RESEARCH ARTICLE OPEN ACCESS

Biotechnological Innovations and Medicinal Plants of Agriculture in the Brazilian Amazon

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ABSTRACT

The fundamental aim of this research is to establish an analysis with regard to non-sustainable economic models to the environment, also known as Business as Usual, and as an alternative proposal sustainable ecosystem model called Sustainable Ecosystem Management, which has a target to reverse this unsustainability of logic in the Brazilian Amazon. The main conclusion is that the growth trend of the pharmaceutical industry demand for products derived from the medicinal plant agriculture may constitute a window of opportunity for interesting application of sustainable development, especially for the countries possessing broad biodiversity - like Brazil - which features unique ability to develop biotechnological innovations, from the application of the ecosystem sustainability model.

Keywords: Biotechnological Innovations; Economic Models Not Sustainable; Sustainable Ecosystem Model.

Date of Submission: 27-02-2018 Date of acceptance 14-03-2018

I. INTRODUCTION

The ability to use scientific knowledge in a creative and productive way to innovate and apply in practice the techno-scientific knowledge in solving concrete demands of society is the main component of success in generating new innovative products, processes and services, new generators economic opportunity, driving the development of a country or a region. The theme on biotechnology and human health has links with biodiversity of natural resources of the earth, as a supplier source of raw materials for industry in general.

The term herbal medicine in general is attributed to drugs uniquely originated whole plant material or extracts thereof used for the purpose of medical treatment. Herbal products are of two types: medicines and food supplements. According Salles *et al.* (1998, p. 05-06):

The phytochemicals are isolated medicinal substances of herbal extracts, as medicinal plants are plants that can be found in wild state or in small domestic crop backyard and having biological activities, having one or more active ingredients useful for human health.

In this context, many existing medicinal plants are used as cosmetics, and in this case, the processed products are called cosmeceuticals. The current concern for the preservation of nature, although it obtained space in the media, about to have greatly improved people's awareness on environmental issues, has yet to reach a level of awareness sufficiently able to transform the speech in collective action in pursuit of sustainable development.

However, ultimately what is sustainable development? For sustainable development must be understood a new pattern of development that involves output growth (economic dimension), the distribution of functional and personal income (social dimension) and rational use of natural resources with proper preservation of the environment (environmental dimension) by the present generations to future generations. Sustainable development therefore has multiple meanings involving several more normative facets - methods that attempt to answer what should be (value judgment), a sustainable development policy - what is positive, which tops methods that attempt to answer the that is in order to theoretically explain the facts to support the formulation of certain public and / or private policy.

This design requires a profound change of the current sustained economic development paradigm (only economic growth) to the paradigm

of sustainable development (economic growth more distribution of income and wealth) and the use of natural resources with the preservation of the form of the environment contemplate another worldview. This means that the application of the concept of sustainable development into practice involves a variety of convergent methods (multidisciplinary, transdisciplinary or interdiciplinares), and multidisciplinary involvement to address complex problems that require the participation of everyone, that is, the collective worker.

The complexity of the concept, therefore warns the operational difficulty when you want to apply it. But that does not mean that we should not continue to pursue, as a good utopia, healthy purposes of sustainable development that makes use of the most advanced "clean technologies" capable of "saving" renewable natural resources and non-renewable to mitigate the action predatory man and reduce the impacts of the industry, and modern farming on the environment.

The purpose of this article is to discuss, in a neo-Schumpeterian perspective, the relevance of the debate on biodiversity, biotechnology and innovations for herbal research in the Brazilian Amazon. For this, we tried to organize this work into six sections, namely: the first and second section presents the introductory and methodological aspects, respectively, to be used for the theoretical development of this work; the third and fourth section is made a parallel on the BAU development models (Business As Usual) and SEM (Sustainable Ecosystem Management), highlighting the damage caused by the BAU model; in the fifth discusses the biodiversity and the valuation of medicinal plants in their relation to human health and the possibility of developing an herbal industry in the SEM model perspective and, finally, in the sixth section an analysis demonstrating the importance of research on herbal products, for the development of agriculture of medicinal plants to support the implementation of an industry of herbal products for the treatment of various diseases of the populations of the Amazon, the rest of Brazil and perhaps the rest of the world.

