



AGROECOLOGY AND SUSTAINABILITY: A CONVERGENCE FOR DEVELOPMENT

Agroecologia e sustentabilidade: uma convergência pelo desenvolvimento

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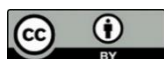
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Trabalho enviado em 26 de maio de 2022 e aceito em 01 de fevereiro de 2025



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Rev. Dir. Cid., Rio de Janeiro, Vol. 16, N.02., 2024, p. 124-142.

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DOI: [10.12957/rdc.2024.67559](https://doi.org/10.12957/rdc.2024.67559) | ISSN 2317-7721

ABSTRACT

Agriculture and development go hand in hand in human evolution. That revolution arose through agriculture to access food and settle in the territory. This brought irreversible damage to nature, establishing a relationship of dominance, by the ease of obtaining our satisfiers at the cost of environmental devastation. The economic activity of food production and profit making translates into a capitalism that destroys and promotes the depletion of resources and the extinction of humanity.

We reflect on the necessary agroecology and sustainability convergence in the preservation of life and development of humanity, dialectically addressed between sustainability and development, and agroecology and sustainability, from the critical hermeneutics we address authors of agroecology and sustainability trying to find core and coincident elements to build that necessary convergence between both perspectives. As a result of this work, agroecology seems to be the most successful solution to recover the ecological production of food.

Keywords: Agriculture, agroecology, capitalism, and sustainable development.

RESUMO

A agricultura e o desenvolvimento caminham juntos na evolução humana. Foi por meio da agricultura que surgiu a revolução que possibilitou o acesso aos alimentos e a fixação no território. Isso trouxe danos irreversíveis à natureza, estabelecendo uma relação de dominação, devido à facilidade de obtenção de nossas necessidades essenciais às custas da devastação ambiental. A atividade econômica de produção de alimentos e geração de lucro se traduz em um capitalismo que destrói, promove o esgotamento dos recursos e ameaça a própria existência da humanidade.

Refletimos sobre a necessária convergência entre agroecologia e sustentabilidade para a preservação da vida e o desenvolvimento da humanidade, abordando dialeticamente as relações entre sustentabilidade e desenvolvimento, bem como entre agroecologia e sustentabilidade. A partir da hermenêutica crítica, analisamos autores dessas áreas, buscando identificar elementos centrais e coincidentes para construir essa convergência essencial entre ambas as perspectivas. Como resultado deste estudo, a agroecologia se apresenta como a solução mais eficaz para recuperar a produção ecológica de alimentos.

Palavras-chave: Agricultura, agroecologia, capitalismo e desenvolvimento sustentável.

BY WAY OF INTRODUCTION

The dependent and subordinate capitalist development through which Mexican social formation passes has meant from the environmental point of view a growing degradation and destruction of its natural environment, and from the anthropological, social, economic, political and ethical point of view a crisis of consciousness in the face of the agrarian, food, industrial, energy, economic, financial and urban crises that manifest itself in poverty, marginalization, unemployment and external indebtedness in most



populations. On the other hand, a concentration in very few hands of national wealth and waste of natural and human resources in one pole and another of the class structure of Mexican society.

Similarly, among the environmental problems facing humanity in the new century, the proliferation of the urban, technological, and industrial is one of the most ambivalent and complex, due to its economic, social, political, environmental and cultural ramifications.

The most obvious environmental consequences for humanity are the transformation and in some cases the destruction of natural spaces, the increasing occupation of productive soils, landscape degradation, increased consumption of energy and other natural resources, and increased waste production. But at the same time, problems of a social nature arise such as exclusion, the rupture of social fabrics or the progression of repressive mechanisms of social control.

According to the linear and "productivist" development model prevailing until today, the linear metabolism of cities makes them consumers of resources from the natural environment, while depositing in it the waste that is produced in them.

This situation leads to the depletion of resources and environmental pollution that characterize the crisis of today's world, when the needs of the urban ecosystem (which feeds on others) exceed the possibilities of its territory of influence to reproduce resources and recycle waste (which is commonly known as carrying capacity).

