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AGRICULTURE AND GREEN ECONOMY

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There are about ten thousand years agriculture participates in human society, changing it, and being transformed by the evolution of this society. In this period were numerous challenges for agriculture, among them an agenda has always been at the food, growing population. In the 18th century Thomas Robert Malthus (1766-1834), his most famous work, “An Essay on the Principle of Population,” published in 1798, warned about the inability of agriculture to feed a growing population, therefore the population should be kept below the level of means of subsistence. However, with the emergence of Agronomy concern Malthus has not materialized.

In the 20th century, the Green Revolution showed once again that a Malthusian theory does not come to fruition, on the contrary, in the first decade of the 21th century the United States, the European Union and Brazil becomes world's barns. This feat is not only the availability of natural resources such as soil, water and light; economic policy, but primarily to technological advances provided by recognized centres of excellence abroad, whose largest emblem is perhaps the use of the Cerrado biome for the development of animal husbandry and cultivation of soybeans and corn.

However, in this 21th century agriculture faces another major challenge, this time placed by the green economy to meet a triple demand: a) provide food, raw materials and bioenergy to a growing population; b) use correctly the resources; c) contribute to social inclusion. The output is, as of earlier times, mainly through knowledge, but also on the changing lifestyle of the population to accept the new paradigm of the green economy.

As to the first, the technological standards of world agriculture are already being changed by the introduction of new technologies resulting from very recent advances in scientific knowledge. Based on such advances and tuned with the green economy, agriculture should be guided by a new set of features and requirements, which will bring you greater challenges. These new features can be described by aspects: the)

food, nutrition, health and well-being; b) environmental services, ecosystem services, carbon economy; c) sustainable aquaculture and integrated systems, livestock-farming-forest; d) traditional knowledge, regional and ethnic markets, rural tourism; e) biomass, bio-energy, biomaterials, green chemistry.

These new requirements and outline features an agriculture organized in food systems targeted technological aspects and clean, with positive balances industrial carbon, that integrate qualitative relationship field-city, with chains and arrangements established sustainability and productive inclusion, especially of family farmers and small producers.

In this new pattern of agriculture, the agricultural programs of PD & I will look more intense for biodiversity, looking for diversification of species, systems and processes. Many important biological functions properly studied and known by modern biotechnology may be gradually incorporated into agriculture, established from radically new scientific and technological base, which goes far beyond the current transgenic crops applied to commodities. Among the main research lines that will be opened will be the area of metabolic processes of organisms (plants, animals, and microorganisms) and their targeting to produce materials and substances of high added value, directed towards non-food usage (chemical and biochemical, medical, pharmaceutical, nutritional, energy, etc.).

Recent advances suggest consolidating multiple fronts of modern biotechnology, represented by genetic engineering by integrated genomics, genetic improvement by metabolic engineering, advanced technologies of reproduction and animal cloning, among other, which will transform the market from the point of view of enlargement of range of opportunities.

The sophisticated technical foundation and the generic nature of modern biotechnology are enabling the creation of a new bio-economy, which inserts the green economy, with influence in many fields of knowledge and possibilities of development of vast range of new products and processes.

Will this new paradigm that agriculture and green economy will have to converge, since the latter, in a practical way, can be considered as having low carbon footprint, efficiency in the use of resources and socially inclusive. According to the UNEP-United Nations Environment Program, in a green economy, income growth and employment must be driven by public and private investments that reduce carbon

emissions and pollution, increase energy efficiency and the use of resources, preventing loss of biodiversity and ecosystem services.

The green economy is not a substitute for sustainable development, but increasingly a growing recognition that the achievement of sustainability is based almost entirely on getting the right model of economy. In other words, sustainability remains a vital goal of long-term, but it is necessary to make the green economy greener to reach there. It is for this reason that agriculture has to insert in the green economy.

