Business Models in the Circular and Collaborative Economy: New horizons for sustainable development in the São Francisco Valley

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Abstract

The Vale do São Francisco in Pernambuco, known nationally for its irrigated fruit farming, faces environmental and social challenges arising from the traditional development model. This study analyzes the application of the principles of the collaborative and circular economy in the context of business models developed from actions to encourage the creation of innovative ventures in this territorial context. Since 2018, operators in this territory have been encouraged to organize themselves as a network during the structuring of the Local Innovation Ecosystem. This is a national policy created by the Micro and Small Business Support Service (SEBRAE) to stimulate business competitiveness and mechanisms for generating wealth in a sustainable way. Between 2022 and 2023, 2,214 people and 307 companies were impacted by SEBRAE's actions, only in the city of Petrolina. This objective study analyzes three business models, at different stages of maturity, and verifies the potential impacts that these businesses cause in the territory. The methodology developed to carry out this study occurred in three phases, the first being a dive into the state of the art and selection of companies; the second involved the preparation and application of questionnaires; and finally, in the third phase the data was analyzed. Therefore, the study fills a gap that has not yet been explored in the literature, which is the lack of in-depth

analysis of the subjective aspects of circular and/or collaborative entrepreneurship and contributes to the contextualization of the dynamics in an Innovation Ecosystem.

Keywords

Circular Economy, Collaborative Economy, Business model, Innovation, Startups, Northeast Brazil

1. Introduction

The Vale do São Francisco in Pernambuco, known nationwide for its agricultural production, with a focus on irrigated fruit growing, faces environmental and social challenges arising from the traditional model of economic development in the most diverse segments and business sizes. The transition to a circular and collaborative economy emerges as a promising alternative to face these challenges, integrating sustainable practices into local business models and innovating to deliver more value to its customers, partners and society in general.

This study analyzes the application of the principles of the circular, collaborative and/or shared economy in the context of business models developed from actions to encourage the creation of startups, through development programs, as well as innovative businesses generated spontaneously by the regional innovation ecosystem. A business model is understood as the logic by which a startup or company creates, delivers and captures value for the market (Osterwalder & Pigneur, 2005).

Since 2018, governmental, educational, institutional and business actors in the São Francisco Valley territory have been encouraged to organize themselves in the format of a network of partners to structure the Local Innovation Ecosystem (ELI), having as the main stimulator of this process, the Pernambuco Micro and Small Business Support Service (SEBRAE/PE). Through direct interventions in the Ecosystem, which range from articulation, training and induction to the creation of an innovation environment such as innovation centers, incubators and innovation hubs to promoting the creation of startups, through specific methodologies, whose main objective is empower such actors to act in favor of a common purpose: the development of the necessary conditions for the creation of innovative businesses that can take this region of the state to new heights.

The ELI methodology is a national innovation promotion program created by the SEBRAE organization, which works as a type of entrepreneurship promotion agency to stimulate regional business competitiveness in Brazilian territories and mechanisms for generating wealth in a sustainable way, harmonious and collaborative. Between 2022 and 2023, 2214 people and 307 companies were impacted by SEBRAE/PE actions, in the territory of Petrolina, state of Pernambuco, in the São Francisco Valley region, among the public of entrepreneurs, businesspeople, researchers, undergraduate university students , master's and doctorate degrees, among others (SEBRAE, 2024). As a result of these stimuli, between 2021 and 2023, 21 formal startups were created in the INOVA SIMPLES modality

only in the city of Petrolina according to the INOVA SIMPLES Observatory (Silveira & Caetano 2023).

However, in this study, we sought to identify and analyze startups from different origins that presented some of the specific characteristics of business models that operated within the principles of the Circular Economy, collaborative and/or shared, in addition to verifying the potential impact of these models in boosting sustainable development in the region, as well as promoting efficiency in the use of resources, waste reduction and reuse or sharing of consumer products or services to strengthen of a community or a city as a whole.

The 28th UN Climate Summit, COP28, which took place in Dubai in 2023, highlighted Circular Economy approaches as a tool in the transition to sustainable patterns of consumption and production (Laita, 2024). Therefore, new global business models increasingly require a change of mindset from their founders, sinceThat companies are at the center of the transition to a Circular Economy (Ellen MacArthur Foundation, 2024), disruptive and at scale.

Therefore, this study aims to analyze three business models that present, in their conception, operation or value proposition, characteristics within the principles of the Circular, Collaborative and/or Shared Economy, at different stages of maturity (Validation, Operation and Traction) , existing in the city of Petrolina-PE, in order to verify the potential impacts that these businesses can cause in the territory.

