

## Chapter 9

# Future advances and challenges

*Maria Sonia Lopes da Silva*

*Alexandre Matthiensen*

*Jorge Furquim Werneck Lima*

## Introduction

In 2015, world leaders gathered at the United Nations (UN) to formally adopt a new agenda for sustainable development, resulting in the [17 Sustainable Development Goals \(SDG\)](#) (United Nations, 2017a), which sought to define clearer and more pragmatic goals than those previously presented in the [8 Millennium Development Goals \(MDGs\)](#) (United Nations, 2010). The decisions taken there determined the global actions to end poverty, promote prosperity and well-being for all, protect the environment and address climate changes (United Nations, 2010).

Brazil, as a signatory, is committed to compose a planning agenda for the implementation of the SDGs. The methodology proposed by the UN and conducted by the Government Office of the Presidency of the Republic and the Ministry of Planning has been carried out in three stages, with negotiation and internalization. At the moment, the SDGs are being internalized in government institutions.

At Embrapa, the Working Group (GT) – SDG Network was created, which accomplished the alignment of the Plurianual Plan (PPA) with the SDG targets, beginning the structuring of several mechanisms for the internalization of these objectives. One of these mechanisms is the elaboration of these collaborative e-books, based on the survey of the effective contributions that Embrapa can provide for compliance with the SDGs. In this way, 17 books by Embrapa's team of researchers, analysts and managers, and an institutional book were prepared showing the contribution of Embrapa's technological solutions, based on the proposed 2030 Agenda for Sustainable Development (Nações Unidas, 2017b), whose areas of importance are: eradication of poverty and hunger; protection of the planet through sustainable production; prosperity through economic, social and technological/environmental progress; peace through the promotion of peaceful, just and inclusive societies, free from fear of violence; and establishing a partnership based on a spirit of global solidarity.

The book 6, entitled *Clean Water and Sanitation: contributions of Embrapa*, addresses technological solutions and research/studies on clean water and rural sanitation, developed by this institution over its 45 years. The knowledge generated, based on scientific studies, shows that it is possible to develop agriculture with the adequate use of soil and water, making it possible the integrated management of water resources. SDG 6 book provides society with technological solutions developed or adapted for different biomes, showing how to use and manage soil and water in crop production, animal husbandry and sanitation, with the aim of avoiding or minimizing their possible/potential impacts on the environment.

## Advances, opportunities and challenges

In recent years, in Brazil, water and sanitation management has been strengthened and has contributed to improving the quality of life and sustainable rural development. However, there are still challenges to be overcome with regard to regular and permanent access to water and sanitation, including rural areas. Brazil is one of the countries with the greatest water availability on the planet – approximately 18% of the fresh water flowing through the world's rivers. In order for the management of this social and environmental heritage to be adequate and sustainable, integration among governments, water users and organized civil society is a fundamental condition.

The major challenges regarding water in agricultural production relate to quantity and quality. In times of water crisis, the question of the rational use of water in productive processes is a mandatory agenda in any discussion forum. Faced with the current patterns of water availability and demand, the culture of waste must be replaced by another one of rationality and optimization of the use of such important resources as water, soil and biodiversity.

The theme on water can and must be worked on several fronts within a production system, but more than ever, these perspectives must be embedded in a river basin scale. Water concerns should begin in the source, in water catchment, storage and treatment, and in the design of productive physical structure in relation to local and regional availability of the resource. A correct quality monitoring plan should be addressed, as well as the conscious use of consumption levels, inside and outside the production areas and, where necessary, the stimulation of water reuse for less noble purposes.

Because it is an indispensable resource in any type of production, its quantity and quality are decisive in the performance of almost all economic activities

developed by man. Any waste can be translated as a “bad use”. The inclusion of a better use of a resource in the business agenda of an activity can generate profit or, at least, save expenses. Conserving water can be translated into reducing production costs. Recycling waste is transforming it into value-added product. However, it involves changes of attitude, not only by the government and sectors of industry and commerce, but by the entire society. The Reduction-Reuse-Recycling trinomial should increasingly be present in the water and its users’ agenda, and, of course, the agricultural sector can play a fundamental role in the implementation of these concepts, not only in rural areas, but also in relation to the externalities of urban environments.

The rational use of water in agricultural production should always seek to optimize the conversion of water quality into healthy products. This is one of the key points for the sustainability of the agricultural production chain. Despite the great technological advances in recent years, many opportunities for improvement still exist.

Water should be thought of in terms of watershed, not only property. It is very important to keep in mind that water is different, from property to property, depending on its origin, its region, the time of year, the existing infrastructures, the treatments available, storage and manipulation. And for all these steps there is technical and scientific knowledge for the best use of water resources, which guarantees that it is possible to minimize the impacts of any scenario of water crisis, whether caused by droughts or floods.

