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Towards a public policy of bio-knowledge: science, technology and research

Hacia una política pública del bioconocimiento: ciencia, tecnología e investigación

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Abstract
This paper reflects the world's economic trends and how Ecuador articulates to them. The purpose is to analyze how to delimit the relevance of science, technology and research activities given that in many aspects of the country's development the main defects reproduce and continue to be undesired in the developed north countries, while the benefits of the several paths towards greater welfare are absent. To achieve this, the current global discussion on the role of science, technology and research was reviewed as an input to discuss the general principles that public policy should have in the field of bio-knowledge. It is necessary, given the unlimited deficiencies that the country has in this area, to prioritize, as appropriate, the efforts of science, technology and research towards the fulfillment of basic needs of the population or the rights enshrined in the Political Constitution, as well as to structure a double strategy that consists on supporting the most dynamic economic activities and those that use traditional production methods.

Keywords
World economy, science and society, technology, research, bio-knowledge economic and social development, economic relations, Ecuador.

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Resumen
Este trabajo reflexiona sobre cuáles son las principales tendencias de la economía mundial y la forma cómo se articula el Ecuador a ellas, con el propósito de analizar de qué manera se puede delimitar la pertinencia de las actividades de la ciencia, tecnología e investigación, toda vez que se considera que en muchos aspectos el rumbo del desarrollo del país reproduce los principales defectos que ocurrieron y, en buena medida, siguen siendo los elementos no deseados en los países del norte desarrollado, en tanto que las bondades de las distintas vías hacia un mayor bienestar están ausentes. Para conseguir tal propósito se realizó una revisión de la discusión académica actual sobre el papel de la ciencia, la tecnología y la investigación como insumos para deliberar los principios generales que debería tener la política pública en el ámbito del bioconocimiento. De las múltiples carencias que tiene el país a este respecto, se precisa que debería ser prioritario volcar los esfuerzos de ciencia, tecnología e investigación hacia la satisfacción de las necesidades básicas de la población o el cumplimiento de los derechos consagrados en la Constitución, y, por otra parte, estructurar una estrategia doble para apoyar tanto a las actividades económicas más dinámicas como a las que utilizan métodos de producción tradicional.

Palabras clave
Economía mundial, ciencia y sociedad, tecnología, investigación, bioconocimiento, desarrollo económico y social, relaciones económicas, Ecuador.

Introduction

The qualitative leap and subsequent expansion of information and communication technologies in recent years, along to the development of different applications in the most diverse areas of human activity, is modifying significantly how society should be understood nowadays and how the economy will be organized in the future (David and Foray, 2002). In this context, it is also presented how the current concepts of development and well-being will be transformed, but in the context of the limits imposed by the exploitation of natural resources and the reproduction of life or, in another sense, the preservation that the laws impose to govern the biosphere (Martínez Alier and Roca Jusmet, 2016) and the planet (Georgescu-Roegen, 1996). This change in the concepts is explained by the influence of the development and expansion of ICT in the dematerialization[1] of goods and

1 The concept of "dematerialization" used by Malembaum (1978) is not used. It refers to "the reduction in the use intensity of different raw materials per unit of GDP" (in Carpintero, 2005). The term

services; although limited and concrete, the process leads to rethinking the concept of production as the work that appropriates the benefits of its own creation[2]. This is the starting point of reflection because it is intimately related to science, technology and research, especially in terms of how they are generated, managed, distributed and appropriated in the world.