Our cities are part of the man-made and man-made environment and as such, interact with the natural environment. If we accept that sustainable development is the capacity of a society or system to continue functioning indefinitely, in the future without being forced to decline due to the depletion or overload of fundamental resources, on which this system depends, then it must be recognized that sustainability implies patterns of development and lifestyles, that allow solving the needs of current generations without compromising the possibility that the next generations can also satisfy theirs, even those needs that are still unknown today.

But then is it possible that in the current process of industrialization-urbanization, development is sustainable?

With the neoliberal proposals of development, they are well known as the most innovative strategies in terms of the refunctionalization of the free market economy, they have conceptualized the environmental problem basically from the aspects of pollution and the scarcity of natural resources. From this base, he has developed his strategies for incorporating the environmental phenomenon into development processes, elaborating "multiple methods for environmental assessment and in the development of accounting systems applied to the accounting of the stock of natural resources and the flows of matter and energy" (Allen, 1996).



Development management requires strategies based on an overview of society, with integrated decision-making in key thematic areas. The concept of integration admits different interpretations, all of them complementary. The polarization of economic activity, social conflicts and pressures on the natural environment in cities should not prevent the aspiration to design sustainable models in which the integration of metropolitan areas into their regional context is considered, nor can sustainable development be conceived that does not address the balance between urban and rural, or that does not incorporate considerations relating to the external dimension of sustainability. This consideration therefore requires planning with a broad view.

A growing complexity of the interrelationships between phenomena has made the relationship between society and the environment increasingly emerge as a global problem that, going beyond the purely physical and natural, concerns all systems and all social groups equally; this complexity worries all ideologies. It is also a relationship whose understanding goes beyond the field of particular sciences, requiring a constant effort of inter and transdisciplinary integration. In this sense, we understand sustainable agriculture as the management and conservation of the natural resource base and the orientation of technological and institutional change, to ensure the obtaining and continuous satisfaction of human needs for present and future generations.

In this situation, we address in the article trying to understand how the relationship nature society occurs, not as separate fields, but rather as parts of a complex but articulated whole.

Sustainability as a multidimensional process converges with the disciplines and efforts of humanity to reverse the impacts on nature by putting at the center the preservation of life in any of its manifestations, agroecology then clearly converges with this vision of sustainability as a process and not as a goal.

Agroecology plays a crucial role of agriculture in human development, at the same time, it pursues a fair and equitable distribution of the costs and benefits associated with agricultural production; is concerned with the critical rescue of management practices used by different ethnicities and cultures and seeks to reduce inequalities in access to productive resources.

A DIALECTICAL RELATIONSHIP

The development of society has been characterized by a constant increase in man's cognitive capacity and his power to act on nature. However, this power has been confronted with a dynamic chain of phenomena and situations that is gradually more evident, placing new demands on it in terms of its actions and instruments, as well as in terms of its way of conceiving and conceptualizing reality. Preserving in a "linear" knowledge, composed of innumerable parallel disciplines, no longer achieves its scientific or



practical objectives. The indispensable process of development implies complementarities and transformations that occur in interdependent universes.

The history of man has been the constant search for instruments and ways of establishing relationships with nature and, through this historical process, he has been using it and adapting it to his needs. This permanent modification of nature affects man at the same time, causing changes in his living conditions and in relations with his fellowmen.

Within this dialectical process of reciprocal influences, the man-nature relationship does not occur in abstract terms, but of man as a social group, part of a certain social system, in a specific environment. Man's relationship with nature and the transformation that derives from this relationship is thus a social phenomenon. There is, therefore, no split between society and nature or, rather, between social system and natural system, and these must be conceived as parts of a whole, as two interrelated subsystems, integrated into a larger system.

Nature only makes sense insofar as it is related to an eminently human practical action, (nature, taken in abstract form, by itself, fixed on the separation from man, is nothing by man). Therefore, the relationship of man and the environment must fundamentally be conceived as a social phenomenon.

