CHAPTER 86

Perspective on biotechnology transfer in brazil in ict: a case of a “spin-off” in the brazilian amazon region

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ABSTRACT
The origins of modern biotechnology date back to the sixties and early seventies in academic laboratories in the US and Europe. In these laboratories, the development of new biotechnological products emerged as a result of technological and scientific advances that used innovation and technology transfer in everyday research. In this context, it is clear that universities and research institutes have played a crucial role in the development of technological innovations, especially in the large area of biotechnology. Potential solutions to some of the global challenges faced by society are provided largely as a result of academic and laboratory research, whether by universities, " Spin-offs ", research institutes and technology-based " Startups ". This article aims to outline an overview of Science and Technology Institutions-ICTs and demonstrate the transfer of technology, through spin-off , in the area of biotechnology in the Amazon, aligned with the perspective of innovation in technologies and green patents. It analyzes the Science and Technology Legal Framework, which allows the use of resources to make innovative activities more flexible and the introduction of a new culture and advances in innovation in the Institution. It mentions the importance of the Amazon biome for the environmental health of the planet and the use of Intellectual Property, in the protection of the innovation of products and services generated in the research. Finally, it reports the case of a biotechnology spin-off in the adoption of practices favorable to sustainable technology and the search, learning and implementation of this technology for the market.

Keywords: Technology Transfer; Spin-off ; Green Technology; ICTs; Innovation.

1 INTRODUCTION

Biotechnology is referred to as one of the enabling and key technologies of the 21st century, having the potential to offer, for example, solutions to health and resource-based problems facing the world, such as unmet medical needs and dependence on fossil fuels. Therefore, it is easy to understand that the relevance of biotechnology is even more unique if we consider that the modern biotechnology industry is only a quarter of a century old.

Another sensitive point in this discussion addresses the concept that the strategic practice of innovation is essential for research and for biotechnology-based companies. Such biotechnological innovations often have a higher level of innovation compared to other industries. Due to this relatively high level of innovation, there is greater uncertainty about whether these innovations will make it to the markets. A major difference lies in the fact that academic research is a crucial source of innovation for the biotechnology industry. Universities and research institutes have played a crucial role in the development of technological innovations. Innovation and technology transfer are effective for the development of biotechnology, as they provide potential solutions to some of the current challenges faced by global society.

The fantastic biodiversity of the Amazon arouses the interest of the entire world scientific community, in this way the Amazonian flora and fauna can create productive processes or even develop revolutionary substances for different applications. These processes must be aligned with the sustainability of the planet, so marked by the constant disrespect for the environment and biodiversity, already visible in climate change and consequent accidents in nature. In this sense, a more eloquent attitude of public policies becomes necessary, enforcing the existing laws, which defend biodiversity interests for the survival, with quality, of future generations, as well as the awareness of the importance of knowledge, coming from Universities and Federal Institutes, to conduct research with the development of new sustainable processes and products, which provide the technological transfer of a solution for society. The Institution of Science and Technology - ICTs, which include Universities and Federal Institutes of Education, Science and Technology - IFs, are no longer just generators of knowledge and basic research, but instead contribute with solutions for society, through of *spin-offs* , which we can conceptualize as nascent companies, based on technological research, which will be able to exploit this technology, generate intellectual property for the Institution and transfer the technology to society. And this was regulated by Law 13.242/2016, called Legal Framework for Innovation and Industrial Property Law Law No. 9.279, of 05.14.1996, which regulates rights and obligations related to industrial property.

Pinsky and Kruglianskas (2017) report that the concept of sustainability-oriented innovation is comprehensive and receives several denominations in the literature, such as sustainable, green, eco or environmental innovation. The research of the aforementioned authors considers the concept of eco-innovation, which was developed based on the Organization for Economic Cooperation and Development (OECD) definition of innovation.

In this sense, the *spin-offs* that work in the biotechnology area, mainly in the Amazon, can contribute with a research project, within the Universities or Federal Institutes, for the development of products with green technology and consequent protection of the product, through of green patents. For Santos *et al* (2017), green patents are patents focused on green technologies, that is, patents that relate to technologies that mitigate climate change, those that include reducing carbon emission and pollution, increasing energy efficiency and of resources and reducing the loss of biodiversity and ecosystems .