Concomitant with this process, there is a change in the structure and distribution of global production that comes from the emergence of the economies that are now known as BRICS —to which other less "big" countries would have to be added, but with similar processes, such as South Korea or Malaysia— what has meant that the production centers and the provision of services are relocated on a planetary scale, taking advantage of the advantages exhibited by some economies that have lower production costs, usually given that they are countries where the wages are low, and have precarious employment conditions (Pérez, 2010) and labor force recruitment are subject to lower controls and regulations compared to the industrialized north countries. Also, as a counterface, these emerging countries have segments of the population with high academic and knowledge levels, which are capable of understanding, sharing or proposing new advances in the fields of science, technology and research (UNESCO, 2010). While the first segment of the population is internationalized from exploitation mechanisms and consumers, this other segment is globalized because it has the ability to access and contribute to the global knowledge networks, as well as integrate transnational corporations and, at the end, migrate to join the most dynamic centers (Carrington and Detragiachi, 1998; Brandi, 2006).

These emerging economies have as a differentiating feature, in relation to the rest of developing countries, the ability to offer products of different technological complexity and quality, so that they occupy the

used here refers to the importance of a large portion of activities that are currently being carried out without becoming corporeal. That does not mean, however, that for the functioning of ICT are not required material elements that are used increasingly (in general, the hardware) and energy use.

2 ICT allows workers to appropriate the results of their creation as they are the programmers, for example, they are scattered all over the world, work a lot, see the results of the work without necessarily having to rely on a capitalist as it is developed from its knowledge; it is a new form of capital. There are also changes in the markets due to the possibility that individuals or small and medium-sized producers will "connect" directly with consumers. Physical capital has given way to intangible capital, which is a component —sometimes not valued in terms of the difficulties it has to do it— that has the investment weight in many of the most dynamic large companies (Jaskel and Westlake, 2018). These traits are those that can help presume that there will be changes in the way in which the production model will be structured, without meaning that the great tendencies that lead to it are modified.

productive spectrum since the elaboration of foods with little value-added content, to high-tech goods that especially require incorporating research and knowledge, although not all are at the border compared to developed countries. That is, from the previously mentioned developing countries, some offer state-of-the-art technology such as robots for industrial use or telecommunications technologies (in the case of China), others like India and Brazil offer aircraft, and others like Russia and South Africa manufacture weapons; although they all produce nuclear energy for peaceful or warlike purposes. As Naudé, Szirmai, and Haraguchi (2015) point out, while the growth of China and India is being driven by the manufacturing industry, in Russia, Brazil, and South Africa —despite the gains achieved in terms of industrial production— the momentum comes from services.

In this scenario, there is a wide range of nations that strive to establish a development strategy amidst the immense pressure that means the control of the state-of-the-art technology by the companies of the industrialized countries of the north and the competition to which has led the production abundance of goods and services of the BRICS. These countries have established different articulation options in order to be part of these general processes. The most widely used tool for this purpose has been the subscription of "Free trade agreements", mechanisms that manage to internationalize production and consumer markets with rules that privilege the interests of companies in developed countries (Acosta *et al*., 2006), especially with regard to the rules on intellectual property and the control of product markets.

Those nations that are struggling to articulate globally, so far in the 21st century, benefited from the global increase in demand and the prices of raw materials of mineral and vegetable origin (FAO, 2018). This has determined, in a few cases, the refocusing of economies and a substantial deterioration of the physical trade balance (Samaniego *et al*., 2017). That is, the adherence to the world trade flows has been given at the expense of an increasingly intense exploitation of mineral resources and the occupation of more and more wide territory extensions —terrestrial and marine— for the provision of biomass abroad, which has caused new problems for the reproduction of life, because it has affected human communities and specific ecosystems, and has created environmental conflicts[3] (Pérez-Rincón, 2014).

3 Some ecological organizations and economists created the ejatlas.org website that brings together the reported cases of socio-environmental conflicts. Currently (July 2018), 2 508 cases are reported

On the other hand, the increase in the prices of primary goods export is one of the elements that explain a stage of high economic growth in the countries of Latin America, an expansion that had as one of its consequences a process of social mobility with poverty reduction and the strengthening of the middle stratum[4]. Several roles are attributed to this stratum, from stabilizing democratic systems (Bárcena and Serra, 2010) to carrying out innovation processes (Solimano, 2014). Perhaps the uniqueness of this segment of the population is that sometimes it occupies management positions and, generally, of control in the productive process, or they are also the workmen with high qualification and to that extent, it can be in the fair place to take advantage of the opportunity that provide the world of knowledge in order to overturn it within the productive system.

