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SUMMARY – DEGREE PROJECT

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TITLE OF THE THESIS	Producir maíz de la especie (Zea mays) utilizando la tecnología bioestimulante crop booster en la granja experimental de la UFPSO.
TITLE IN ENGLISH	Producing corn of the species (*Zea mays*) using the biostimulant Crop Booster technology in the UFPSO experimental farm.

ABSTRACT

(70 words)

El Crop Booster es una alternativa tecnológica aplicada a la agricultura, que ha sido creada con el fin de mejorar la eficiencia de la planta, está por medio de ondas de radio de baja frecuencia llegan a la planta y mejoran el rendimiento de la misma; la presente investigación tuvo como objetivo producir maíz de la especie (Zea mays) utilizando la tecnología bioestimulante Crop Booster; Este estudio utilizó dos campos

ABSTRACT IN ENGLISH

The Crop Booster is a technological alternative applied to agriculture, which has been created in order to improve the efficiency of the plant, it is through low frequency radio waves that reach the plant and improve its performance; The objective of this research was to produce maize of the species (*Zea mays*) using the Crop Booster biostimulant technology; This study used two fields.

KEYWORDS	Crop Booster, plantas, maíz, ondas
KEYWORDS IN ENGLISH	Crop Booster, plant, corn, waves.

FEATURES

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Producing corn of the species (*Zea mays*) using Crop biostimulant technology Booster at the UFPSO experimental farm.

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Zootechnics study plan

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Summary

The Crop Booster is a technological alternative applied to agriculture, which has been created in order to improve the efficiency of the plant, is by means of radio waves of low frequency reach the plant and improve its performance; the present The objective of the research was to produce maize of the species (*Zea mays*) using the Crop Booster biostimulant technology; This study used two fields, one Crop Booster and the second control field; soil samples were taken in both fields at the beginning of the implementation of the Crop and at the end of the harvest, the growth rate was evaluated in 4 stages of cultivation; 25%, 50%, 75% and harvest, where variables were analyzed that indicated the difference between the two fields experienced as: height of the silver, stem thickness, leaf width and number of leaves.

Linear gauging was carried out within the rows of the two fields; in the countryside Crop Booster 7.59 kg per linear meter and in the control field 1.58 kg per linear meter, generating an amount of green forage in the Crop Booster of 79,664 kg and in the field control of 11,672; without the application of any fertilizer in either field. To the finish the harvest of the corn Crop (*Zea mays*) forage samples were taken and these They were taken to the laboratory for their respective physicochemical analysis. It was carried out shelf life sampling with a durability of 3 days in the Crop Booster forage and a durability of 2 days in the control field, the two samples from the two fields were left outdoors; thus generating satisfactory results for the new technologies of the future.

Produce corn (*Zea mays*) with the alternative Crop Booster generates greater efficiency in forage production, also better soil quality, less amount of use of fertilizers, and shorter duration for the harvest. Allowing the use of a technology that guarantees suitable productions of green fodder for animal feed and generating efficiency in the use of the soil for the Crops used.

Keywords: Crop Booster, plant, corn, waves

Introduction

This research refers to the positive impact of technologies as the Crop Booster in the agricultural sector, since it manages to use low frequency waves for the development of Crops. Crop Booster technology is based on the use of natural frequencies, produced by the vibration of the atoms of the same plant; taking into account that the same vibration physically and chemically affects the health and plant performance, external conditions that are adverse to the plant can alter these frequencies, producing a deterioration in the cycle of growth and maturation of a plant; and that is where technology comes in, since it achieves the transport of waves of low frequency through the water, these waves arrive with a positive message to the plant which achieves that it achieves optimal vigor and reaches high production peaks (organikolatam, 2021).

The implementation of technology such as the one mentioned above would give rise to a great technological advance, which would allow the increase of agricultural production, since it is evident that in the Colombian countryside there is a growing crisis due to rainy seasons and prolonged drought, which together with inadequate production practices cause land deterioration.

The use of this type of technological innovation makes it possible to be more efficient production process, due to the efficient use of available resources for the plant, since Crop rotation is not enough to avoid the loss of nutrients and soil wear, therefore the main objective of the internship was Produce corn of the species (*Zea mays*) using Crop biostimulant technology

Booster in the experimental farm of the Francisco de Paula Santander Ocaña University, in the time period from September 1 to December 15, 2021.

Chapter 1. Production of corn (Zea mays) using biostimulant technology Crop Booster at the UFPSO experimental farm.

1.1 Brief description of the company

In July 1974, agreement No. 003 was established by the Superior Council of the Francisco de Paula Santander Cúcuta University, where the university is created Francisco de Paula Santander Ocaña, to strengthen higher education in the area of Catatumbo.

The Francisco de Paula Santander Ocaña University was created under a statute of academic-administrative dependency attached to the rectory, with principles, objectives and fields of action of a university, which has its own income and administrative and financial autonomy. The purposes, principles and objectives are in accordance with the established in law 30 of December 28, 1992 and the general statute of the university which was established in agreement No.091 of December 1993 provided by the council university superior in his first article.

1.1.1 Mission.

The Francisco de Paula Santander Ocaña University, a public institution of higher education, is a community of learning and self-assessment in improvement continuous, committed to the training of suitable professionals in the areas of knowledge, through innovative pedagogical strategies and the use of technologies; contributing to national and international development with relevance and responsibility Social. (UFPSO, 2021)

1.1.2 Vision.

By 2025, we will be a high-quality, accredited university recognized by excellence and efficiency in the exercise of mission functions with a global focus, valuing the potential of the university community and participating in the environmental changes through knowledge transfer and innovation; contributing to the sustainable development of society. (UFPSO, 2021)

1.1.3 Company objectives.

1.1.3.1 Strengthening of the culture of self-assessment and assurance of academic quality. Includes everything related to teacher development for academic excellence; the activities of the Internal Quality Assurance System basis for institutional and academic program accreditation; the consolidation of visibility, internationalization and bilingualism activities; and virtualization and innovation of the academic programs with a view to establishing a virtual campus.

1.1.3.2 Relevant and quality student management. Includes everything related to the strengthening of academic services; the curriculum management enhance the skills of students and allow the implementation of the results Learning; and promotion of the academic offer through local strategies with national and international focus.

1.1.3.3 Institutional sustainable development. Modernization of the University in terms of its structure, process architecture and information systems; the actions strategies for the sustainability of the university campus; and talent cycle management as a pillar of the future of the Institution.

1.1.3.4 Research and extension with global projection. Consolidation of the scientific production, the strengthening of the extension process with relevance and impact and the development of processes of innovation, entrepreneurship and transfer technology that result in benefits for the Institution and its value groups.

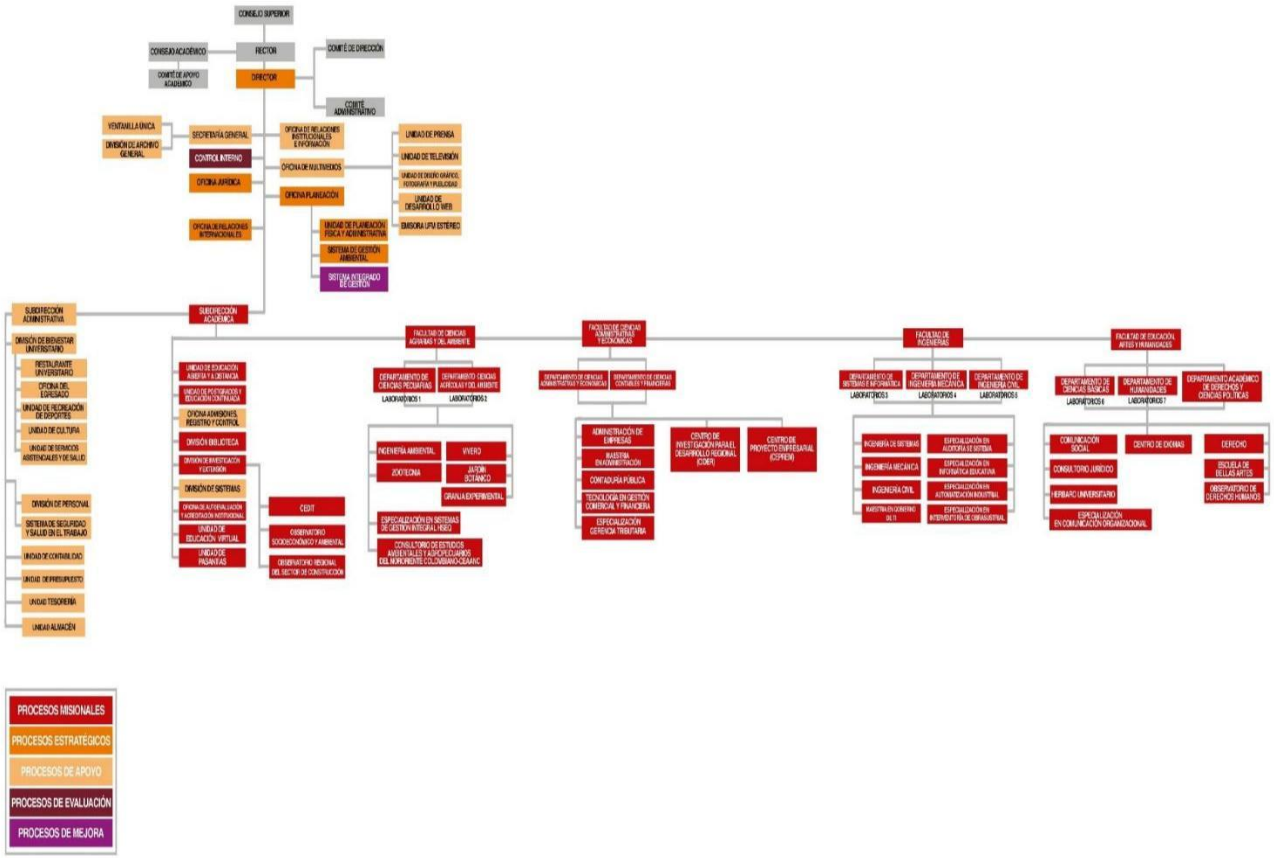
1.1.3.5 University welfare and social responsibility. Strengthening of services and the consolidation of welfare processes that benefit the climate and environment organizational. Likewise, it articulates the efforts of the University to exercise its social responsibility with special emphasis on inclusive education. (UFPSO, 2021)

1.1.2 Description of the organizational structure.

The Francisco de Paula Santander Ocaña University currently has the following organic structure:

Figure 1

Organic Structure of the Francisco de Paula Santander Ocaña University



Note: **The conceptual map describes the organizational structure of the Francisco de Paula Santander University. Taken from** **https://ufpso.edu.co/Estructura**

1.1.5 Description of the department and/or project to which he was assigned.

The UFPSO experimental farm is located on the right bank of the cotton river within the university campus at a height of 1150 meters above sea level, with a temperature average of 23 ºC, a relative humidity of 70% and an extension of 135 ha; The farm Experimental, it is a large laboratory within the campus, where a space is offered suitable physical, technical personnel and all the necessary tools for the development of the field academic activity of the Faculty of Agricultural and Environmental Sciences, such as also for the other faculties and all those external institutions that require it. (UFPSO, 2021).