According to Richter (2014), green patents are important for the dissemination and use of new technology, as well as its effects on sustainability. The author states that the pilot program "Green Patents" was created in 2012 through Resolution PR 283/2012 of the National Institute of Industrial Property - INPI, in line with public policies related to combating climate change in the form of Law 12187/ 2009, which established the National Policy on Climate Change - PNMC. She also states that the advantage in the agility of granting green patents is the fact that their holders make the new technology available on the market also in less time than usual, considering the environmental appeal and the pressing need for new technologies.

Thus, it is important to consider which parameters contribute to the success of Science and Technology Institutions-ICTs that can generate *spin-offs* with green technology, to generate environmental sustainability, as well as the perspectives of protection and technology transfer arising from the development of biotechnological activities in the Amazon, thus constituting a valuable opportunity to understand this universe and its challenges.

2 PURPOSE

Demonstrate that Science and Technology Institutions-ICTs can generate *spin-offs* with green technology and the perspectives of protection and transfer of this technology, arising from the development of biotechnological activities in the Amazon.

3 METHODOLOGY

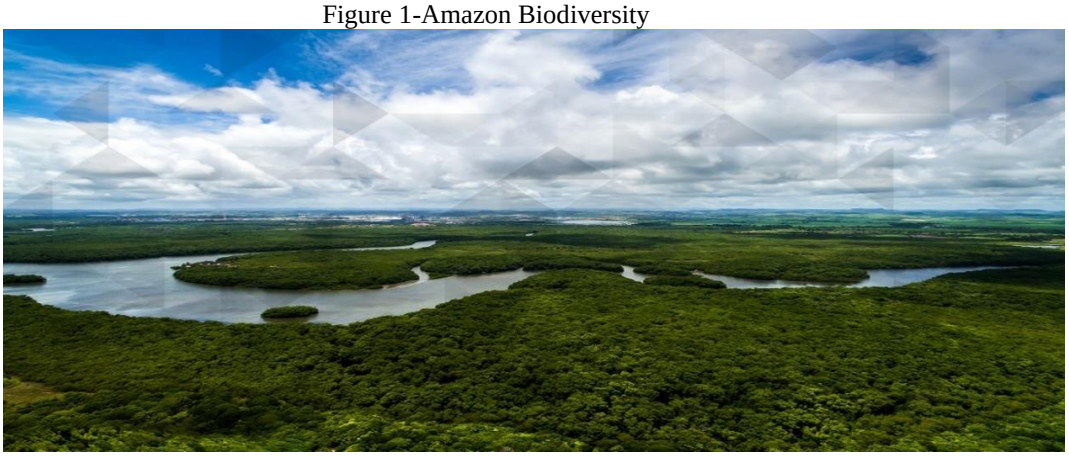
This article is structured under the exploratory and bibliographic method, developed based on a literature review, using secondary data. It contextualizes Amazonian biodiversity, presents the panorama of Science and Technology Institutions-ICTs, the Legal Framework for Innovation and the case of an academic spin-off in the area of biotechnology, generated in an ICT, and its motivation for the discovery of a product with green technology and the transfer of this technology to society.

4 THEORETICAL REVIEW

4.1 AMAZON BIODIVERSITY

The Amazon comprises one of the largest and most diverse biomes on the planet Figure 1) containing a rich biodiversity of fauna and flora with a high degree of endemism. In an area of almost four thousand km², it integrates eight Brazilian states and 125 federal conservation units (ICMBIO, 2021).

Figure 1-Amazon Biodiversity



Source: image taken from the page of AMBIPAR GROUP/BRASIL COLETA on 03.08.2022

According to Franco (2013), in the scientific literature, the interchangeable terms biological diversity and biodiversity emerged to address issues related to the fundamental themes of ecology and evolutionary biology, related to the diversity of species and the environments that serve as their basis. support, at the same time that they are supported by it and that are, at the same time, the stage and the result – always unfinished – of the evolutionary process .