II. METHODOLOGY

In theoretical research, unlike the empirical research - while the search method based on primary data from field surveys or even collection of secondary data - the research method has more to do with the method of exposition of ideas: if deductive or inductive .

The method used in this assay involves the deductive method because of the general, that is, the debate in a neo-Schumpeterian perspective on biodiversity, biotechnology and innovations for herbal research in the Brazilian Amazon and also the inductive method because it considers the particular - the biotechnological innovation.

Note that the deductive method, too, was accompanied by empirical data, in the form of tables and graphs to illustrate the arguments and conclusions that level of theoretical analysis.

III. UNSUSTAINABILITY ECOSYSTEM MODEL IN THE BRAZILIAN AMAZON

The BAU development model (Business as Usual) should be understood as current practices that contribute to the degradation of the ecosystem and biodiversity of life on planet Earth. This model consists of a variety of businesses that seek only to private profit when applied in many industrial and agricultural activities in developed countries and developments. In the Brazilian Amazon, for example, the most frequent practice of economic occupation of rural areas is deforestation and the burning of upland forests and wetlands, two vital ecosystems for local people. This model also appears in the native logging activity in the Amazon forest to meet the growing demand for wood from the wood furniture industry and the construction industry.

The very common practice of destroying the forest of the humid tropics, possessing an immeasurable wealth of natural resources, to plant grass to form pastures for livestock activity and the illegal extraction of forest woods are two typical application examples the BAU model in the Amazon. In this sense, the Indians, blacks and maroons of “quilombos”, the “mestizos” and so-called "forest people" are living examples of the resistance against the BAU model.

In the Brazilian Amazon, the BAU model is a practice of unsustainable development that has been used in various production processes, especially in agricultural activities and timber extraction. The BAU model is present in the mines that use traditional techniques to extract gold and precious stones from the rivers and streams of the region, but is also present in large mining companies, although they use modern techniques to benefit or even transform the ore extracted from underground, however do no care of the waste pollutants that are generally played in streams rivers; and, when using sedimentation basins to store toxic waste, often with heavy rainfall in the Amazon, the waste will leak into the rivers killing fish and other animal species that are part of the diet of coastal communities.

IV. SUSTAINABLE ECOSYSTEM MANAGEMENT MODEL IN THE BRAZILIAN AMAZON

The SEM model of development (Sustainable Ecosystem Management) is identified by the implementation of public policies and

practices that reduce not only the negative impacts of production and extractive activities on the environment, but also aims to increase the social product, thus contributing to the advance sustainable development. In a scenario of SEM models, the use of clean technologies aims to correct or even prevent corrosive practices to the interaction of the binomial environment and socio-economic development. In addition, the SEM model is also important for the implementation of sustainable practices and pro-development policies to conform a socio-political movement toward an ideal setting a standard of sustainable development for all the inhabitants of planet earth.

The application of the SEM model, however, requires a change in behavior of the importance of both nature as a source of natural resources that are used by human activity, as the man who transforms the raw materials into products that are used for consumption or to produce human capital equipment that will help in the production of other capital goods and consumer goods. This leads one to think mother nature and father-work are solely responsible for the production and reproduction of life on planet earth. Modern civilization will understand that you can not practice a BAU development model that does not care about social poverty and not with the natural environment.

Indeed, the nature and society have a "wedding" unbreakable all aspects, so that destruction leads to the end of the other and vice versa. When, for example, a private industrial mineral enclave or state, or even a large hydroelectric plant in the government, is established in the Amazon, is immediately broken the state of social entropy that existed before the economic life of local people. To Altvater (1995, p.43-58), "the socio-economic standard of sustainable development using traditional techniques with respect to the preservation of nature is broken and in its place comes the poverty of the majority of these small communities." In addition, the state of social entropy, due to increased pressure for land, aggravates the struggle for land which results in the expulsion of peasants and squatters to close or distant cities.

