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Teaching Entrepreneurship in the Agricultural Sciences: The Practical Case of the Empreenda Agro Sustentável Program

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Abstract

This project aimed to develop the development of sustainable innovation and entrepreneurship through educational actions aimed at rural companies, using the Empreenda Agro Sustentável University Extension Program as a promotion tool. In order to contemplate the proposed objective, workshops roundtables were adopted as a method, aiming at the dissemination of agile management values and techniques and the promotion of entrepreneurship, to stimulate business in rural production. Through the Empreenda Agro Sustentável Program, based on the form of active methodologies, teams of students discussed and sophisticated ideas in start-up model designs, resulting in scalable and negotiable businesses in rural areas. Through the Empreenda Agro Sustentável Program, based on the study of active methodologies, 15 teams discussed and matured ideas in start-up designs. The participants who were involved in each of the stages (workshops) boosted their entrepreneurial visions by contacting methodologies that are not yet included in the regular academic content of undergraduate courses in agrarian sciences. This research presents an important discussion about active education methodologies as a university development program and the interdisciplinarity between the areas of agrarian sciences and the development of entrepreneurial science.

Keywords: Sustainable business, learning workshops, entrepreneurial culture, university development.

1. Introduction

The capacity to stimulate innovation, especially the disruptive one, associated with entrepreneurship, is essential to the process of growth and future performance of the rural sciences professional in the modern market for services and products (Santos et al., 2015). The act of innovating can be understood as the art of making things happen with creativity and motivation, it consists in the pleasure of carrying out synergistically any personal or organizational project, a permanent challenge to opportunities and risks, and assuming a proactive behavior in the face of issues that need to be resolved (Melo et al., 2015), this concept brings similarities with the act of entrepreneurship. In this context, the ability to implement innovation is essential to the professional's career growth and maintenance progress, mainly in the agricultural systems for his original market for services and productsproduces (Weisblat & McClellan, 2017).

For there to be innovation, multiple skills are needed to find alternative solutions to problems and to seek ideas that bring improvements (Poon, 2014). When creativity is fostered in the educational environment, and the adoption of an entrepreneurial stance, the achievement of the student's intellectual autonomy is a consequence (Berg et al., 2020).

To develop creativity in the academic environment, many teaching centers have used active methodologies, which can contribute to the knowledge of the contents involved in practical activities that the job market requires (Poncelet & Hudson, 2015).

In a globalized world where technology is advancing and gaining more and more space, it is essential that teaching is not restricted to traditional technical continuities practices (Bayhan & Karaca, 2020), and communication should not happen only unilaterally, it must have the student as the protagonist of learning (Szerwieski et al., 2018). Scientific studies in education aimed at the development of entrepreneurship education can provide interesting contributions to highlight new ideas within the agricultural sector.

There are few opportunities for academics to generate sustainable technological innovation, including for the practical application of the gained knowledge (Arcila, 2018). In the same way, for an inventive idea to achieve the desired success, it takes much more than technical knowledge.

For a sustainable business to be successful, it takes more than an innovative idea. It must have the tools and trained professionals. Currently, these business categories contribute to the growth of several geographic regions, since they expand not only but also in new locations, besides encouraging employment in their related industries (Alves & da Silva Jr, 2015). Given this scenario, for the learning of professionals to be more effective, several approaches and methodologies to be assimilated arise.

In this context, there must be a greater production of studies and content on entrepreneurship and the educational models that best apply to learning, as highlighted (Dionello et al., 2020). As a topic of great importance, entrepreneurship education promoted within higher education can be the path to the emergence of sustainable and economically viable, passable, and scalable (Fichter & Tiemann, 2020).

In the educational methodological context, we have active methodologies, which brings the possibility of changing the centrality of the teacher (teaching) to the student (learning) (Pereira, 2019). The methods understand education as a process that is not carried out by someone else, or by the individual, but that happens in the interaction between people through their experience, through words, actions, and reflections. It is believed that entrepreneurial behavior as an inducer of innovation can be stimulated through the use of university extension projects such as the Program Empreenda Agro Sustentável (Martins et al., 2016).