An agreement was made with the company Organiko Latam, which provided free Crop Booster technology to be evaluated in a maximum of 2 Ha and the university agrees to follow the evaluation protocols and deliver to Organiko Latam a detailed report of the results obtained, laboratory analysis, photos and videos of the whole process; the agreement described above is to be viewed in job appendix.

1.2 Initial diagnosis of the assigned dependency.

The experimental farm of the Francisco de Paula Santander Ocaña University It has areas of forage Crops suitable for feeding ruminants, this It is because there is an optimal infrastructure for managing them.

Forage Crops as an alternative to animal feed for ruminants are of great importance since in a small area we can have a greater amount of animals per hectare, which facilitates the operational and logistical functions within all the subdivisions of the experimental farm, thus allowing greater efficiency in the themselves, below. Weaknesses and opportunities can be identified, such as also, strengths and threats, of the experimental farm at the Universidad Francisco de Paula Santander Ocaña, in a SWOT matrix.

Table 1

SWOT Matrix

	Weaknesses	**Strengths**
	- low amount of biomass in forage Crops. - Lack of control in water management for Crops. - Shortage of fodder in dry seasons. - Lack of control in the personnel to assign farming tasks.	- infrastructures meet the appropriate area for the fodder Crops. - There are water sources to supply the needs of the Crops. - Availability of trained staff for forage management.
Opportunities	**WO**	**SO**
- Conditions favorable for the implementation of new alternatives for feeding of ruminants. - It has resources technicians like technology for the development of new technologies.	- Implementing new technologies can be increase the amount of biomass in forage Crops and improve control in water management. - developing food alternatives in dry seasons	- With the right infrastructure, you can implement the new alternatives within forage Crops. - There are water sources that help improve conditions environmental for the development of

- Conditions suitable environmental for the development of alternatives technology, for forage improvement	we can counter fodder shortage. -	alternatives in the Crops. - With the availability of trained personnel we can implement technical resources and technological for improve cultivation forager
	WT	**ST**
Threats - diseases and pests in Crops. - dry seasons extensive. - constant flow of outside farm personnel.	- By implementing the new technologies are you can get more pest control and diseases for fodder Crops. - with the administration adequate of the water resources are manages the affectation of dry seasons.	- Suitable staff for obtain a reduction in the control of pests and diseases in the fodder Crops. - With the right infrastructure, you can control the constant staff flow external that can contaminate Crops.

Note: The table shows the SWOT matrix, with the respective strategies that will be implemented in the area in which the internship will take place. (Herrera Carvajal, 2021)

1.2.1 statement of the problem.

Since the rate of assimilation of carbon dioxide through photosynthesis It is directly related to the growth of Crops and the development of themselves, there is a growing concern that the photosynthetic capacity of these decrease due to the high load of herbicides currently used, which could lead to to a deficit in Crop yields, in this case fodder (Haley, 2017).

According to the Washington State University Extension (2020), goats and sheep you get more than 80% of their nutrition from forage, while cattle get the 73% of its nutrition from forage, therefore the non-application of efficient alternatives that manage to meet the need for forage in ruminants has caused the requirements nutritional are not adequate, therefore they do not obtain adequate weight, they present failures in their body condition. Generating losses, which affects the profitability of the farms, these affectations occur more due to the scarcity of strategies and technologies that allow increased forage production, optimizing resources available.

In Colombia, forage is of seasonal production, which leads to present abundant fodder in the rainy season and with scarce growth is dry seasons, with a distribution of between 70% and 30% respectively of forage production, taking into account that these production indices are going to be linked directly with determinants such as the climate; being of great importance the fact that In our country, the nutritional quality of forages is deficient due to poor management. inadequate use and excessive use of chemical products (Nieto Sierra, Meneses Buitrago, Morales Montero, Hernandez Oviedo, & Castro Rincon, 2020).

The variability in climatic conditions such as periods of drought very prolonged and extensive rainy periods, has produced that the conventional fodder is limited, which further deepens the need for alternatives that allow reduce production losses. There are multiple species used for forage purposes, but corn, due to its high nutritional value and high yields, generates positive responses when used with technologies to increase the nutritional value of the plant (González, Ceballos, & Benavides, 2015).

In the experimental farm of the UFPSO an alternative has been found viable in forage production for ruminants, which will have an impact on the optimization of the metabolism of the plant and will achieve a rate of energy saving and of water, in such a way it is proposed to implement the Crop Booster technology, which through wave frequencies in focused irrigation, it is allowed to evolve photosynthetically to the plant to have a greater development of the same in spite of any situation of stress to which is subjected.

1.3 Objectives of the internship

1.3.1 General.

Producing corn of the species (*Zea mays*) using Crop biostimulant technology Booster in the experimental farm of the ufpso.

1.3.2 Specific.

Implementing Crop Booster technology in the UFPSO experimental farm as an improvement alternative for corn Crops (*Zea mays*) in animal feed.

Develop procedures for the use of Crop Booster technology in Crops of corn (*Zea mays*).

To determine the effect of the use of Crop Booster technology in the forage Crop of corn (*Zea mays*)

1.4 Activities to develop

The experimental farm of the Francisco de Paula Santander Ocaña University

Table 2.

Activities to develop

General objective	Specific objectives	Activities to develop
Produce corn of the species (*Zea mays*) using the biostimulant technology Crop Booster on the farm experimental of the ufpso.	1. Implement the Crop Booster technology in the experimental farm UFPSO as an alternative to improvement for Crops corn (*Zea mays*) on the animal feeding. 2. Develop the procedures for the use of Crop Booster technology in corn Crops (*Zea mays*). 3. Determine the effect of use of Crop technology Booster in the Crop corn fodder (*Zea mays*)	1. Sampling soil before fertilization of the Crops and harvest. 2. Plant the corn species (*Zea mays*) in two fields with features Similar. 3. Determine intensity Crop Booster signal both at harvest and at planting. 4. Evaluate features from the ground before fertilization prior to corn plantation (*Zea*

	mays) and after the Crop harvest.
	5. Evaluation of the vigor of corn plants (*Zea mays*) in Crops, with respect to each other.
	6. Make a comparison of the weed propagation and Crop pests, with respect to each other.
	7. information analysis obtained (harvest data)

Note: The table shows the description of the activities in relation to the stated objectives. Source: (Herrera Carvajal, 2021)

1.5 Schedule of activities

Table 3

Schedule of activities

Activity	month 1				month 2				month 3				month 4			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Soil sampling before Crop fertilization and postharvest	x												x			
Plant the corn species (*Zea mays*) in two fields with similar characteristics.		x														
Determine signal strength of the Crop Booster both in the sow as in harvest.			x	x								x	x			
Evaluate soil characteristics before fertilization prior to corn planting*Zea mays*) and after harvest of the Crop.			x	x									x	x		
Evaluation of the vigor of the corn plants (*Zea mays*) in Crops, with respect to one of the other.				x			x			x			x			

Make a comparison of the spread of weeds and pests in Crops, with respect to one of the other.	xxxxxxxxxx	
Analysis of information obtained (harvest data).		xxxx

*Note:*the table specifies the achievement of the schedule of activities in the established time. Source: (Herrera Carvajal, 2021)

Chapter 2. Referential Approaches

2.1 Conceptual approach

The most relevant concepts for the synthesis of this document are contextualized below, the project is based on "Producing maize of the species (*Zea mays*) using Crop Booster biostimulant technology in the experimental farm of the ufpso", therefore it is essential to be clear about the concepts keys in the investigation.

2.1.1 Forage Crops

Forage Crops are plant species that have high nutritional value, These, as their name indicates, are cultivated for later harvest and converted into a conservation food, as a base in animal feed (Jewsbury, 2016).

2.1.2 Types of plants according to the mechanisms of CO2 assimilation in the photosynthesis

- C3 plants: C3 plants are those that do not have the photosynthetic capacity to reduce photorespiration, which leads to a loss of CO_2 (Photorespiration), because oxygen competes with carbon dioxide by the active sites of the enzymes, which reduces the photosynthetic capacity of the plant; These plants are characteristic of temperate and cold climates, the most characteristics are: rice, wheat, barley, soy, pepper and tomato. these plants take carbon from atmospheric carbon dioxide and convert it into compounds of three carbons, for this reason they were called C3 plants, these plants achieve convert 1% of light energy into carbohydrates (INTAGRI, 2018; khan academy, 2016)

-C4 plant: In C4 plants, light-dependent reactions and the cycle of Calvin are physically separated, in this type of plants the reactions light-dependent are carried out in spongy tissue in the center of the leaf, while the Calvin cycle occurs in special cells around the veins of the leaf, called vascular bundle cells, in plants of tropical regions the organic molecule where the carbon is fixed has 4 carbons for this reason it is they call C4 plants (INTAGRI, 2018; khan academy, 2016).

- CAM plants: cam plants have the same process as C4 plants with the difference that these instead of separating the light dependent reactions and the use of CO_2 in the Calvin cycle in space, CAM plants separate these processes in time. The most important part of the process occurs at night, where they open their stomata so that the CO_2 diffuses into the leaves. This CO_2 is fixed in oxaloacetate by PEP carboxylase, in the second stage of the process organic acid is stored within vacuoles overnight. During the day CAM plants keep their stomata closed, but manage to continue with the process of photosynthesis because organic acids are transported out of vacuoles and these break down to release CO_2 around the rubisco. CAM plants use water very efficiently for that reason alone. They open their stomata at night when the humidity in the environment is high and the temperatures drop which helps prevent any water loss. For such reason this type of plants are predominant in dry environments (INTAGRI, 2018; Khan Academy, 2016).

2.1.3 Corn

The corn (*Zea mays*) is a grass with a high energy value, a great palatability and with few antinutritional factors that lead it to be in the world the third major cultivated cereal; used in food for humans, such as for animals; in which the stem, leaves and cob are used in its harvest (ANTONIO I., 2012).