The biodiversity of the Amazon, according to the MCTI (2021), is gigantic and this exceptional variety of life plays a fundamental role in the functioning of ecosystems and, ultimately, for human well-being. Its importance is recognized worldwide, occupying a prominent place in the international scenario. Unfortunately, threats to this rich biodiversity are growing. However, highlights MCTI, deforestation and forest fires have increased in recent years. Illegal logging always predominates over legal management. Hydroelectric plants and mining promote drastic socio-environmental changes. To top it off, climate change trumps all these problems. One of the main ones, emphasizes the MCTI, is the disruption of a web of biological processes and interactions essential for environmental and human health. For example, the reduction in the diversity of slow-growing trees leads to a lower capacity to absorb carbon from the atmosphere, contributing to worsening global climate change. The loss of biodiversity also compromises the potential for its sustainable use and prosperity for local and other populations around the world through the use of bioproducts in industries (MCTI, 2021).

However, when debating the role of ICT under the dynamics of globalization, it is imperative to make a critical assessment of current advances and challenges, but also of the ingrained dilemmas that lead to possible setbacks in research and the emergence of *spin-offs* , in order to propose sustainable solutions. Therefore, it is necessary to recognize that there is an immense demand to guide development with inclusion and reduction of social inequalities, expanding actions in the field of sustainability and socio-environmental responsibility.

4.2 SCIENCE AND TECHNOLOGY INSTITUTION-ICT AND THE LEGAL FRAMEWORK FOR INNOVATION

In contemporary debates, Chaves and Araújo (2020) point to the strategic relevance and commitment of Science, Technology and Innovation - ST&I to the establishment of innovation *habitats* as important bases for the development of society with sustainability. Still in the authors' view, the performance of Science and Technology Institutions-ICTs is perceived as strategic for advancing the process of society's development. However, this statement mixes a complexity of challenges and dilemmas for the generation of *spin-offs.*

13,243 /2016, regulated by Decree 9,283/2018 and called Legal Framework for Innovation (amends Law 10,973/2014), in its Art . with a view to technological training, the achievement of technological autonomy and the development of the country's national and regional production system, pursuant to arts. 23, 24, 167, 200, 213, 218, 219 and 219-A of the Federal Constitution .

Defines the Scientific, Technological and Innovation Institution (ICT) as a body or entity of the direct or indirect public administration or a non-profit legal entity governed by private law legally constituted under Brazilian law, with headquarters and jurisdiction in the country, which includes in its mission institutional or in its social or statutory objective basic or applied research of a scientific or technological nature or the development of new products, services or processes.

Among the permissions granted by the Legal Framework for Innovation, there are:

- Promotion of cooperation and interaction between public entities, between the public and private sectors and between companies;
- Stimulation of innovation activity in Scientific, Technological and Innovation Institutions (ICTs) and in companies, including for the attraction, constitution and installation of research, development and innovation centers and technology parks and poles in the country;
- Encouraging the creation of favorable environments for innovation and technology transfer activities;
- Promotion and continuity of scientific and technological training and qualification processes;

In this universe, points out SEBRAE (2022), the approved law seeks to encourage the development of the sector through three main axes: it allows the integration of private companies into the public research system; the simplification of administrative, personnel and financial processes in public research institutions and the decentralization of the promotion of the development of ST&I sectors in the States and Municipalities. stands out to be It is important to note that the changes brought by Law No. 13,243/2016 have the potential to integrate research, the market and the public sector, and also to transform the scientific knowledge produced in the country into innovative products and services for society.

Corroborating the previous statements, Goulart (2022), in a recent lecture at INPA, explained that the Brazilian Legal Framework allows for a series of flexible measures for innovation and *spin-off development* , but the internalization of these measures in the university is complex, given that the autonomy they have and the non-use of the solutions mentioned. He explains that in other countries universities are

partners in *spin-offs,* receiving royalties , but these opportunities, allowed by the Legal Framework, are not absorbed by universities. It explains that the R&D must be validated by regulatory agencies and form strategic partnerships to achieve scalability or license the technology to be commercialized and obtain product certification.

Therefore, in this sense, ICTs still have the possibility of implementing business incubators (to support *spin-off* and *startup management*) and Technological Innovation Centers (NIT), to support the Innovation and Intellectual Property policy. at the Institution, among other areas, biotechnology, with a focus on environmental sustainability.