Based on what was established as the objective of this study, the research strategy was constructed taking into account a perception of three phases using the methodology adopted by Silveira, Moura and Moura (2021) and, we followed as a model the procedures brought by Dias Pedro et al. (2013) and dos Santos et al. (2014), which were detailed below. The Souza Multiple Case Study strategy (2019) was used, as we sought to investigate contemporary events, in addition to the exploratory approach to understand a context that is still little studied in the literature.

We therefore highlight that the study fills a gap that has not yet been explored in the literature, which is the lack of a deeper understanding of the integration of subjective aspects of entrepreneurship in the Circular (Miyashiro et al., 2023) and Collaborative Economy. As well as in the contextualization of the territorial dynamics of these types of enterprises, mainly in an Innovation Ecosystem still under construction, in the northeast of Brazil and in the interior of the state of Pernambuco. Therefore, the case study of three startups with different profiles, in a universe of innovative and technology-based businesses, created recently, already demonstrates a positive result and a peculiar and powerful vision of a developing ecosystem.

2. Circular Economy and Innovation Ecosystems

The Circular Economy is a framework of systemic solutions to face global challenges such as climate change, loss of biodiversity, waste and pollution (Ellen MacArthur, w/d), working on three principles: eliminate waste and pollution, circulate products and

materials, maintaining their value and regenerating nature. The European Community launched the Circular Economy Plan in 2015 and has inspired other countries. In the case of Brazil, through the National Confederation of Industry (CNI), academia and the actions of the Ellen MacArthur Foundation. Still, it is a reality far from organizational culture and the various productive and industrial sectors.

A production, processing and management model linked to business models, as well as public policies that propose the adoption of "interdependent natural systems", seeking to ensure long-term economic growth, without compromising the regeneration of ecosystems (Abdalla & Sampaio, 2019; Azevedo, 2015). In addition to prioritizing a broad restructuring of organizational culture and industrial production processes, which are capable of promoting the engagement of both people and governments in promoting effective public policies (Abdalla & Sampaio, 2019).

All of this is due, in large part, to the fact that, due to the very concept of Circular Economy, as an innovative proposal for implementing a new production process system, it suggests profound structural changes and assumes a greater role when compared to the usual system. of the Linear Economy (Abdalla & Sampaio, 2019), inherited from the Industrial Revolution (Azevedo, 2015) and based on the extraction, production and disposal of products. While the Circular Economy, based on the biological cycle, preaches exactly the opposite of this model, which is a closed cycle.

In this way, the principles of this new Economy are based on the idea of rethinking current models based on non-linear systems, which enable the systematic use and reuse of durable and non-durable goods, food and industrialized products, since their conception, therefore, the design of products and services must be thought out so as not to generate waste (Abdalla & Sampaio, 2019). In other words, an innovative proposal that extends throughout the entire useful life cycle of a product (Abdalla & Sampaio, 2019). Furthermore, it leads to a reduction in the extraction and use of natural resources, and, consequently, in the generation of waste.

According to Santiago et al., 2020, the Brazilian Association of Public Cleaning and Special Waste Companies (ABRELPE), in 2018, recorded around 79 million tons of waste generated in the Panorama of Solid Waste in Brazil, without there being a significant percentage of this amount destined for recycling.

In 2022, at the Feeding the Future Panel, during the Food Ingredients South America Summit 2022 (FiSA), Carneiro, Senior Officer at the World Food Program (WFP) Center of Excellence Against Hunger, warned that the world produces around four billion tons of food per year, but waste across the entire supply chain amounts to around 1.35 billion tons, from planting to final consumption. He further concluded by stating that if food waste were compared to a country, it would be the third largest producer of greenhouse gases in the world. Paying attention to the urgency of reversing this trend (UN, 2022).

According to the Ministry of Agriculture and Livestock - MAPA (2024), food losses in Brazil occur in the production, storage, packaging and transportation phases, while waste is concentrated in the retail and consumption phases. Therefore, the great challenge in this

segment involves the significant effort to reduce food losses and waste throughout this production and consumption chain, which requires the development of research and innovation, technology transfers and public policies guided by the circular economy. , in addition to education and awareness-raising actions for all links in the chain, as well as the population for behavioral change with the aim of ensuring food and nutritional security.

Faced with these structural problems in the various production chains, several business models have emerged willing to solve them, in an innovative way and based on different types of technologies. Therefore, the reduction of food losses and waste, as well as the ineffective production and consumption of different types of industrialized products and inputs, from another perspective, can be seen as business opportunities.