Finally, the depletion of the planet's load Capacity (Hardin, 1968) and the climate change (IPCC, 2013) are the main problems that are affecting the life viability, therefore, must be understood and confronted because if solutions are not found, no national policy will be viable. In other words, there is a big determinant that originates the way society has been organized historically and is a source of very strong restrictions for the future: the processes that govern the functioning of the great system, the biosphere, are being limited by the conventions (production, institutional matrix) created by humans to build, organize and function in society.

This is the general scenario in which a national bioknowledge policy should be constituted, within the framework of the aforementioned restrictions and in order to overcome them. However, it is undoubtedly that there is no way to move forward because the problems that affect are also generated by the policies and actions carried out by other countries.

However, the transformations that are occurring in the world and that have been synthesized can open opportunities if it is possible to articulate the country based on its own characteristics and strengths, the particular

around the world. Thanks to this initiative it is possible to determine —for the first time in a systematic way— how civil society takes advantage of modern communication and information systems to alert the international community to these facts, likewise, facilitate the academic investigations of these phenomena.

4 The term "middle stratum" and not of "middle class" is used because the methodology that employ the aforementioned studies is based on the income received by the households (Ravallion, 2009) and not in a class classification that is typical of the sociology (Giddens, 2000; Wright, 1985) and of the social studies that proliferated in Latin America between the decades of the 60 and 80 of the last Century (Sémbler, 2006).

conditions that come from its history and, specifically, the relevance or concordance with socio-economic, political, cultural and environmental characteristics (CUVI, 2013).

Ecuador is a small, open, dollarized and deeply heterogeneous country in several ways[5]. In this case, it is interesting to highlight the productive heterogeneity and within it the extremely high concentration degree in the internal and export markets, and of the profits. Both heterogeneity and economic concentrations define and are the result of specific social, political and cultural relations. On the other hand, cultural heterogeneity is a potential source of knowledge generation, provided that this diversity is articulated for the construction of bioknowledge.

This proposal cannot be free from the national political context. The Ecuador of the last ten years differs from the previous two decades for having had a broad period of institutional stability and —which is of particular interest to this research— by the "return of the State" (Acosta, 2012). Therefore, it has been witnessed a return of the capacity and political decision to design, structure and implement measures that were previously unthinkable in neoliberalism, which advocated that "the best industrial policy is to have no policy" (Becker, 1985). However, that return is and will be mediated, within the correlation framework of political forces, by the group that leads the government. Even in this phase of institutional stability were observed changes in the interference capacity of some groups on others in the conduction of the public policy, being perhaps one of the most important breakpoints the decision to exploit the Yasuní-ITT block in 2010, formerly incorporated into a new proposal for the conservation of underground oil (Rival, 2010).

5 The term *heterogeneity* is used to designate the diversity of populations in Ecuador, most of them with specific and differentiated development projects (Walsh, 2007), and a different worldview or dissimilar epistems (de Sousa Santos, 2010). Geographically, it implies the interaction of different ecological floors that form a natural megadiverse system, whose importance lies that on that condition "depends the food, the medicine, the provision of goods for the construction, for the handicraft and to cover many needs of local populations "(Bravo, 2013). Finally, the term heterogeneity also includes the functioning and interrelation of strata with differentiated degrees of technological development, productivity and forms of production (Cimoli *et al*., 2006).

Bioknowledge as a conceptual axis

Bioknowledge has traditionally been associated only with life sciences, more specifically biology and its extensions to genetics and other related specializations. The concept of bioknowledge used here is one that articulates analysis, research and apprehension of the world from the integration of all life forms and the knowledge generated by humanity[6]. It also recognizes that social, political, economic and cultural relations intervene and affect knowledge.

