

PARTNERSHIPS For the goals

CONTRIBUTIONS OF EMBRAPA

Susana Lena Lins de Góis Mariana de Aragão Pereira Paulo Eduardo de Melo Selma Cavalcanti Cruz de Holanda Tavares Patrícia Maria Drumond

Technical Editors





Brazilian Agricultural Research Corporation Ministry of Agriculture, Livestock and Food Supply



Sustainable Development Goal 17

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"Those who walk alone may arrive faster, but those who walk together will surely go further."

Clarice Lispector (our translation)

Foreword

Launched by the United Nations (UN) in 2015, 2030 Agenda for Sustainable Development is powerful and mobilizing. Its 17 goals and 169 targets seek to identify problems and overcome challenges that affect every country in the world. The Sustainable Development Goals (SDG), for their interdependent and indivisible character, clearly reflect the steps towards sustainability.

Reflecting and acting on this agenda is an obligation and an opportunity for the Brazilian Agricultural Research Corporation (Embrapa). The incessant search for sustainable agriculture is at the core of this institution dedicated to agricultural research and innovation. Moreover, sustainable agriculture is one of the most crosscutting themes of the 17 goals. This collection of books, one for each SDG, helps society realize the importance of agriculture and food in five priority dimensions – people, planet, prosperity, peace and partnerships –, the so-called 5 Ps of 2030 Agenda.

This collection is part of the effort to disseminate 2030 Agenda at Embrapa while presenting to the global society some contributions by Embrapa and partners with potential to affect the realities expressed in the SDG. Knowledge, practices, technologies, models, processes, and services that are already available can be used and replicated in other contexts to support the achievement of goals and the advancement of 2030 Agenda indicators.

The content presented is a sample of the solutions generated by agricultural research at Embrapa, although nothing that has been compiled in these books is the result of the work of a single institution. Many other partners joined in – universities, research institutes, state agricultural research organizations, rural technical and extension agencies, the Legislative Power, the agricultural and industrial productive sector, research promotion agencies, in the federal, state and municipal ranges.

This collection of books is the result of collaborative work within the SDG Embrapa Network, which comprised, for 6 months, around 400 people, among editors, authors, reviewers and support group. The objective of this initial work was to demonstrate, according to Embrapa, how agricultural research could contribute to achieve SDGs.

It is an example of collective production and a manner of acting that should become increasingly present in the life of organizations, in the relationships between public, private, and civil society. As such, this collection brings diverse views on the potential contributions to different objectives and their interfaces. This vision is not homogeneous; sometimes it can be conflicting, just as is society's vision about its problems and respective solutions, a wealth which is captured and reflected in the construction of 2030 Agenda.

These are only the first steps in the resolute trajectory that Embrapa and partner institutions draw towards the future we want.

Maurício Antônio Lopes President of Embrapa

Preface

The need to create partnerships and the difficulties to implement and consolidate inter-institutional, global and multilateral relations for promoting sustainable development are not exclusive to Brazil, nor are they particular to Brazilian agriculture. In fact, they affect, to a greater or lesser extent, all countries and sectors of economy and politics.

Because of that, and considering other worldwide relevant issues, such as hunger, poverty and healthcare, the United Nations (UN) has set 17 Sustainable Development Goals (SDG) in 2015.

The Brazilian Agricultural Research Corporation (Embrapa), an important organization in the Brazilian agricultural innovation system, has been widely contributing to pursue all SDGs proposed by the UN, and thus is helping Brazil to achieve these internationally accepted goals.

The Brazilian agricultural innovation system is complex and diverse, involving multiple parties with varied characteristics, interests and limitations. In spite of this complex diversity, the effort to reach sustainable rural development has been and is being pursued by these parties coming from different Brazilian rural production chains. The production sector, government, financial and scientific and technological institutions (S&T), universities, private companies, non-governmental organizations and organized civil society are part of this environment; all of them act to increase the Brazilian agricultural production capacity while reducing its environmental impacts and ensuring its sustainable intensification.

