Chapter 2

Demands and opportunities for sustainable development

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Introduction

Recognizing the non-sustainability of using natural resources over the centuries became imperative when the term "development" still did not include the environmental consequences of all types of uses, among which were those related to food production in the so-called "rural environment." In another type of use of the physical space, small human groups attracted people in search of a sense of community and work, gave rise to villages, which were converted into cities, and also used natural resources after frequent misplanning, which led to river and atmosphere pollution, besides deforestation.

In the 20th century, due to some environmental disasters and the scholars' attention, the theme expanded beyond academic and philosophical realms. The concern of organized society with the effects of human activities on the environment has arisen due to the inattentive and uncontrolled use of natural resources. Several global initiatives were implemented, which resulted in *Rio-92* (also called *Earth Summit*), which embraced the term "sustainable development" in full.

Challenges for agricultural research

In agricultural research, the main challenges are clearly identifying problems and demands primarily of the rural society, which are increasingly influenced by and overlap with those of urban society. These demands must be responded to by well-structured teams technically prepared to approach each raised problem. Available resources may and shall be disputed by different projects, so as to reveal those that are more likely to deliver good results.

Currently, due to changes in communication and information access, demands increased exponentially, such as those included in Sustainable Development Goal 15 (SDG 15). Themes such as deforestation and restoration of degraded

forests, management of invasive alien species and strategies to protect species threatened with extinction are the targets.

This reduced scope of themes already reveals the risk of pulverized efforts. Additionally, one can observe that each technology targets a specific environment, out of which it must be tested.

Thus, careful planning regarding the approach to each problem, its scope and range is needed. Following changes in society and in its needs and adapting to new scenarios are also vital. It could be said that relating agricultural and forest products with water and soil shall be a continuous concern of research teams, as well as the consequent monitoring and search for mitigating solutions.

In search of indicators for the sustainable use of natural resources, some themes appear, such as the suitable use of water, soils, fauna, flora, and renewable energies on the planet. It is worth stressing that, in forest, all such themes are integrated (Oliveira; Oliveira, 2017).

For example, society is becoming increasingly aware of the importance of preservation and environmental restoration of river banks, steep slopes, and other permanent preservation areas provided in the environmental law (Figure 1) to regularly supply water to crops, livestock, and urban areas, to generate hydropower, among other uses.

However, the importance of soil conservation in sustainable agricultural production is still not well-recognized; thus, improving the joint action of programs on degraded land restoration and soil and water conservation in agricultural production is needed.

Biodiversity use

There are information gaps that restrain conservation actions of several species, mainly native species with economic potential, for which still there are not tools allowing its wide use. Additionally, the lack of research and development on promising native species has contributed to increased imports of potentially invasive species (for example, alien fishes and forages) for which technological packages are already available. The purpose is to simplify management and increase productivity, which results in problems for the conservation of native species.

Photo: Fabiano Bastos

Figure 1. Example of springs conservation: *vereda* ecosystem with *buriti* (*Mauritia flexuosa*) trees.

Degradation and soil conservation

Degraded lands can be considered those that, after having gone through some type of environmental impact, had considerable losses or even the complete loss of their mechanisms of natural recovery (that is, they have lower resilience) and may return or not to its original condition. So, to recover those areas, it is necessary to apply technologies allowing the restoration of their ecological functions, thus contributing to expedite natural regeneration processes and/or the soil capacity of vegetative production; depending on the degradation condition, this can take hundreds of years (Figure 2).

Among factors responsible for the sustainability of agricultural production systems, soil is considered one of the most important. This thin layer covering the land surface and that takes millions of years to be formed can be lost in a few years because of erosion or become unproductive depending on the use and management practices adopted. After the loss of the natural vegetation coverage, degradation can be worse due to erosion. Despite being a natural process, erosion

Photo: Luiz Henrique Magnante

Figure 2. Agricultural landscape with winter crops promoting coverage and soil conservation.

can become more intense due to the use of areas highly susceptible to erosion and/or improper agricultural practices. Therefore, sped-up erosion (provoked by anthropogenic action) can be considered one of the worse enemies of tropical agriculture, for it can lead to more than 100 ton/ha/year of soil loss, depending on the climate, soil class, use, and management system (Andrade, 2015).

Availability and use of water

Water availability and organized use are currently among the greatest concerns. Approaching those themes is expected not only in documents that organize the rationale and conclusions on the environmental impact of its use in agriculture, but also in expert meetings, such as the *8th Water Global Forum*, held in Brasilia in March, 2018. The other themes approached here shall be a priority for discussion in the *XXV World Congress of the International Union of Forest Research Organizations — IUFRO*, which will happen in Curitiba in 2019. Knowledge gaps and challenges regarding the reversion or mitigation of the improper use of natural resources must be a priority for experts and widely disclosed to demanding parties and potential beneficiaries.

References

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