type tool was carried out considering 47 items that addressed criteria such as infrastructure, sanitation, training, and personnel, among others

(29) with an evaluation scale such as the one used by Canto de Gante et al. (30), i.e., they used a Likert-type scale with five options according to the level of compliance.

The next stage was to *validate the instrument* through Delphi sessions, which allowed obtaining relevant indicators for measuring performance and validating applicability and suitability as proposed by Van der Spiegel et al. (31). For this case, Delphi sessions were carried out with nine experts related to the cocoa production chain, including the harvest, post-harvest, processing, quality, and market phases, who evaluated the entire instrument as well as each criterion.

With the feedback from the panel, the *final consolidation* of the tool was carried out, which, once *approved*, was *applied* in the four processing plants (centrals) of the Department of Huila in the municipalities of Rivera, Campoalegre, Algeciras, and Gigante, during the intermediate and final diagnosis phases, calculating Cronbach's alpha and *determining the reliability* of the results obtained according to Equation 1 (32).

$$\propto = \left[\frac{k}{k-1}\right] \cdot \left[1 - \frac{\sum s_i^2}{\sum s_t^2}\right] \qquad \text{Equation 1}$$

Where:

s_i^2 = the sum of variances of each item

st^2 = the variance of the total score of the evaluators

k = the number of items

RESULTS AND DISCUSSION

Monitoring and establishing a baseline

When searching for related data and selecting baseline information, the authors decided that the starting point would be the "checklist for the monitoring and control of the cocoa harvest" presented by the Cocoa Network (n.d.), whose focus is given to producers and personnel of processing and collection centers, consisting of six activities, nine sub-activities and 63 items, referenced to harvest and post-harvest tasks. Since the processing plants (centers) only carry out fermentation, drying, and storage activities, these criteria were prioritized and complemented with the requirements included in Resolution 2674 of 2013, according to the conditions these collection plants (centers) may require. The Hygiene and Quality Management model or GHYCAL (for its acronym in Spanish) addressed by Castro and Ramirez (22) was used as support, ensuring product quality without significantly affecting the structure and design of the area, in addition to Resolution 082394 of 2020 of Instituto Colombiano Agropecuario in "Annex 1 - Checklist for the certification of good practices." This checklist allows the quantification of the impact on quality based on the above and identifies that there is no instrument with direct application to this type of establishment.

Preliminary development and validation

With the above information, a set of initial or preliminary criteria was developed, which were evaluated by a panel of experts who, based on their experience, issued their opinions and recommendations so that the instrument would be more effective in following the stated objective. Based on the feedback from the evaluators of the initial version of the tool consisting of 47 items, only 28 items were approved in the first Delphi session, with the annotations of distributing the list into four large groups according to the nature of the criteria and their correlation with quality assurance factors, allowing a more significant relationship of what was evaluated with the different stages addressed in a HACCP type system. In addition, notes regarding the broad content of three items were presented, recommending that they be divided for their better understanding and judgment. For the other items, adjustments were made according to the suggested interventions. Finally, to make the tool more interactive, it was recommended to apply a scoring system that in its entirety added up to 100 since the scale proposed by adding the grades could reach a total score of 200, which could generate confusion in its global interpretation.

Consolidation and approval

After carrying out all the interventions suggested by the experts, the inspection checklist tool, consisting of 50 items, was generated and distributed in four segments (see Table 1). Each score given in the inspection partially adds up to the section to which it belongs, and to be expressed, it is divided in half, allowing a direct relationship between its score and the percentage of compliance. The criteria that were intervened and used for the final session and received approval were the following: the title of the instrument because it can be applied in different stages, not only for diagnosis but also for follow-up. The title was adjusted to "Evaluation List of Sanitary Requirements in Cocoa Processing Plants." Items

1.5, 2.9, and 3.18 were created, and semantic and writing interventions were carried out for the better understanding and coverage of criteria 1.3, 1.4, 1.7, 1.9, 1.10, 2.1, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 3.1, 3.17, 4.1, 4.3, 4.4, 4.5, and 4.6. In addition, a bar graph was included indicating the progress of each area evaluated and a percentage of overall compliance. This instrument was approved by experts who expressed its importance at the national level in establishing improvements in the collection plants (centers) for cocoa fermentation, drying, and storage (See Annex 1).

Table 1. Inspection tool sections.

Section	Description	Items
1	Hygienic requirements	10
2	Quality assurance	10
3	Operations in progress	20
4	Hazard analysis and critical control points	10
	Total	50

Source: elaborated by the authors

Application

With this consolidated tool, the respective application was carried out to evaluate the state of compliance with sanitary requirements adapted to the conditions of cocoa processing plants (centers) in the Rivera, Campoalegre, Algeciras, and Gigante municipalities. The diagnosis corresponding to the phase before applying a quality system allowed formulating an improvement plan under three essential aspects: infrastructure-equipment, documentation, and management.