Table 4

Taxonomic Classification of Maize (Zea mays)

taxonomic classification	
Kingdom:	Plantae
Edge:	Magnoliophyta
Class:	Liliopsida
Order:	poales
Family:	Poaceae
Gender:	*Zea*
Species:	*Zea Mays*

Note: the table specifies the taxonomic classification of maize (*Zea mays*) Source: (Jaramillo A., 2012)

2.1.4 Crop Booster

The Crop Booster is a technology based on the use of radio waves of low frequency, which consists of about 3000 unique waves with frequencies specific ones that are programmed in small discs of alloy steel through equipment special, which are connected in the irrigation system and transport the signals through of water to the soil and plants, thus improving the assimilation of nutrients in the plant (organikolatam, 2019).

2.2 Legal approach

In Colombia there are different laws that regulate the application of new technologies in the agricultural sector, these are focused on the technological development of agriculture Colombia, and the implementation of new alternatives that allow greater productivity. Therefore, reference is made below to the regulations concerning the development of new technologies in the agricultural sector.

"Food production will enjoy the special protection of the State. for such In effect, priority will be given to the comprehensive development of agricultural, livestock, fishing, forestry and agro-industrial industries, as well as the construction of physical infrastructure and land suitability." (Colombian Political Constitution, 1991, Article 65)

Law 1876 of 2017. Through which the national innovation system is created agriculture and other provisions are enacted, in other words, this lawhas as an object the creation and implementation of the systemNational Agricultural Innovation (SNIA), composed of subsystems, strategic plans, planning instruments and participation, management platforms, procedures for its implementation, as well as mechanisms for its financing, monitoring and evaluation (Law 1876 of 2017)

Chapter 3. Work Compliance Report

3.1 Description of the study.

This study was carried out in the experimental farm belonging to the UFPSO, this was It is located at an altitude of 1202 meters above sea level and an average temperature of 22°C. Saying research was carried out during the second semester of the year 2021. To carry out Two fields with similar soil characteristics were used for this trial, with the same corn Crop (*Zea mays*) and maintaining the usual management.

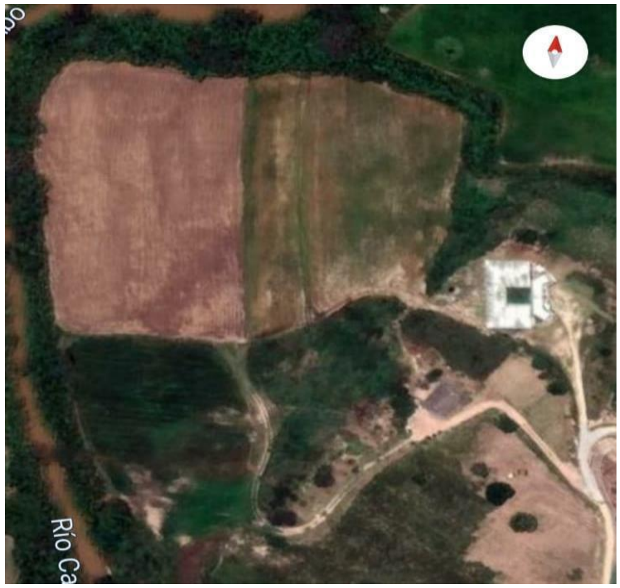
The two fields were divided to prevent seepage of water from one field with the other, in which one field received water with Crop Booster technology and the other field control with normal water, which were irrigated twice a week.

Within this study, an ANOVA was carried out in the two fields in the growing season corresponding to 25%, 50%, 75% and Crop harvest; with Based on the foregoing, an analysis of the follow-up of each of the fields was carried out. over time and comparing the percentage of the two fields according to the evolution of the corn Crop (*Zea mays*).

3.2 First specific objective: Implement Crop Booster technology on the farm experiment of the UFPSO as an improvement alternative for maize Crops (*Zea mays*) in animal feed.

Figure 2

Implementation of Crop Booster Technology



Note. This figure shows the fields where Crop Booster technology was experimented with. Taken from https://www.google.com.co/maps

3.2.1 Establishment of the Crop Booster device.

The Crop Booster device was established in an area close to the target field to be evaluated.

Figure 3

Establishing the Crop Booster Device

Note. Establishment of Crop Booster technology in the field to be evaluated. own authorship

3.2.2 Soil composition.

Soil samples were taken from each of the two fields before sowing.

and fertilization.

Figure 4

Soil Sample

Note. 500 g of soil samples were collected from each field. own authorship

3.2.3 Planting.

Sowing was carried out on September 18, 2021; a density was obtained planting of

35kg per hectare.

Figure 5

Planting of Corn in the Two Fields

Note. Planting of mechanized corn. own authorship

3.3 Second specific objective: Develop procedures for the use of the Crop Booster technology in corn Crops (*Zea Mays*).

3.3.1 Determine the signal intensity of the Crop Booster both at harvest and at harvest. sowing.

Evaluation of the Crop Booster signal intensity, by observing the evolution of the Crop in the different stages of irrigation and in the difference with the field control.

Figure 6

Crop Booster Signal Evaluation

Note. Evaluation of the performance of the Crop Booster in the experimental Crop, comparing it with the control Crop. Own authorship.

3.3.2 Evaluate soil characteristics before fertilization prior to planting the corn (Zea Mays) and after harvesting the Crop.

The soil samples were sent to the Colombian Corporation for Agricultural Research (AGROSAVIA), to be analyzed and the respective comparison between the two fields, in which earlier times were fertilized with urea.

For the study, no fertilizer was used in the two fields.

Corn is a plant with high biomass production and rapid growth, needing significant amounts of nutrients supplied by the soil. In (table 5) it was possible to observe the analyzes of the Crop Booster field, in which the analytical determination expresses that from the beginning to the end of the harvest of the corn Crop the levels of each soil parameter obtained a minimum reduction of minerals, with a improvement in pH and an increase in the availability of Phosphorus (P), in relation to the Crop employee in the studio. In (table 6) you can see the analyzes of the control field at beginning and end of the harvest determining parameters which express a decrease of minerals in the soil relatively consecutive to the infertility of the soil for the fodder Crops.

Table 5

Soil Analysis Start and End Field Crop Booster

		Home Fields		Final Crop Booster		Analysis Comparison
Analytical Determination	**Unit**	**Value**	**Interpretation**	**Value**	**Interpretation**	
pH	Units pH	6.26	Slightly Acid	6.62	Near neutral or neutral	pH stabilization
Electrical Conductivity (EC)	dS/m	0.30	not saline	0.16	not saline	Decrease in (EC)
Organic Matter (OM)	g/100g	1.41	Bass	1.28	Bass	Decrease in (MO)
Organic Carbon (CO)	g/100g	0.82		0.74		Decrease in (CO)
Phosphorus (P) Available (Bray II)	mg/kg	27.52	Medium	34.48	Medium	Increase of (P)
Sulfur (S) available	mg/kg	11.39	Medium	8.28	Bass	Decrease of (S)
Capacity Interc Cationic Effect (CICE)	cmol(+)/kg	10.30	Half	9.23	Low	Decrease in (CICE)
Boron (B) Available	mg/kg	0.63	Tall	0.14	Bass	Decrease of (B)
Acidity (Al+H)	cmol(+)/kg	NA	Not shown	NA	Not shown	
Aluminum (Al) Interchangeable	cmol(+)/kg	NA	Without restrictions	NA	Without restrictions	
Calcium (Ca) available	cmol(+)/kg	7.89	High	7.36	High	Decrease in (Ca)
Magnesium (Mg) Available	cmol(+)/kg	2.15	Medium	1.64	Medium	Decrease in (Mg)
Potassium (K) Available	cmol(+)/kg	0.14	Bass	0.12	Bass	Decrease in (K)
Sodium (Na) Available	cmol(+)/kg	<0.14	Normal	<0.14	Normal	Decrease in (Na)
Iron (Fe) olsen Available	mg/kg	96.16	High	51.72	High	Decrease in (Fe)

Copper (Cu) olsen Available	mg/kg	4.38 High		2.77 Medium		Decrease in (Cu)
Manganese (Mn) olsen Available	mg/kg	5.62 Medium		5.41 Medium		Decrease in (Mn)
Zinc (Zn) olsen Available	mg/kg	3.65 High		3.52 High		Decrease in (Zn)
Calcium saturation	%	77	Tall	80	Tall	Increased calcium saturation
Magnesium saturation	%	twenty-one	Medium	18	Medium	Increased magnesium saturation
Potassium saturation	%	1	Bass	1	Bass	Low amount of potassium in both fields
Sodium saturation	%	1	Normal	1	Normal	Normality of sodium saturation
Aluminum Saturation	%	0	Normal	0	Normal	Normality of Aluminum saturation

Note. Comparison of the soil analysis at the beginning of the corn Crop (Zea Mays) and at the end of the harvest in the Crop Booster field; which indicate that soil nutrients reduced in low quantity, within the entire Crop harvest. Font: *(AGROSAVIA, 2022)*

Table 6

Soil analysis Start and End Field Control

		Home Planting		**Final Harvest Control Field**		**Comparison Analysis Fields**
Analytical Determination	**Unit**	**Value**	**Interpretation**	**Worth**	**Interpretation**	
pH	Units of pH	6.26	Slightly Acid	6.12	slightly acidic	Increased Soil Acidity

Electrical Conductivity (EC)	dS/m	0.30	not saline	0.20	not saline	Decrease in (EC) Decrease in
Organic Matter (MO)	g/100g	1.41	Bass	1.05	Bass	(MO) Decrease in (CO) Decrease
Organic Carbon (CO)	g/100g	0.82		0.59		in (F) Decrease in (S) available
Phosphorus (P) Available (Bray II)	mg/kg	27.52	Medium	25.10	Medium	
Sulfur (S) available	mg/kg	11.39	Medium	7.15	Bass	
Capacity Interc Cationic Effect (CICE)	cmol(+)/kg	10.30	Half	9.10	Short	Decrease in (CICE)
Boron (B) Available	mg/kg	0.63	Tall	0.10	Bass	Decrease in (B) Available
Acidity (Al+H)	cmol(+)/kg	NA	Not shown	NA	Not shown	
Aluminum (Al) Exchangeable	cmol(+)/kg	NA	Without restrictions	NA	Without restrictions	Decrease in (Ca) available Decrease in
Calcium (Ca) available	cmol(+)/kg	7.89	High	7.20	Tall	(Mg) Available Decrease in (K)
Magnesium (Mg) Available	cmol(+)/kg	2.15	Medium	1.50	Medium	Available Decrease in (Na) Available
Potassium (K) Available	cmol(+)/kg	0.14	Bass	0.02	Bass	Decrease in (Fe) olsen Available
Sodium (Na) Available	cmol(+)/kg	<0.14	Normal	<0.14	Normal	
Iron (Fe) olsen Available	mg/kg	96.16	High	51.39	High	Decrease in (Cu) olsen Available
Copper (Cu) olsen Available	mg/kg	4.38	High	2.44	Medium	Decrease in (Mn) olsen Available
Manganese (Mn) olsen Available	mg/kg	5.62	Medium	5.30	Medium	Decrease in (Zn) olsen Available
Zinc (Zn) olsen Available	mg/kg	3.65	High	3.40	Tall	Increased Calcium Saturation
Calcium saturation	%	77	Tall	85	Tall	Increased Magnesium Saturation
Magnesium saturation	%	twenty-one	Medium	22	Medium	