The result is the forced departure of the rural man to urban centers without any preparation for the harsh working life deprived of its principal means of production - the land for their livelihood. When the worker, deprived of the means of production (land and tools), comes to urban centers is not worthy or in construction work, leaving him little alternative employment for him and members of his family. The social cost of this process is high for society as a whole and just overloading the urban middle class with more taxes. Increased police apparatus and building more prisons do not solve the problem that has its origin in rural areas.

This demonstrates that the model SEM will succeed only if it is accompanied also associated social and political practices not only to prevent the destruction of nature and environmental pollution, but also a stand against poverty. Of course, the SEM model, incorporating this social problem becomes even more complex when applied. Either way, the advantages of SEM model is incomparably higher than the current dominant model BAU. In fact, the paradigm shift of unsustainable development model (BAU), currently in crisis, for a sustainable development model (SEM) implies the convergence of efforts to a new social, economic and environmental pact involving all countries of the world.

However, the discussion on the global environmental problem caused by the emission of carbon dioxide (CO2) by urban industry, modern agriculture, transportation and urban comfort equipment (air conditioning, for example), can serve as a starting point for paradigm shift from unsustainable development (BAU), whose basic source of energy originated from oil, to the paradigm of sustainable development (SEM) which should take as input the direct or indirect use (biomass) of solar energy.

V. BIODIVERSITY AND EVALUATION OF A MEDICAL PLANTS

Brazil has diverse ecosystems that include representatives of more than 70% of the living organisms of the planet Earth, of which about 20% are found only in Brazil. Even without even asking an accurate inventory of existing species, it is considered that there are about 55,000 kinds of higher plants, many with therapeutic use traditionally adopted by certain rural communities, and other more with active ingredients have been identified by researchers, able to cure various diseases. However, the continental dimensions of Brazil and the diversity of biomes present challenges when it comes to conservation and management of biological resources.

Faucheux and Noël (1995), biodiversity must be understood as the existence of a variety of multiple animal and plant species, inhabiting a biogeographic space, form an ecosystem in perfect harmony with the environment.

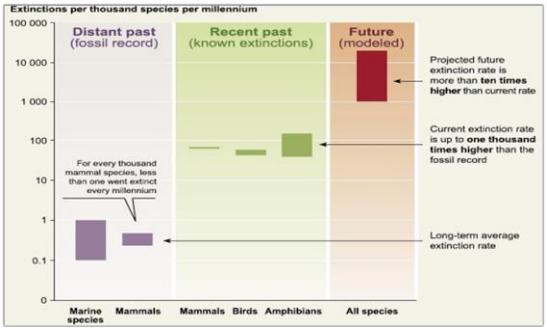
The diverse ecosystems depend on weather conditions and the variety of water resources which helped its formations along the very existence of the Earth Biodiversity is therefore a tremendous resource for life itself on the planet.

For Alroy (1998, p.232-287):

The destruction of ecosystems, with the advancement of human populations towards the forests, and other natural vegetation rich in biodiversity, has accelerated the extinction of many animal and plant species endangering the survival of other species, not only for the destruction of habitat of many of them, but also break the food chain that has the largest predator on top of all species: the man.

It must be said that how quickly disappear thousands of species of life on Earth and many other endangered should serve as a warning to individuals and governments become aware and practical measures to prevent the big disaster to annihilate the beautiful biodiversity of our planet. In addition, the industrial development of the last two centuries did not care about the destruction of existing biodiversity in the sea, on land and in the air. There are many species that have been and are still being extinguished today by poaching of animals in Africa, Asia and Latin America, as shown in Figure 1.

Figure 1: Projection of Extinction of Species for Millennium



Source: Millennium Ecosystem Assessment.

The Brazilian Amazon is almost 68% of the total Pan Continental Amazon that has (7.5 million square kilometers) and 43% in Latin America. Therefore, the Brazilian Amazon has a great weight and importance in the continental and global discussion on environment, ecology and biodiversity. In addition, the Brazilian Amazon, more than a giant "green spot" uniform, when viewed from above, is a huge archipelago ecosystem where more than 20 million species of which are known only a million and a half.