4.3 ABOUT ECO-INNOVATION / GREEN TECHNOLOGY / GREEN PATENT

Green technology starts from a concept that seeks to determine a **sustainable production process,** applying good techniques in order to cause less possible impact on the environment. Eco - **innovation, according to** Schneider (2020), it is part of a sustainable and innovation-based development process . The author mentions that eco-innovation is closely linked to a variety of related concepts, such as eco-efficiency, ecological design and sustainable design. Therefore, it is possible to verify the existence of gaps between each of these concepts, as well as, such gaps could and should be filled to unify them in a single movement strong enough to create a new trend/ecological order, both in the technological dimension and in the in the social dimension, whose priority is sustainable development. On the other hand, Schneider (2020) states that eco-innovation represents a fundamental opportunity to overcome global sustainability challenges and a business opportunity that can make the Brazilian economy even stronger and more competitive in the future, as it is a new business approach that promotes sustainability over a long period of time. the entire life cycle of a product, in addition to increasing the company's performance and competitiveness. A new management approach to sustainability.

In this trend, the “Green Patents” program, promoted in Brazil by the National Institute of Industrial Property (INPI-BR), has as main objective to gather and accelerate the examination of patent applications that contemplate innovations related to the environment and at the same time identify new technologies for sustainable development, on the other hand, makes it possible to obtain a letter patent with a reduction of up to 90% of the normal examination period (RICHTER, 2014). This measure encourages researchers to seek protection for their innovative technologies.

For Santos and Martinez (2021), although the process of development, diffusion and implementation of green technologies is complex and multidisciplinary, one thing is clear: a fundamental first step in the process of green innovation is taken when the available green technologies are known, followed by the identification of the main actors in this large “cluster”. Thus, the authors clarify that with the provision of such knowledge about Industrial Property, scientists, engineers, policy makers and industry stakeholders can plan more effectively research and development activities for environmentally sound

technologies (EST's), forging strategic partnerships and delivering more effective technology transfers as needed.

According to Santos and Martinez (2021), much information currently available in the world about new green technologies can only be found by reading patent documents. They also state that since the 1970s, many scientists and researchers, entrepreneurs and industrialists, have discussed side by side with heads of state in a major world conference organized by the United Nations (UN) to address issues related to environmental degradation, as well as how to point out real alternatives on how to improve man's relations with the Environment. For Fanhaimpork et al (2022), describing and defining these green technologies constitutes a challenge for anyone seeking to file a patent application.

Currently, the Sustainable Development Goals (SDGs) propose the 2030 Agenda for global development for the next 9 years, but there is still much to discuss about the real actions that are being carried out to improve the life of the planet and allow a healthy world for the next generations. According to the SDGs, the 17 Goals based on 169 goals are the steps identified to guarantee a fairer, more dignified, more inclusive and sustainable world where it proposes the eradication of poverty and hunger to gender equality and quality health, from clean water and sanitation to decent work and economic growth, from reducing inequalities to quality education, from renewable energy to climate action. This agenda reflects the balance between the following 05 (five) principles: (i) people; (ii) planet; (iii) peace; (iv) partnerships; and, (v) prosperity that are presented as pillars of this global strategy.

4 .4 BIOTECHNOLOGY *SPIN-OFF*

Biotechnology can be understood as the application of science and technology to living organisms, as well as their parts, products and models, to alter living or non-living materials with a focus on generating knowledge, goods and services. And in this context, Bioeconomy focuses on putting into practice biotechnological applications in the set of economic activities of production, promotion of production, distribution and consumption of goods and services from socio-biodiversity resources (SECTI-SEDECTI, 2022) .

According to CNI (2013), Bioeconomy emerges as a result of a revolution of applied innovations in the field of biological sciences. It is directly linked to the invention, development and use of biological products and processes in the areas of human health, agricultural and livestock productivity, as well as biotechnology.

- *offs* are companies generated from a research project developed within universities or Federal Institutes. According to Amaral (2021), they have information difficulties in the area of business management, from the development of marketing plans, strategic partnerships, sales and financial management, since most managers of this type of company come from academia. and do not have training or experience in business management.

Biotechnology is a relatively new area and the entrepreneur, in general, is a researcher, who concentrates the main source of information within the institution as a university project and the information he has is strongly located in knowledge and technology involved in the development of the product, scientific research results. However, for Amaral (2021) The biggest challenge for biotechnology companies is to transform their business into a business model that is efficient and is an interface between the technology developed and the creation of economic value. Taking this statement into account, one observes the difficulty of a *spin-off* in transferring its technology to society and many open their own businesses, when possible.