Given this, this project aimed to promote the development of sustainable and entrepreneurial innovation through an educational action aimed at rural businesses, using the university extension Program Empreenda Agro Sustentável as a promoting tool.

2. Methodology

Aiming to understand the entrepreneurial behavior in graduates of the courses of the Centro de Ciências Agrárias Aplicadas (CAAA) of the Universidade Federal de Sergipe (UFS), the population for this investigation was defined for this analysis of 1,453 students of the courses of the CCAA of UFS contained in the institution's 2017 statistical enrollment report, of the courses: Agronomic Engineering, Agricultural Engineering, Animal Science, Forestry Engineering, Veterinary Medicine and Fishing Engineering. The last sample comprised 118 students who took part in the Empreenda Agro Sustentável Program.

The activities were developed in four workshops, which worked on active methodologies, workshops, lectures considering the promotion of meaningful and collaborative learning. During the project modules (workshops), participants tested their insights so that additional requests could be made and / or that errors in planning could be found and debated and mitigated.

After all the *Sprints* (activities of the three workshops) were finished, that all modules were covered, a cycle of presentations and development of the ability to present and show products through summary presentations (Pitch) began.

During the project modules (workshops), participants tested their projects so that additional requests were made and/or that errors in planning were found, debated and mitigated, using the business modeling methods (Lean Canvas and Business Model Canvas), (Flores-Aguilar, 2019; Nidagundi & Novickis, 2017; Osterwalder & Pigneur, 2010).

After the *Sprints* (activities of the three workshops) were completed, after all the modules were worked on, a cycle of presentations and development of presentation skills and demonstration of products with presentations (started Pitch). It is also noteworthy that the innovations capable of generating intellectual property records presented in this research were encouraged to register and document rights.

2.1 Pedagogical Program Planning

The Empreenda Agro Sustentável Program brings the proposal of work to the teaching of entrepreneurship in a multidimensional, multidisciplinary and disciplined way. This program used workshops divided into themes that would allow a global understanding of entrepreneurship.

The program proposed to combine workshops in a day format (Fig. 1) aimed at developing business characteristics and plans with lectures given by highly knowledgeable professionals in specific areas. With *team-based learning*, the program initially delimited the enrollment of participants only in pre-established groups.

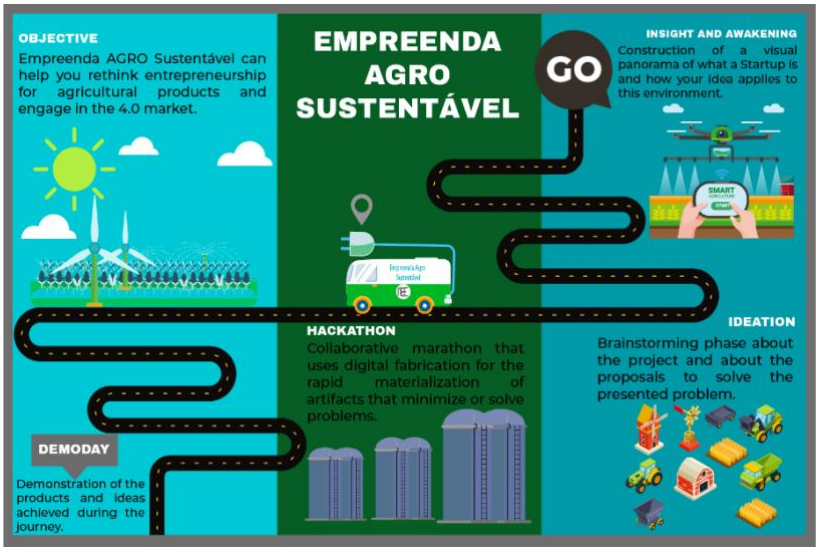


Figure 1. The journey proposed by the Empreenda Agro Sustentável Program

2.2 Mobilization of Teams

Initially, vacancies were opened for students of undergraduate courses linked to the Center for Applied Agricultural Sciences (CCAA) of the Federal University of Sergipe (UFS), in which the enrollments were carried out by a team, provided that the enrolled students had the following criteria:

- They were regularly enrolled and taking any course, and at least one student connected to the CCAA;
- Show availability of time to take part in all scheduled workshops;
- Willing to deal with teamwork.