According to data from the Millennium Ecosystem Assessment (2005), in the Amazon region are concentrated 80% of the biodiversity of the planet and home to a multitude of plant and animal species, accounting for more than one and a half million cataloged plant species; three thousand species of fish; 950 types of birds; and even insects, reptiles, amphibians and mammals and many other species still unknown. In this aspect, biodiversity needs to be conserved to be exploited rationally for the benefit of humanity, particularly for people living in the humid tropics. The Amazon, with much of its agricultural soils chemically fragile to intensive agriculture, has the water of rivers, streams and rain the basis of the survival of all species existing forming its mega-biodiversity in forest land and firm wetlands, savannas, open fields and rivers, streams, channels and ponds.

Therefore, we must think of SEM models for economic exploitation that preserves its most important natural resource - biodiversity. The emphasis on the importance of the Brazilian Amazon biodiversity is necessary not only because it depends on the rural population, but also because of its recognized importance for the global climate since the land and lowland forests function both as the "world's lung "and as a" filter "of carbon dioxide surplus is reached to the ozone layer that protects the earth from ultraviolet rays that cause skin diseases.

This is not scaremongering, as suggested by the proponents of BAU model, when analyzing the economic effects of loss of biodiversity of the Amazon forests. There are at least four reasons for the concern of the scientific community in Brazil regarding the loss of Amazonian biodiversity: the first concerns the increase of the forest deforestation rate that has been reducing the biological space needed for the survival of animal and plant species; the second is associated with the importance that is assigned the largest rainforest in the world; the third because the Amazonian forests contain more than 50% of the species of the world's biota; and, finally, the fourth relates to the fact that in addition to biodiversity and the free flow of services that forests provide human life on the planet, is in the rainforests of the Amazon region who are the most vulnerable biological habitats, according Farley and Daly (2004).

Concern about the destruction of biodiversity is one of the reasons that has led the ecological economists to develop accounting methods to calculate the valuation of biodiversity. Do not confuse valuation with an appreciation of a good or service. In political economy, employs the word appreciation when it comes to goods that result from human labor and are objects of commercial transactions, because otherwise the products or natural resources provided by mother nature has no value because it does not contain any portion of human work and because nature does not return, she donates its resources and services to man. The inclusion of human labor occurs when the product of nature is extracted and processed or benefited by the action of the workforce in such a way to become a useful social product (goods) as to be exchanged for money so validates the effort processing a product of nature in a good market acceptance.

The herbal medicine extracted from a wild medicinal plant extraction is a product that is still at the core of the production chain and, therefore, has low added value, it is not the result of a commercial act. However, as soon as industrialized for commercial purposes, then the herbal remedy, whose active component was extracted from the medicinal plant, becomes a merchandise when sold in the market. Markandya et al. (2002) notes that ecological economists seek to impute a subjective value, based on scarcity, to establish a valuation (in terms of estimated prices) by charging the economic, social and environmental losses Unrecognized in the prices of resources extracted or collected from ecosystems.

As for the important knowledge of popular knowledge, this should be understood as a dynamic information accumulated by generations, within a given community, about medicinal plants, their many uses and the environment in which they operate. In particular, the concept of artisanal technology (or traditional), to the strict, may also be appropriate when studying the application of knowledge by the community in solving local social issues.

Note that the transfer of traditional knowledge is not such an easy activity and, often, the difficulty of absorbing it comes from the uncertainty of the real owners, the loss of their cultural backgrounds through so-called acculturation processes, the lack of some kind of written documentation since, in general, the transmission of knowledge is oral and is only recorded in the memory of individuals that form the indigenous communities, riparian, forest peoples, "quilombos" and maroon.

Therefore, the learning process requires some familiarity of the researcher by the participant observer method, which requires time and dedication. Anyway, these inventories surveys can be quite interesting as from them; one can learn and develop alternative forms of social organization in the form of local clusters suitable for SEM models of socio-economic and environmental terms.

VI. RESEARCH, DEVELOPMENT AND INNOVATION BIOTECHNOLOGICAL

In the global economy, there is that big investors in R & D projects in biotechnological innovations - whose technological paradigm and technological paths to search for the cure of certain incurable diseases (cancer and diabetes, for example) - are the Big Pharms, ie, the large transnational companies with property rights and are controlling the world market prices of medicines.