And to strengthen this process of change, according to MAPA (2024), the development of policies and the promotion of public and private initiatives are essential to accelerate the circular economy revolution. It is worth highlighting that the path of technological innovation is essential to strengthening food security, as it can contribute to introducing new forms of production and consumption behaviors that are so essential for the country's economic development, from this new perspective.

According to the United Nations Environment Program (UNEP), in 2022, 1.05 billion tons of food waste were generated. Of the total food wasted this same year, 60% occurred at home, with food services responsible for 28% and retail for 12%. Households on all continents wasted more than 1 billion meals a day, while 783 million people were affected by hunger and a third of humanity faced food insecurity, highlights the global report (UN, 2024).

The UN (2022) brought another worrying data that shows that, by 2060, there will be around 10 million inhabitants in the world. This scenario serves as a warning so that countries can seek joint and sustainable alternatives to increase global demand for food, where technology should be a great ally in combating climate change and balancing food production and waste.

The Brazilian Micro and Small Business Support Service (2023) has invested heavily in bringing together innovation and socio-environmental impact ecosystems with the purpose of expanding commitment to the Environmental, Social and Governance (ESG) movement and adhesion to the Pact Global and the Sustainable Development Goals (SDGs). Therefore, in 2023, a mapping of impact startups across Brazil began in order to deepen the knowledge of the dynamics of social innovation, whose role has been to transform realities and boost the creation of scalable business models that generate a positive impact, while meeting the profitability requirements and current socio-environmental demands of society, large corporations and governments.

Therefore, for the development of these startups, whether they have a socio-environmental impact or innovative companies in general, it is essential that the National and International Innovation Ecosystems are in full operation and working as a network so that these complex problems can be solved. , both through public policies arising from government institutions, Science and Technology Institutions (ICT), in the area of Research,

Development & Innovation (RD&I), and through entrepreneurship and innovation from private initiatives such as technology-based companies, impact or startups in general.

These are the actors, who together constitute the triple helix, a term “coined by Henry Etzkowitz, which foresees, for its ideal functioning, the articulation between three actors: industry, government and university” (Audy & Piqué, 2016), which different mechanisms and tools can be used to drive and drive the changes necessary for the transition of global society to a new Economy, since the private sector, through tools such as Marketing, is capable of influencing the market and consumers towards a changing behavior, as well as influencing companies in equal and complementary segments to break different paradigms.

As an example of an international innovation ecosystem applied within the purpose of the Circular Economy we find the case of Circular Economy 100 (CE100) which is:

> ‘an innovation program in which competitors collaborate, designed to enable organizations to create new opportunities and more quickly realize their ambitions in the circular economy. The program brings together large companies, governments and cities, academic institutions, emerging innovators and affiliates on a single multi-stakeholder platform. Elements developed especially for the CE100 program help members learn, develop skills, network and collaborate with key organizations around the circular economy’.

This is an initiative of the Ellen MacArthur Foundation (2017) that works with companies, governments and academia with the aim of building a framework for an economy that is restorative and regenerative.

Another practical example, in Brazil, of how Innovation Ecosystems have been created is the SEBRAE Program: Local Innovation Ecosystems (ELI), whose objective is to develop the municipality or a region through structured planning, articulation and intervention between governments, companies and institutions to form a network of partners with the aim of identifying and developing the territory's entrepreneurial vocations from an innovation perspective to transform cities and municipalities into more innovative territories.

In this way, the program created by SEBRAE Nacional in partnership with the Reference Centers for Innovative Technologies (Fundação CERTI) and which is currently being implemented in the 27 Brazilian States and the Federal District and in around 200 cities or regions (SEBRAE, 2023), can be established when some prerequisites are identified, in the municipality or region, such as the presence of essential assets: ICTs, Technological Universities, Innovation Mechanisms, and technology-based companies and/or startups. And it is implemented through the following steps: characterization of the Local Innovation

Ecosystem (ELI); Definition of the maturity level of the Local Innovation Ecosystem (ELI); Identification of intervention points; Construction of the Intervention Plan; Organization for intervention; Joint action of actors; Monitoring the Local Innovation Ecosystem.

The Program can be implemented with a minimum duration of around 6 months using training, coordination and constant monitoring tools throughout the process by specialist consultants in the areas of innovation (SEBRAE, 2021). In a similar way, this was what happened with the São Francisco Valley Local Innovation Ecosystem, which has been one of the main drivers of the emergence of several startups.