Potassium saturation	%	1	Bass	1	Bass	Normality in potassium saturation
Sodium saturation	%	1	Normal	1	Normal	Normality in sodium saturation
Aluminum Saturation	%	0	Normal	0	Normal	Normality in aluminum saturation

Note. Comparison of the soil analysis at the beginning of the corn Crop (Zea Mays) and at the end of the harvest in the control field; this indicates that the soil analyzes compared within the Crop harvest obtained a reduction in soil nutrients. Font:*(AGROSAVIA, 2022)*

Figure 7

Recommendations for Fertilization

RECOMENDACIÓN DE FERTILIZACIÓN

AGROSAVIA

USUARIO:	JOSE EFRAIN SALCEDO PAREDES
IDENTIFICACIÓN:	1066084520
NÚMERO DE LABORATORIO:	LQAS22-000809
FECHA RECOMENDACIÓN:	2022-02-08
DEPARTAMENTO:	NORTE DE SANTANDER
MUNICIPIO:	OCAÑA
VEREDA:	El rhin
FINCA:	Granja exp. UFPSO
CULTIVO:	MAÍZ
EDAD: (MESES)	0

Quien realizó la recomendación

Oscar Suárez

Oscar Javier Súarez Castillo
Profesional de Apoyo de Laboratorio
Contacto:

Anuncio importante

Recuerde consultar el asesor técnico de su zona para ajustar el plan de fertilización de acuerdo a las particularidades de su cultivo

Centro de Investigación Tibaitatá

Km 14 vía Mosquera (Cundinamarca)

Tel: 4227300 extensión 1414-1372

DIAGNÓSTICO DE LOS RESULTADOS DEL ANÁLISIS DE SUELO

Suelo con reacción ligeramente ácida, sin problemas por acidez, no es necesaria la aplicación de enmiendas calcáreas. Disponibilidad baja de Nitrógeno considerando el porcentaje bajo de materia orgánica, se recomienda la aplicación de Nitrógeno. Los elementos Fósforo y Azufre se encuentran en cantidades moderadas, por consiguiente, se aconseja añadirlos al suelo. Para las bases de cambio Calcio se recomienda su aplicación moderadamente, para Magnesio y Potasio se recomienda su aplicación debido a sus moderados a bajos niveles edáficos. En cuanto a los micronutrientes Hierro, Manganeso, Zinc y Boro no se aconseja agregarlos.

CANTIDAD DE NUTRIENTES APORTADOS EN EL PLAN DE FERTILIZACIÓN

NITRÓGENO	FÓSFORO	POTASIO	CALCIO	MAGNESIO	AZUFRE	HIERRO	MANGANESO	ZINC	BORO
Kg/ha									
121.0	40.0	64.0	14.0	15.0	26.0	0.0	0.0	0.0	0.0

DOSIS DE ENMIENDA

- No se recomienda su aplicación actualmente.

DOSIS DE FERTILIZANTE Y EPOCA DE APLICACIÓN

Aplicar las siguientes fuentes fertilizantes incorporado en banda al momento de la siembra

• 13-26-10	40.0 kg/ha

V6 (cuando el cultivo tenga 6 hojas o tenga una altura de 50 centímetros aplicar las siguientes fuentes de fertilización)

• Sulfato de Magnesio	50.0 kg/ha
• KCl	50.0 kg/ha
• 31-8-8	375.0 kg/ha
• Yeso Agrícola	50.0 kg/ha

FIN DEL INFORME

Note. **It is recommended to fertilize the fields for research because in the soil analysis they find low amounts of nutrients that are absorbed by the plant. Source: (AGROSAVIA, 2022).**

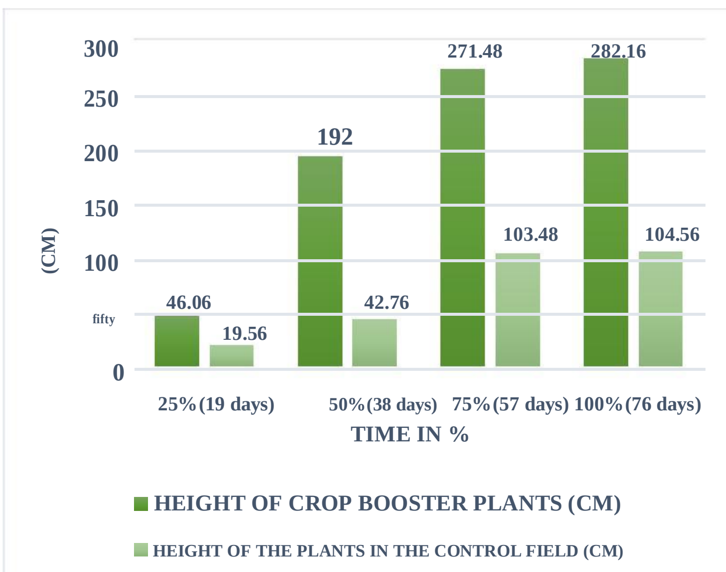
3.3.3 Evaluation of the vigor of corn plants (Zea Mays) in Crops, with respect to each other.

The growth rate was evaluated in four stages of the culture; at 25%, 50%, 75% and at harvest, an ANOVA was performed to analyze the variables of the two fields through time and comparing the two fields according to the percentage of development of the plant like:

Plant height: In the Crop Booster field in the harvest stage, a height of 282.16 cm with respect to the control field with a height at harvest of 104.56 cm.

Figure 8

Plant Height



Note. Plant height with respect to time; It is observed in the graph that the Crop field Booster obtained a continuous difference from the beginning of sowing of 20 cm until the end of the harvest of 170 cm of difference with the control field. Own authorship.

It is observed in (table 7) that in the Crop Booster field there are differences significant in each percentage of evolution of the height of the plant and in the field control shows the significant difference in the evolution of 25 and 50% of the plant except 75 and 100% in which the evolution of the height of the plant ends

Table 7

Plant Height Comparison Within Each Field.

%(days)	**Crop Booster**	**Control Field**
25 (19 days)	46.06 - 10.89a	19.56 - 4.20a
50 (38 days)	192.00 - 12.18b	42.76 - 13.97b
75 (57 days)	271.48 - 6.19c	103.48 - 24.51c
100 (76 days)	282.16 - 3.44d	104.56 - 28.87c
P - value	0.000	0.000

Note: In this table it is observed that the height of the Crop Booster field obtained a greater growth over time because the plant better assimilated nutrients through of the Crop Booster device and in the control it is observed through time that the plant does not It obtained the necessary nutrients from the soil for its proper development. Own authorship.

In (table 8) you can see the follow-up of the two fields showing significant differences over time

Table 8

Comparison of Fields over Time at Plant Height.

Treatment	25%(19 days)	50%(38 days)	75%(57 days)	100%(76 days)
Crop Booster	46.06 - 10.89	192.00 - 12.18	271.48 - 6.19	282.16 - 3.44

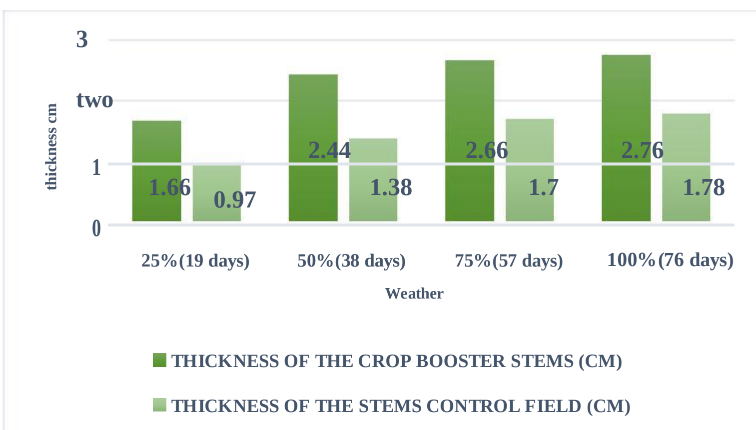
Control Field	19.56 - 4.20	42.76 - 13.97	103.48 - 29.51	104.56 - 28.87
P - value	0.000	0.000	0.000	0.000

Note. It is observed in the table that there is a significant difference between the two treatments in the passing of time because the Crop Booster field obtained day after day a greater height in its plants thanks to the efficient absorption of nutrients from the soil and through the photosynthesis than the control field. Own authorship.

Stem thickness: at the end of the harvest within the fields; the Crop Booster obtained a stem thickness of 2.76 cm and in the control field a thickness of 1.78 cm.

Figure 9

stem thickness



Note. Stem thickness at time to harvest, giving a difference between the two study fields because the Crop Booster field having a better system radicle and a greater photosynthetic efficiency increased the growth of the stem of each plant within the field, with a difference of 1 cm in thickness of the stem in the stages of the weather. Own authorship.

In (table 9) shows the significant difference in the Crop Booster field with a stem thickness growth except for 50% to 100% and in the control field finds significant difference within the field, outside 75 and 100%.

Table 9

Stem Thickness Comparison within each Field.

% (days)	Crop Booster	Control Field
25 (19 days)	1.66 - 0.43a	0.97 - 0.37a
50 (38 days)	2.44 - 0.36b	1.38 - 0.31b
75 (57 days)	2.66 - 0.45b	1.70 - 0.34c
100 (76 days)	2.76 - 0.44b	1.78 - 0.33c
P - value	0.000	0.000

Note. The sequence within each field is differentiated because the Crop Booster field had moderate stem thickness growth through photosynthesis efficiency and its roots of the plant and in the control field a slow thickness of the stem is observed due to not obtain the necessary nutrients from the soil. Own authorship.

The (table 10) shows the achievement obtained in the compared fields demonstrating the significant difference between the two fields through time.

Table 10

Comparison of the fields through time in stem thickness.