These Big Pharms, alone or in partnership with other national companies, through joint ventures, are very interested in finding new natural sources to research and development of new medicines. It should be emphasized, however, that the production of biotechnological innovations is subject to risks and uncertainties, such that the volume of investments in dollars required is so high ($ 50 billion) that the number of competitors was reduced in US over 2000 in the 80 to just over 20 today.

Perez and Soete (1988) suggest the incorporation of the concept of windows of opportunities (windows of opportunity through which, in situations of paradigm shift, learning takes place during a certain period in the relatively homogeneous time for all countries), and the concept of catching up of the arising opportunities that captures or access new technologies through intelligent strategies of partnerships with foreign companies, where both concepts of neo-Schumpeterian approach, become reasonably possible to discover a new biotechnology trajectory directed to the formation of industrial clusters in emerging countries, such as Brazil, with a large and rich potential of medicinal plants. In designing Gadelha (2001, p.154-161):

The use of these open windows of opportunity requires certain appropriate conditions, such as the assembly of a national-regional system of technological, industrial and technological policies selective articulated the horizontal policies (energy infrastructure, transport and communication), but also the creation an extensive network of laboratory infrastructure and equipment installed in Science and Technology (S & T) in the university and research institutions as a necessary condition for the absorption, generation and diffusion of new technologies, and investments in human capital.

Either way, it should be stressed that the process of absorption, generation and diffusion of technological innovations are subject to risks and uncertainties, and in the case of basic and applied research of herbal products, the volume of investment dollars required is so high (in average one billion dollars) for the development of new allopathic medicines that only through partnerships is possible to reduce the risk of failure, which ultimately forcing a large number of mergers that eventually generates almost always a market dominated by large multinational companies.

Brazil is one of the largest empires vegetables on the planet. To get an idea of the 120,000 species of medicinal plants, tens of thousands have medicinal properties. The world market for vegetable drugs now generating about $ 12.5 billion per year. Meanwhile, Brazil's share in the world market is negligible.

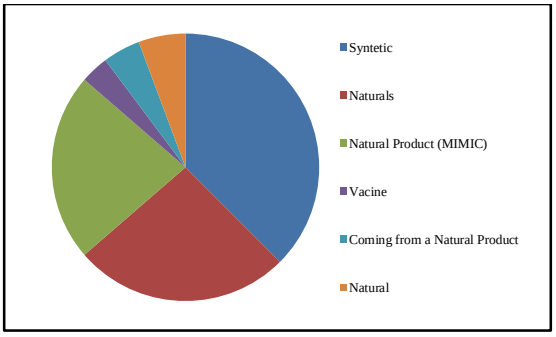
Most research and botanical inventories of the herbal potential of Brazilian biodiversity has been provided by the observation of the use of the

native population has always given to medicinal plants. The isolation of active principles of such medicinal plants led to finding of a close correlation between the effect and the selected active mechanism of action, thus proving their therapeutic efficacy in curing several human diseases.

The new findings of the research resulting from natural products have encouraged local farmers for growing various medicinal plants considered economically important. In fact, the possibility of active agent industrialization of medicinal plants has aroused the interest of local communities for the cultivation of medicinal plants as raw material for the manufacture of herbal products.

This alternative is covered by the SEM model not only because it enables the technological, agricultural and industrial development, but also because this practice will allow surplus income and the preservation of the natural system of medicinal plants. To get an idea, approximately 64% of phyto-medical products comes from natural products, as can be seen in Figure 2

Figure 2: New classification of pharmaceutical products ABIFISA: 1981-2002



Source: Brazilian Association of Herbal Medicines Company (ABIFISA in Brazil).

In so-called advanced countries systemic conditions of competitiveness were created, related to the convergence of the following: laboratory infrastructure in science and technology, industrial and innovative and stimulating action proactive state that articulates the health system with the innovation system. The federal funding agencies are allocating 25% of its budget to health and are within the standard internationally verified.

The Table 1, in turn, has the burden of health research area both in terms of lines of research as the number of researchers, according to data from the National Council for Scientific and Technological Development (CNPq in Brazil) Directory of research groups for the years 2000, 2002, 2004 and 2006.