Therefore, it can be seen that it consists of a national policy to promote innovation created by the organization SEBRAE, which functions as a type of agency to promote entrepreneurship to stimulate regional business competitiveness in Brazilian territories and mechanisms for generating wealth in a sustainable way, harmonious and collaborative. Between 2022 and 2023, there were 2214 people and 307 companies impacted by SEBRAE/PE actions, in the territory of Petrolina, state of Pernambuco, in the São Francisco Valley region, among the public of entrepreneurs, businesspeople, researchers, university students at level undergraduate, master's and doctoral degrees, among others. (SEBRAE, 2024). As a result of these stimuli, between 2021 and 2023, the creation of 21 formal startups in the INOVA SIMPLES modality was identified in the city of Petrolina alone (Silveira & Caetano 2023).

3. Startup Business Models in the Circular and Collaborative Economy

The need for a transition to a Circular and regenerative Economy has been the subject of a growing discussion not only by environmentalists, activists and academia, but in various environments, whether corporate, political, governmental, where the topic has increasingly gained momentum. space as climate change has affected people's lives, both in urban centers and in the countryside, from developed countries to the poorest countries, from the strongest and most consolidated economies to the most fragile. And that's why it has been the target of concern from large corporations to small businesses.

For this reason, pressure from global society is growing on big brands to create more sustainable products and services from the point of view of their design, also influencing the entire production chain from industry, distribution to marketing, reaching small companies as a multiplier effect at the local level. This avalanche caused by the more conscious and, consequently, more demanding consumer, impacted on the increase in demand for environmentally, socially and economically sustainable products. This change in behavior has been directly affected by the increase in access to information, attributed mainly to the world wide web, better known as the internet, and also by the advent of social networks, which have become both a means of acquiring knowledge and information and a consumer tool, where companies offer their products.

In convergence with this trend is the emergence of alternative business models, socio-environmental impact businesses (NIS), or simply “impact businesses”. According to the Alliance for Impact Investments and Business, created in 2014, the Institute of Corporate Citizenship (ICE) and the Pipe. Social (2019) the concept attributed to the term

“impact business” is still under construction. Therefore, these institutions carried out a study to identify common characteristics in different types of enterprises that operate efficiently to solve social and environmental problems, with the aim of consolidating the concept of this type of business model nationally and internationally (ICE, Pipe.Social, 2019; Ferreira, 2022).

However, for the most diverse national and international institutions, representing the pro-economic transition movement, it is consensual that a new transaction model is emerging. Business models, in which individuals can access services instead of owning products provided by the market, thus becoming users (Ellen Macarthur Foundation - EMF, 2013). This has already proven to be a reality in some markets such as food, fashion, electronics, transport and mobility, real estate, tourism and among others, within the commerce and services segments. Rental or sharing models are widely used, all made easier for customers by new technologies, and experiencing exponential growth.

In this way, several business models aligned with the Circular and Collaborative Economy have emerged in several countries around the world, as well as in Brazil. A recent survey by SEBRAE showed that the number of impact startups has grown in the last 3 years. In total, the country has 408 of these companies. Only in 2023, wererThere are 97 startups in the sector, 22 more than in the previous year and most of them, 169 are concentrated in the southeast region, followed by the northeast region with 86 startups (Exame, 2024).

This trend shows that just a reduction in the use of fossil resources and energy consumed in the generation of industrialized products will not be enough to solve the problem of the finite nature of natural resources and raw materials, but can only delay the inevitable. Therefore, entrepreneurship, through new technology-based or impact business models, has fundamental characteristics to accelerate this transition process.

This happens because the*startups* These are initiatives designed to create new innovative products and services and normally operate flexibly until they find an ideal business model to operate. And because they are operating under conditions of extreme uncertainty (Ries, 2012; Coelho & Branco, 2022), they are at an opportune moment to take risks, which a large company or traditional company would not be willing to face, due to their robustness. or even its management model.

One of the striking principles of a startup is agility, its ability to change its route in a short time and according to its customer's behavior and needs. These characteristics of flexibility and agility favor the creation of totally innovative and disruptive solutions, which meet the complexity and need for the transition to a Circular Economy, in which startups find fertile ground to solve problems and structural dilemmas of society, such as the case of the linear model of production of goods and consumption.

Several factors indicate that this linear model has been put to the test by the very context in which it operates, and that a disruptive change in the operating system of our economy isessential Is it urgent. Thus, some of the reasons for accelerating the transition process to a new economic model were listed in the Report Towards a Circular Economy: business rationale for an accelerated transition, which imply: economic losses and

structural waste; price risks; supply risks; degradation of natural systems; growth in urbanization in contrast to regulatory trends; advances in technology, and the acceptance of alternative business models. (Ellen Macarthur Foundation, 2013).

