







Corn as an alternative method for contributing to the country's public policies in terms of health, sustainable economy and food security, accordance with the 2030 Agenda and FAO

El maíz como método alternativo para la contribución de las políticas públicas del país en materia de salud, economía sostenible y seguridad alimentaria, acorde a la Agenda 2030 y a la FAO

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Abstract











The general objective is to determine the viability of corn as an alternative method for contributing to the country's public policies in terms of health, sustainable economy and food security, in accordance with the 2030 Agenda and the FAO, through its sowing, harvesting and processing, until it becomes a coffee substitute with a similar aroma, smell and taste to coffee, for its proof of concept. This project provides an alternative to reduce poverty through the sowing of corn, promoting the reactivation of the countryside and sustainable agriculture. Food security would be promoted with a product that is friendly to the environment and health; it would support sustained, inclusive and sustainable economic growth, full and productive employment for the sale and distribution of the product; consequently, products of this type can contribute favorably to the public policies of the country and the world.

Resumen

El objetivo general consiste en determinar la viabilidad del maíz como método alternativo para la contribución de las políticas públicas del país en materia de salud, economía sostenible y seguridad alimentaria, acorde a la Agenda 2030 y a la FAO, mediante su siembra, cosecha y procesamiento, hasta convertirlo en un sustituto de café con aroma, olor y sabor similar a éste, para su prueba de concepto. Este proyecto aporta una alternativa para disminuir la pobreza mediante la siembra de maíz, propiciando la reactivación del campo y una agricultura sostenible. Se promovería la seguridad alimentaria con un producto amigable con el medio ambiente y con la salud; apoyaría en un crecimiento económico sostenido, inclusivo y sostenible, el empleo pleno y productivo para la venta y distribución del producto, en consecuencia, productos de este tipo pueden contribuir de forma favorable en las políticas públicas del país y del mundo.

			
Objetivo: Determinar la viabilidad del maíz, acorde a la Agenda 2030 y a la FAO.	Contribución:		
	 1 FIN DE LA POBREZA	 2 HAMBRE CERO	 8 TRABAJO DECENTE Y CRECIMIENTO ECONÓMICO
Metodología: Naturaleza Cualitativa. Investigación de campo, documental y multidisciplinaria.			
			

Public policies, Agenda 2030, Corn

			
Objective: To determine the viability of corn, in accordance with the 2030 Agenda and the FAO.	Contributions:		
	 1 FIN DE LA POBREZA	 2 HAMBRE CERO	 8 TRABAJO DECENTE Y CRECIMIENTO ECONÓMICO
Methodology: Qualitative Nature. Field, documentary and multidisciplinary research.			
			

Políticas públicas, Agenda 2030, Maíz

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Peer review under the responsibility of the Scientific Committee MARVID® in the contribution to the scientific, technological and innovation Peer Review Process through the training of Human Resources for the continuity in the Critical Analysis of International Research.



Introduction

Maize is present in the country with a variety of uses, but even so, agriculture has been declining and generating migration to other cities in search of sources of employment, which is why it is a priority to find alternatives that allow this situation to be halted or diminished.

To be sustainable, agriculture must satisfy the needs of present and future generations, and at the same time guarantee profitability, environmental health, and social and economic equity; therefore, a varied use of maize would be to use it to make a drink that replaces coffee, with a smell, colour and flavour similar to coffee; A 100% natural product, free of preservatives and without artificial sweeteners that has a favourable impact on the health and food security of the population; a product that can last up to 9 months in storage without losing its quality; which would also mean that maize is required to produce the coffee substitute, so that the reactivation of the countryside in areas with fertile capacity for planting and harvesting would contribute to the sustainable economic growth of the region.

Therefore, the general objective of this paper is to determine the viability of maize as an alternative method for contributing to the country's public policies on health, sustainable economy and food security, in accordance with the 2030 Agenda and the FAO, through its planting, harvesting and processing, until it becomes a coffee substitute with aroma, smell and taste similar to coffee, for its proof of concept.