The needs of science, technology and research in Ecuador are immense, because the delay with respect to other countries classified as medium-high developed and the so-called developed countries, is abysmal. However, this gap must be analyzed and resolved in the light of its own needs and the ethical-normative principles, which are the basis of the organization of the Ecuadorian State. In other words, if priorities are not set out from national needs, all fronts should be attacked to try to overcome that backwardness in a global way, which is not possible because of the amount of human and economic resources that would be required, the time required to mature the policies applied and the very logic of the scientific, technological and research processes, which demands the formation of networks and synergies that are in training phase in Ecuador.

As Kranzberg points out (1986, p. 545) —and this can be assimilated for knowledge— "technology is neither good nor bad; it's not neutral either". This means, among other things, that it must be articulated to particular needs to be relevant or explicitly non-neutral.

In order to delimit this reflection, it is divided into relevance in two areas. The first refers to the fact that science, technology and research, as constituent elements of bioknowledge, turn over to examine the means for the population to satisfy their basic needs. However, the definition of what are *basic needs* depends on the concept of well-being used and on what is socially determined as such. Reason for which to specify them, some measure of poverty or deprivation can be employed, but in addition there must be correspondence with the constitution, since this represents the fundamental pact of the society. In other words, it is proposed that the

6 De Sousa Santos (2010) speaks, in this sense, of the dialogue of knowledge as a way to avoid the supremacy of an understanding of others. This dialogue should culminate with the constitution of an "epistemology of the South", based on the understanding of epistemology underlying the different manifestations of knowledge.

Constitution, while it is a framework that defines compulsory enforcement rights in Ecuador, is the guide to identify the needs on which the activities of knowledge should be privileged in the field of people needs.

The second area, in terms of relevance, refers to solving the particular problems of the domestic production apparatus. As pointed out, the productive structure in Ecuador is extremely heterogeneous and disparate, while highly technical sectors that use imported technology of last generation coexist with other production forms that do not even reach expanded accumulation levels —that is, they do not generate profits to expand business[7]. There are also great differences between the urban and rural areas due to their own operating logics.

It is important to emphasize the rural area, because in addition to regional divergences (coast, mountains, Amazon and insular) due to the ecological conditions inherent in each, can be found subsistence production that has abandoned traditional production forms and, therefore, depends on the agrochemical market, which coexists with subsistence production that continues with the ancestral cultural practices and has sustainable crops. These sectors, on the other hand, have the responsibility to guarantee food security because they offer their production mainly to the domestic market and due to the dependence that this population has of their own production to meet their basic needs. According to Calero (2011, p. 33): "From the families that in 2006 were in a state of food insecurity, the 76% lived in the rural area and more than half were located in the Sierra region". This aspect is specified because it accounts for the complexity of the approaches that science, technology and research should have.

Moreover, within the productive structure are the exporting segments, dominated by large plantations, which sustain much of the import needs. These sectors —excluding oil that have particular characteristics— are concentrated in primary production (agriculture, hunting, forestry and fisheries) and, to a lesser extent, in the food industry[8]. Considering that the economy being dollarized depends on this production to have an adequate

7 For example, while some of the companies that manufacture vehicles use robots in the assembly of parts, in other sectors such as textiles subsist individuals or small businesses that develop their activity with technology that has at least a hundred years of founded.

8 Between 2013 and 2017, 61% of non-oil exports were from non-industrialized primary products, while agro-industry contributed 21%, on average, in that period (data obtained from the Central Bank of Ecuador by June 2018).

flow of circulating currency; then, these sectors cannot be excluded from the field of science, technology and research.

In this context, the concept of relevance in the productive structure field can be complex to define, by the different roles that these different modes of production have in the supply of products and as economic support; relevance can be defined by the content of public policy, i.e, answering the following questions: What development model is pursued? Or what sociopolitical paradigm is the guide? The answer to these questions will depend on how the current dispute —citing the two extremes— is defined within the framework of public policies, between a sustainable organic production model and the industrial input-based model of high genetic performance and modifications (Szirmai, 2005).