Therefore, *spin-offs* that work in the area of biotechnology, especially those that operate in the Amazon, have an enormous possibility of generating innovation with a focus on sustainable technology for the transfer of this technology to society and the subsistence of future generations with quality of life. It is important to recognize the central role of academies, notes Chaves and Araújo (2020) as producers and depositories of knowledge and trainer of technical skills, and this training points out Lasmar (2005), refers to the accumulation of knowledge and skills by individuals and organizations, from learning processes. In this aspect, the importance of the knowledge generated by the ICT for the creation of *spin-offs* is fundamental. The more knowledge is involved in the design of products and services, the greater their value in the market and the consequent added value of innovation in the company.

However, in the trajectory of the entrepreneurial vocation, Kupor (2019) observes that the most important thing for an entrepreneur, even with hard work and daily difficulties, is to maintain the hope of achieving success.

It was reported by Professor Ernesto Goulart, researcher at the Center for the Study of Human Genome and Stem Cells at USP, São Paulo-SP, at the "4th International Conference on Innovative Processes in the Amazon" "Academic Spin-off" (Palestra), at the Institute of Pesquisas da Amazônia-INPA, in Manaus-AM, June 14, 2022, that the research journey in search of something promising, innovative, until it becomes a marketable product is a challenge in Universities, as there are also problems and peculiarities of the innovation process in Brazil, since it has large amounts of patents deposited, but in the 57th position in the world innovation rank. It mentions that the patent application is not an indicator of innovation, as this indicator is measured by Technology Transfer-TT, which in Brazil are limited. He explains that this situation occurs because the innovation process in Science and Technology Institutions-ICTs is closed, inside the institution and with the imposition of limits and restrictions on its internal intellectual capital. It explains that *spin-off* has to think about intellectual property-IP every day, with everything mapped, to avoid failure, being extremely important to delve into this theme.

For Carayannis et al. (2012), the development of an innovation must take into account the pluralism of sources of knowledge, such as traditional knowledge that comes from the practices and *modus vivendi* of traditional populations composed of quilombolas, riverine people, various indigenous ethnicities, among

others. , whose main characteristics are orality and ancestry that provide important information for research and production of scientific knowledge.

In this context, the production of specialized knowledge, the production of social technologies, the increment of innovative inputs, products and services represents a field and a domain that has only just begun its pioneering in the region (CHAVES, 2012).

Thus, from this perspective, new horizons, new contours, contents and forms emerge, gaining scope and expectations of generating *spin-off* in biotechnology, protecting this technology and transferring it to society. It remains clear that there is a need for effort to expand the implementation of innovation practices, arising from technological research in biotechnology, through *spin-off* and its access to the market.

5 AMAZÔNICA *SPIN-OFF CASE* : PORÃ PRODUCTS DA AMAZÔNIA

The study carried out by the Center for Orchestration of Innovations COI (2022), points out that the five main scientific areas that appeared for the total of 1070 publications found in the search, according to the classification by categories of the *Web of Science* , were: plant sciences; environmental Sciences; food science and technology; ecology and molecular biochemistry. The following *case* used some of the areas cited by the IOC. The study results from the experience report presented by an IFAM researcher and co-author of the work.

Porã Produtos da Amazônia is a *spin off* originated from the Federal Institute of Education, Science and Technology of Amazonas-IFAM, founded in 2017, with the objective of bringing to the market a technological innovation differential associated with the phytopharmaceuticals, cosmetics and functional foods segment. , based on the benefits arising from the inclusion in their products of essential oils found in plants from the biodiversity of the Amazon. These benefits consist of offering the market products without preservatives, without added sugar, without lactose, thus providing an improvement in the quality of life and that benefit the body, in addition, functional foods help to slow down the evolution of diseases such as diabetes. or cancer. In addition, they also help to mitigate health problems, such as intestinal constipation, contributing with their bioactive compounds, which have proven activity in various types of treatments, also improving physical conditioning.

5.1 HISTORY

The idea arose when an IFAM researcher discovered that the diagnosis of hypothyroidism and type 2 diabetes and the need for people with this type of disease not to have adequate and tasty food to minimize the effects of diets prescribed by nutritionists, always with a routine and proposal for food reeducation, in a lifestyle change. The products on the market were horrible and unpleasant for the consumption of those who are under this type of treatment.