Reliability estimation

Cronbach's alpha was calculated to determine the reliability of the applied tool and using the results obtained, not only during the initial phase ($\alpha = 0.949$) but also during the intermediate ($\alpha = 0.908$) and final ($\alpha = 0.934$) follow-ups carried out as a semi-annual compliance follow-up, giving high reliability of results expressed by the instrument in all three moments according to the classification addressed by Castillo-Sierra et al. (33).

DISCUSSION

The criteria addressed by the tool applied to the processing plants (centers) are homologous to those established by Gonzales in 2014 (34) for installations such as restaurants. These are basic quality aspects and provide an approach to risk identification under "Inspection, Surveillance and Control" activities, behavior expressed by Fajardo-Guerrero and Rodríguez-Mora (35). The base information constituted a fundamental pillar for developing activities that would guide an optimal final result and with an initially regional application horizon but with the capacity for national expansion to identify sanitary and productive requirements.

This tool established an appropriate improvement plan for each plant (central), focusing on designing and implementing a quality assurance system under an identification of critical control points approach. Starting from the base knowledge that, as expressed by Dudin et al. (36), it became a key axis to execute these continuous processes with a clear vision that allows establishing process improvements under standard conditions and, in this way, provides the security that cocoa or any other product, as postulated in its review and applied by Rincón-Ballesteros et al. (37), is marketed under physical, chemical, biological, sensory and safety quality conditions.

The development through four sections or axes allowed emphasizing the identification of improvement opportunities that increase the effectiveness of the actions carried out and the optimization of resources use (38). Concerning the initial information, the items were reduced because a greater link was sought between the evaluated parameters and the conditions and processes executed by the plants (centers) assessed, just as Van Der Spiegel et al. (39) sought to establish actions that would generate the most significant development impact on its production process; in this case, the objective was directed towards a homologous path.

The validation of the tool was a relevant and enriching factor since, in addition to having been subjected to comprehensive sessions by experts who oriented it towards the needs of the sector from different areas or perspectives that lead to a single objective, enhancing it and giving results of higher impact with the possibility of consolidation as a model or reference in the future, scientific support and proven reliability were also provided with the Cronbach model ($\alpha > 0.9$). Just like the intention of Soriano in 2014 (40) when designing an evaluative instrument, this inspection list becomes a proposal for the Colombian and international cocoa sector, which seeks strategies to improve their productive

activities in the cocoa post-harvest phases that directly affect the final chocolate quality (41).

Considering the evaluation during the diagnostic, intermediate, and final phases, the influence of a HACCP-type quality assurance system designed from the results obtained was made viable, similar to that carried out by Kafetzopoulos et al. (42), who experimented with a similar methodology to determine the effectiveness of their HACCP system. Therefore, the surveillance and control characteristics required for traceability in the processing processes in community cocoa plants (centrals) in the department of Huila are met, knowing the state of progress or relevant aspects of it, to finally compare the impact of the activities developed in favor of improving cocoa quality, which generates impacts on the life quality of producers, with a view towards the economic and social development of the region as indicated by Murcia et al. (43).

CONCLUSIONS

The GHYCAL methodology allowed the development of an inspection and monitoring tool for cocoa processing plants (centrals) in the department of Huila with reliability percentages above 90%, according to the Cronbach model. This tool allows producers, associations, and cocoa companies at the national and international levels to draw up lines of action in the design of quality assurance systems throughout the agri-food chain, which positively impacts the processing processes and allows the department of Huila to position itself as a potential producer of specialty cocoa.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR'S CONTRIBUTIONS

JCQ: Project formulation, experimental development, statistical analysis, and document writing. JKCC: Methodology and statistical analysis. LRP: Project administrator and supervision. JCN: Project formulation, experimental development, logistics, and document review and editing.

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ANNEXES

Annex 1. Evaluation list of sanitary requirements in cocoa processing plants (centrals).

AGROSAVIA Corporación colombiana de investigación agropecuaria	**Evaluation of sanitary requirements in cocoa processing plants**	**Code: ASC_D01** **Version: 01** **Date: September / 2023**
Elaborated by: Jean Carlo Quintero García	**Approved by:** Jenifer Criollo Nuñez	

Data of the establishment or installations			
City / Department		**Date**	

Processing plant (center)		**Address**	
Legal Representative		**Telephone**	
Related associations			
No. of Employees		**Weekly Capacity**	

Inspection requirement			
Company / Legal Representative		**Telephone**	
Address		**E-mail**	

Purpose of the Inspection:

Professional evaluator			
Name		**Profession**	
ID card		**Professional Card**	
Telephone		**E-mail**	

Evaluation scale		
Score	***Compliance***	***Description***
2	**Satisfactory**	The plant (central) satisfactorily meets all of the evaluated criteria, both concerning documenting and in terms of execution and implementation.
1	**Medium**	The plant (central) partially meets the requirements described in the aspect to be evaluated, carries out the execution but does not have registration documentation or vice versa.
0	**Null**	The plant (central) does not meet any of the requirements described in the criterion to be evaluated and may represent a risk to cocoa safety; the criterion is neither documented nor implemented.