Data brought by Exame magazine (2024) shows that 79% of impact startups in Brazil are aimed at solving problems in the environmental area. Around 18.7% of them work with recycling and waste management; 18.3% seek to reduce greenhouse gas emissions; and 17.5% deal with the sustainable use of natural resources. And reverse logistics represents 12.7% of impact startups, followed by sustainable agricultural production, with 11.4%. In the social area, supporting entrepreneurship and the social inclusion of minorities still manage to stand out, with 10.9% and 10.1%, respectively (Exame, 2024).

We identified some examples of startups that have been attracting the attention of the market, investors and the specialized press in different business models that bring proposals to positively impact the ecosystem in Brazil. Some of them have been awarded and recognized nationally and internationally for initiatives such as: the 100 Startup to Watch, from Pequenas Empresas & Grande Negócios Magazine;World Summit Awards (WSA), the world's largest award for digital content that promotes social impact; Startup Awards, from the Brazilian Association of Startups (Abstartups) and Top Startup, from Linkedin.

Buser, which was chosen as a Top Startups 2020 by Linkedin, is a business model that charters buses for intercity trips. People interested in traveling make a reservation through the app and, at the time of the trip, divide the bus freight costs among themselves, with a reduction of up to 60% in the prices charged by traditional bus lines. And recently it has faced difficulties with Brazilian justice due to its innovative model, just as Uber faced several legal challenges in the USA (https://www.buser.com.br).

SAS Brasil, nominated for the awardWorld Summit Awards (WSA) through the Anairá project, is a social impact startup in the health segment that has been operating since 2013, and provides access to specialist doctors, providing free care and oncology and gynecology teleservices, directly impacting the waiting list for specialized consultations in the region south of the country (https://www.sasbrasil.org.br).

Featured in the Guide 100 Startups to Watch, from Pequenas Empresas & Grandes Negócios, Trashin is a startup focused on reverse logistics and specialized in selective collection and waste management from large companies, such as Natura, Havaianas, Nike, Movida and iFood. In 2021 alone, the startup collected 1,300 tons of garbage, generating income of R$591,480 with this waste (https://trashin.com.br/parceiros/).

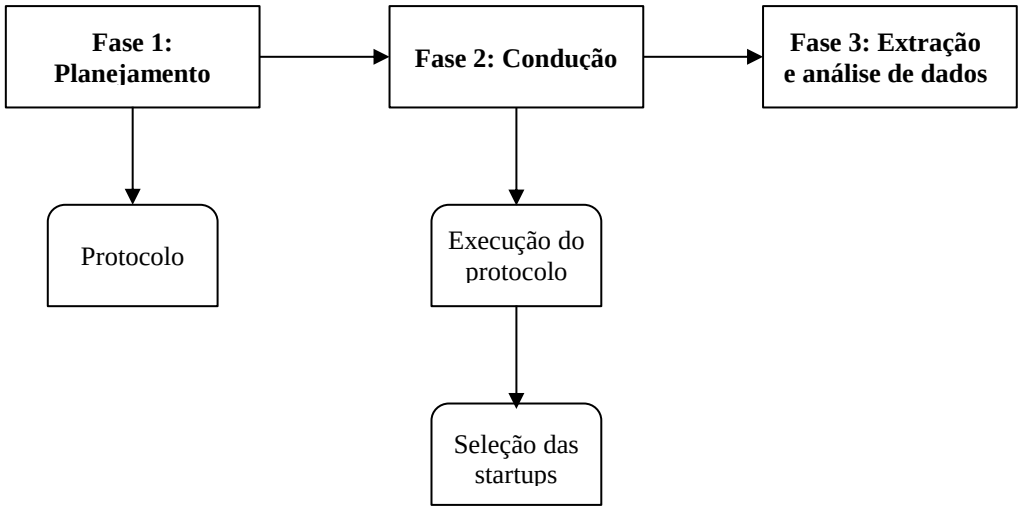
Meanwhile, the startup Butterfly is a Chilean startup and the first unicorn in Latin America, which has been gaining ground in the Brazilian market, encouraging healthy habits among its policyholders and well-being benefits for employees of other companies. One of its strategies is the offer of credits that can be converted into donations for social and environmental causes when adopting meditation, yoga, other sports or a more balanced diet in exchange for greater coverage in their policies. The company began its expansion in 2022, starting to operate in seven new markets: Mexico, Colombia, Argentina, Peru, Ecuador, Panama and Costa Rica and has now begun to explore the European market (https://v1.betterfly.com/pt-br/).