The transition to a green economy needs some conditions facilitating such as national regulations, policies, subsidies and incentives, international market, legal infrastructure and supporting business protocols. These conditions seem of difficult reach? Not. According to UNEP, the gradual redirection of 2% of GDP of the world economy currently employed in support of the current model, if directed to supporting the production of renewable energy. Nationally, a green economy depends on changes in tax policy, reform and reduction of subsidies that are harmful to the environment, employment of new market-based instruments, and public investment to key sectors of the economy and green agriculture technological standard equalization.

For Brazil, even with advances in incorporating innovations for agriculture, the country has a long way to insert in this new paradigm. A large number of producers still use low technological content in their production, as evidenced by the recent publication of the Institute of Applied Economic Research, IPEA. Many producers still have difficulty accessing and using modern methods and processes in production, such as fertilizers, soil correctives, pesticides, tractors, in addition to financing units, technical guidance, cooperatives, among other features.

Of the total of 5.2 million rural establishments in Brazil, which are identified in the agricultural census of IBGE, 2006, 983 thousand wore high technology and only 19% among the establishments considered family farms. Consequently, the income in agriculture was heavily concentrated, with 8.19% reaching 84.89% of the value of production, while producing less of 3,776 thousand establishments 10% of this value. These numbers demonstrate the coexistence of agriculture but dynamic and yet another long and lacking, on the sidelines of the market. The latter must, as soon as possible, have access to information, knowledge and technological innovations.

As agriculture is an important factor of the green economy, these constraints will have to be made possible, because one of the factors that characterize agriculture

is to absorb cost, since decision-making cannot pass prices, and any inefficiency will charge on production, particularly in cases of small producers, especially those in the green economy or include on the market. To do this, you must innovate in segments less efficient. Public policies for that segment also means reducing emissions, pesticide application and fuel expense, so that the whole agriculture is sustainable.

Furthermore, it is likely that a careful assessment of the economy of production systems in developing countries will show that the environmental inputs, i.e. the natural resources (water, soil, biodiversity, etc.) and environmental services (recycling of waste, water supply, air quality, etc.) used in agricultural production are being sub-remunerates. To ensure the future sustainability of productive activity will therefore be necessary to invest in scientific and technological knowledge to develop innovative production systems, aimed at increasing the productivity of natural resources and environmental services used by agribusiness.

Conversion models should be sought, often sustained in solutions of own environment, which, applied to productive activities, rendering them less aggressive. To some extent, Brazilian agriculture gives examples of the possibility of achieving this goal. The research on genetic resources and crop improvement has contributed significantly to the development of productive systems, adding more environmentally suitable stresses tolerance and nutrient use efficiency, facilitating conservation farming systems. Crop management based on tillage is used for decades in millions of hectares of plantations in Brazil, with significant contribution to the reduction of erosion, the general improvement of the quality of the soil and recharges the water table.

The biological fixation of nitrogen by inoculation of bacteria has made possible the significant reduction of chemical fertilizer application in crops like soybeans, with substantial reduction of environmental impacts, such as the contamination of water resources. The biological control used regularly in several crops, such as soybeans, sugarcane, cotton and fruit plants also has reduced the demand for chemical control of pests and diseases in various management systems, with a positive impact to the environment, the quality of life of rural workers and for the safety and quality of products. Crop-livestock integration-forest seeking synergistic effects among the components of agro-ecosystem, contemplating the environmental suitability, the appreciation of man and economic viability.

However, the great pressure of agriculture on the environment indicates that we must seek a new level of knowledge, a new paradigm in science and technology, in order to break these boundaries, particularly in the tropical region of the globe, where

are the most challenging environments for agriculture, in addition to the poorest nations. Also, the discussion of family farming *versus* agribusiness or agriculture *versus* environmentalism is so outdated, laden with so much ideology, which has just not advancing. Need to change the paradigms, not least because in the future we will only have a rating, which is high-efficiency agriculture committed to environmental issues.

It is concluded that the challenge of this century between agriculture and green economy is already released and are forwarded, but solutions will depend, not only scientific and technological advances, new policies, but above all a new lifestyle and holistic understanding of the planet's population.