MPS: Maximum possible score *MSO: Maximum score obtained*

Item	**Criterion**	**Assessment**		**Observations**
1.	**Sanitary requirements**	**MPS:**	**20**	
		MSO:	**0**	
1.1	The processing plant (central) is located in an area far from unhealthy zones and does not represent a risk to the community.			
1.2	The accesses and surroundings of the processing plant (central) are clean and free of stagnant water and accumulations of solid waste.			
1.3	The design of the processing plant provides protection for the product in all its phases (reception, fermentation, drying, storage), avoiding air currents, abrupt changes in temperature, rain, entry of animals or unauthorized personnel.			
1.4	The design of the processing plant (central) presents a sequence and size suitable for carrying out operations according to its capacity and allows for the fluid circulation of raw materials, dry cocoa and personnel.			

1.5	The processing plant (central) areas are delimited, physically separated and have the necessary signalling.			
1.6	The floors, walls, ceiling, windows, doors, stairs and lighting provide protection from the external environment, are firm, resistant, and are in a good state of cleanliness and maintenance.			
1.7	The processing plant (central) has sufficient sanitary units, washbasins and changing rooms (minimum 1 for every 15 people), and it is fully equipped for the hygiene and grooming of the staff.			
1.8	The design of pipes and drains does not generate contamination risks, and are duly identified and protected.			
1.9	The solid or liquid waste storage area is designed and located so that it does not represent a risk of contamination for the product or the production areas. It also has containers in sufficient quantity and volume according to its daily generation capacity, with frequent removal to prevent the proliferation of pests.			
1.10	The processing plant (central) has sufficient equipment, machinery and tools for the processes carried out, and they are also built with materials that prevent contamination (for 400 kg, minimum: 1 fermentation box of 1 m^3, 3 drying trays of 1.5 m^2, and 1 pallet of 1 m^2).			
2.	**Quality assurance**	**MPS:**	**20**	**Observations**
		MSO:	**0**	
2.1	The processing plant (central) executes a preventive or corrective maintenance program for facilities, equipment and utensils, which is documented with manuals, instructions, guides, records and controls carried out on them.			
2.2	There is a calibration program for measuring equipment at the processing plant (central), with its respective records of use and calibration.			
2.3	The processing plant (central) has and applies a water supply program and drinking water quality control records.			
2.4	The processing plant (central) has a documented and implemented program to comprehensively manage solid and liquid waste.			
2.5	The processing plant (central) carries out preventive actions through an integrated pest control program and documents them.			
2.6	The processing plant (central) carries out cleaning and disinfection activities on surfaces, equipment, utensils, and areas of the facilities guided by a written program with its respective protocols and controls for the reception, fermentation, drying, and storage phases.			
2.7	The processing plant (center) establishes and implements a training plan for personnel linked to any activity related to the cocoa production process carried out on the facilities, whether frequently or occasionally.			
2.8	The food handling staff at the processing plant (central) have a valid food handling certificate.			
2.9	The food handling staff of the processing plant (central) wear the necessary equipment for their personal protection and that of the product, carrying out the processes under hygienic conditions.			
2.10	The cocoa handling staff at the processing plant (central) work in optimal health and if they are not, they are assigned tasks that do not represent a risk of contamination for the cocoa.			
3.	**Operations in progress**	**MPS:**	**40**	**Observations**
		MSO:	**0**	
3.1	The processing plant (center) has a supplier program, where it identifies or codes owners and producing farms for traceability in its processes.			
3.2	The process flows executed in the plant (central) do not represent a risk of cross-contamination of fresh cocoa with dry cocoa and are carried out in a logical and sequential manner.			
3.3	The plant (central) has a program through which it executes and records the control of process variables in the reception, fermentation, drying and storage phases.			
3.4	There is a protocol, schedule, records, acceptance and rejection criteria for receiving raw materials from the processing plant (central).			
3.5	Physicochemical variables such as weight, pH, temperature, sensory variables such as appearance, color, odor, and diseased beans are monitored during the reception of fresh cocoa.			
3.6	The sanitary conditions of the vehicle in which the fresh cocoa was transported are inspected.			