From there, he started to make some simple recipes at home and take them to be tasted in the department of the Department of Chemistry, Food and Environment - DQA, of IFAM, aiming to find a solution that would benefit this public.

5.2 DISCOVERING THE BENEFITS OF BIODIVERSITY

The tasting of differentiated recipes was well accepted at the Institution and from that moment on, the idea arose of starting research in the Food Laboratory of the Specialization in Food Technology course, where he had the opportunity to learn and discover the universe of the world of plants and their essences or rather their essential oils.

In 2015, I was already aware that products for people being treated for chronic diseases, such as diabetes (they had an inflamed body and altered taste due to the pathology), so it was necessary that there were products on the market that had taste, appearance and , mainly, were absent from preservatives, which could contribute to acting on energy *deficits* suffered by these people, in addition to providing therapeutic food comfort.

The first research came from the specialization with *Ocium gratissium essential oil* in tambaqui meatballs, under the guidance of two researchers from IFAM.

In the meantime, he started courses on Bakery with the use of Non-Conventional Food Plants (PANC), as well as research on the reuse of malt bagasse and brewer's yeast, originated from the production of artisanal pineapple beer by two more IFAM researchers, contributing with the reuse of malt.

The research at IFAM ended up interacting in a way that the waste was always used, so much so that in 2015 the idea of research for the production of flour from fruits, seeds, tubers, originating from the Amazonian biodiversity, always with the environmental awareness of the production of closed cycle, that is, total reuse of food, taking all the usual care of food safety and sanitary control, collaborating with sustainability.

The first breads were prepared and tested, based on the nutritional balance of each fruit, seed or tuber of açaí, araçá-boi, peach palm, bacaba, cupuaçu (pulp and almond), purple yam, gizzard yam, Brazil nut, babassu nuts, manioc, pequi, piquiá, uixi, camu-camu, acerola, buriti, among others, which are Amazonian plants and fruits, with some of the results presented as shown in figures 1 to 4.

Fig.01 Naturally Fermented Bread With Malt Pomace and Yeast Pineapple Beer – Fermentation Phase

Source: Munhoz, 2017

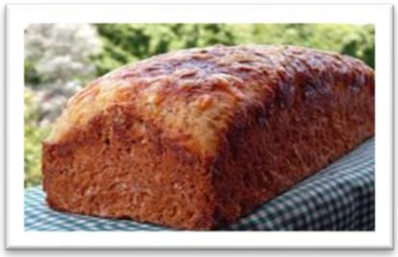
Fig.02 Naturally Fermented Bread With Malt Pomace and Yeast Pineapple Beer – Roasting Phase

Source: Munhoz, 2017

Fig.03 Naturally Fermented Bread With Malt Pomace and Yeast Pineapple Beer – Fermentation Phase

Source: Munhoz, 2017

Fig. 04 Naturally Fermented Bread With Malt Pomace and Yeast Pineapple Beer – Roasting Phase



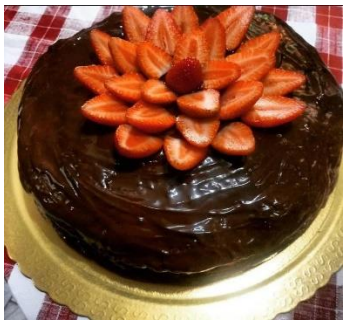
Source: Munhoz, 2017

The development team was formed by highly specialized professionals, in several knowledge segments (Bioprocesses, Design, Logistics, Information Technology and Process Management), due to the scope of the enterprise involving a complex context of activities, such as: Extractivism, agronomy family, training of manpower and Chemistry, with a view to serving both the national and international market. This provides a value chain for the product of Amazonian biodiversity. The *spin-off* , derived from research carried out at the IFAM Food Technology Laboratory and using green technology, has 5 types of gluten-free flour mix for breads, cakes and cookies, all with functional taste action and pleasant and different appearance. . The company produces its own banana peel-based yeast, which in the absence of raw material from craft brewery waste (yeast and malt bagasse) meets current demand. Figures 05 and 06 show more products manufactured from green technology.