Man, although a part, confronts nature in an attitude of transformation and appropriation. From this derive two important elements to explain the impact of the development of society on the environment: its utilitarian attitude and its partial, selective approach to natural phenomena. Such domination should not be understood as an attitude of plunder, predatoriness of nature. It is not an unrestricted exploitation, but an adequate management of the natural system with a view to satisfying human needs, as Engels indicates: (1972:145-146) ... and so at every step we take we are reminded that in no way do we govern nature as a conqueror to a foreign people, as someone who is outside of nature, but that we, beings of flesh, bone, and brain, belong to nature and exist in its bosom, and all our dominion of it consists in the fact that we possess over other creatures, the advantage of learning its laws and applying them correctly.

Throughout history, man's action on natural processes has been materializing in what could be called a built environment, which overlaps the natural environment: the social-historical process takes place in each place, in a space that preexists human life and any society. It is the physical, natural space or, in its most common sense, the environment. With the historical evolution, another space is created that is basically determined by human relations and by its mode of social organization. Together with the pre-existing physical space, a social space is thus built. Both are closely interrelated, to such an extent that it is not possible to distinguish one from the other without a deep analysis process, of the context, of that reality.



This development of humanity is understood by Marx and Engels as a process of change of social formations (Lange 1966; 19) through the development of the productive forces. We can distinguish the real productive forces and the human productive forces. Both are formed and modeled in close interdependence; indeed, men create the means of production and the technical methods that enable them to use them, while, at the same time, human aptitudes are modeled on the process of the production of things and on the use of the means of production. Marx also uses the term "material productive forces" thus emphasizing that the productive forces are an expression of man's attitude towards nature, that is, of the relationship between man and the material world around him; likewise, the active nature of this relationship.

The development of the productive forces modifies man's relations with nature, which in turn modifies the process of interaction of society with nature. The transformation within the social formations results from the overcoming of the internal contradictions that lead society to adapt to a new situation. It is here that the man-nature relationship is shown as dialectical interaction.

From the perspective of historical materialism societies that were organized according to the possibilities of taking advantage of a specific natural environment, generally settled in hydrological basins and structured based on the use of hydraulic resources, with the development of the Asian mode of production takes place the passage from the archaic or primitive community to the class society. According to Godelier (1969) the primitive community corresponds to the economy of "occupation of nature", and there is a process of transition towards the economy of "transformation of nature".

It is Marx (1988) who glimpsed the man-nature articulation, pointing out that "work is, in the first place, a process between man and nature, a process in which man mediates, regulates and controls his metabolism with nature. Man faces natural matter itself as a natural power. It sets in motion the natural forces that belong to its corporeity, arms and legs, head and hands, in order to seize the materials of nature in a form useful for its own life. By operating through that movement on nature outside of it and transforming it, it transforms at the same time its own nature. He develops the powers that slept in it and subjects to his lordship the play of forces of the same."

Work, then, is the material nexus where the actions of man and the functioning of nature meet and synthesize. It is a strongly dynamic relationship, of permanent exchange and interaction. Society modifies and is modified, nature undergoes changes, but at the same time it reacts by transmitting those changes. Man administers an exchange of materials with nature. He assimilates what nature gives him through the putting into play of his bodily capacities, his strength and ability, his intellect and imagination, with tools or machines, appropriating and transforming matter to turn it into a useful object to his needs. This modified nature, in turn, configures a new environment that acts on man creating new conditions.



The ways of developing and proceeding will follow guidelines according to the social group that carries out the action. The natural environment, in turn, will impose its conditions enabling certain types of intervention on it.

But the process of work understood in its simple elements, as an essential moment in the articulation society-nature, is characteristic of any mode of organization of human society, "it is an activity oriented to an end, that of the production of use values, appropriation of the natural for human needs, general condition of metabolism between man and nature, eternal natural condition of human life and therefore independent of all forms of that life, and common, on the contrary, to all its forms of society" (Marx, 1988:223).