On the other hand, while recognizing that the concept of bioknowledge is the result of socio-economic, political and cultural training, it requires the incorporation of a fundamental ethical position that refers to the way in which Science, technology and research generate, manage and distribute.

In the gestation of knowledge, it is generally unknown its social and collective character, both in its generation and in the priorities that are established, which is very much related with relevance, as well as with its consequences. A hypothesis that guides this reflection is that there is a dynamic relationship between knowledge and society, as the results of knowledge lead to changes in society and this, as a recipient, feeds and modifies the contents of knowledge. Therefore, there is no independence between science, technology, research and society. Some authors even propose co-construction and co-responsibility, proclaiming a science for society, with society (Owen et al., 2012), i.e. they conceive a system that can integrate society into the construction of science. Being that the character sought in the gestation of the bioknowledge can become an additional space of democratic participation and, in that way, to be pertinent to the problem solution that confront the society, in which case the direct representation would not necessarily have to go through the government plans and the needs identified in them. This view contrasts the individualistic fiction that pretends that knowledge is an isolated and personal act, constituted outside by the social and cultural dynamics; therefore, by having a strictly private origin, the use of intellectual property rights is justified in order to limit, on the one hand, and to profit, on the other, a public good.

From another perspective, this principle of co-construction and co-responsibility must also be articulated within the framework of the co-

government and the autonomy proposed in the Manifesto de Córdoba, understanding that these two principles lead to respond or act in correspondence with the needs of society from which the university is a recipient not only in terms of financing, but mainly in the dynamics that it engenders. It also implies that universities and their research centers are spaces of academic excellence that serve as a bridge for the scientific development required to be relevant:

The teaching methods were flawed with a narrow dogmatism, helping to keep the university away from science and modern disciplines. The lessons, enclosed in the endless repetition of old texts, protected the spirit of routine and submission (Federación Universitaria de Córdoba, 1918).

In terms of management, it recognizes the need to overcome the tragedy of the anti-commons (Ouellette, 2010), i.e, the limits imposed on access (David and Foray, 2002) and knowledge development, and the increase in costs involved in management based on the excessive use of patents and intellectual property rights (Ramírez, 2014), without knowing the need for those who make discoveries or develop new technology to be remunerated for their work and the investment they made. These restrictions or the so-called "over-patenting" occur precisely when the best conditions are given, through information and communication technologies, for the transmission of knowledge, its exchange and the formation of global networks of thought (Hagreaves, 2011).

The organic Code of the Social Knowledge Economy (National Assembly, 2016) contains several articles whose purpose is to prevent these forms of restriction around science, technology and innovation from being part of the knowledge management practice in Ecuador. At the end of the third article, the code states that it looks for:

To encourage the circulation, the national and regional transfer of the available knowledge and technologies through the conformation of networks of social innovation, research and academic, and in general, to increase them from the practice of the complementarity and solidarity (National Assembly, 2016, p. 4).

Guidelines for the construction of a public policy of bioknowledge

The most general policy of bioknowledge should focus on understanding the generation and permanence of human and non-human life in all its forms

for not interrupting the self-reproduction systems (autopoiesis) (Maturana and Varela, 1984). Simply the continuity of one of the animal species, the human, has no viability if the reproduction of each living system in particular is not ensured as well as the interaction of all of them; in other words, the laws governing the functioning of the biosphere itself must be respected (Martínez Alier and Roca Jusmet, 2016; Carpintero, 2005) as a condition for the operation of other subsystems such as economic or social organization. In addition, the potential that environmental systems have for human life could be considered as unlimited, since all the uses that plants and animals can provide have not yet been discovered (however, this extent will not be able to know in a completely way, because all species are in a constant evolution process.