The program had 118 effectively taking part students, the sample number for the research. For the delimitation of the teams, 12 priority productive chains and areas of agrarian development were listed, standing out (Table 1).

Table 1. Areas referred to the development of the idea by students taking part in the program.

Areas referred to the projects to be developed	
Sustainable Agriculture	Phytotherapy
Foods	Hygiene/beauty products
Mobile applications	Tourism
Agricultural Automation	Green Livestock
Biotechnology	General technologies
Creative economy	

To propose better mentoring in the development of the proposed objectives, in the program four work workshops were defined, defined in this research as Workshops, that approached themes about entrepreneurship and entrepreneurial behavior, namely:

2.3 Workshops

2.3.1 1st Workshop

Seeking a greater engagement of the participants, five strategies/dynamics were applied Presentation of the ideas initially proposed; Golden Circle; who am I in the Universe?; discovery of the user client and the development of the value proposition (Fig. 2).

In this phase, educational dynamics were developed to present the suggested ideas and oral expression, and to develop the value of a new product. In Figure 2 can be seen.

Figure 2. First Workshop of the Empreenda Agro Sustentável Program

2.3.2 2nd Workshop

With the macro perspective of what may be innovation and business means, the second meeting presented the proposal for the discovery of opportunities and the development of insight, through the search for business hypotheses and the mining of innovations (Fig. 3). Empathy maps have also been developed that aim to understand customers and users of business ideas.

Figure 3. Second Empreenda Agro Sustentável workshop

After the development of the business persona through the empathy map, the participant is expected to have a holistic view of what he wants to produce as a business, so that they are visualized the possibilities and structures of the business, the framework, was worked on *Lean Canvas* proposed by Maurya (2012), based on the development of the Business Model Canvas (BMC) among other materials. He adapted 4 BMC staff, seeking to work on aspects of greater risk in creating Startups.

The table is composed of the following fields: 1st Problem, 2nd Customer Segments, 3rd Unique Value Proposition, 4th Solution, 5th Channels, 6th Sources of Revenue, and, finally, the 7th Cost Structure. (Maurya, 2012; Sebrae, 2019). During the workshop, it was recommended to build the board following the sequence cited. Figure 4 shows the table that was used during the program.