The satisfaction of human needs, together with other connotations related to control over the environment, the struggle for power and the search for knowledge has "justified" the current levels of development, as well as the path followed to reach them. The city was born as a result and symbol of this process, in which man not only occupies the nearby territory, but extends his footprint, transforming his environment to provide himself with the necessary inputs for its expansion. Although this phenomenon is usually considered only from the demographic and urban perspectives, urbanization also involves an ecological transformation (Rees 1996 and Wackernagel, 1997 and Vitousek et al., 1997).

SUSTAINABILITY AND DEVELOPMENT

The restrictions on economic activity of natural resources have been the basis of the literature referring to the "limits to growth" during the sixties and seventies. Boulding (1978) speaks of the imminent economy of the "spaceship earth" to refer to the impossibility of unlimited growth on a planet with finite and non-renewable resources: in the future, well-being cannot be based on the growth of material consumption. The Meadows Report for the Club of Rome (Meadows et al., 1972) raises the clearest warning signs about the sustainability of the development model. The exponential growth of the consumption of natural and energy resources is not sustainable in the medium-long term and it is necessary to opt for a development model that allows the improvement of well-being and quality of life, while the conservation and correct management of natural resources.

According to Castro (2002), economic orthodoxy had not assumed, until very recently, the inclusion of environmental objectives among the list of macroeconomic purposes. This evolution has been driven by a series of events (energy crises of the seventies, nuclear catastrophes, manifestation of inequalities between the countries of the first and third world, hole in the ozone layer, etc.) that have motivated the transition from the mechanistic logic prevailing in neoclassical models (Georgescu-Roegen,



1971), where the "fallacy of endless substitution" sustains the unlimited growth of the sixties, to the current ideas that make up the economy of Sustainable Development.

For Passet (1996), Constanza (1999) and Castro (2002), development is defined as "multidimensional growth of complexity". Human well-being can be achieved by increasing the use of matter/energy in production (growth) or by increasing efficiency in the use of resources (development). There are clear limits to growth, but not to development. Growth refers to quantitative easing on the scale of the physical dimensions of the economic system. On the contrary, development refers to the qualitative change of an economic system, physically non-growing, into a dynamic equilibrium with the environment. Internalize that modern agroecology is a developmental, holistic, and systemic conception of the relations between human societies and the plant and animal societies of each ecosystem, oriented to agricultural production in harmony with natural laws.

According to Daly (1997) "growing means naturally increasing in size, as new materials are added by assimilation or growth. To develop is to expand or realize the potentialities of something; gradually lead to a more complete, greater or better state. Growth is a quantitative increase in the physical scale, while development is an improvement or qualitative deployment of potentialities."

The term sustainability is complex and various definitions can be found. The truth is that it arose after it was evidenced that the carrying capacity of the ecosystems had been reached. Thus, for decades this term has been present both in political discourses, mass media and is the target of diverse and varied academic works, becoming the popular domain. Achieving sustainability in the management of natural resources requires interdisciplinary work, as well as the participation of the state at its various levels, and collaboration between countries (Del Rosario, 2010). Similarly, the concept of sustainability is dynamic, changing over time, with the spatial scale, with the concerns of the time, with the technological level and the knowledge of how ecosystems work (Dixon and Fallon, 1989).

According to Rodríguez *et al.*, (2007), sustainability is not an ecological, social, or economic problem, but a combination of the three. The need for this transformation process derives from the misuse of resources by man, generated by global social change due to population growth, economic growth, technological advancement, and poverty (Jiménez-Herrero, 1989).

For Allen *et al.* (1991), it is essential that sustainability extends not only over time but globally, and that it considers the well-being not only of future generations but of all people and living beings in the biosphere. Allen and Sachs (1993) argue that sustainable agriculture should include not only the production process, but the entire food and agricultural system. Moreover, these authors point out that categories such as class, gender, and race should be considered in the debate about the meaning and implications of sustainable agriculture.