This article presents the specific objectives, the background of the project and maize, the hypotheses proposed and the methodology used to acquire the necessary results for their respective analysis.

Specific objectives

1. To search for, locate and choose a piece of land suitable for planting maize grains.
2. To fallow the land for the subsequent sowing of maize grains.
3. To sow the maize grains on a plot of land located in Ixhuatlán del Sureste for subsequent processing.

4. Harvest the main raw material.
5. Process the maize for the elaboration of the coffee substitute, for the sample of the product in a real environment (Ixhuatlán del Sureste, Ver.).
6. Produce a coffee substitute with a smell, taste and colour similar to coffee without using any chemical components.
7. Conduct interviews with people involved in agriculture on the subject.
8. Develop the proof of concept.

Background on maize

Maize is a central food in the daily consumption of most Mexicans, being a reference of history, culture and economic development in our country.

This grain belongs to the Poaceae or Gramineae family and is one of the oldest known food grains. It is considered that maize was cultivated approximately 10,000 years ago B.C.

The oldest evidence we have is from 6,250 years ago, evidence found in the cave of Guila Naquitz, in Oaxaca, a few kilometres from Mitla.

There are two theories as to the origin of maize:

1. Maize with multicentric origin, i.e., the existence of several domestication centres from different teocintle populations around 8,000 years ago, and
2. the single domestication event theory (unicentric), which proposes that populations of the teocintle of the Balsas race or subspecies *parviglumis* located in the centre of the Balsas basin (eastern Michoacán, southwestern Mexico state and northern Guerrero) gave rise to maize.

These two theories are associated with how maize originated and diversified in its different forms to adapt to specific environmental conditions and cultures.

Maize in Mexico

Mexican government intervention in the grain market dates back to 1937, when the Comité Regulador del Mercado del Trigo was founded, replaced in 1938 by the Comité Regulador del Mercado de las Subsistencias Populares, and in 1941 by the Nacional Reguladora y Distribuidora. In 1943, a consortium was created comprising the Banco Nacional de Crédito Agrícola, the Banco de Crédito Ejidal, the Comité de Aforos and the Nacional Distribuidora y Reguladora. In 1950, the Compañía Exportadora e Importadora Mexicana (CEIMSA) was founded.

The total sown area registered in 2003 in the Minatitlán-Coatzacoalcos zone was 95,055 ha, which represents 9.33% of the total area of the zone.

The main annual crops are maize, beans and grain sorghum; coffee, rubber and copra are also recognised.

Maize production and marketing in Mexico

In addition to being the grain with the highest consumption among Mexicans, in economic terms it represents a relevant issue for both market participants and public policy, due to the proportion of sown area that the grain represents, as well as the dependence on imports to satisfy domestic consumption, the market positioning of large companies and the international negotiations that have repercussions on the price of the grain.

In the case of maize, the gap between producers has widened, with the smallest stratum being the most disadvantaged, as farmers who have not disappeared have been transformed into self-consumption producers.

Project background

Since 2018 and to date, on an annual basis I plan and coordinate the Local Fair of Goods and Services, an event developed in the Multipurpose Hall of the Technological University of Southeast Veracruz (University located in the southeast of the state of Veracruz).

In which students from the Higher University Technical Education Programme in Human Capital Management presented innovative ideas, with projects that can really generate a positive footprint in the community, impacting the Sustainable Development Goals (SDGs) of the 2030 Agenda and that allow them during the course of the semester to acquire the skills, abilities and attitudes derived from the professional competencies to which the subject contributes, thus achieving a comprehensive training.

As a result of the above, field research was carried out through the Marketing subject during the period September - December 2021, to identify the feasibility of producing a beverage, this being a coffee substitute, using corn as the main raw material.

In December 2021 we participated in the 4th. Local Fair of Goods and Services at the Technological University of Southeast Veracruz, where the product was shown for the first time to the general public and some basic adaptations were shown, in accordance with the field research carried out.