Treatment	25%	fifty%	75%	100%

	(19 days)	(38 days)	(57 days)	(76 days)
Crop Booster	1.66 - 0.43	2.44 - 0.36	2.66 - 0.45	2.76 - 0.44
Control Field	0.97 - 0.37	1.38 - 0.31	1.70 - 0.34	1.78 - 0.33
P - value	0.000	0.000	0.000	0.000

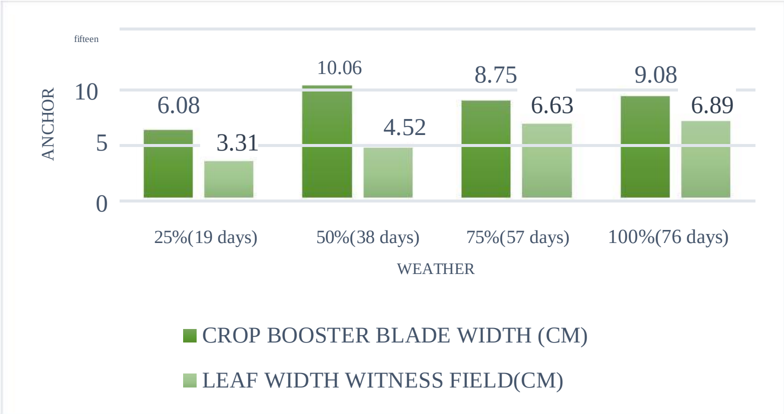
Note. This table shows the thickness of the stem over time in the Crop Booster is larger than the control field because the plants in the Crop Booster field by medium of the device were more efficient in nutrient adsorption and photosynthesis, which led to a difference of 1 cm in stem thickness compared to the two fields.

Own authorship.

Leaf width: in the fields the leaves had differences at the end of the harvest of 9.08 cm in the Crop Booster field and 6.89 cm in the control field.

Figure 10

Leaf Width



Note. In this graph you can see the difference in the width of the leaves, because obtained a photosynthetic efficiency in the leaves of the plants of the Crop Booster field at through time. Own authorship.

Table 11 shows the significant difference in each of the fields with respect to the evolution; except that in 75% and 100% of each field there is a respective relationship.

Table 11

Sheet Width Comparison Within Each Field.

%	Crop Booster	Control Field
25 (19 days)	6.08 - 1.27th	3.31 - 0.74a
50 (38 days)	10.06 - 3.00b	4.52 - 1.27b
75 (57 days)	8.75 - 0.70c	6.63 - 0.96c
100 (76 days)	9.08 - 0.70c	6.89 - 1.02c
P - value	0.000	0.000

Note. A constancy of 75% to 100% can be seen in the two fields because in the Crop Booster field the photosynthesis efficiency helped to obtain a greater width of the leaf within time and in the control field no photosynthesis efficiency was obtained. which is shown in the width of the field sheet. Own authorship.

In (table 12) a significant difference can be observed in the comparison of the two fields with a better width of the leaf of the Crop Booster field, than the control field.

Table 12

Comparison of the Fields through Time in the Width of the Leaf.

Treatment	25% (19 days)	fifty% (38 days)	75% (57 days)	100% (76 days)

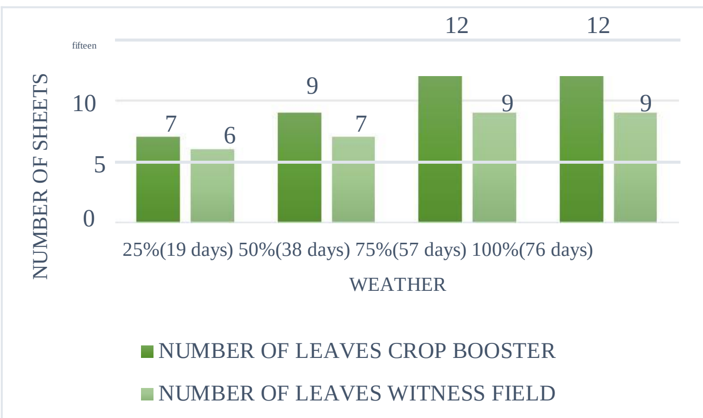
Crop Booster	6.08 - 1.27	10.1 - 3.0	8.75 - 0.69	9.1 - 0.70
Control Field	3.31 - 0.74	4.52 - 1.3	6.63 - 0.96	6.9 - 1.01
P - value	0.000	0.000	0.000	0.000

Note. It is observed in the table a better leaf width in the Crop Booster field over time than in the control field because through the device the plant had better efficiency in photosynthesis for leaf development. Own authorship.

Number of leaves: in the fields, the number of leaves obtained a difference of 11.64 leaves in the Crop Booster field and 9.16 leaves in the control field.

Figure 11

Number of leaves



Note. This graph explains the number of sheets found in each field with a difference of 3 sheets between field. Own authorship.

In (table 13) shows within each field the significant difference of the number of leaves; expressing the relationship of 75% and 100% in the number of leaves, in each of fields.

Table 13

Comparison Number of Leaves Within Each Field

%	Crop Booster	Control Field
25 (19 days)	6.84 - 0.85a	5.72 - 0.84a
50 (38 days)	9.48 - 1.58b	7.32 - 1.44b
75 (57 days)	11.56 - 0.96c	8.06 - 1.38c
100 (76 days)	11.64 - 1.08c	9.16 - 1.55c
P - value	0.000	0.000

Note. It is observed in the table the number of leaves in the 75 to 100% with a relation in each field studied because the plants in their development goes to the stage of maturation or spike of the same, for this reason the number of leaves in each field did not increase considered from the 75% stage. Own authorship.

In (table 14) it is observed in the comparison between the two treatments the difference significant with a higher number of leaves per plant in the Crop Booster field.

Table 14

Comparison of the Fields through Time in the Number of Leaves.

Treatment	25% (19 days)	fifty% (37 days)	75% (58 days)	100% (76 days)
Crop Booster	6.84 - 0.85	9.48 - 1.58	11.56 - 0.96	11.64 - 1.08
Control Field	5.72 - 0.84	7.32 - 1.44	8.06 - 1.38	9.16 - 1.55
P – value	0.000	0.000	0.000	0.000

Note. It is observed in the table that the number of leaves compared between the two fields with a difference of three leaves per silver between the fields is due to the greater development of the silver in the Crop Booster field than in the control field. Own authorship.

3.3.4 Carry out a comparison of the spread of weeds and pests in Crops, with respect to each other.

In the two fields, both Crop Booster and control field, an application was made of herbicide with gramisom in a volume of 5 liters for the two fields.

Figure 12

Herbicide Application

Note: own authorship

In the evaluation of the pests, the armyworm was found*(Helicoverpa armiger)*in the two study fields, in the following relationship, in the Crop field Booster 1 out of 10 plants was bollworm and in the control field 4 out of every 10 plants were observed bollworm; On the other hand, the percentage of incidents of diseases in the two fields observed, no diseases were seen in any of the plants.

Figure 13

Pest Assessment

Note. Fall armyworm incidence *(Helicoverpa armigera)*.Own authorship.

3.4 Third specific objective: Determine the effect of using Crop technology Booster in the forage Crop of maize (*Zea Mays*).

3.4.1 Analysis of information obtained (harvest data).

- Corn Crop quality grades (*Zea Mays*) according to the standards of USDA. The quality standards of the USDA were determined through the chemical parameters that analyze the protein (PB), the acid fiber detergent (FAD), neutral detergent fiber (NDF) and the relative value of forage (RFV) thus giving a category of forage in animal feed.

Table 15

USDA Quality Grades

Countryside	Category	PB (%DM)	FAD (%DM)	FND (%DM)	RFV

Crop Booster	Stream	8.7	35.1	45.69	125
Countryside Witness	Stream	6.04(-16)	38.3(-35)	47.6(-44)	115(-100)

Note. This table shows the scores of the two experienced fields generating the cultivation of corn a current category, within fodder. Own authorship.

- Corn Crop yield (*Zea Mays*) in linear meters in both fields.

  In (table 16) you can find the 1 linear meter forum in the grooves of the corn Crop (*Zea Mays*) of one meter, at 5 points chosen in a random, with an average of 7.59 kg in the Crop Booster field and 1.58 kg in the control field

Table 16

Linear Capacity

Crop Booster		**Witness Field**	
# Sample	**Kg Fv**	**# Sample**	**Kg Fv**
1	7.44	1	1.55
2	7.36	2	1.2
3	8.8	3	1.8
4	7.22	4	1.6
5	7.15	5	1.73
Average	7.59 Kg Fv	**Average**	1.58 Kg Fv

Note. It can be seen that the Crop Booster obtained a higher linear yield in kg per chosen point. Own authorship.

- Yield amount of corn Crop (*Zea Mays*) in each of the fields; In (table 17) indicates the amount of green forage in each of the fields giving a Crop Booster field production of 77,418kg of green forage and in the control field 16,116kg of green forage is obtained with a difference of 480% in green forage.

Table 17

Green Forage Production

Crop Booster	Control Field
77,418 Kg Fv	16,116 Kg Fv

Note. A higher production of green forage was obtained in the Crop Booster field because in the variables previously observed in the tables indicate a phenological development efficient field Crop Booster in: stem, leaf and cob. Own authorship.

- Efficiency of water use in the fields; in the Crop Booster field carried out a duration of water per sprinkler furrow of 30 minutes with a amount of water used of 94,770 liters in the irrigation of the entire field and in the control field was irrigated by aspersion for 1 hour per furrow of sprinklers using a quantity of water of 189,540 liters throughout the countryside.

- Brix rating b. Titratable Acidity (TA)

Brix degrees are the amount of sugar obtained in a plant and the titratable acidity is a chemical analysis that expresses the acid of the plant or forage. In (table 18) it is observed in the Crop Booster field a greater percentage of 11.70% of dissolved sugars and 8.70% in the control field; the titratable acidity in the minor Crop Booster field was 2.47% and in the control of 3.79%.

Table 18

Brix classification b. Titratable Acidity

Brix Degrees In The Two Harvests		**Titratable Acidity Of The Two fields**	
Crop Booster	**Witness Field**	**Crop Booster**	**Witness Field**
11.60%	8.70%	2.51%	3.74%
11.40%	8.40%	2.48%	3.79%
11.70%	8.60%	2.47%	3.75%

Note. This table displays the amount of dissolved sugars in the degree analysis Brix and the amount of acid obtained in the samples made in the cultivated fields.

Own authorship.

- Relationship between Brix degrees and titratable acidity; dissolved sugars and

The acidity of a Crop indicates its maturity in order to be harvested. In la (table 19) indicates an adequate maturity index for the harvest in the Crop Booster field and in (table 20) explains the maturity indices of the control field, which are not suitable for harvesting.

