



International Workshop on Tropical Agriculture Development

**Transforming Tropical Agriculture:
An Assessment of Major Technological,
Institutional, and Policy Innovations**

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**Transformando a Agricultura Tropical:
Uma Avaliação das Principais Inovações
Tecnológicas, Institucionais e Políticas**

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Sustainable Use of Waters in Brazil

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When we talk about water, numbers in Brazil are astonishing! We have 13,7% of the freshwater of the world, the largest continuous freshwater wetlands - the Pantanal, the largest floodable forest in the largest drainage basin on the planet, the Amazon Basin, and a large groundwater, the Guarani aquifers, in Southeast and South, extending to other southern countries. By the other hand, we have regions like the Northeast of Brazil, where the rains have an unequal distribution and a semi-arid condition, the survival of man and animals been critical in some months and years. With these numbers, our responsibility is also great. If we want a sustainable use of this enormous amount of water in Brazil, we need to understand the relationships between the use for several purposes and the way water circulates and regulates the natural ecosystems on which the economical activities are developed.

The Pantanal ecosystem with 140,000 km², is regulated by an annual cycle of flooding and drought, including a multi-year pattern involving occasional greater fluctuations, known as flood pulse, responsible for the existence, productivity and interactions of the major biota in river-floodplain systems, a predictable pulse of long duration that engenders organismic adaptations and strategies that efficiently utilize attributes of the aquatic/terrestrial transition zone, responsible for the diversity, richness and abundance of fishes and other aquatic organisms. The same is true for rivers with large floodplains in the Amazon region.

Cattle ranching are the main economical activity in the Pantanal, in a very extensive system, based on native pastures. The sustainable management of this native pasture is dependent on flood pulse, as the development of different kind of grasses is directly related to the amount of water in the soil and groundwater. The second economical activity is the fisheries performed by artisanal fishermen and well-developed sport fishing. All the economical activities in the Pantanal are dependent on the flood pulse.

The Amazon River discharges 220.800 m³ of water per second, which represents about 15% of the total river discharge of all the rivers in the world. In the hydrology and biogeochemistry of the Amazonian watersheds, the flooded areas along river corridors as well as small streams play important roles. As their behavior is intimately tied to terrestrial processes it is important to be able to track these processes. Thus evaluation of land use effects on the water quality and nutrient and carbon cycling in the Amazon region are necessary.

In the eastern Amazon, region agriculture has been based on slash-and-burn shifting cultivation for over 130 years. Burning of fallow vegetation leaves soils depleted of nutrients, which are lost to the water bodies. So, management techniques such as chop-and-mulching the fallow vegetation have been proposed as alternatives to mitigate these environmental impacts. Another point is the extensive pasturelands and the expansion of agriculture frontiers with soybean crops in the Amazon region. Runoff water can carry away sediments as well as chemical products from the agriculture fields when they are not used properly. Farmers or ranchers should, in addition of managing properly the soils by techniques that do not degraded them, take good care of the riparian forests that insure water quality for all the human communities, and than avoid impacts that can impoverish ecosystem functions and the rich Amazonian biodiversity.

The Brazilian Northeast has an area of 1,6 million km², where the Semi-arid area is included, with about 1 million km², with short periods of rainfall, followed by a long period of dry every year. Not always, the accumulation of waters in dams solves the water scarcity, due to a great evaporation produced by the high temperatures in the region. Groundwater is also available in the region, sometimes being alkaline and sometimes freshwater. In the region, two large rivers can be found: São Francisco and Parnaíba, whose waters have been used for irrigation purposes, since 1960. Nowadays, in the São Francisco Medium Valley, with the existence of appropriate soils for irrigation, there are several irrigation projects in the State of Pernambuco and Bahia. The government provide the infra-structure and the agricultural research needed for irrigated cultures, while the private sector participate actively, choosing the species to be cultivated, cultivation management and the logistic for distribution of produced foods. Additional researches are needed to reduce the water waste, the development of new plants adapted to semi-arid conditions, biological control of pests and integrated management of pests and diseases. Evaluation of agrochemicals in water, soil and plants produced for food are needed to establish indicators of sustainability for the irrigated agriculture. Great, medium and small farmers are engaged on irrigated agriculture. In the semi-arid region, there are 600,000 irrigated hectares changing to fruit and vegetable production for internal and external markets, as they have more high value and generate more revenue and employment. In all the projects, research was fundamental for the success.

Brazil is known as a country with high agricultural production, mainly in soybean, orange juice, beef cattle and tropical fruits based on very high technological improvements. But, considering all the Brazilian territory, new ways of production need to be found to get sustainability. It can be by the continuous innovation on intensive agriculture, but being more responsible in environmental protection and public health, trough the development of varieties and strains resistant to pests and diseases and adapted to specific environmental conditions, the use of non tillage systems, the integration of agriculture with livestock and forest, the quality certification with social and environmental criteria, traceability, etc. Another way is the development of new models of agriculture, like organics in its several techniques, the main characteristics being the replacement of the use of industrial based products by natural processes and products, along the process of production.

With the approval of the Water law in 1997, we have a new way to manage waters, in a participative way, trough the Water Basin Council, with the participation of all actors, as regulators, water owners, NGOs and so on. In this Law, there is a payment for water use, a reason to be more responsible in their use.