In May 2022, we participated in the Local Innovation and Entrepreneurship Competition, obtaining 2nd. Place, producing a market summary and a technical-economic summary.

The project was presented at the State Week of Science and Technology on 8 and 9 November of the same year at the UT del Sureste de Veracruz sub-site.

In turn, in October 2022 the project participated in the 'SECOND CALL FOR SCIENTIFIC RESEARCH AND TECHNOLOGICAL DEVELOPMENT PROJECTS' of the Veracruz Council for Scientific Research and Technological Development (COVEICYDET), being approved in July 2023 for funding with resource allocation agreement CP 1111 1508/2023; with the above there is a project schedule from 26 October 2023 to 15 November 2024. Finally, from 26 to 29 September 2023, the product was presented at the Kaná Museum during the State Week of Science and Technology Veracruz 2023 'Dialoguing for peace: science unites us'. People of different ages tried the product and the response was extremely favourable.

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Normative Framework

United Nations (UN)

Officially established on 24 October 1945. Currently, 193 member states are represented in the General Assembly, the only place on Earth where all the nations of the world can come together and find shared solutions that benefit humanity.

Food and Agriculture Organization (FAO)

The Food and Agriculture Organization. At the heart of the United Nations development system, it leads efforts to address the world's most pressing food and agriculture challenges.

To fulfil its mandate to end hunger, FAO works closely with other UN agencies, funds and programmes, and builds on the strengths and comparative advantages of each of them.

Agenda 2030

Adopted in September 2015 by the United Nations General Assembly, it sets out a transformative vision towards economic, social and environmental sustainability for the 193 Member States that signed up to it.

It has a universal approach and is integrated with 17 Sustainable Development Goals.

Sustainable Development Goals (SDGs)

They are a planning and monitoring tool for countries, both at national and local level. Thanks to their long-term vision, they will support each country on its path towards sustained, inclusive and environmentally sound development, through public policies and instruments for planning, budgeting, monitoring and evaluation.

The SDGs are:

1. End Poverty.
2. Zero Hunger.
3. Health and Well-being.
4. Education and Quality.
5. Gender Equality.
6. Clean Water and Sanitation.
7. Affordable and Clean Energy.
8. Decent Work and Economic Growth.

9. Industry, Innovation and Infrastructure.
10. Reducing inequalities.
11. Sustainable cities and communities.
12. Responsible production and consumption.
13. Climate action.
14. Underwater life.
15. Life of terrestrial ecosystems.
16. Peace, justice and strong institutions.
17. Partnerships to achieve the goals.

Previous research

A thorough documentary research is carried out through the databases of high quality scientific and editorial journals, which can be used as documentary support for the present document, locating the following (table 1, 2 and 3):

Box 1

Table 1

Investigación previa 1

Title:	Maize in Mexico: biodiversity and changes in consumption
Authors:	Massieu Trigo, Yolanda; Lechuga Montenegro, Jesús
Magazine:	Economic Analysis
Year:	(2002)

Own elaboration

Box 2

Table 2

Preliminary research 2

Title:	Importance of Mexico's native maize in the national diet. An indispensable review
Authors:	Rocío Fernández Suárez, Luis A. Morales Chávez y Amanda Gálvez Mariscal.
Magazine:	Fitotecnia mexicana
Year:	(2013)

Own elaboration

Box 3

Table 3

Previous research 3

Title:	Analysis of the maize market in Mexico from a price perspective.
Authors:	Ester Reyes Santiago, Fidel Bautista Mayorga, José Alberto García Salazar.
Magazine:	Acta Universitaria
Year:	(2022)

Own elaboration

Hypothesis

Hi: The planting and cultivation of maize for subsequent processing and sale as a coffee substitute represents an effective and alternative method for the contribution of the country's public policies on health, sustainable economy and food security, in line with the 2030 Agenda and the FAO.