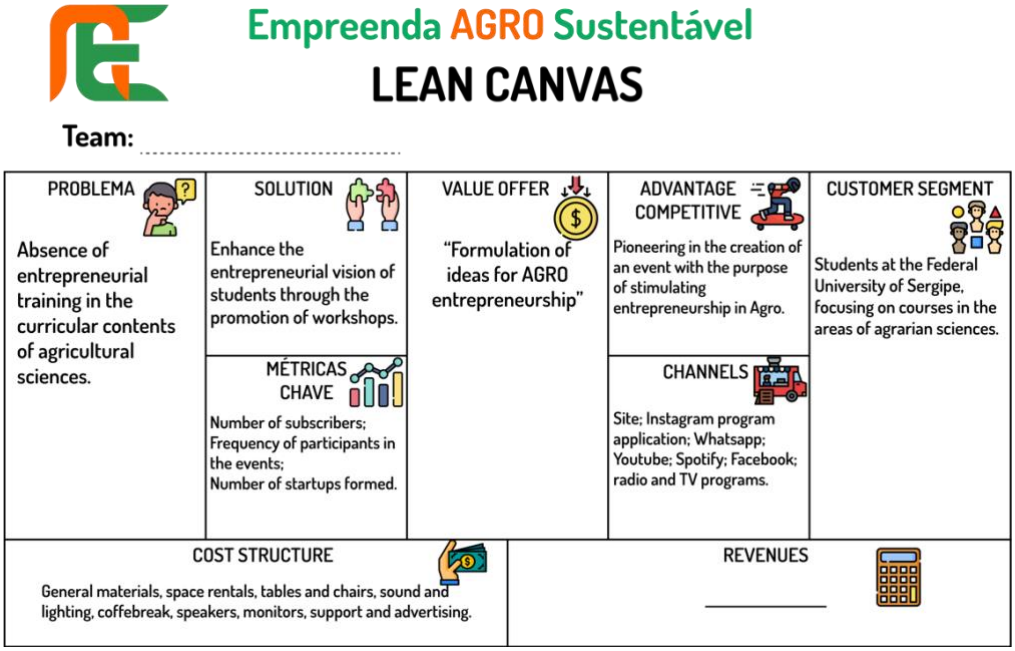


Figure 4. Diagram of the Lean Canvas Model of the Empreenda Agro Sustentável Program

2.3.3 3rd Workshop

In this workshop, the Hackathon (Fig. 5) was carried out, at which time students developed their Minimum Commercially Viable Product (MCVP) practically, according to Aulet, (2019). A Hackathon-style learning workshop brings together people of various abilities to solve one or several proposed problems.

They are usually organized as intense and fast-paced games, where teams generate innovative solutions. In this research, two models were adopted to present the proposals: *Storytelling* and *Storyboard.*

The tool *Storytelling* (TS) a narrative form that creates a context in which a product or process can be introduced to a developed story. "Story" means history and "telling", to tell (Brites et al., 2018).

The *Storyboard* (BS) is a sequential sketch in an organized way just like a series of comics or similar to a short film that presents the product or even the narrative context of the TS the image of a Storyboard conveys a more faithful impression of a real image (Moreira et al., 2018).

Figure 5. Third Workshop: Hackathon Empreenda Agro Sustentável

2.3.4 4th Demoday

The Demoday or Demonstration Day of the business models of startups was held on November 22, 2019. This was the event in which startups became involved, presented to investors, who are represented by "venture capitals", accelerators or angel investors.

The Workshop was proposed in the format of Talk Show with the display of the *pitches* of each business to all audiences present at the event (Fig. 6).

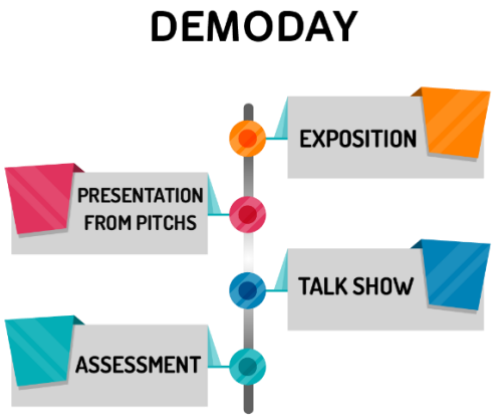


Figure 6. Fourth Workshop: Demoday Empreenda Agro Sustentável

3. Results

3.1 About the teams and participants

In the program's development, 26 teams were initially formed, totaling 118 students from undergraduate courses at the Center for Agricultural Sciences and Applied from the Federal University of Sergipe, besides other courses such as Visual arts, Administration, Graphic Design, Chemical Engineering, Production Engineering, Marketing and Ecology, of the 26 teams, 15 maintained continuity in the program.

Business proposals focused on their largest number of applications: mobile App 27.1%, followed by businesses for sustainable agriculture 19.5% (Fig. 7). Currently, many paid and

free agricultural mobile applications have been developed for rural areas, covering several areas inside and outside the rural property, substantially contributing to agricultural development for both large and small properties (Silva, 2017).