Table 19

Maturity Index

Crop Booster			
samples	**Brix (%)**	**Acidity Titratable**	**Index of Maturity**
1	11.60	2.51	4.62
2	11.40	2.48	4.6
3	11.70	2.52	4.64

Note. Within the table you can see in the Crop Booster field a percentage of ideal plant sugars and low acidity; indicating a suitable ripeness for the subsequent harvest. own authorship

Table 20

Maturity Index

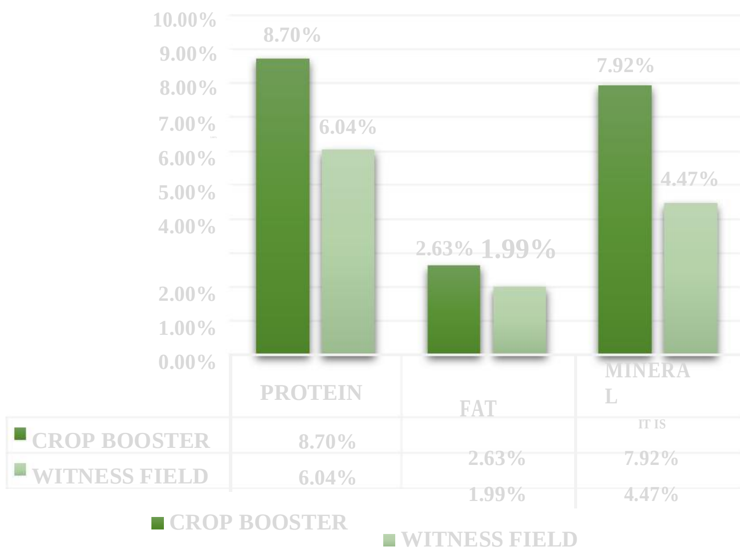
Control Field			
samples	**Brix (%)**	**Acidity Titratable**	**Index of Maturity**
1	8.70	3.74	23
2	8.40	3.79	2.22
3	8.60	3.75	2.29

Note. The samples obtained from the control field indicate a maturity of the Crop not suitable for harvest. Own authorship.

- Bromatological analysis in both fields. It can be seen in (Fig. 12) that the Crop Booster field has a higher quality of nutrients for the animal feed, unlike the control field.

Figure 14

Bromatological



Note. This graph shows the relative difference in the bromatological analysis of the two fields. Own authorship.

- Number of ears: within the fields studied, the Crop Booster is obtained an amount of 2 ears per plant and in the control field obtained 1 cob per plant.

Figure 15

Number of ears

Note. The quality of the cobs from each field can be seen in the figure. Authorship own.

- Shelf life or post-harvest time. In (table 21) the time post-harvest of the Crop Booster field has a longer duration compared to all the observed parameters and in (table 22) the parameters observed of the postharvest life of the control field Crop obtained a shorter duration of a maximum of two days with the presence of fungi in the food.

Table 21

Shelf Life

Crop Booster						
Day	**Temperature**	**pH**	**Smell**	**Palatability**	**Presence of Mushroom**	**Forage loss**

1	31°C	5.1	Cool	90%	None	0%
2	55°C	6.3	Cool	80%	Presence	20% Intermediate Layer
3	67°C	7.2	fermented either	fifty%	Presence	40%
4	91°C	7.9	Acid	twenty%		fifty%

Note. In this table it is observed that the food harvested for the animals has a palatable duration of 3 days. Own authorship.

Table 22

Shelf Life Field Control

Control Field						
Days	**Temperature**	**pH**	**Smell**	**Palatability**	**Presence of Mushroom**	**Loss Forage**
1	35°C	5.5	COOL	80%	NONE	20%
2	60°C	6.7	FERMENTED	50%	PRESENCE	60%
3	80°C	7.8	ACID	30%	PRESENCE	80%
4	98°C	8.0	ACID	0%	PRESENCE	100%

Note. It is observed in the table that the harvested food has a durability time of 2 days for the animals. Own authorship.

Chapter 4. Final Diagnosis

In the second semester of 2021, the professional practices were carried out which were carried out in the areas of forage Crops for animal feed, implementing technological alternatives that are more efficient in the area allowing a more food for animals in times of water scarcity.

Chapter 5. Conclusions

The implementation of Crop Booster biostimulant technology is an alternative that helps in the green forage yield of the maize Crop (Zea*shift*) increasing the production of 16,116 kg fv traditional cultivation without fertilizers to 77,418 kg fv with the Crop Booster device, improving the quality of 6.04% control field protein to 8.70% of field Crop Booster protein, being efficient in the use of water and a post-harvest life of the control field of 2 days and 3 days in the Crop Booster field being palatal for the animals and their food.

In this study, the objectives set out in the work plan were achieved. obtaining optimal results in the research carried out, as well as the training and experience obtained as a professional.

Chapter 6. Recommendation

It is necessary that in the implementation of the Crop Booster technology in the Crops of corn (*Zea Mays*) new research is generated in which the food produced with the device is given to the animals to analyze their quality and production.

It is important that the application of sprinkler irrigation in Crops such as corn (*Zea Mays*) the water is used in a maximum time of 30 minutes, because in the first days of seed germination for as long as the sprinkler irrigation lasts they produce puddles that affect the germination of the sown field by 10%.

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Appendix

Appendix A: Agreement with the Organiko Latam Company

Programa de validación de la tecnología Crop Booster para Universidades

Propósito: Comparar los resultados del uso de la tecnología Crop Booster con un campo testigo.

Procedimiento: se plantarán dos campos con características de suelo similares, con el mismo cultivo y se mantendrá el manejo habitual. Un campo recibirá agua con Crop Booster y el otro agua normal. Los dos campos deben estar separados para evitar que el agua con Crop Booster se filtre en el campo de control.

Los campos se deben irrigar al menos 3 veces a la semana.

Formato de recopilación de datos:

Intensidad de la señal Crop Booster:

1. En la siembra: dos muestras de agua con Crop Booster, una en la bomba y la otra en el punto de riego más alejado.

2. Después de la cosecha: dos muestras de agua con agua con Crop Booster, una en la bomba y la otra en el punto de riego más alejado.

Salud del suelo:

1. Una muestra de suelo en cada uno de los campos antes de aplicar el fertilizante previo a la planta. (Esta prueba mide nutrientes, CIC, pH, etc.)

2. Una muestra de suelo después de la cosecha en cada uno de los campos.
(Las muestras de suelo se compararán con el análisis de tejido vegetal al final de la temporada para dar una idea de la eliminación de nutrientes por parte de las plantas con y sin tratamiento con Crop Booster).

Vigor de crecimiento (fuerza / salud):

Las plantas serán clasificadas por su vigor en tres ocasiones después del trasplante o germinación lo que corresponde al 25%, 50% y 75% de la temporada de crecimiento para cada cultivo que se evalúa. La comparación del vigor entre el testigo y el ensayo debe documentarse visualmente (imágenes o video).

1. Tasa de crecimiento
a. Evaluación visual del vigor (salud, tamaño del dosel, color, desarrollo, etc.)
b. Altura de planta

2. Comparación de malezas y plagas
a. Evaluación visual
b. Aplicaciones de herbicidas y pesticidas (volumen, frecuencia o cantidad)

3. Comparación de enfermedades medida justo antes de la primera cosecha
a. % De incidencia de enfermedades de enfermedades foliares (hoja) y del suelo
[Proporción de plantas (hojas, etc.) enfermas del número total de plantas (hojas, etc.) observado.]

Programa de validación de la tecnología Crop Booster para Universidades

b. Recuento de enfermedades [Número de lesiones (u otras unidades de infección) por planta o por área de tejido vegetal]

Datos de cosecha:

1. Grado de calidad (basado en USDA o estándares similares)
2. Rendimiento de peso
3. Cantidad de rendimiento
4. Eficiencia en el uso del agua (WUE): peso fresco del rendimiento / volumen de agua aplicada
5. Indicadores de sabor
6. Contenido sólido soluble (SSC) o clasificación Brix b. Acidez titulable (TA)
7. Relación SSC / TA
8. Análisis de tejidos vegetales.
9. Análisis de proteínas de cultivo y densidad de nutrientes.
10. Vida de anaquel o tiempo poscosecha

Organiko Latam proporcinará de manera gratuita la tecnologia Crop Booster a ser evaluada en un máximo de 2 Ha, para universidades calificadas en Suramerica.

La Universidad se compromete en seguir el protocolo de evaluación antes descrito, y entregar a Organiko Latam un informe detallado de los resultados obtenidos, análisis de laboratorio, fotos y videos de todo el proceso.

Universidad: UNIVERSIDAD FCO DE PAULA SDER OCAÑA

Ing. a cargo de la evaluación: DANIEL A. HERNANDEZ V.

Firma: ____________ Fecha: 10-06-21

Representate de Organiko Latam: ____________

Firma: ____________ Fecha: ____________

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Appendix B: Crop Booster Photographs.

(organikolatam, 2019)

Appendix C: Soil Sample from the Field at the Beginning of the Investigation.

INFORME No.44549 JOSE EFRAIN SALCEDO PAREDES 2022-02-08

AGROSAVIA
Corporación colombiana de investigación agropecuaria

ACREDITADO ONAC
ISO/IEC 17025:2017
13-LAB-031

REPORTE DE RESULTADOS LABORATORIO DE SERVICIOS UNA MUESTRA
GESTIÓN DE LA AGENDA CORPORATIVA

LABORATORIO DE QUIMICA ANALÍTICA (Química de suelos)

1. Información del cliente

NÚMERO BOLSA	CÓDIGO DE LABORATORIO
44549	**LQAS22-000809**

NOMBRE Y APELLIDO: JOSE EFRAIN SALCEDO PAREDES
CÉDULA O NIT: 1066084520
DIRECCIÓN: CALLE 15A 25A-50
DEPARTAMENTO: NORTE DE SANTANDER
MUNICIPIO: OCAÑA
TEL, FIJO/CEL: 3114962451 / 3114962451
TIPO DE ANALISIS:

2. Información de la muestra suministrada por el cliente

IDENTIFICACIÓN: No indica
MATRIZ: Suelos
VEREDA: El rhin
FINCA: Granja exp. UFPSO
PRODUCTOR: JOSE EFRAIN SALCEDO PAREDES
CULTIVO(S): Maiz variedad No indica con 0 Día(s) de edad
ALTURA: 1190m.s.n.m
PROFUNDIDAD : 0 a 15 cm
TIPO DE RIEGO Aspersión
TOPOGRAFIA: Plano
DRENAJE: Buen drenaje

Corporación Colombiana de Investigación Agropecuaria Agrosavia con acreditación ONAC vigente a la fecha, con código de acreditación 13-LAB-031, bajo la norma ISO/IEC 17025:2017

El laboratorio tiene acreditación ONAC bajo la norma NTC ISO/IEC 17025 en los ensayos de: pH (GA-R-46 versión 05 de 2019-10-02), fósforodisponible Bray II (GA-R-48, versión 05 de 2019-10-02), conductividad eléctrica en suelos (NTC 5596:2008. Método b. Medición en suspensiónsuelo/agua en relación 1:5 (peso/volumen)), cationes cambiables en suelo calcio, magnesio, potasio y sodio disponibles (GA-R-050 versión 7 de 2019-10-02), micronutrientes en suelo por Olsen modificado Hierro, Manganeso, Cobre y Zinc (NTC 5526:2007), determinación de Carbono Orgánico ensuelo (GA-R-119 versión 2 2019-09-20).