Ho: The planting and cultivation of maize for its subsequent transformation and sale as a coffee substitute does not represent an effective and alternative method for the contribution of the country's public policies in terms of health, sustainable economy and food security, in line with the 2030 Agenda and the FAO.

Methodology

- Nature of the research: Qualitative.
- Type of research: Documentary, experimental and field research.
- Research modality: Scientific.
- Knowledge areas: Multidisciplinary research.
- Areas of development: Agricultural food chain, environment and natural resources.
- Data collection technique: Observation and interview.
- Data collection instrument: Questionnaire.
- Representative sample of the farmer sector: for the selection of the representative sample for the feasibility study among farmers, the universe was taken as a reference, which will be the people actively involved in economic activities, between the ages of 18 and over, using the equation of probabilistic samples of Dr. Sampiere in the sixth edition of Dr. Sampiere. Sampiere in the sixth edition of his book *Research Methodology*, with a margin of error of 30% and a confidence level of 95%, which will be 132 economically active people in the agricultural sector in the Municipality of Ixhuatlán del Sureste between the ages of 18 and over.
- The experimental research and proof of concept was carried out in Ixhuatlán del Sureste, Ver., where the maize was planted and harvested.

- The processing was carried out in the facilities of the Technological University of Southeast Veracruz.

Impact area

Agenda 2030 of the UN General Assembly, FAO (Food and Agriculture Organization), public policies of the country immersed in the National Development Plan and the Veracruz Development Plan.

Sustainable Development Goals of the 2030 Agenda implemented:

SDG 1. End poverty in all its forms everywhere.

1.1 By 2030, eradicate extreme poverty for all people everywhere (extreme poverty is currently defined as people living on less than US\$1.25 a day).

SDG 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, livestock keepers and fishers, including through secure and equitable access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and off-farm employment.

SDG 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment.

8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation.

Resource requirements

The research will be carried out in a period from 26 October 2023 to 25 August 2024, with the support of three students of the Bachelor's Degree in Human Capital Management Educational Programme, who will have as deliverable the completion of their internship report, as well as the collaboration of two to three day workers, depending on the quarter.

Also required as a technological resource is a roaster and a mill for the transformation of corn, as well as a drone and a laptop to record data. In terms of operating expenses, the following are included: Triton 22 maize, Zinflow fertiliser, Quicelum growth regulator, Jacto Manual sprayer, Dragocson herbicide and Foley Rey insecticide.

Results

During the first quarter of work from 26 October to 25 January 2024, we looked for people who are dedicated to and have experience in agricultural work, especially in maize cultivation; after that, we searched for, located and chose a piece of land in the city of Ixhuatlán del Sureste that was suitable for maize cultivation and where the planting area would not be flooded (figure 1).

A piece of land with high and low areas was detected, where the people who will carry out the following indicated the suitability of the land for planting, so this was chosen to carry out the follow-up of the project.

Box 4



Figure 1

Land search

In the meantime, according to institutional guidelines, suppliers that meet the specifications requested for each of the required equipment are reviewed; for the purchase of each piece of equipment (roaster and mill), at least three suppliers that offer the same or similar equipment to what is required are investigated.

During this quarter, the land was fallowed, where the agricultural workers proceeded to clean the land: clearing the weeds, cutting dry trunks, removing and replanting those that prevent sunlight from entering the planting area and preparing the land for the subsequent planting of maize.

For the second quarter, from 26 January to 25 April, the overgrown weeds caused by the rains of the season and the passage of time were cleared so that the soil would be clean at the time of planting; Dragocson was also used to control the weeds.

Inputs for weed control and planting care were purchased. Traditional maize (white) and hybrid maize (Triton 22) were also purchased to compare the two crops for processing.

During the quarter, the purchased maize was planted (figure 2) and after ten days, according to the instructions provided, it was sprayed with Zinc Flow fertiliser (figure 3).