This general and transversal line must be incorporated in the context of a historical and prospective analysis, i.e, in the way the development of humanity has made to reach a saturation point of life reproduction possibilities as it should inform and analyze the restrictions that will weigh in the future, because humans inhabit "a system [...] basically closed with respect to the entry of materials" (Martínez Alier and Roca Jusmet, 2016, p. 17).

One of the main paradoxes and expressions of the growth frivolity in countries with a lesser degree of relative development is that they repeat the same pattern and path that developed countries followed. There are innumerable similarities of a nation classified in the range of those who have middle and middle-high income by PNUD (2014) to what happened in the 1970 in the developed countries. The inability to avoid the problems already presented by those societies thirty or forty years ago is especially astonishing: pollution, extreme traffic congestion, deficiencies in public transport, over-exploitation of natural resources, social inequity, over-consumption, increased violence, indiscriminate exploitation of biosphere resources, etc. Instead, the virtues of such a process are absent, such as the establishment of high-level academic universities, high public investment in research and development, the strengthening of cultural expressions, the strength of democracy through construction of the welfare state, the installation of massive transport systems of people and goods, etc.

Therefore, it is essential to know, study and discuss this model of growth, but not of development, using the meaning of Sen (2000) or Max-Neef (1993), who is arriving uncritically and repeating the same mistakes. Therefore, an indispensable task in the framework of the bioknowledge is

to structure a critical thought based on the contributions of the history to build different models of social organization, in order to overcome those pitfalls that are implicitly seen as "own or connatural" of the "progress". And this requires the formation of multidisciplinary groups that look at all the dimensions of these processes in the past, in order to find ways of facing growth and the increase of wealth with different or reformed paradigms. Knowledge is permanently conceiving and analytically observing this continuum of social experiments called society.

There is also the need to develop prospective studies, because the analysis of needs and options in the future can establish the lines that should address science, research and technology. The idea is to know the strategic challenges that Ecuador has as a nation with the purpose of fulfilling one of the bioknowledge dimension. As mentioned earlier, priorities should refer to how to meet the basic needs of the population to build a suitable environment for human reproduction and how to solve the problems and challenges facing the productive structure. However, it is necessary to envisage that the demands will be in the context of the changes that would occur in the coming years due to the application effect of public policies and the transformations in the economic and political fields at the national and global level, and on the advances in knowledge. To name a few key elements, it is necessary to envisage which are the trajectories of the population, the production and the consumption of energy, the production and demand of water, the way it can affect and the forecasts to be taken with respect to the natural risk, the way social mobility will influence the consumption and sustainability of the external sector and the characteristics that the political dispute assumes due to the strengthening of the middle class.

More than the incorporation of the historical and prospective analysis, the bioknowledge must also be overturned to the current situation. In this sense, it seems appropriate to collect the proposal of Carlota Perez, who presents an integrated dual model that consists of:

Half of the development strategy to promote "from above" would aim at achieving competitiveness in world markets to reach the technological frontier in certain areas and processes and even take the lead, sometimes through alliances with global companies. For its part, half of the strategy "from below" would involve acting directly in every part of the territory, at the municipal and local levels, identifying, promoting, facilitating and supporting the activities of wealth creation directed to the more suitable market: local or

regional, national or global. These will tend to be specialized clusters focused on niche markets based on local advantages (Pérez, 2010, p. 124).

This implies that the concern of the bioknowledge should not only point to the creation of the conditions to know, appropriate and generate research and knowledge in the leading topics in the world to be incorporated in the more modern sector premises in technological terms, but is also required —as mentioned— solving the problems that arise in the economic sectors that produce with ancestral technology and knowledge or in the small and medium-sized industry that faces obvious challenges of competitiveness, because:

The globalization process has brought with it the hypersegmentation of three key areas: value chains, global markets and technological competencies. Each of these areas becomes a complex network with differentiated components [...]. When the value network has been segmented to the simplest subcomponents and markets have been fragmented into countless niches, technological capabilities can be singling and deep innovative specialization allows units or knowledge companies thrive inside or outside the global corporation. At the other extreme, some traditional artisanal methods may also occupy high-value[9] niches (Pérez, 2010, p. 127).