4. Circular and Collaborative Business Models in the São Francisco Valley – Case Study

Methodology

Based on what was established as the objective of this study, exploratory research was chosen as the methodology, taking into account three phases (Silveira, Moura and Moura, 2021), and following the model of procedures adopted by Dias Pedro et al. (2013, p. 2) and dos Santos et al. (2014) the research was organized, adapting the model to a systematic review.

This study was, therefore, developed in the following phases: Study planning; Conducting research; and Data extraction and analysis respectively:



Source: Prepared by the authors (2024) based on Santos et al (2014) and Silveira, Moura and Moura (2021)

In the first phase, we delved into the state of the art, into the theoretical framework of the literature involved in the central theme of the study, then the problem was established to guide the research objectives; In the second phase, a protocol was created for selecting companies for the Multiple Case Study and in the field stage, the questionnaire questions and the conditions under which they would be applied to the companies selected for the research were defined; and, finally, in the third phase, questionnaires were administered and then the data collected from startups was analyzed (Lima et al 2012; Gil, 2017; Yin, 2005).

The questionnaire established in phase two followed the main themes within the objective of the study. The questionnaire has 13 main questions that were applied electronically to the 03 startups, as shown in (Table 1) below.

Table 1: Questionnaire for startups and base authors

Question	Reason for choice and base author
1. Startup Name	Description of the respondent; (Carneiro, Zlinsky and Costa, 2017)
2. Name of representative	
3. Current maturity stage of your company/startup	Maturity level of the company; (Silva, 2019)
4. How did your business idea come about?	Understand the reason for the emergence of startups and whether from this emergence there was participation in business model improvement programs; (Carneiro, Zlinsky and Costa, 2017)
5. Have you and your startup participated in any Acceleration Program? If yes, which one?	
6. Explain your business model (Explain how your business delivers value to the customer)	
7. Are you aware of whether your business model meets any of the 17 UN Sustainable Development Goals? If so, which ones?	Understand the alignment of the company's business model with the SDGs and the objective of this study; (Trusz and Serafim, 2022)
8. Do you believe that your model is aligned with a circular, collaborative and/or shared economy model? 8a.If yes, why?	
9. How do you believe your business model differs from traditional models of buying and selling products and/or services?	
10. How many people have already been impacted by your business model and how do you analyze this impact?	Impacts and challenges of this model in the region; (Silva, Lucas and Pinto, 2022)
11. What are the main challenges faced by these business models in Petrolina-PE?	

12. Is there any type of partnership/cooperation between your business and other local entities, such as the government, NGOs or other companies?	Understand the startup's involvement with other actors in the city's innovation and social ecosystem; (Prado, Bezerra, Esteves and Souza, 2020)
12a. If there is some type of partnership, how was it established?	
12b. Are these partnerships beneficial to the development of your business or do they represent additional challenges? Why?	
13. How much do you hope your company can grow and impact the São Francisco Valley Innovation Ecosystem in the next 2 years?	Future perspective of the company within the ecosystem. (Dominguez, 2020)

Source: prepared by the authors (2024) with research data

This is exploratory and explanatory research, following the definitions of Piovesan (1999) and Gil (2017), exploratory because it aims to discover and analyze elements of a phenomenon, from any perspective, still little observed and explanatory because it delves deeper into certain knowledge specific to the reality of a location. Furthermore, it is characterized as a bibliographic and documentary research, based on the definitions of Mazucato (2018), bibliographic because it delves first into materials published in books, newspapers, magazines and websites and documentary because it was carried out based on legal, public and institutional sources.

In relation to the Case Study, according to Souza (2019), it can be defined as a study that aims to investigate contemporary events, but contextualized based on holistic and significant characteristics. Furthermore, as mentioned, the research has an exploratory and descriptive approach, for which the Multiple Case Study strategy was used in order to look for similar characteristics in the business model of three startups in the São Francisco Valley. Souza (2019), based on the perception of Collis and Hussey (2005), identifies that an approach is exploratory when it seeks to understand a contemporary context that is still little studied in the literature.

Three startups from Vale do São Francisco were selected that have different work profiles, that is, they stood out for presenting some of the characteristics of a business model being collaborative, shared and/or circular, a characteristic identified in the first phase of the study , when a preliminary analysis was carried out on the profile of startups that have or have not gone through some acceleration programs of the Petrolina/PE Innovation Ecosystem. In this context, as a starting point, observation and collection of basic information was carried out with several startups to understand the collaborative and/or internal circular vision, which enabled the preliminary understanding that three startups presented this profile (Table 2).