Addressing sustainability poses a complexity in terms of its multidimensionality, the temporal and spatial scale that is intended to be covered, and the need for an interdisciplinary approach to it. Ferraz (2003) points out that "the conceptual basis of sustainability lies in the recognition that the world's natural resources are finite and that the biological limitations of the planet limit economic growth. The scope of sustainability has as its main challenge the change in consumption patterns, and the logic of the market cannot prevail over the logic of needs".

So, to achieve the development of humanity, understood as an increase in the levels of well-being of the population, sustainability would mean the existence of economic, ecological, territorial, social and political conditions, which allow its functioning in a harmonious way in time and space. There can be no development in a society when natural assets are being destroyed or terminated, or when the wealth of one sector is achieved at the expense of the poverty of another, or when a territory is exploited for the benefit of another, or when some groups repress others, or with the destruction of cultures or races, or when men exercise varying degrees of exploitation, violence and marginalization against women. Nor can there be sustainability in a world that has communities, countries or regions that are not sustainable. There can be no sustainability when life on the planet is so vulnerable and advancing by leaps and bounds to its destruction. Sustainability must be global, regional, local and individual and in the ecological, territorial, economic, social and political fields.

In this multidimensional vision of sustainability, the new agroecology encompasses more comprehensive levels. Wezel and Soldat (2009), identify two levels: first, they show three types of meaning in the use of the notion of agroecology, scientific discipline, social movement and set of agricultural practice. Second, they identify three major types of uses of the concept of agroecology based on a scale of approaches at the level: parcel, agroecosystem, and food system.

According to Conway (1994) the sustainability of agriculture is "the ability of an agroecosystem to maintain its production over time overcoming, on the one hand, ecological tensions and forcings and, on the other, socio-economic pressures".

AGROECOLOGY AND SUSTAINABILITY

According to the American Society of Agronomy (1989), sustainable agriculture is one that, in the long run, promotes the quality of the environment and the basic resources on which agriculture depends; provides the fibers and food necessary for the human being; is economically viable and improves the quality of life of farmers and society as a whole

The Food and Agriculture Organization of the United Nations (1991) defines sustainable agriculture as the "management and conservation of the natural resource base and the orientation of



technological and institutional change, to ensure the obtaining and continuous satisfaction of human needs for present and future generations. Such sustainable development in agriculture results in the conservation of soil, water and animal and plant genetic resources; in addition to not degrading the environment, being technically appropriate, economically viable and socially acceptable."

Sustainable agriculture, at the same time, pursues a fair and equitable distribution of the costs and benefits associated with agricultural production; is concerned with the critical rescue of management practices used by different ethnicities and cultures, and seeks to reduce inequalities in access to productive resources. It also seeks to develop technologies and management systems adapted to the diversity of local ecological, social and economic conditions. It tries to be economically profitable, without being carried away by a short-term logic (Masera 2000).

In the context of sustainability, seen as a multidimensional process, Agroecology can be understood as "a scientific approach aimed at supporting the transition from current models of rural development and conventional agriculture to styles of rural development and sustainable agriculture" (Caporal and Costabeber, 2002).

For Altieri (2002), sustainable agriculture refers to the search for lasting, long-term yields using ecologically appropriate management technologies, which requires the optimization of the system as a whole and not just the maximum yield of a specific product.

According to the Brazilian Agricultural Research Company (2006), "Agroecology can only be understood in its fullness when it is directly related to the concept of sustainability and social justice. In this sense, Agroecology is concretized when, simultaneously, it complies with the dictates of economic sustainability (potential for income and work, access to the market), ecological (maintenance or improvement of the quality of natural resources), social (inclusion of the poorest populations and food security), cultural (with respect to traditional cultures), political (organized movement for change) and ethics (change aimed at transcendent moral values)"

For Otmann (2005) and Merola (2015), agroecology as a discipline should be seen in three dimensions of analysis:

- a). Technical-productive, focused on the sustainable design of agroecosystems, where ecology is the scientific frame of reference that in dialogue with traditional peasant and indigenous knowledge proposes the redefinition of the technical foundations of agronomy, veterinary and forestry sciences.
- b). Socioeconomic, seeks the revaluation of local resources and potentialities and the recreation of an endogenous development.
- c). Sociopolitics, involved in the accompaniment of participatory processes, from critical networks or applied research initiatives, aimed at building alternatives for agri-food globalization.