FECHA DE RECEPCIÓN 2022-01-24
FECHA DE ANÁLISIS: De 2022-01-25 a 2022-02-05
FECHA DE REPORTE: 2022/02/08

Yeni Rodriguez Giraldo (E6968)
Coordinador técnico del laboratorio de Química Anlítica

DETERMINACIÓN ANALÍTICA	UNIDAD	MÉTODO	VALOR	INTERPRETACION*
pH (1:2,5)	Unidades de pH	GA-R-46, versión 05 de 2019-10-02	6.26	Ligeramente ácido
Conductividad eléctrica (CE) (1:5)	dS/m	NTC 5596:2008 Calidad del suelo: Determinación de la conductividad eléctrica. Método B. Medición en suspensión suelo/agua relación 1:5 (Peso/volumen)	0.30	No salino
Materia Orgánica (MO)	g/100g	Cálculo según NTC 5403 Walkey & Black	1.41	Bajo
Carbono Orgánico (CO)	g/100g	GA-R-119 versión 2 2019-09-20	0.82	
Fosforo (P) Disponible (Bray II)	mg/kg	GA-R-48, versión 05 de 2019-10-02.	27.52	Medio
Azufre (S) disponible	mg/kg	Fosfato monobasico de calcio	11.39	Medio
Capacidad Interc Catiónico Efect (CICE)	cmol(+)/kg	Cálculo	10.30	Media
Boro (B) Disponible	mg/kg	Fosfato monobasico de calcio	0.63	Alto
Acidez (Al+H)	cmol(+)/kg	KCl	ND	No Indica
Aluminio (Al) Intercambiable	cmol(+)/kg	KCl	ND	Sin restricción
Calcio (Ca) disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	7.89	Alto
Magnesio (Mg) Disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	2.15	Medio
Potasio (K) Disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	0.14	Bajo

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CENTRO DE INVESTIGACIÓN TIBAITATÁ
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TELÉFONOS: 4227300 EXTENSION: 1369
suelos@agrosavia.co

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GA-F-97
Versión: 5
FECHA DE APROBACIÓN Y PUBLICACIÓN DEL CAMBIO: 2020-10-21

INFORME No.44549 JOSE EFRAIN SALCEDO PAREDES 2022-02-08

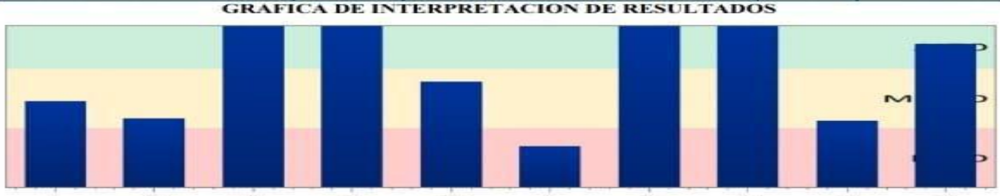
AGROSAVIA
Corporación colombiana de investigación agropecuaria

ACREDITADO ONAC
ISO/IEC 17025:2017
13-LAB-031

REPORTE DE RESULTADOS LABORATORIO DE SERVICIOS UNA MUESTRA
GESTIÓN DE LA AGENDA CORPORATIVA

DETERMINACIÓN ANALÍTICA	UNIDAD	MÉTODO	VALOR	INTERPRETACION*
Sodio (Na) Disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	<0.14	Normal
Hierro (Fe) olsen Disponible	mg/kg	NTC 5526:2007	96.16	Alto
Cobre (Cu) olsen Disponible	mg/kg	NTC 5526:2007	4.38	Alto
Manganeso (Mn) olsen Disponible	mg/kg	NTC 5526:2007	5.62	Medio
Zinc (Zn) olsen Disponible	mg/kg	NTC 5526:2007	3.65	Alto
Saturación de Calcio	%	Cálculo	77	Alto
Saturación de Magnesio	%	Cálculo	21	Medio
Saturación de Potasio	%	Cálculo	1	Bajo
Saturación de Sodio	%	Cálculo	1	Normal
Saturación de Aluminio	%	Cálculo	0	Normal

GRAFICA DE INTERPRETACION DE RESULTADOS



NOTAS: 1) interpretacion basada en: ICA,1992. Fertilización en diversos cultivos. Quinta aproximación. Manual de asistencia N 25; 2) ND = No Determinado; 3) Se hace corrección por pW (factor de corrección por humedad) para los análisis de Materia orgánica (MO), Fósforo disponible (P) Bray II, Azufre disponible (S), Acidez intercambiable (Al+H), Aluminio intercambiable (Al), Calcio intercambiable (Ca), Magnesio Intercambiable, Potasio intercambiable (K), Sodio intercambiable (Na), Hierro disponible (Fe)Olsen, Manganeso disponible (Mn) Olsen, Zinc disponible (Zn) Olsen, Cobre disponible (Cu) Olsen y Boro disponible (B).

Los valores del limite de cuantificación del método para Calcio (Ca) menores a 1,12 cmol (+)/kg , Magnesio (Mg) menores a 0,20 cmol (+)/kg y Fósforo (P) Disponible Bray II menores a 3,83 mg/kg , se encuentran fuera del alcance de acreditación.

La información presentada en el numeral 2. del informe de resultados, es suministrada por el cliente.
Los resultados expresados en el informe se obtienen de la muestra tal como fue suministrada por el usuario del servicio.
El cliente es responsable del muestreo y traslado de muestras al laboratorio, las muestras no son modificadas o alteradas en su composición desde la recepción y sus características son las reflejadas en el análisis.
Los resultados son validos unicamente para la muestra en referencia.
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(AGROSAVIA, 2022)

Appendix D: Crop Booster Field Sample at End of Harvest.

INFORME No.027566 LUIS CARLOS HERRERA CARVAJAL 2022-01-18

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Corporación colombiana de investigación agropecuaria

ACREDITADO ONAC
ISO/IEC 17025:2017
13-LAB-031

REPORTE DE RESULTADOS LABORATORIO DE SERVICIOS UNA MUESTRA GESTIÓN DE LA AGENDA CORPORATIVA

LABORATORIO DE QUIMICA ANALÍTICA (Química de suelos)

1. Información del cliente

NOMBRE Y APELLIDO: LUIS CARLOS HERRERA CARVAJAL
CÉDULA O NIT: 1066098259
DIRECCIÓN: CLL 3 10-67
DEPARTAMENTO: NORTE DE SANTANDER
MUNICIPIO: OCAÑA
TEL, FIJO/CEL: 3165330417 / 3165330417
TIPO DE ANALISIS:

NÚMERO BOLSA	CÓDIGO DE LABORATORIO
027566	LQAS21-015589

2. Información de la muestra suministrada por el cliente

IDENTIFICACIÓN: No indica
MATRIZ: Suelos
VEREDA: No indica
FINCA: UFPSO
PRODUCTOR: LUIS CARLOS HERRERA CARVAJAL
CULTIVO(S): Maíz variedad No indica con 1 Año(s) de edad

ALTURA: 1200m.s.n.m
PROFUNDIDAD : 0 a 10 cm
TIPO DE RIEGO Aspersión
TOPOGRAFIA: Plano
DRENAJE: Buen drenaje

Corporación Colombiana de Investigación Agropecuaria Agrosavia con acreditación ONAC vigente a la fecha, con código de acreditación 13-LAB-031, bajo la norma ISO/IEC 17025:2017

El laboratorio tiene acreditación ONAC bajo la norma NTC ISO/IEC 17025 en los ensayos de: pH (GA-R-46 versión 05 de 2019-10-02), fósforodisponible Bray II (GA-R-48, versión 05 de 2019-10-02), conductividad eléctrica en suelos (NTC 5596:2008. Método b. Medición en suspensiónsuelo/agua en relación 1:5 (peso/volumen)), cationes cambiables en suelo calcio, magnesio, potasio y sodio disponibles (GA-R-050 versión 7 de 2019-10-02), micronutrientes en suelo por Olsen modificado Hierro, Manganeso, Cobre y Zinc (NTC 5526:2007), determinación de Carbono Orgánico ensuelo (GA-R-119 versión 2 2019-09-20).

FECHA DE RECEPCIÓN 2021-12-27
FECHA DE ANÁLISIS: De 2021-12-27 a 2022-01-16
FECHA DE REPORTE: 2022/01/18

Yeni Rodríguez Giraldo (E6968)
Coordinador técnico del laboratorio de Química Anlítica

DETERMINACIÓN ANALÍTICA	UNIDAD	MÉTODO	VALOR	INTERPRETACION*
pH (1:2,5)	Unidades de pH	GA-R-46, versión 05 de 2019-10-02	6.62	Casi neutro o neutro
Conductividad eléctrica (CE) (1:5)	dS/m	NTC 5596:2008 Calidad del suelo: Determinación de la conductividad eléctrica, Método B. Medición en suspensión suelo/agua relación 1:5 (Peso/volumen)	0.16	No salino
Materia Orgánica (MO)	g/100g	Cálculo según NTC 5403 Walkey & Black	1.28	Bajo
Carbono Orgánico (CO)	g/100g	GA-R-119 versión 2 2019-09-20	0.74	
Fosforo (P) Disponible (Bray II)	mg/kg	GA-R-48, versión 05 de 2019-10-02.	34.48	Medio
Azufre (S) disponible	mg/kg	Fosfato monobasico de calcio	8.28	Bajo
Capacidad Interc Catiónico Efect (CICE)	cmol(+)/kg	Cálculo	9.23	Baja
Boro (B) Disponible	mg/kg	Fosfato monobasico de calcio	0.14	Bajo
Acidez (Al+H)	cmol(+)/kg	KCl	ND	No Indica
Aluminio (Al) Intercambiable	cmol(+)/kg	KCl	ND	Sin restricción
Calcio (Ca) disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	7.36	Alto
Magnesio (Mg) Disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	1.64	Medio
Potasio (K) Disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	0.12	Bajo

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GA-F-97
Versión: 5
FECHA DE APROBACIÓN Y PUBLICACIÓN DEL CAMBIO: 2020-10-21

INFORME No.027566 LUIS CARLOS HERRERA CARVAJAL 2022-01-18

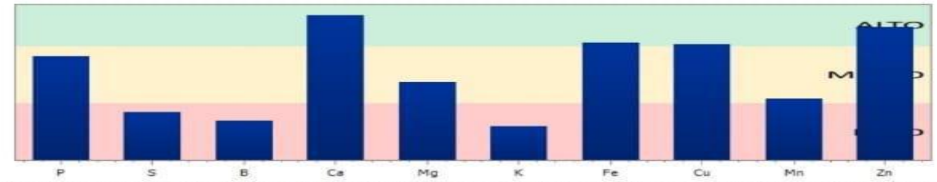
AGROSAVIA
Corporación colombiana de investigación agropecuaria