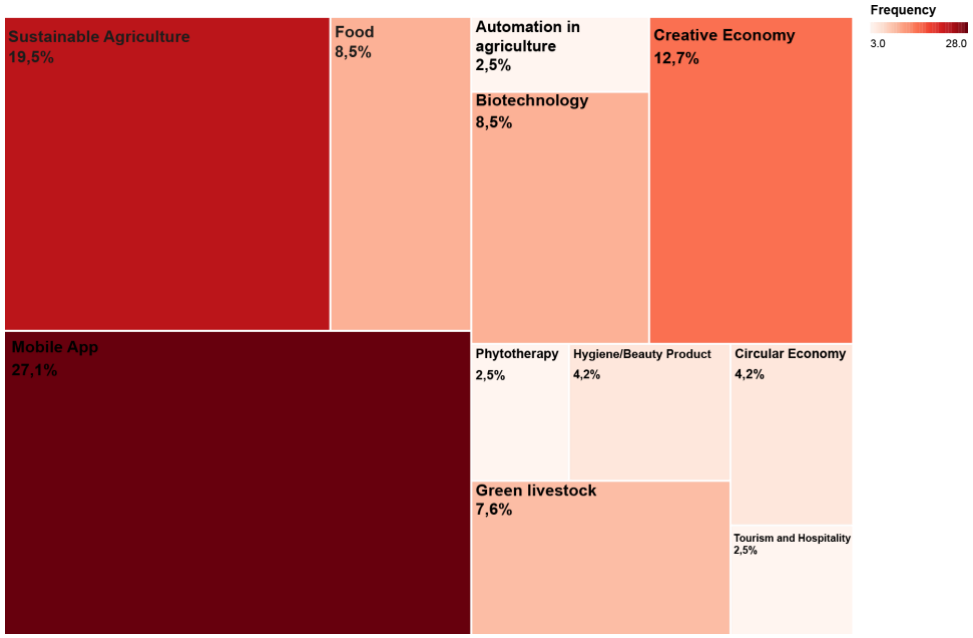


Figure 7. Areas and potential business proposals of the teams

The course with the highest numerical participation was that of Agronomic Engineering, representing 47.32% of this total, while the courses in Zootechnics, Agricultural Engineering, Forest Engineering, and Fisheries and Aquaculture Engineering took part in percentage terms, respectively, with 19.64%, 11.61%, 6.25% and 4.46% of the total enrolled students.

The number of participants decreased during the workshops until 15 teams composed of 3 to 5 students were reached who transformed ideas into business designs, in a training process through active methodologies. Evasion of academic projects can be answered by the lack of a culture of promoting practical educational models within the university, and projects that show students how to leverage their professional life projects, can also contribute to students' evasion and interest, lack of perspective on life change and distance from the entrepreneurial culture.

The program highlighted the need for proposals aimed at exploring this segment within the university since entrepreneurship is still little encouraged in the academic environment, especially within the agricultural sciences, to contribute to the training of professionals capable of entrepreneurship, and with characteristics and knowledge that will highlight them in the job market.

Seeking to mitigate these increasingly complex problems in agricultural production, advances in intelligent agriculture, decision-making methods based on information techniques, precision agriculture, and new embedded technologies, offer important tools to face these challenges, while maintaining agricultural sustainability. Agricultural practices not only focus on enriching agricultural productivity but also help to reduce harmful environmental affects

sustainably (Adnan et al., 2018; Ye et al., 2020).