The three dimensions of agroecology according to Guzmán et al. (2000) are complemented at five territorial levels: farm work (property level); alternative market (local community level); design and implementation of endogenous strategies (local society level); regional articulation of dissidents against neoliberalism and capitalist economic globalization for the agroecological transition (state level); and global articulation of dissent against neoliberalism and capitalist economic globalization for food sovereignty (global level)

We consider then according to Altieri (1991) that Agroecology is also an environmental discipline whose purpose is to contribute to rural development based on endogenous resources and peasant knowledge – ancestral practices, without renouncing scientific and technical advances. Its main objective is the sustainability of the ecosystem; diversity of productive species or crops and animals, soil covered and rich in organic matter, low incidence of pests / diseases, optimal levels of temperature and humidity, and the entire agri-food system (production, transformation, distribution, and consumption) from the ecological, economic, and social point of view.

The basis for fulfilling this objective lies in the management of agroecosystems under agroecological principles and standards and in short marketing circuits, to fix the population in its territory and keep the rural environment alive and diverse. The method used is research, participatory action, (Guzmán, 2000).

For Toledo (1996) agroecology prioritizes the social, political, and practical implications of the ecological conception, emphasizing its subversive and critical character; criticizes conventional approaches that perpetuate the tendency to consider culture as something distinct and autonomous from production. Agroecology proposes in its scientific action, to cover three inseparable domains: nature, production and culture. This subversive and critical dimension arises from the rejection of the "myth of superiority of the industrial urban world over the rural one, since this has been the cause of the destruction of traditional cultures, as a fundamental condition for the modernization of rural production."

The native peoples of America learned to deal with forging an agriculture, although subsistence, also of persistence adapted to the worst environmental conditions (Knight, 1980). Continuity, diversity, time, optimal use of space, resource management, nutrient recycling, water-soil-jungle-forest-mountain conservation, protection, and succession of crops were undoubtedly processes that favored traditional agro systems over time.

Toledo (1985), points out that the knowledge of indigenous people with respect to the soil, climate, vegetation, flora, fauna, water, atmosphere, forests, and the ecosystems of their environment, are a valuable strategy to understand the interrelations of beings with their environment, which allows them to develop food self-sufficiency in their localities.



Local knowledge about the physical environment is abundant. Ancestral agriculture around the world has created traditional lunar calendars for agricultural development. In Mexico, for example, traditional farmers from Chiapas and Oaxaca sow according to the lunar phases. Many others face climate change using indicators based on the phenology of local vegetation. For example, in West Java, the Gadung is a meteorological indicator of the rainy season, supposed to begin shortly after its leaves begin to grow. In the same region, grapefruit has a similar function: when its fruits begin to grow, the propitious season for the cultivation of annual plants begins (Christianty et al., 1985).^{1,2}

There are coincidences between Toledo, Altieri, Odum and Glisseman, that for sustainability knowledge systems are:

Physical environment: water sources and their cycle, relief, geomorphology, soil types, rainfall, humidity of the environment, temperature, and climate.

Popular systems to identify living beings: flora, fauna, forests, thickets; phenomena of nature and exact location of natural resources and their productive cycles.

Practical application of traditional knowledge.

According to Toledo (1985), The ethnobotanical knowledge of the Tzeltals, Purépechas and Mayas, cultures native to Mexico, recognize more than 1200, 900 and 500 species of plants respectively. This gives us an idea of the wealth of knowledge of these cultures. In addition, they have strategically created patterns of feeding, agroforestry, polycultures, care of flora, fauna, forests, water and landscapes; based on experiences of years of observation and practice guided by complex ethnobotanical classification systems. These systems have allowed them to assign to each landscape a specific production practice, obtaining a diversity of products from plants through a multipurpose strategy. The new agroecology, by retaking this ancestral knowledge and knowledge, becomes a paradigm that redirects the perspective of the development of humanity towards sustainability as a transdisciplinary axis in a multidimensional process, which manages to clearly differentiate growth from development.