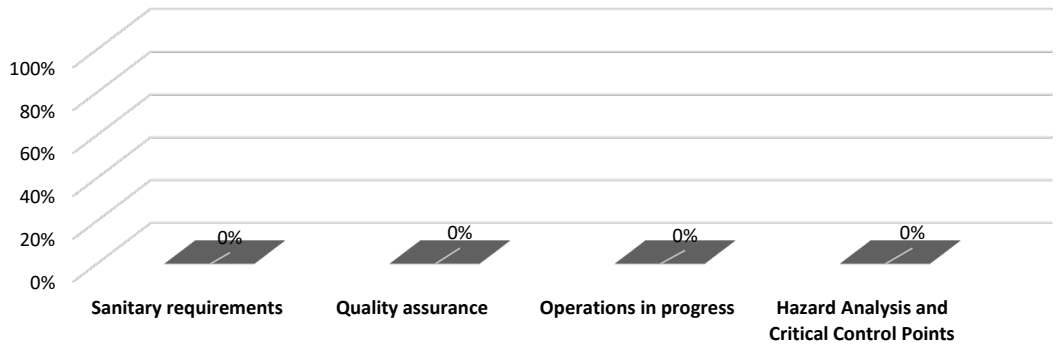
3.7	In the event of a deviation in the acceptance conditions of the cocoa, the plant (central) has defined the action protocol for dealing with these situations.			
3.8	The plant (central) creates production batches based on the nucleus or zone, variety and quality of fresh cocoa. It does not mix cocoa from different reception days.			
3.9	The plant (central) has identified and documented its fermentation process, as well as the record of physicochemical and sensory variables during the process.			
3.10	The fermentation boxes are in good condition, clean and coded for monitoring and traceability of the cocoa.			
3.11	The material used to cover the cocoa mass for fermentation is hygienic and does not pose a risk of contamination.			
3.12	During fermentation, turning is carried out according to protocol and using sanitary tools that do not pose a risk of contamination for the cocoa.			
3.13	The handling staff uses the necessary safety elements to avoid affectations caused by the generation of vapors during the turning throughout fermentation.			
3.14	Physicochemical variables such as temperature, pH and sensory variables such as appearance, color, odor are monitored during each turning of the cocoa mass. At the end of the fermentation, a cutting test is performed to verify the state of the cocoa.			
3.15	The plant (central) has identified and documented its natural or mechanical cocoa drying process, as well as the record of physicochemical and sensory variables during the process.			
3.16	The elements or tools used in the removal and turning of cocoa during drying are in an intact and hygienic condition.			
3.17	The dried cocoa beans obtained at the processing plant (central) are packaged in food-grade certified material that does not represent a risk of contamination and are placed in batches on pallets separated from the floor and walls.			
3.18	The plant (central) has a protocol for storing dry cocoa under controlled conditions, as well as a record of the control of variables carried out and labelling of the batches.			
3.19	The plant (central) applies a traceability program through which it identifies its customers, as well as the protocol, rotation, release or dispatch records, labeling and measures in case of product returns.			
3.20	The plant (central) applies a random sampling program to monitor dry cocoa beans produced in the establishment through an internal or external laboratory for physical, chemical and sensory analysis of the cocoa; including the determination of heavy metals and pesticides.			
4.	**Hazard Analysis and Critical Control Points**	**MPS:**	**20**	**Observations**
		MSO:	**0**	
4.1	The plant (central) has a multidisciplinary team for product quality control and identification of critical points. and it includes a qualified on-site professional who leads the quality assurance department.			
4.2	The organizational chart and functions of the different levels or roles of the profit center are clearly defined and documented.			
4.3	The plant (central) has, under its custody and with easy access, the distribution plan of areas, personnel and product flow.			
4.4	The plant (central) documents the cocoa processed at the facilities using a product technical sheet.			
4.5	There is evidence of a flow chart document for the dry cocoa bean process as well as its phases or stages.			
4.6	The plant (central) has identified the potential physical, chemical and biological hazards presented by its production process.			
4.7	At the plant (central), critical control points are identified by the processing plant.			
4.8	Critical limits are established for critical control points in the processing plant (central).			
4.9	In accordance with critical limits, the plant (central) has a sensitive and rapid response monitoring procedure.			
4.10	The processing plant (centre) has corrective measures in place in the event of a deviation in one or more critical limits, as well as records of these.			

5.	Global Compliance Index	MPS	MSO	% Compliance
		100	0	%

General Observations

Summary of the Central Sanitary Benefit Profile			
Item	**Aspect**	**State**	**Observations by Aspect**
1.	Sanitary requirements	%	
2.	Quality assurance	%	
3.	Operations in progress	%	
4.	Hazard Analysis and Critical Control Points	%	
5.	**Global Compliance Index**	**%**	

COMPLIANCE PROFILE



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