INSTITUTE FOR APPLIED RESEARCH IN SUSTAINABLE ECONOMIC DEVELOPMENT – IPADES

THE SUSTAINABILITY OF TROPICAL AGRICULTURE

The current society in reductionist vision sees the food being produced at the supermarket; for its part, agriculture is offset its environmental context.

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Agriculture and the environment are inseparable. However, the intensive exploitation of agricultural areas improperly and without defined criteria, coupled with the absence of conservation concern, has resulted in the gradual exhaustion of natural resources, especially soil and water, as well as contributing to the pollution of watersheds and the siltation of rivers and lakes.

The expansion of agriculture changes the natural landscape resulting in changes in hydrological surface processes; this reduces the productivity of water. On the other hand, a larger load of nutrients, agrochemicals and sediment can reach out to rivers and thus change its quality. In quantitative terms, the pattern of evapotranspiration changes, decreasing in deforested areas. Increased erosion and degradation of soil organic matter, over the production cycles, make smaller scale water productivity, primarily due to reduced infiltration, to increased runoff and reducing the capacity of your storage (Bossio *et al.,* 2011).

The agricultural production unit exists within a watershed. This is the scale of the water. Natural constraints determine its structure and hydrologic functioning, while the legal charges, as permanent protection areas (PPAs), intended to protect her from the other hand, the consequences of management actions targeting the production may affect it in terms of reduction of water flow, and the change in the quality and environmental services.

A fundamental aspect in the development of the plants was going to use the soil as its new environment. This, as an important natural resource, and essential to the plants is implicit in sustainable development, this means that its preservation and correct usage should be included as another concern the preservation of the diversity that is established on Earth, since the soil is the result of the interactions involving the atmosphere, hydrosphere, biosphere and lithosphere. It is in the wild for attachment and growth of plants, that is, become the substrate of life-physical-chemical-biological support for plants to carry out photosynthesis give life itself, to animals and to *Homo sapiens*.

The soil, as organisms, habitat is heterogeneous, dynamic and complex that in natural conditions provides that the chemical elements present in it be recycled making it available for plant growth. However, when a series of crops is done in a particular field and nutrients are continuously removed during the harvest cycle, some of these cations may not be present in sufficient quantity and in the form available to plants. So these solos are unable to sustain new vintages, although have sufficient nutrients for the growth of native plant communities.

It appears then, that between natural resources, the soil is of great importance, as it is the natural environment outside of the aquatic environment, where increased biodiversity; and there are approximately 10,500 years man has begun to agriculture, making it possible to maintain a growing population of people who built villages, cities and civilizations.

However, we have a lot to learn about them. There are trillions of microorganisms per square meter, which can reach tons per hectare. The diversity as well as the functions of most micro-organisms is, still, a "black box" that gradually being opened and unveiled (Moreira, 2009).

Thus, agricultural systems aiming at the maximization of biological processes as an alternative to ensuring the sustainability and environmental quality must consider the important role of biodiversity as an indicator of soil quality.

Agriculture, practiced for ten thousand years, has made it possible for man to become sedentary and build civilizations. Today the agricultural production has the indispensable support of science and technology, through the Agronomy, and in that context the increase in productivity, food quality and environmental preservation, that is, reconciling agriculture and sustainability.

The Agronomy, a term derived from the Greek agro = field, nomos = Law Treaty; is the set of sciences that study the laws or theoretical principles applicable to agriculture. Its main objective is the explanation of all the complex phenomena that govern plant and animal production, thereby aiming to establish the recommended techniques for the rational exploitation of the soil (Enciclopédia, 1995).

By didactic and methodological issues the Agronomy separates the teaching of agriculture in disciplines such as, soil, climate, plant physiology, plant pathology, entomology, animal husbandry, forestry, etc. to be able to know and teach, but they must be grouped in any complex, as in fact occurs in the real world, so the professional can apply technology that allows production with economic efficiency, a product with quality, and to preserve the environment, in which live the living, abiotic and biotic components, and the relationships between these components. This focus has a new branch of Agronomy that is agroecology, i.e. is the discipline that studies agricultural production systems – agroecosystems – including conceptual and methodological tools of Ecology.

Historical records show a millennial practice in agriculture which was the use of cover plants, developed by ancient civilizations, but that was relegated in modern agriculture, initiated in the last century. However, over the past three decades, researchers and farmers in various parts of the world are making this effective practice began to resume its important place in different agroecological conditions and production systems of different countries, mainly in tropical and subtropical regions, which contributes to the maintenance and improvement of the physical, chemical and biological conditions of the soil.

In this line of agriculture, Brazil can be considered the father of the "Brazilian green revolution", i.e. the introduction of the tillage system (SPD in Portuguese), which stands as a differentiator for the important role in environmental preservation, in productivity gains and reduced consumption of fertilizer, which has served as a model to many countries.

The SPD is one of the largest revolutions of the Brazilian agriculture, especially in the tropical region thanks to his undeniable agronomic, economic and environmental benefits. The SPD Association with rotation farming-ranching has brought improvement of soil attributes, among other advantages. Once designed, in most cases, the strategy is to keep the SPD as unique in the system, which has proved to be possible provided that they keep the ground protected by mulch. Surface coverage and gradual increase of soil organic matter are the main components of the success of the SPD (Kluthcouski *et al.*, 2009).

The production unit to seek to reconcile your activity to sustainability must observe some important points to be followed: a) management practices adapted to the ecological conditions of the watershed; b) preferred use of species increase soil cover crop residues; c) tillage system; d) forest-crop livestock integration; e) soil conservation practices); f) efficiency in irrigation.

The sustainability of tropical agriculture, the level of agronomic knowledge available, passes by the introduction of the following practices: a) the nitrogen biological fixation); b)

genetic improvement; c) tillage system; d) balance of fertilizer, liming and gypsum; e) integrated pest and diseases; f) forest-crop livestock integration; g) biotechnology. As research agenda has been the evolution of the SPD includes not using herbicide. In such a situation the SPD approaches the ideal of sustainability for tropical agriculture.

The reality of the Brazilian rural context is still very far from achieving the binomial agriculture and sustainability. In private areas are 65% of the Brazilian natural vegetation (Nassar; Antoniazzi, 2012). This means that the rural producer awareness regarding this theme undergoes two new concepts: a) lead the production system for sustainable systems; b) undertake the preservation of areas of permanent preservation (APPs) and legal reserve areas (RLs).

However, the producer is moved by the profitability of your business. Thus, it is essential to create economic incentives to encourage them to preserve the biomes on the property in addition to the requirements imposed by the law, since sustainable production systems already provide this profitability through increased productivity, decreased use of fertilizers and pesticides, and a significant improvement of the soil conditions. Two lines of funding already made available for this preservation. The Amazon Fund is an instrument to make the APPs, and the rural credit for low carbon farming (ABC in Portuguese) must be used for RLs. New times, new mindsets!

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