Box 5



Figure 2

Maize planting

Box 6



Figure 3

Fertiliser spraying

Source: [own elaboration]

The field was kept under constant surveillance to prevent any pests from damaging the sowing and manual watering was carried out to prevent the sowing from drying out (figure 4).

Box 7**Figure 4**

Manual water irrigation

During this period, the roaster and the mill purchased from the supplier Casa Salazar in the previous period were received (figure 5).

Box 8**Figure 5**

Roaster and mill

However, during the period from 26 April to 25 July, the field was also kept under constant care to avoid the proliferation of pests (figure 6).

Box 9**Figure 6**

Care of the land

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The plants were watered daily, as the heat waves at the beginning of sowing were atypical because the temperatures were significantly higher than expected, both in terms of intensity and duration. For this purpose, a hose with a pump was installed to draw water from the well in the area (figure 7).

Box 10**Figure 7**

Hydraulic pump installation

During this period, the roaster and mill were installed in a space within the Innovation and Creativity 4.0 Centre at the University, where the roasting and grinding process takes place. In addition, the electrical installation necessary for its function was carried out (figure 8).

Box 11**Figure 8**

Electrical installation of the toaster

For the fourth quarter, only the first month is considered for this research, from 26 July to 25 August, when the maize was harvested (Figure 9) and taken to the University facilities for processing, i.e. roasting and milling (Figure 10 and 11).

Box 12



Figure 9

Maize harvesting

Box 13



Figure 10

Roast

Box 14



Figure 11

Grinding

During this period, interviews were conducted with the agricultural sector in the municipality of Ixhuatlán del Sureste, in the state of Veracruz, obtaining the following data:

- The length of time they have been cultivating maize is 25 years.
- The youngest farmers have been farming for five years.
- Most of the interviewees have their own land, which they call ranchos.
- Some farmers make lease agreements for certain amounts of hectares, where they plant, and this agreement is renewed from time to time.

We had the opportunity to know how each one of them carries out the planting process from clearing the land to harvesting, they mention that they use fertilisers to nourish the soil and some of them prefer organic fertiliser as a second option.

The interviewees sow 2 to 3 times a year depending on the weather, after sowing it takes them approximately 5 to 6 months to harvest the cobs, and when harvesting they tend to lose 5 to 8 sacks of maize.

They all agree that growing maize is a viable business because growing maize has been their livelihood for years, although they have only done it to sell it in nearby markets and businesses; however, they showed interest in having a new option, to sell it so that it can become a substitute for coffee.

Conclusions

Developing a project focused on health, sustainable economy and food security, fundamental pillars of the Sustainable Development Goals of the 2030 Agenda, requires to a large extent the reactivation of the countryside through the planting and processing of maize.

For this reason, this project conducted the experimental study in situ in Ixhuatlán del Sureste, Veracruz, a city where 50.9% of the population lives in poverty, 36.2% is considered a vulnerable population due to social deprivation and 3.0% is considered a vulnerable population due to income.

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As for the occupations of the people living in this city, they are mostly domestic workers, construction support workers, sales employees, shop assistants and shop assistants, drivers, catalogue sellers, corn and bean growers, among others.

At this point it is taken into consideration that only 1.26% of the people are engaged in maize or bean cultivation, leaving land uncultivated due to the lack of farmers to do so, as young people decide to migrate to other cities to work mainly in maquilas.

The present study with the planting, harvesting and processing of maize, as well as the respective proof of concept, allowed for a ten-month analysis of the impact on health, sustainable economy and food security of the society in that region, initially and later replicated in other entities.

Interviews were also conducted with farmers in the area, who responded favourably, showing optimism that maize can be used as an alternative to coffee and that they can plant something that will actually be bought.

Now, as for the impacts that the project can generate, they are: related to health, referring to the fact that normally people who consume coffee suffer from high blood pressure, irritability, nervousness or insomnia, among others; while the consumption of this coffee substitute does not cause the above, containing a base of roasted corn grains and cinnamon, an innovative element that helps to improve circulation and blood pressure.