ACREDITADO ONAC
ISO/IEC 17025:2017
13-LAB-031

REPORTE DE RESULTADOS LABORATORIO DE SERVICIOS UNA MUESTRA GESTIÓN DE LA AGENDA CORPORATIVA

DETERMINACIÓN ANALÍTICA	UNIDAD	MÉTODO	VALOR	INTERPRETACION*
Sodio (Na) Disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	<0.14	Normal
Hierro (Fe) olsen Disponible	mg/kg	NTC 5526:2007	51.72	Alto
Cobre (Cu) olsen Disponible	mg/kg	NTC 5526:2007	2.77	Medio
Manganeso (Mn) olsen Disponible	mg/kg	NTC 5526:2007	5.41	Medio
Zinc (Zn) olsen Disponible	mg/kg	NTC 5526:2007	3.52	Alto
Saturación de Calcio	%	Cálculo	80	Alto
Saturación de Magnesio	%	Cálculo	18	Medio
Saturación de Potasio	%	Cálculo	1	Bajo
Saturación de Sodio	%	Cálculo	1	Normal
Saturación de Aluminio	%	Cálculo	0	Normal

GRAFICA DE INTERPRETACION DE RESULTADOS



NOTAS: 1) interpretacion basada en: ICA,1992. Fertilización en diversos cultivos. Quinta aproximación. Manual de asistencia N 25; 2) ND = No Determinado; 3) Se hace corrección por pW (factor de corrección por humedad) para los análisis de Materia orgánica (MO), Fósforo disponible (P) Bray II, Azufre disponible (S), Acidez intercambiable (Al+H), Aluminio intercambiable (Al), Calcio intercambiable (Ca), Magnesio Intercambiable, Potasio intercambiable (K), Sodio intercambiable (Na), Hierro disponible (Fe)Olsen, Manganeso disponible (Mn) Olsen, Zinc disponible (Zn) Olsen, Cobre disponible (Cu) Olsen y Boro disponible (B).

Los valores del limite de cuantificación del método para Calcio (Ca) menores a 1,12 cmol (+)/kg , Magnesio (Mg) menores a 0,20 cmol (+)/kg y Fósforo (P) Disponible Bray II menores a 3,83 mg/kg , se encuentran fuera del alcance de acreditación.

La información presentada en el numeral 2. del informe de resultados, es suministrada por el cliente.
Los resultados expresados en el informe se obtienen de la muestra tal como fue suministrada por el usuario del servicio.
El cliente es responsable del muestreo y traslado de muestras al laboratorio, las muestras no son modificadas o alteradas en su

(AGROSAVIA, 2022)

Appendix E: Soil Samples From Control Field at End of Harvest.

INFORME No.029657 LUIS CARLOS HERRERA CARVAJAL 2022-02-10

AGROSAVIA
Corporación colombiana de investigación agropecuaria

ACREDITADO ONAC
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ISO/IEC 17025:2017
13-LAB-031

REPORTE DE RESULTADOS LABORATORIO DE SERVICIOS UNA MUESTRA GESTIÓN DE LA AGENDA CORPORATIVA

LABORATORIO DE QUIMICA ANALÍTICA (Química de suelos)

1. Información del cliente

NOMBRE Y APELLIDO: LUIS CARLOS HERRERA CARVAJAL
CÉDULA O NIT: 1066098259
DIRECCIÓN: CLL 3 10-67
DEPARTAMENTO: NORTE DE SANTANDER
MUNICIPIO: OCAÑA
TEL, FIJO/CEL: 3165330417 / 3165330417
TIPO DE ANALISIS:

NÚMERO BOLSA	CÓDIGO DE LABORATORIO
029657	LQAS21-015589

2. Información de la muestra suministrada por el cliente

IDENTIFICACIÓN: No indica
MATRIZ: Suelos
VEREDA: No indica
FINCA: UFPSO
PRODUCTOR: LUIS CARLOS HERRERA CARVAJAL
CULTIVO(S): Maíz variedad No indica con 1 Año(s) de edad

ALTURA: 1200m.s.n.m
PROFUNDIDAD : 0 a 10 cm
TIPO DE RIEGO Aspersión
TOPOGRAFIA: Plano
DRENAJE: Buen drenaje

Corporación Colombiana de Investigación Agropecuaria Agrosavia con acreditación ONAC vigente a la fecha, con código de acreditación 13-LAB-031, bajo la norma ISO/IEC 17025:2017

El laboratorio tiene acreditación ONAC bajo la norma NTC ISO/IEC 17025 en los ensayos de: pH (GA-R-46 versión 05 de 2019-10-02), fósforodisponible Bray II (GA-R-48, versión 05 de 2019-10-02), conductividad eléctrica en suelos (NTC 5596:2008. Método b. Medición en suspensiónsuelo/agua en relación 1:5 (peso/volumen)), cationes cambiables en suelo calcio, magnesio, potasio y sodio disponibles (GA-R-050 versión 7 de 2019-10-02), micronutrientes en suelo por Olsen modificado Hierro, Manganeso, Cobre y Zinc (NTC 5526:2007), determinación de Carbono Orgánico ensuelo (GA-R-119 versión 2 2019-09-20).

FECHA DE RECEPCIÓN 2021-12-27
FECHA DE ANÁLISIS: De 2021-12-27 a 2022-01-16
FECHA DE REPORTE: 2022/02/10

Yeni Rodríguez Giraldo (E6968)
Coordinador técnico del laboratorio de Química Anlítica

DETERMINACIÓN ANALÍTICA	UNIDAD	MÉTODO	VALOR	INTERPRETACION*
pH (1:2,5)	Unidades de pH	GA-R-46, versión 05 de 2019-10-02	6.12	Ligeramente ácido
Conductividad eléctrica (CE) (1:5)	dS/m	NTC 5596:2008 Calidad del suelo: Determinación de la conductividad eléctrica, Método B. Medición en suspensión suelo/agua relación 1:5 (Peso/volumen)	0.20	No salino
Materia Orgánica (MO)	g/100g	Cálculo según NTC 5403 Walkey & Black	1.05	Bajo
Carbono Orgánico (CO)	g/100g	GA-R-119 versión 2 2019-09-20	0.59	
Fosforo (P) Disponible (Bray II)	mg/kg	GA-R-48, versión 05 de 2019-10-02.	26.50	Medio
Azufre (S) disponible	mg/kg	Fosfato monobasico de calcio	7.15	Bajo
Capacidad Interc Catiónico Efect (CICE)	cmol(+)/kg	Cálculo	9.10	Baja
Boro (B) Disponible	mg/kg	Fosfato monobasico de calcio	0.10	Bajo
Acidez (Al+H)	cmol(+)/kg	KCl	ND	No Indica
Aluminio (Al) Intercambiable	cmol(+)/kg	KCl	ND	Sin restricción
Calcio (Ca) disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	7.20	Alto
Magnesio (Mg) Disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	1.50	Medio
Potasio (K) Disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	0.09	Bajo

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FECHA DE APROBACIÓN Y PUBLICACIÓN DEL CAMBIO: 2020-10-21

INFORME No.029657 LUIS CARLOS HERRERA CARVAJAL 2022-02-10

AGROSAVIA
Corporación colombiana de investigación agropecuaria

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ORGANISMO NACIONAL DE ACREDITACIÓN DE COLOMBIA
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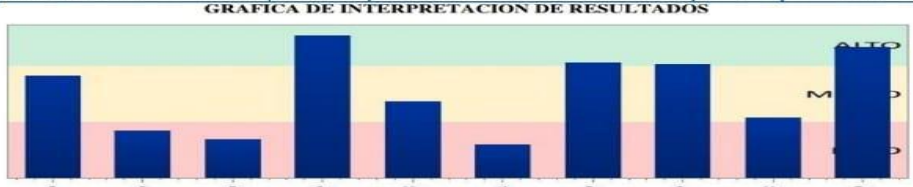
13-LAB-031

REPORTE DE RESULTADOS LABORATORIO DE SERVICIOS UNA MUESTRA GESTIÓN DE LA AGENDA CORPORATIVA

DETERMINACIÓN ANALÍTICA	UNIDAD	MÉTODO	VALOR	INTERPRETACION*
Sodio (Na) Disponible	cmol(+)/kg	GA-R-050 versión 7 de 2019-10-02	<0.14	Normal
Hierro (Fe) olsen Disponible	mg/kg	NTC 5526:2007	51.39	Alto
Cobre (Cu) olsen Disponible	mg/kg	NTC 5526:2007	2.44	Medio
Manganeso (Mn) olsen Disponible	mg/kg	NTC 5526:2007	5.30	Medio
Zinc (Zn) olsen Disponible	mg/kg	NTC 5526:2007	3.40	Alto
Saturación de Calcio	%	Cálculo	85	Alto
Saturación de Magnesio	%	Cálculo	22	Medio
Saturación de Potasic	%	Cálculo	1	Bajo
Saturación de Sodio	%	Cálculo	1	Normal
Saturación de Aluminio	%	Cálculo	0	Normal

GRAFICA DE INTERPRETACION DE RESULTADOS



NOTAS: 1) interpretacion basada en: ICA,1992. Fertilización en diversos cultivos. Quinta aproximación. Manual de asistencia N 25; 2) ND = No Determinado; 3) Se hace corrección por pW (factor de corrección por humedad) para los análisis de Materia orgánica (MO), Fósforo disponible (P) Bray II, Azufre disponible (S), Acidez intercambiable (Al+H), Aluminio intercambiable (Al), Calcio intercambiable (Ca), Magnesio Intercambiable, Potasio intercambiable (K), Sodio intercambiable (Na), Hierro disponible (Fe)Olsen, Manganeso disponible (Mn) Olsen, Zinc disponible (Zn) Olsen, Cobre disponible (Cu) Olsen y Boro disponible (B).
Los valores del límite de cuantificación del método para Calcio (Ca) menores a 1,12 cmol (+)/kg , Magnesio (Mg) menores a 0,20 cmol (+)/kg y Fósforo (P) Disponible Bray II menores a 3,83 mg/kg , se encuentran fuera del alcance de acreditación.

La información presentada en el numeral 2. del informe de resultados, es suministrada por el cliente.
Los resultados expresados en el informe se obtienen de la muestra tal como fue suministrada por el usuario del servicio.
El cliente es responsable del muestreo y traslado de muestras al laboratorio, las muestras no son modificadas o alteradas en su composición desde la recepción y sus características son las reflejadas en el análisis.

(AGROSAVIA, 2022)