Fig. 05 Mixed Bread 01 Gluten-free Flour (Amazonian fruits and seeds) Natural Fermentation

*Yeast: from reused fruit peels

Fig.06 Chocolate Truffle Cake** Gluten -free Flour Mix 02 (Amazonian fruits and seeds)



*Yeast: reused from Amazonian fruit peels

In particular, the *spin-off* presents innovation routes since its conception, since the raw materials have characteristics that allow the development of a huge range of products, with different applications, until then little or nothing presented to the consumer market. Finally, another important aspect deals with the business model, which is premised on preserving the forest, sustainable development and valuing the culture of traditional peoples.

5.3 THE TECHNOLOGY

The project aimed to identify biopharmacological substances from the extracts of plants: Alfavaca (Ocimum basilicum), Crajiru (Arrabidaea chica) and (Curcuma) curcuma longa L, as well as to produce an ethanolic extract, with a certain concentration and to test antibacterial activity using culture, for the growth of gram-positive and gram-negative bacteria. The dry extract was also produced, from the maceration and drying of leaves, rhizomes and branches, for drying in an oven and subsequent crushing. After the extraction and purification of essential oils, the purified substances are engineered through Spray Dryer and nano encapsulation processes, for use in bioproducts (Phytotherapics, cosmetics and functional foods).

In conclusion, the company is studying an outsourcing strategy, establishing partnerships with companies in the scientific, industrial and commercial segments to enable a greater number of product options, thus making it possible to expand its operations in the phytopharmaceuticals, functional foods and cosmetics market and providing the technology protection, through the Technological Innovation Nucleus-NIT.

6 FINAL CONSIDERATIONS

This study sought to demonstrate that Science and Technology Institutions-ICTs can generate *spin-offs* with green technology, transfer this technology from biotechnological activities. It is understood that the dialogue between academia and researchers can create possibilities to promote various actions that can contribute to sustainable development and combat threats to this rich biodiversity . The ICT has a whole legal framework to start a support process in the creation of *spin-offs* , protect the product and transfer the

technology, it is enough to internalize Law 13.243/2016, in order to socialize its knowledge and transform it into an innovative and sustainable solution for society, as well as the Industrial Property Law No. 9.279, of 05.14.1996, which regulates rights and obligations related to industrial property. The *case* of Porã Produtos da Amazônia , *a spin-off* generated in IFAM laboratories using green technology, is an example of how the knowledge provided by Universities and Federal Institutes can contribute to the future of the planet.

The benefit of accelerating the examination of patent applications, which contemplate innovations related to the environment, enabling agility in granting green patents at the INPI, should encourage the application for the filing of patents arising from green technologies and collaborate for innovations in the market. Thus, the feasibility of investing in *spin-offs* in the bio-business area, contributing to the health of the planet, makes it possible to see a future of opportunities that must be taken advantage of in the Amazon region. There is immense potential for the production, processing, commercialization and consumption of products from biodiversity, which generates expectations to develop solutions to stimulate the production chain and the development of the Amazon Region, which serves to strengthen the path of development with social inclusion from the perspective of sustainability and respect for the environment. Therefore, these opportunities can be used to strengthen applied research and technology transfer from ICT to society, generating innovations.

One can also prove the possibility of creating a *spin-off* in ICT, through the case of Porã Produtos da Amazônia, which from a public need met a great demand, using biodiversity to create innovative products with green technology, developing a value chain. It is worth mentioning that the *spin-off* was supported by the AYTY-Incubator of Companies of the IFAM, in several capacities, from understanding its Business Model (CANVAS) to the elaboration of its Business Plan.

Therefore, it is evident the importance that knowledge has in promoting entrepreneurship, in this way, it becomes necessary for Educational Institutions (ICTs) to use available resources to present solutions and generate biotechnology *spin-offs* . This means a new procedure and a new culture at all levels of the Institution. Furthermore, in Brazil, especially in the Amazon, which is rich in biodiversity, research seeds are already sprouting in the ICT scientific community, mainly in green technologies. There is a strong coexistence with traditional communities and the appeal of forest preservation is evident, as it directly affects the future of the next generations.

The *spin-off* can still count on the support of the NIT, for the due protection of its creation, at the National Institute of Industrial Property-INPI. You can also count on the support of a business incubator to support your journey to market. Therefore, the prospects for research in ICTs to transform themselves into innovative and sustainable products, through a biotechnology *spin-off* , among other areas, are in place, it is enough to be practiced, as the legal framework, through the Legal Framework for Innovation and demands are made.

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