3.2 Development of the First Workshop

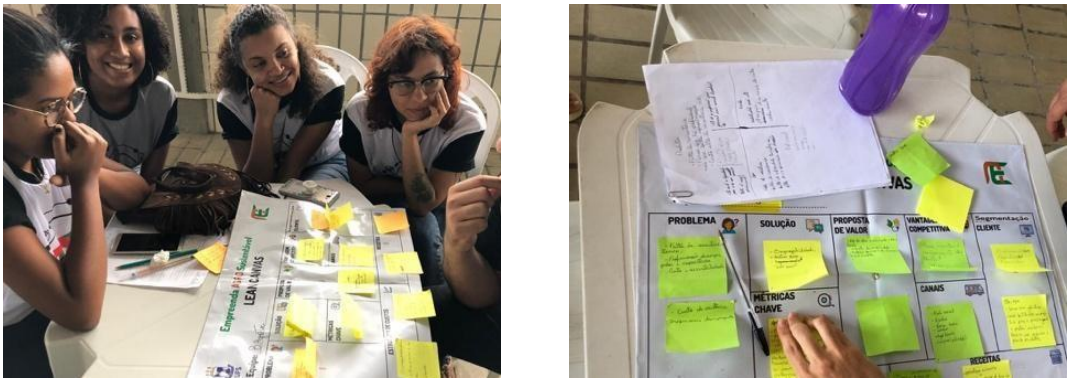
The activities started with the opening of the program which was carried out by the organizing team on the 9th and 10th of August 2019, an opportunity to present the Workshops program, called "A Jornada". The moment of the program (1st Workshop) focused on the development of lectures and workshops that addressed topics related to entrepreneurship, such as startups, entrepreneurship, entrepreneurial behavior, and entrepreneurial culture, problems (market segmentation) according to the DGSs (Development Goals Sustainable) and Agritechs in the lecture "Digital technologies and opportunities for Agribusiness". Based on the active methodologies as a pedagogical basis, the Lean Canvas workshop was held with a focus on the value proposition (Fig. 8).

(a) Lecture on market segmentation (A) (b) Lean Canvas learning workshop

Figure 8. First Workshop of the program: (a) Lecture on market segmentation and (b) First workshop for the development of Lean Canvas.

3.3 Development of the Second Workshop

The second workshop took place on August 30 and 31, 2019, when topics such as the search for opportunities as a fundamental characteristic of an entrepreneur, collaborative economy "Coworking", and the benefits of shared space were addressed. These were cross-cutting themes that contributed to the theoretical support of the teams (Fig. 9a). Proactively deepened the knowledge about each Lean Canvas block (solution, channels, key metrics, competitive advantage, revenues, costs, and closing the value proposal) (Fig. 9b).



(a) Students taking part in the program

(A) (b) Closing of the Lean Canvas

Figure 9. Second Workshop of the program: (a) Participants of the program and (b) Closing of the Lean Canvas

3.4 Development of the Third Workshop (Hackathon)

The third workshop was held on 18 and 19 October 2019. This workshop was conducted as a Hackathon when the perception of the market was worked out, and the construction of prototypes such as Storyboard and Storytelling (Fig. 10 a-b). Meetings like Hackathon comprise programming marathons, in which teams worked on their ideas and build a Minimum Viable Product through prototyping.

(a) Students participating in the program

(b) Prototype Workshop

Figure 10. Third Program Workshop: (a) Program participants and (b) Prototype workshop.

3.5 Development of the fourth Workshop an application

The Demoday or Demonstration Day (Fig. 11) of the startups' business models was held on November 22, 2019. That was the event in which startups (groups of students) presented their products to investors, represented by *venture capitals*, accelerators, or angel investors. On that occasion, young entrepreneurs presented their projects in search of investments.