Table 2: Characteristics of startups

STARTUPS	FOUNDED IN	MATURITY STAGE	BUSINESS MODEL
Womantech	2023	Validation	Platform to connect, guide, encourage, train and empower a network of pregnant women to undertake. (Collaborative Business Model)
Greentech	2022	Operation	It carries out studies, projects and consultancy for agricultural companies that wish to map and monetize their carbon credits. (Circular Business Model)
Foodtech	2018	Traction	Digital platform that connects consumers, delivery people, restaurants and retailers and brings meals and purchases to customers' homes (Collaborative / Shared Business Model)

Source: prepared by the authors (2024) with research data

For the purposes of identifying the companies interviewed, we chose to adopt the nomenclature as shown in Table 2: “Womantech”, “Greentech” and “Foodtech”. These companies were chosen from SEBRAE-PE's and Ecossistema's own innovative ideas acceleration programs.

5. Analysis and discussion of results

The São Francisco Valley is a region of contrasts and potential, where natural wealth intertwines with a vibrant local culture. Its relevance to the economy of the Northeast and Brazil is indisputable, but the future of the Valley depends on a balanced approach between sustainable development and environmental preservation, known as one of the regions with the highest production of mango and grapes, in this sense there is an increase in discussion on sustainability and circular and collaborative business models.

The three chosen companies were created in the last 5 years in the city, as shown in table 3, demonstrating how the business environment in the region has changed in recent years, driven mainly by the constant dynamics required by international agribusiness. Each of the startups has a different target audience, WomanTech, founded in 2023, develops work focusing on women who are returning to the job market after pregnancy; GreenTech, founded in 2022, works directly with rural irrigated fruit producers and FoodTech focuses its delivery services in small cities in Brazil.

Table 3: year of founding of startups and maturity

STARTUPS	FOUNDED IN	MATURITY STAGE
Womantech	2023	Validation
Greentech	2022	Operation
Foodtech	2018	Traction

Source: prepared by the authors (2024) with research data

The emergence of the 3 startups were also from different perspectives, GreenTech, from question number 4, describes that its business idea came with the construction of "Academic research", that is, the idea arises from research developed by the founding team at the university and then the business model is adapted to the market. FoodTech states that "The idea for the business came from visualizing the model of marketplaces and delivery platforms in countries like China and the United States" which was adapted to the reality of small cities.

WomanTech develops its idea based on the personal experiences of its founding team. When we look at the business model of these startups, from question 6, there is also a big difference, impacted by where the idea is born; GreenTech is a company with "carbon management services for farms, part of the sustainability tripod"; FoodTech is "a technology company that enables entrepreneurial retailers in small cities in Brazil to increase sales through its platform"; while "WomanTech" is an "exclusive community to improve the quality of parenting, with solutions to facilitate the maternal entrepreneurial journey".

The 3 startups understand that their business model impacts and meets some SDGs, as confirmed by the answers to question 7. The SDGs mentioned were: 2, 13, 17, 11 and 8, understanding that they impact society from "Zero Hunger and sustainable agriculture" "Action against global climate change", "Sustainable Cities and Communities", "Partnerships and means of implementation", "Decent Work and Economic Growth".

This understanding of the impacts with the objectives of sustainable development also shows from their perspective how the business model of these startups differs from traditional models. "We participate in reducing GHG emissions on agricultural properties" and "Focus on connecting consumers directly to small local businesses" and "Improving the lives of entrepreneurial mothers", are phrases said in question 9, which demonstrate the vision of impact and difference with the traditional. These models have also, in both startups, already generated an impact on thousands of Petrolina residents, even with "WomanTech" which has an ideation model.

All startups consider the partnership relationship with different actors and institutions in the region's innovation ecosystem to be positive. This relationship is beneficial to their models and they all have it, but they understand that there are still challenges - as per questions 11 and 13 - we highlight what was said by FoodTech that impacts all startups: "Part of the challenges is due to the informal context of relationships between store owners, delivery people and customers".

The emergence of the three startups reflects an evolving business environment. WomanTech, GreenTech and FoodTech address different sectors in the region: women returning to work after pregnancy, irrigated fruit farming that is the basis of the local economy and delivery in small towns, respectively. This diversity suggests a more dynamic and inclusive innovation ecosystem where different business visions can thrive or be idealized.

The process of founding startups is interesting, as each one was inspired by different sources. GreenTech had its origins in academic research, demonstrating the importance of the relationship between academia and entrepreneurship. FoodTech was based on global market models, highlighting the search for innovation and adaptability. WomanTech was inspired by personal experiences, highlighting the importance of entrepreneurship with a focus on social issues. These different views and interconnections prove the importance of the tripod of innovative action of Etkowski and Leydesdorff's (2000) triple helices.