Table 1: Participation of human resources and research lines second major area: Census 2000, 2002, 2004 and 2006: %

Areas	Researchers				Doctors			
	2000	2002	2004	2006	2000	2002	2004	2006
Agricultural Sciences	14	13	13	12	15	15	15	14
Biological Sciences	14	14	14	13	17	17	17	16
Health Sciences	17	18	20	20	16	17	19	20
Exact Sciences and Earth	15	14	13	12	19	18	17	16
Humanities	17	19	19	21	15	16	17	18
Applied Social Sciences	9	10	12	13	7	8	10	11
Engineering	17	17	17	15	18	18	18	17
Language, LiteratureandArts	5	5	5	6	4	5	5	6
All Major Areas	100	100	100	100	100	100	100	100
Areas	**Students**				**Technical**			
	2000	2002	2004	2006	2000	2002	2004	2006
Agricultural Sciences	10	11	11	11	22	19	18	18
Biological Sciences	19	19	17	16	20	20	19	19
Health Sciences	14	14	15	17	21	22	23	23
Exact Sciences and Earth	15	13	12	11	13	11	10	9
Humanities	14	16	17	19	6	8	8	9
Applied Social Sciences	6	7	8	9	4	4	5	6
Engineering	20	17	17	15	14	14	14	13
Language, LiteratureandArts	4	4	5	6	1	2	2	2
All Major Areas	100	100	100	100	100	100	100	100

Areas Research Lines	2000	2002	2004	2006
Agricultural Sciences	15	15	14	13
Biological Sciences	15	15	15	15
Health Sciences	16	16	17	16
Exact Sciences and Earth	16	15	14	14
Humanities	11	12	12	14
Applied Social Sciences	7	7	8	9
Engineering	17	17	17	16
Language, LiteratureandArts	3	3	3	4
All Major Areas	100	100	100	100

Source: NationalCouncil for Scientific andTechnological Development (CNPq in Brazil).

It is clear that you need a great effort to convert the results of basic and applied research in inventions that can, depending on the businessman-entrepreneur and government stimulus, be transformed into innovations. There is also a strong field of patent non-residents submitted to the National Institute of Industrial Property (INPI in Brazil) compared with patents of residents in Brazil. The patents filed by residents, including foreign companies operating in the country, represent only 3% of the deposited by non-residents.

From the point of view of science and technology policy, merges knowledge generation with the generation of innovations. Technology policy for stimulating innovation requires a much higher selectivity in terms of supported projects. Companies or research institutions, to succeed in their effort to generate products or processes to be used on a large scale, must concentrate it in very selective bets, which rules out their horizon a huge magnitude of projects for a few and often, even a single initiative with the potential to leverage knowledge and strategic productive potential. It should be noted that the side of the service, the interaction between universities and the industry has been marked by a high degree of mistrust and low interactivity.

VI. I. TECHNOLOGICAL INNOVATIONS

The innovations differ from inventions. This means that innovations have two dimensions: one technical and the other economic. Thus, the inventions are economically irrelevant until they are put into practice by the entrepreneur, that is,

while not creating a new market capable of providing, in the creative destruction process, extraordinary monopoly profits and generate "waves" of new primary and secondary investments financed by the new purchasing power created by banks.

Of course, lead to any technological innovation effect is an entirely different task for his invention, and is a social task, moreover, requires kinds of fitness fully different. Although entrepreneurs can be, of course, inventors, just as can be capitalists (bankers) are not inventors by the nature of their work, more by coincidence. In Addition, the innovations, the realization in the market, is a business man function, need not necessarily be inventions. So it is not well advised, and can be misleading, emphasize both the element invention about to confuse it with innovation.

In the economic perspective, the innovator is important as the unit of analysis of competition, actual or potential, to be responsible for deciding the introduction of innovation, management and ownership of extraordinary gains. The market is where the capital plural rivals compete, or rather is the economic space of competitive interaction between established rivals and potential that the "battle of competition" are well in advance guided by competitive strategies.