Gliessman (2002), considers that the transition to sustainable agroecosystems comprises at least three fundamental levels: the first level foresees the improvement of the efficiency of conventional practices to reduce the use of external inputs harmful to the environment. The second level of the transition concerns the replacement of conventional inputs with alternative inputs. The third level of the transition is represented by the redesign of agroecosystems with the incorporation of a set of agroecological practices and principles and mainly, biodiversity within the agroecosystem.

¹ Es a plant acquaintance as three-leaf Indian yam. It is native to South and Southeast Asia; is Poisonous when is drought.

² Citrus genus plantacquaintance also like citrus.

The agroecological approach is more sensitive to the complexities of local agriculture, encompassing properties of sustainability, food security, biological stability, resource conservation, and equity. Thus, the agroecological paradigm sees the agricultural process as an integrated system, by environmental, economic, social, and cultural aspects; and its purpose is not only to increase the productivity of one of the components; rather, to optimize the system as a whole and maintain sustainability in time and space (Altieri, et al, 2000).

We could point out that agroecology is understood as a system, which applies ecological principles, including:

1.- Organic soil management

For Fijoo T (2013) and Jaramillo (2013), organic soil management is one of the fundamental principles for agroecological production in the agro ecosystem, without organic or biological soil you can only with chemical inputs (synthetic fertilizers and pesticides), so organic management involves looking for mechanisms that allow to have a soil rich in organic matter, with intense biotic activity, with a good physical and chemical structure, with good aeration, humidity and temperature to ensure favorable conditions for the growth of plants, particularly through the management of organic matter and the increase of the biological activity of the soil, recycling of nutrients, conservation of its physical and chemical structure, on the other hand it helps us to improve production both in volume and in its quality and the detoxification of soils by use of toxic agro.

2.- Agrosystems diversification

The objective of agroecology, which Gliessman (1998) points out, is to provide balanced environments, sustainable yields, biologically obtained soil fertility and natural pest regulation through the design of diversified agroecosystems and the use of low-input technologies. Polycultures, agroforestry and other methods of diversification mimic natural ecological processes and that the sustainability of complex agroecosystems is based on the ecological models they follow. By designing farming systems that mimic nature, optimal use of sunlight, soil nutrients and rain can be made.

3.- Adaptation to local conditions

Using local varieties adapted in agroecosystems, this ensures that there will be greater success in the recovery of balances (ecological and nutritional) and in less time. (Feijoo T. 2013). Adapting to local conditions implies approximating the composition of fauna and flora of the agroecosystem to the species of the locality. The knowledge of local farmers in terms of climatic conditions, rainfall, humidity, soils and agricultural varieties are fundamental to achieve the adaptation and success of productions. It is they who have the most empirical evidence.

4.- Increase synergistic relationships



To achieve this, it is necessary to apply processes to increase biological interactions and synergies between the components of biodiversity by promoting key ecological processes and services; increase the complex relationships between the components (species) of agrobiodiversity. Abandon the traditional linear scheme in trophic relationships and favor redundancy functions and the occurrence of alternative pathways to the flow of nutrients energy (Jaramillo: 2013).

5.- Balance the flow of nutrients

For Feijoo (2013) the balance is achieved by recycling biomass and optimizing availability, using as inputs of each of the subsystems (animal subsystem, plant subsystem, forest subsystem, etc.), the by-products generated in other subsystems (harvest remains, animal excreta, etc.), zero waste in the production system, reduce artificial inputs and outputs of the system. And minimize losses due to solar radiation, air and water flows by managing the microclimate, harvesting water and managing soil through increased coverage.