The business models of these startups also vary. GreenTech focuses on carbon management services, integrating sustainability into its core business. FoodTech connects small businesses to consumers, facilitating the local economy and WomanTech addresses the issue of entrepreneurial mothers, showing a commitment to social issues. Therefore, there is an impact of startups in relation to the Sustainable Development Goals (SDGs) and this is relevant. The citation of SDGs such as “Sustainable Cities and Communities”, “Decent Work and Economic Growth”, and “Partnerships for the Goals” reflects an effort to align operations with global sustainability and social impact goals.

Reports from startups suggest that their business models differ from traditional ones, focusing on environmental and social issues. GreenTech, for example, participates in reducing greenhouse gas emissions on farms, while FoodTech connects consumers with local small businesses, and WomanTech aims to improve the lives of entrepreneurial mothers. This alignment with social and environmental issues differentiates these startups, making them more attractive to investors and partners interested in sustainable businesses with a positive social impact.

Despite progress, startups face challenges. FoodTech highlights the informality in relationships between retailers, delivery people and customers as an issue to be addressed. This type of challenge is common in emerging ecosystems and requires an approach with different streams of action to resolve legal and cultural issues related to entrepreneurship.

The scenario is naturally promising for these startups in the region, with innovative business models aligned with the Sustainable Development Goals. However, challenges persist, especially related to informality and strengthening partnerships with different actors in the innovation ecosystem. The success of these startups will depend on their ability to overcome these challenges and continue to innovate with a focus on sustainability and social impact.

6. Final Considerations

The challenges of transitioning to a circularized global economy are immeasurable. However, as we have shown throughout this research, many initiatives have emerged to

try to stop the acceleration of environmental degradation resulting from urban growth, the increase in demand for natural resources, as well as the increase in the production of industrialized products and food waste, due to the bad use of water resources, increased generation of waste which is dumped into the oceans, all of this aggravated by the linear system of production and consumption, triggering climate change, which has affected several countries and ecosystems, which are the result of the imbalance between different factors of life on the planet.

Without bringing into debate the major social problems such as inequality that affect minority groups such as women, indigenous people, quilombolas, LGBTQIAPN+, among others who are affected by hunger and poverty, violence and crime more evidently in emerging and developing countries. .

As an alternative to this system, it was identified from a vast bibliographical research, in addition to periodicals, national and international publications from non-governmental institutions and secondary sources, through the world wide web, which has been a very recurring theme for researchers and the target of business interest from large to micro companies, but which still requires a deeper understanding of the local dynamics of how, mainly countries and their respective governments and production chains, have mobilized to contribute to a transition to a revolutionary Circular Economy.

In this way, it was found that discussions that were previously restricted to international spheres taken over by the United Nations Organizations (UN) with the Global Compact for economic transition, went to government spheres until they reached companies with the implementation of sustainability policies.It is in Environmental, Social and Corporate Governance (ESG).

Especially with the spread of sustainability ideals through the various media, these have been absorbed by thousands of entrepreneurs from all over the world, who, using advances in new technologies, have led the creation of new, more innovative and disruptive business models.

This is the case of impact business models, whose purpose is to solve environmental and social problems through resources raised with the help of investors attentive to new market dynamics that generate exponential demands and wealth, which are fed back by the innovation ecosystems of the Worldwide.

And, in Brazil, it has been no different, given the work of development agencies with SEBRAE, which together with several actors from the triple helix: government, universities and companies, has stimulated the organization and emergence of more than 200 ecosystems of innovation in all regions of the country.

This study focused on analyzing how startups from a promising region in northeastern Brazil, known as Vale do São Francisco, rich in its biodiversity, bathed by the São Francisco River, and recognized as one of the largest producers and exporters of fruit in the country, are managing to impact the region with their solutions.

In this study that adopted the approachof an exploratory nature to gain insight into this phenomenon of innovation in this region, we were able to identify that these startups, despite not all of them being fully aware of the Circular Economy, are able to identify the degree of importance and ability to influence the market in the territory in their respective segments and production chains. As they are at different levels of entrepreneurial and business maturity and at different moments in their entrepreneurial journey, we were able to verify that they all stated that they had Sustainable Development Goals (SDGs) linked to their goals and purposes. We also observed that they all stated that they had good expectations for growth in the local market. However, everything will depend on how much your teams and especially your founders will be willing to invest time and study knowledge to create the best strategies to stay in the market until they find the opportunity to reach the level of traction or scale.

This study did not aim to delve into the dynamics of management and processes, especially because startups operate in conditions of extreme uncertainty and are seeking to find the ideal business model to serve their market, but we sought to analyze how These business initiatives behave and how they believe they add value to their customers, partners and the ecosystem itself.

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