Although the unit of analysis is the company, the environmental conditions are decisive for the formulation of business strategies in competitive market - which is the process of competition between capital plural - and systemic competitive strategies in a more general level, which also involve the externalities and macroeconomic, industrial and foreign trade policies.

This dynamic interaction over time between the competitive strategies of companies, systemic competitive strategies - these involving, in addition to domestic and foreign markets, externalities (socio-economic and technological infrastructure), financial (investment banking and markets capital) technology (national innovation system) - and market structures, when aimed at coping competition in the global market, are important for the formation of a dynamic industrial setting whose industrial and commercial - in terms of process innovations, products and organizational used, participation in the markets of companies, the profitability and growth of companies is transformed over time.

This means that the market structures are important, but not unique, because subject to change defining the competition standards in a range of market structures, especially oligopolistic. These mutants' structures markets are endogenous largely, the competitive business process, and its evolution should be seen in the context of the dynamic interaction between competitive business strategy and market structures. This dynamic interaction mediated by competition, while the locus of the rivalry between the plural capitals in the company has the relentless pursuit of extraordinary profit appropriation through the technological and organizational innovations. But in Schumpeterian competition, some companies strive to lead, in a pioneering way, the technological innovations, while imitators companies strive to track the success of leaders through imitation technology.

More recently, new theoretical contributions were incorporated into the Schumpeterian theory of technological innovations. In fact, the new evolutionary currents of Nelson and Winter (1982) and neo-Schumpeterian of Dosi and Orsenico (1998), for example, introduced new concepts as opposed to neoclassical economics. For example, the neoclassical idea of balance was replaced by the more general concept of natural history or technological trajectory; and the maximizing or substantive rationality was replaced by limited or procedural rationality of Simon (1982).

In evolutionary line of Nelson and Winter (1982), the concept of search process (search) technological innovation is defined by companies from competitive strategies. Another important concept is the selection process (selection) of the economic results of technological innovation achieved by markets and / or institutions of research and development. This dynamic analysis model, it is part of the temporal interaction between the competitive strategies of enterprises involving the search process of technological innovations and the selection process of innovation by the markets of those innovations.

The fact is that technological progress often walk a certain "way" by the lines of least resistance, that is, progress, towards the improvement of technology, is to eliminate bottlenecks apparently easier to overcome. Particularly in the more technologically dynamic industries, advances seem to follow advances a way that seems kind of "inevitable" following a natural path. Dosi (1984), based on this idea and kunhniana notion of scientific paradigm, framed the concepts of "technological paradigm" and "technological trajectory". According to Dosi (1984, p.14-15):

The concept of technological paradigm as a kind of "heuristic model" and a "pattern" of selected technological problems solutions, based on selected principles derived from the natural sciences and the selected material technologies; while the technological trajectory is defined as the pattern of normative action to solve problems (that come with technological advances) based on the technological paradigm.

These concepts indicate that the process of technological innovation is a process that can be cumulative in the sense that the company that dominates and technology are better able to improve it and continue making the improvements needed to be at the forefront as a distinguished entrepreneur.

According to Nelson and Winter (2005), the cumulative motivated by obtaining over-profit and the improvement of technological innovations could lead to creation of asymmetries in the markets. Companies that can differentiate themselves through innovations have higher profits, which causes them to grow more and more easily reach new competitive advantages.

When the cumulative acquired the progressive improvement of technological innovations is very high, higher profits favor further gains, which makes companies more successful growing faster than its rivals, reaching larger sizes that modify the pattern of competition in the market structure increasing the degree of concentration of the industry. In turn, the process of improvement of innovations is associated with learning processes through learning by doing (learning by doing) and by using learning (learning by using).

Possas (1999, p.70-81) notes that "the search permanently renewed competitive advantage is a key feature of the competition dimension". The dimensions of competition correspond to different possibilities of competitive advantages. There are two types of competitive advantages: 1) the cost advantages; 2) The product differentiation advantages. The innovation-based competitive strategy is the main weapon of capitalist competition. The literature on this subject observes that the opportunities and entry and exit costs influencing the efficiency and performance of an industry.