These processes also define the priorities of university education and vocational and technical training. On the one hand, they establish the need to significantly elevate the quality, methods and formation contents, in order to gain improvements in the production and productivity with the gradual incorporation of the knowledge acquired in the processes, for the elaboration of the products, to enter into the elaboration of goods and services with more incorporation of added value, including and especially in those sectors where the country has been successful as a global producer and those that provide adequate standards to the local market. It also aims to establish synergies that allow the development of new products from the knowledge and research of the rich biodiversity that is especially found in the Amazonia, with the purpose of gradually modifying a production structure that has remained without major changes in the last forty years.[10]

9 Global solidarity markets are a good example that it is possible to unite small-scale organic production or communities, associations or cooperatives with the national and international demand that seeks to consume goods produced with specific characteristics.

10 Within the multiple ways to sustain that statement, can be cited the index of economic complexity, in which it is observed that only in the period of the "oil boom" in the 1970s the index improves with a clear and sustained tendency, then there is a high volatility with a flat tendency (MIT, 2018).

On the other hand, both university and technical training should serve as a support and a mainstay to the process of social mobility experienced in recent years. If it is agreed that such mobility, viewed from an income stratification, has not been accompanied by a parallel process in terms of an increase in knowledge and skills (Samaniego, 2015), it is then concluded that there is a need to take advantage of this change at the social level with an extension of capacities, in order to eliminate possible vulnerabilities due to their absence, i.e. to avoid the loss of livestock in terms of mobility. Perhaps the greatest urgency in this area would be in technical training, as it is the basis for articulating improvements in the productive sector with advances at the social level.

The actor who must pursue a strategy based on bioknowledge is the state through government entities and preferably from public universities. It is the main actor because it can make available the human resources and materials required to overcome the market failures that occur in the field of knowledge (Stiglitz and Greenland, 2014), But the priorities to be established must come from collective action or a broad discussion involving workers, farmers and peasants, informal workers, small, medium and large entrepreneurs and businessmen, and academics. It could be a great challenge and even a utopia that in the defining process the concrete lines in which the bioknowledge should be concentrated, a pedagogy of participatory democracy is created.

Conclusions

The main interest of this exhibition is to encourage discussion and debate on the role of science, technology and research in Ecuador in a context marked by major global changes that are reshaping the economic, social, and cultural relationships and planetary policies, as well as showing the life reproduction limits and the earth resources.

What has been proposed are the general lines for the construction of a relevant bioknowledge ecosystem in Ecuador to make an approach as broad as possible in order that it can serve, in addition, as a reflection for other countries.

In this sense, three axes are highlighted to give content to the relevance. The first is the environmental system, as it is the principle on which any type of human construction is supported. The second, refers to the attention to the basic rights that people should enjoy in the context of social mobility

experienced in the last ten years, and it has been proposed that the relevance be sustained in the national agreement represented in the constitution of 2008, because there are contained the basic ethical-normative principles that the State has assumed to base its existence. The third is the development of productive forces in a heterogeneous, small, open and dollarized economy, which by these characteristics requires thinking at different levels, because the productive structure is formed by technological strata differentiated with particular problems and at times very distant from each other. The needs in science, technology, and research of the subsistence economy are qualitatively different from those of modern economic sectors.

It is proposed that these three axes are the reason and purpose for the construction of science, technology and research because knowledge is part and is imbricated by the characteristics of the environmental system and by the way the structure socioeconomic is formed, but at the same time it is the source to transform it. In this sense, the approaches of co-construction and social co-responsibility are collected, so that the development of the bioknowledge is structured from a democratic and participative exercise.

In this sense, and retaking the first lines of this section, the purpose is that the knowledge elaborated in this reflection be useful to provoke more knowledge.

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