In terms of food safety, we know that corn provides great benefits such as Contains B vitamins and beta-carotene (provitamin A), which can give a feeling of satiety and prevents constipation.

At the same time, a sustainable economy is presented, where what is required is sown and processed for packaging and subsequent sale; without compromising future generations, as the maize continues to be sown to obtain the raw material necessary to convert it into a coffee substitute. This project would provide an alternative to reduce poverty through the sowing of maize, which in turn would promote the reactivation of the countryside and sustainable agriculture.

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It would promote food security with a product that is environmentally and health friendly. It would also support sustained, inclusive and sustainable economic growth, full and productive employment for the sale and distribution of the product, and consequently, products of this type can contribute favourably to public policies in the country and the world.

Declarations

Conflict of interest

There is no conflict of interest, nor are there any known competing financial interests or personal relationships that might have appeared to influence the article reported herein.

Authors' contribution

Mina, Susana del Carmen: Generated the idea, identifying the need, methodology and phases of the project.

Quintana-Garrido, Juan Diego: The co-author contributed to the Policy Framework, linking the SDGs to the project.

Availability of data and materials

The data obtained in this research is available for reading and citation.

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To my students who know that they can be a fundamental part in generating positive changes in society, in the environment and in the economy.

To Finita, my mother.

Abbreviations

FAO	Food and Agriculture Organization
ODS	Sustainable Development Goals
ONU	United Nations

References

Background

Fernández Suárez, R., Morales Chávez, L. A., & Gálvez Mariscal, A. (2013). Importance of Mexico's native maize in the national diet. An indispensable review. *Fitotecnia Mexicana*, 275-283. Retrieved from Importance of Mexico's native maize in the national diet. An indispensable review.

Massieu Trigo, Y., & Lechuga Montenegro, J. (2002). [Maize in Mexico: biodiversity and changes in consumption](#). *Análisis Económico*, 281-303.

Reyes Santiago, E., Bautista Mayorga, F., & García Salazar, J. A. (2022). [Analysis of the maize market in Mexico from a price perspective](#). *Acta Universitaria*, 1-16. Retrieved from

Basics

Agencia de Servicios a la Comercialización y Desarrollo de Mercados Agropecuarios. (January 19, 2018). [Government of Mexico](#). Retrieved from www.gob.mx:

ECLAC (December 2018). [ECLAC Repository](#). Retrieved from

ECLAC (August 2024). [ECLAC - United Nations](#). Retrieved from

National Water Commission. (n.d.). [Estudio de Alternativas de solución para suministrar agua potable a las ciudades de Minatitlán y Coatzacoalcos](#). Federal District: CONAGUA.

FAO. (August 2024). [Food and Agriculture Organization of the United Nations](#). Retrieved from

Kato Yamakake, T. Á., Mapes Sánchez, C., Mera Ovando, L. M., Serratos Hernández, J. A., & Bye Boettler, R. A. (2009). [Origin and diversification of maize. An analytical review](#). Mexico, D.F.: Impresora Apolo, S.A. de C.V.

Martínez, G., Rivera, M., Franco, A., & Soria, J. (January 2011). [Scielo](#). Retrieved from [Economía, sociedad y territorio](#):

United Nations (August 2024). [United Nations](#). Retrieved from [Peace, dignity and equality on a healthy planet](#):

Narváez Ibarra, H. A., & Holguín Alvarado, F. A. (2024). [Social investment report for sustainable development](#). Chihuahua: Fundación del Empresariado Chihuahuense, A. C. Retrieved from

Ministry of Agriculture and Rural Development (21 September 2023). [Government of Mexico](#). Retrieved from [Secretaría de Agricultura y Desarrollo Rural](#):

SIEGVER. (2021). [Comité Estatal de Información Estadística y Geográfica de Veracruz](#). Retrieved from Ceieg.veracruz.gob.mx:

Discussion

Venegas García, M. d. (15-18 November 2016). [UNAM](#). Retrieved from UNAM.org