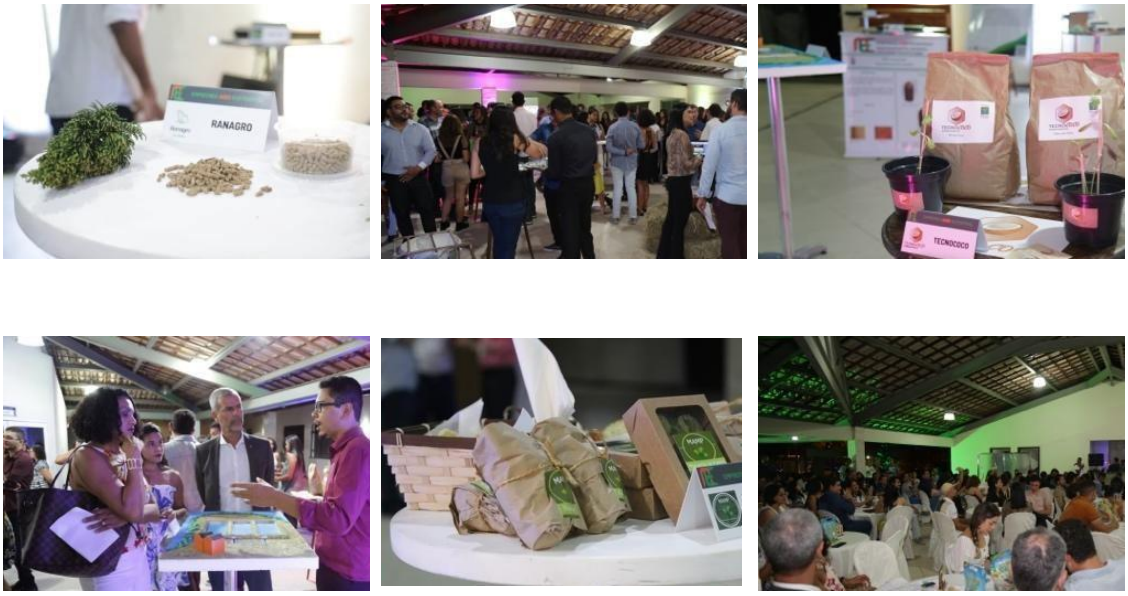


Figure 11. Fourth Workshop of the program: Demoday

3.6 Products and Brands Developed

The program resulted in 16 brands, 15 for the groups and the program's own brand, as shown in Fig. 12.

Figure 12. Portfolio of the brands developed during the program.

3.6.1 Aqua Plant

Startup, which aims precisely to eliminate the uncertainties that afflict the farmer regarding his production, since the product is a closed aquaponics system, with water recirculation, which at the end of the process, the producer will have guaranteed quality protein and vegetables. The product is integrated in technical help packages, both directly to the producer and also in contracts with municipalities

3.6.2 Agrion

Application developed by digital systems, in order to directly connect producers to markets retailers in buying and selling agricultural products where profitability is predicted by charging tax on the total amount of sales differentiating wholesale and retail sales values and percentage by product.

3.6.3 BAgroTec

The App connects the producer to the agricultural professional, solving problems in the field and, generating a job market for professionals. Besides the App, the BAgroTec website will assist the registration of producers who have difficulties with the mobile platform.

3.6.4 AGROPEC

The business model is based on the production of lamb meat with zoo-technical efficiency and financial management, besides the bonus of the results, purchase and sale of agricultural products where profitability is predicted through the collection of taxation over the total amount of sales, differentiating wholesale and retail sales values, and percentage by product.

3.6.5 Agro View

Product that monitors production. To be more assertive in identifying and deciding to apply the products at the right time, customers will have to enter a monthly contract with control before the pests can cause severe damage and avoid unnecessary use of pesticides.

3.6.6 Be Solutions

To reduce this waste of water, the use of a system has been proposed. Unlike the current systems that have a high cost and that do not have as many resources in a unified way in a single equipment, a product was developed that provides a high precision when using a system of data collected in real time, got in the specific place of the culture.

3.6.7 Grão Nordestino

Knowing the reality of the small and medium producer who for lack of a storage unit lose a good part of their harvest or are forced to sell at the lowest price so that they do not lose their product, the Northeastern grain startup will produce low cost silos and sustainable, adding value to the product and combating the waste of poorly stored food.

3.6.8 Horta House

The number of companies specialized in consultancy for urban gardens still does not meet

this growing demand. Trying to solve this problem, many people resort to Internet search tools and end up taking instructions from people who rarely have an adequate qualification for technical recommendations, which sometimes end up causing the cultivated plants not to respond as desired.

3.6.9 ItecAgro

The Platform aims at a direct interaction with a multidisciplinary team focused on agro, which uses digital systems to boost its business in an innovative, entrepreneurial and sustainable way; propose a facilitating channel through digital systems to boost the agriculture business. It has the vision of being a reference startup: developing solutions through quality technical help, generating value for the producer and promoting socio-environmental responsibility, and working with excellence.