In some places in Brazil, low reservoir levels impose the need for new approaches to water use, since their lack affects much more than just the consumption of this resource. In a country where the energy base is hydroelectric generation, water is also critical to any energy-dependent process. These new approaches involve a greater appreciation of this resource, often not ideally accounted in economic activities. Therefore, it is necessary to advance water governance in Brazil, which demands political decisions, greater investments, mobilization and participation of society, efficiency in management, and also the development of research solutions for the optimization of financial and human resources, reduction of losses and reuse of water, treatment and disposal of effluents and effective methods for agri-environmental conservation, which directly reflect on water resources.

According to the UN World Water Development Report: Water for a Sustainable World (Water..., 2015), the interconnections between water and sustainable development go far beyond their social, economic and environmental dimensions. Human health, food and energy security, sanitation, urbanization and industrial

growth, as well as climate changes, are critical areas of challenge, where policies and actions of vital importance to sustainable development can be strengthened (or weakened) by means of water.

Persistence of poverty, unequal access to water supply and sanitation services, inadequate funding and poor information on water resources, their use and management, have imposed restrictions on the management of these resources and on the capacity to contribute to the achievement of sustainable development goals.

According to UN,

A major priority for the **Latin America and the Caribbean** region is to build the formal institutional capacity to manage water resources and bring sustainable integration of water resources management and use into socio-economic development and poverty reduction. Another priority is to ensure the full realization of the human right to water and sanitation in the context of the post-2015 development agenda. (Water..., 2015, p. 4, emphasis add).

As far as agricultural research is concerned, there are many Brazilian challenges for sustainable development, including the systematization of all knowledge generated, standardization and integration of methods, translation of knowledge into solutions to be directly appropriated by society, sufficient financial resources, approximation of scientists and decision makers, among others.

The countless opportunities for agricultural research, specifically for Embrapa, regarding the potential for participation in the improvement of integrated water resource management from its innumerable technological solutions, are undoubtedly a valuable support for Brazil to effectively contribute to the achievement of the future challenges imposed by SDG 6. To develop and implement projects, programs and activities aimed at the training of human resources for the management of water resources, within the framework of the Sistema Nacional de Gerenciamento de Recursos Hídricos (National Water Resources Management System – Singreh), is one of the ways to meet the challenges of the future. Embrapa participation in Singreh is a way of bringing the agricultural sector closer to the spheres of discussion and management of water resources, leading, above all, knowledge to the decision-making processes.

The Programa Nacional de Solos (National Soil Program – PronaSolos) is an opportunity to adapt a soil research structure to increase the knowledge level of Brazilian soils, aiming at the sustainable management of natural resources, especially soil and water. PronaSolos will provide an instrument for soil governance in the national territory, enabling public power and private initiative to contribute to Brazil's orderly and long-term agricultural development. With a network of institutions from all over the country, PronaSolos will provide soil maps on compatible scales for the elaboration of river basin management plans, many of which are responsible for the water supply to populations and productive sectors.

Finally, the Brazilian law on water resources has as one of its main premises the need for participation and articulation among the different agents that are directly related to the theme. Decentralized and participatory management is undoubtedly something extremely modern and relevant, especially in a country with the extension of Brazil, however difficult to implement. The society was called to participate in the water resources management process and, considering that knowledge is fundamental for the management of any good, resource or activity, Embrapa has been contributing and can contribute even more to the proper territorial and water resources management in the country or even in other continents, with technologies and studies that support the decision-making process, especially in cases where the issues are related to the rural environment. Participation in the system can also guide and motivate new projects and partnerships in the search for solutions to existing problems and the effective achievement of the goals established by SDG 6, with clean water and sanitation for all.

## References

NAÇÕES UNIDAS. **Água**. 2017a. Available at: <<https://unric.org/pt/agua/>>. Accessed on: Dec. 8, 2017.

NAÇÕES UNIDAS. **Agenda 2030 para o desenvolvimento sustentável**. 2017b. Available at: <<https://brasil.un.org/pt-br/91863-agenda-2030-para-o-desenvolvimento-sustentavel>>. Accessed on: Dec. 8, 2017.

UNITED NATIONS. **2010 UN Summit**. 2010. Available at: <<http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/2015-water-for-a-sustainable-world/>>. Accessed on: Dec. 8, 2017.

WATER for a sustainable world. Paris: Unesco, 2015. (The United Nations World Water Development report, 2015). Available at: <<http://unesdoc.unesco.org/images/0023/002318/231823E.pdf>>. Accessed on: Dec. 7, 2017.