VI.2. RESEARCH, DEVELOPMENT AND REGIONAL BIOTECHNOLOGICAL INNOVATIONS

The complexity of the dynamics of technological innovation lies in the fact that it is not only assumed as a linear sequence proceedings as basic research or research-type applied to the development and diffusion of a new product or production process and sale of the same in market. Stokes (2005, p.16-46), is that "technological innovations also arise within the relations of production process and knowledge of learning that result in cost advantages and product differentiation advantages."

Possas (1999) points out that there are certain attributes such as appropriateness, cumulative, opportunity, interactivity and flexibility, which serve to enable innovation in the creation of the market. On the other hand, national-regional policy innovations need to give more attention regions at the periphery. Note, for example, the region of Northern research groups in Science (group 770) and medicinal plants (group 29) are only 3.95% and 8.24%, respectively, of the total existing research groups as shown in Table 2 for the year 2004.

Table 2: Regional Distribution of Research Groups in S & T and Medicinal Plant

Regions	Researchgroupsin S &T (A)		Research Groups Medicinal Plants(B)		Proportion (B/A)%
	Abs.	%	Abs.	%	
North	770	3,95	29	8,24	3,77
Northeast	2760	14,18	78	22,16	2,83
Midwest	1139	5,85	29	8,24	2,55
Southeast	10221	52,50	129	36,65	1,26
South	4500	23,11	87	24,72	1,93
Brazil	19470	100,00	352	100,00	1,81

Source:NationalCouncil for Scientific andTechnological Development (CNPq in Brazil).

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Authors such as Salles et al. (1998) confirm the existence of a difference in terms of research investments in the Amazon, despite being the richest region of the planet biodiversity herbal products. Innovation develops in time and history is important because the process is often "dependent on the path" (path dependent): small events are sometimes reinforced and become crucially important in a positive feedback.

With the intention of overcoming the bottleneck suggest the following proposals for the construction of a positive agenda in the field of medicinal plants:

1) Increased university-industry interaction to the use of knowledge developed by the researchers (university) and greater efficiency in conducting research to obtain products demanded by the market (industry).

2) Organization of producers of medicinal plants to allow: (i) the botanical appropriate quality control, (ii) the condition for safe collection, processing in the field, transport, storage and standardization and (iii) the continuous supply to the fulfillment of delivery times for raw materials.

3) Investment in R & D in a rational way, to prevent waste of duplication in research by different groups (universities, research institutes) and to explore niches in which foreign companies could be interested.

4) Establishment of win-win partnerships between public/Brazilian companies with investors outside companies, as they are guaranteed not only the rights of the parties as of the local population, holders of traditional knowledge and ensure compliance with the sustainable development criteria.

VII. CONCLUSION

Amazonian forests have the largest germplasm bank of medicinal plants on the planet with great potential cure for various diseases. But despite the advancement of science and technology and new synthetics discoveries, urban industry still depends on natural inputs coming from Mother Nature. Thus, to remain the BAU model, everything suggests the exhaustion of Fordist industrial model as voracious consumer of fossil energy, biodiversity destructive and polluting the environment.

More recently, however, has been debated as this great therapeutic potential in Brazil, since used rationally and in accordance with the standard set by sustainability SEM model, can be turned into a source of competitive advantage for regional-sized businesses or national.

The growth trend in demand from the pharmaceutical industry for medicinal products from natural sources, aiming drugs with fewer side effects than synthetic on people, may be an opportunity for countries possessing broad biodiversity can develop strategies for structuring a great industry of herbal products in the Amazon, from the application of the SEM model for medicinal plants in order to reduce dependence of the biotechnology and access to curative natural medicines cheaper the population.

However, for this window of opportunity is seized, it is necessary to conduct integrated industrial and technological policies, enhance skills training through investments in education and internal training and create favorable regulatory environment.

Finally, companies and Amazon universities and many other institutions in Brazil, may, in partnership, take advantage of this "window of opportunity" open biodiversity represented by the potential to develop a pharmaceutical industry, using the biological elements present in it without dissociating the continuity of public and private effort in terms of industrial scale production of generic products, and in the search for biotechnological innovations. Furthermore, the rational use of medicinal plants within the standard model of SEM, an alternative strategy may be appropriate to the area.

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