3.6.10 Impacto Pescados

Startup specializing in the creation of type shrimp *Litopenaeus vannamei* using a diesel-powered pump for suction of sea water, making water exchanges more frequent, making the culture time shorter, launching a quality product on the market with a shorter growing period.

3.6.11 La Flora Pet

Observing the growth of the PET market in recent years and the persistent pains suffered by the owners of these animals in relation to high cost and accessibility to efficient treatments, La Flora Pet develops natural and artisanal products based on extracts or essential oils whose goal is to prevent. After registering personal data of the client and user, personalization comprises choosing the extract or essential oil according to the desired therapeutic purpose, the format, color and size of the product. to the customer's address.

3.6.12 MAMP

Palm is not a conventional food in Brazil, however, in Mexico and other countries with Mexican influence, there are already over 200 recipes using this species. The Fitness market has a great demand for healthy food, so we brought Palma as an alternative to supply this lack of the market, currently supplied with high-cost products, different from our low cost and high profit product.

3.6.13 Ranagro

With the market becoming increasingly competitive, it is necessary to innovate to achieve a satisfactory and economically viable result for the producer and consumer, besides bringing innovative technologies to the ranch sector. The ration offered on the market is the same used in creating fish, which causes less use of the meat and increases the cost for fattening.

3.6.14 Tecno Coco

The idea is to generate a cyclical production chain where the Field produces the coconut which is destined for the trader, sold to the user where it is discarded and processed by our

Startup, returning to the Field as an agricultural input, helping in productivity.

Another part will other productive and manufactured chains, such as material for sound insulation, reinforcement of materials, upholstery filling, blankets for soil protection and many other products that this waste can be transformed.

3.6.15 Une Agro

UneAgro has developed an application where the producer can advertise his products in a practical and quick way, without leaving home, where he will have a wide range of interested customers. The application is developed for both farmer and distributor.

4. Conclusion

With the development of this study, it can be seen that the objectives proposed by the Empreenda Agro Sustentável Program were contemplated if several undergraduate students from agrarian sciences and other areas of knowledge at UFS were mobilized, in a challenge to create startups proposals using active methodologies in a pre-acceleration phase.

Despite the growing interest in innovation research in the academic environment, the result of new products from the teaching units, very few studies currently explore how the academic environment interferes in the development of new products aimed at the rural environment sustainably. This study shows that the university with the university extension program can also be a pre-acceleration center for new businesses and enterprises.

The 15 teams presented their Business Models with great consistency, attracting the attention of investors, or putting themselves up for discussion with accelerators, who will search for investors. In this way, universities and colleges can promote quality help in fostering students' self-efficacy and entrepreneurial intent.

The improvement of Entrepreneurial Education in higher education, especially in agricultural science courses, with an emphasis on practice and contact with new businesses, can directly contribute to the formation of professionals more capable of generating new scalable businesses, since the intention the entrepreneurial spirit promoted by the program, together with self-efficacy, can be positively influenced by educational programs, as presented in the results.

The Empreenda Agro Sustentável Program was a pioneer in conducting actions with this formation of contents for the university education of agrarian sciences in the state of Sergipe, it can increase the development of entrepreneurial act, even in situations where the entrepreneurial intention comes act as a reducer of entrepreneurial behavior such as the student's family participation.

This project shows that participants in university extension projects positively develop their entrepreneurial ambitions and the development of new businesses planned in the pre-acceleration stage and find greater security for the next step which is the acceleration of their business plans.

For the next works, it is recommended that the dimension of entrepreneurial motivation be

studied, which actions lead students to seek extension courses and programs that deal with this theme, to understand what impulse the individual has to develop a new business, until it becomes the object of your personal fulfillment.

And finally, it is recommended to develop an action research, which allows evaluating the students taking part in the acceleration phase of their ideas developed during the pre-accelerator nature program, making it possible to assess the program's levels of influence after the phase proposed in this study.

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