6.- Conserve nature and restore natural balances

It is important to be clear that agrosystems are not a factory of producing food, they are rather, a set of biotic and abiotic elements that interact dialectically in various ways; disturbances or modifications that some of its components have can impact and modify the other components. From this understanding of agrosystems will give the elements to consider them with a holistic perspective and as Feijoo (2013) points out "Modern agroecology is a holistic and systemic conception of the relationships between human societies and the plant and animal societies of each ecosystem, oriented to agricultural production in harmony with natural laws".

For Altieri and Nicholls (2000), the objectives of sustainable agriculture are the stable and efficient production of productive resources; food security and self-sufficiency; the use of agroecological or traditional management practices; the preservation of local culture and small property; assisting the poorest through a process of self-management; a high level of community involvement in deciding the direction of its own agricultural development; and the conservation and regeneration of natural resources.

To achieve the above, Altieri (1994), proposes that sustainable agriculture has as its main tool agroecology, which becomes a key point, understood as a multidimensional vision of agroecosystems, because it includes genetics, soil science or agronomy, to incorporate an understanding of the ecological and social levels of coevolution, structure, and function. In the perspective of sustainability, agroecology shows the great potential that originates from structuring biodiversity to create positive synergisms that provide agroecosystems with the ability to remain and return to an original state of natural stability.

While recognizing the crucial role of agriculture in human development, agricultural processes are the most widely used anthropic activities, such as land and water. Conventional agriculture, considered to be highly degrading of the environment, is the main cause of the devastation of forests, the overexploitation of soils, the pollution of rivers, the pollution of water by agrottoxins and the impoverishment of biodiversity (Van Raij, 2003).

Despite the difficulty in conceptualizing sustainability, it is necessary to evaluate it as a starting point to improve production systems. Thus, progress has been made in the development of analysis and evaluation frameworks that make this term operational in a coherent manner. The concept of sustainable agriculture, then, is a relatively recent response to the decline in the quality of the natural resource base associated with modern agriculture (Altieri, 2002).

Sustainable agriculture in the idea of Altieri, (2002), refers to the search for lasting yields, in the long term, using ecologically appropriate management technologies, which requires the optimization of the system as a whole and not only the maximum yield of a specific product. In this context, agroecology proposes the ecological management of natural resources "through a collective social action of a participatory nature, carried out through a holistic approach and a systemic strategy, which seeks to redirect the altered course of social and ecological coevolution, through the establishment of the control of the productive forces to curb the degrading and plundering forms of production of nature and society". In this sense, Guzmán (2000) agrees that the local dimension plays the central role as a carrier of an endogenous potential that, through the articulation of knowledge, allows the implementation of systems and styles of agriculture that potentiate ecological and sociocultural biodiversity, projecting methods of sustainable development.

Under these arguments Gliessman (2002), considers that the transition to sustainable agroecosystems comprises at least three fundamental levels: the first level foresees the improvement of the efficiency of conventional practices to reduce the use of external inputs harmful to the environment. The second level of the transition concerns the replacement of conventional inputs with alternative inputs. The third level of the transition is represented by the redesign of agroecosystems with the incorporation of a set of agroecological practices and principles and mainly, biodiversity within the agroecosystem.

IN CONCLUSION

If capitalism has no limits other than death (depletion of natural resources), it is necessary to modify the forms of that causal chain of capitalist logic between the visions of the north and the non-geographical south. Considering that between sustainability and agroecology there is a necessary and



essential convergence: life. The incorporation of sustainability in development strategies arises from the need to protect life and natural resources and recover those that have been degraded by humans. Water, soil, forests, biodiversity, and human populations constitute a single system and are interdependent: a change in one of the components generates a change in the others.

This dimension recognizes the environment as the basis of life and, therefore, as the foundation of development. It also recognizes the human being as an integral part of nature and values, with special attention, the positive and negative effects of its actions in nature, but also, the way in which nature could affect human beings. They are dialectical and indissoluble relations; Necessary and convergent, that is why agroecology plays a strategic role in the new conditions of vulnerability of humanity and life on the planet.

New actions of action are required to preserve life, and even apply those that worked for the cultures of the past, because the advancement of science and technology would be useless if the forms that maintain life and promote the well-being of humanity are not prioritized.

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