Similarly complex and challenging are structural problems, which involve the access of rural people to quality healthcare and education as well as wider issues, such as infrastructure for the transportation and storage of agricultural products, telecommunication networks, technical assistance and rural credit, and development and transfer of new technologies. Given these challenges, jointly cooperating and concentrating efforts, skills and resources are required to overcome barriers and achieve major results in order to enable sustainable development in rural areas. Partnerships in this context are an important means of producing change and have gained even greater support since 2004, after the Private-Public Partnerships Act (PPP) was issued by the Brazilian federal government.

This book aims to present and discuss some of the technological solutions and partnerships of Embrapa that contribute to pursuing SDG 17, which aims to

"strengthen the means of implementation and revitalize the global partnership for sustainable development". Of the 19 targets of SDG 17, seven are addressed in this book because they are closely related to the mission of Embrapa, namely: targets 17.6, 17.7, 17.8, 17.9, 17.11, 17.16 and 17.17.

Chapter 1 describes each of these targets and impacts of SDG 17 in the world, Brazil and Embrapa. This chapter also includes a brief background on SDGs (which followed the Millennium Development Goals - MDGs), particularly tracing the origin of SDG 17. Chapter 2 discusses the context, main challenges for establishing and maintaining global partnerships, spanning from biomes to people. The next three chapters present and discuss some contributions of Embrapa to meeting SDG 17 targets. Chapter 3 addresses capacity-building mechanisms for implementing sustainable development and involves contributions of Embrapa to targets 17.6. 17.7, 17.8 and 17.9. Chapter 4 discusses target 17.11. Examples of successful national and international partnerships are presented in Chapter 5, related to targets 17.16 and 17.17. Finally, Chapter 6 highlights the main advances, perspectives and future challenges related to SDG 17. It also reflects on lessons Embrapa learned after countless national and international partnerships and cooperation. It should be noted that this is not an exhaustive publication on the matter, but rather a presentation of the important work developed by Embrapa and its network of partners for the benefit of the Brazilian and world societies within the scope of SDG 17.

Technical Editors

Table of contents

Chapter 1

13 SDG 17 in the world, in Brazil and within Embrapa

Chapter 2

21 Challenges for establishing global partnerships: from biomes to people

Chapter 3

27 Mechanisms of capacity-building for implementing sustainable development

Chapter 4

41 Developing countries and increased exports: contexts and challenges

Chapter 5

49 Joining forces, gathering competencies: partnerships for sustainable development

Chapter 6

81 Partnerships and cooperation: lessons, challenges and perspectives of joint work

Chapter 1

SDG 17 in the world, in Brazil and within Embrapa

Mariana de Aragão Pereira Selma Cavalcanti Cruz de Holanda Tavares Susana Lena Lins de Góis

Introduction

This chapter addresses Sustainable Development Goal 17 (SDG 17) – Strengthen the means of implementation and revitalize the global partnership for sustainable development (United Nations, 2018) – in global and Brazilian contexts, and how it interfaces with the mission and programmes of the Brazilian Agricultural Research Corporation (Embrapa).

Amongst the 19 targets of this SDG, seven are strongly aligned with Embrapa initiatives included in the federal government's Multi-Annual Plan (MAP). These initiatives, described below, represent 40% of the commitments took on by the Brazilian government until 2030. For some of the 19 targets (United Nations, 2018), contributions are direct; for others, they rely on sector policies or effective state action:

- Target 17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation, and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism.
- Target 17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favorable terms, including on concessional and preferential terms, as mutually agreed.
- Target 17.8 Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017, and enhance the use of enabling technology, in particular information and communication technology.

- Target 17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all sustainable development goals, including through North-South, South-South and triangular cooperation.
- Target 17.11 Significantly increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020.
- Target 17.16 Enhance the global partnership for sustainable development, complemented by multisector partnerships that mobilize and share knowledge, expertise, technology and financial resources to support the achievement of the sustainable development goals in all countries, in particular developing countries.
- Target 17.17 Encourage and promote effective public, private-public and civil society partnerships, building on the experience and resourcing strategies of partnerships.

The clearly crosscutting nature of SDG 17 is reflected in the challenges for implementing and maintaining global partnerships for worldwide sustainable development, as discussed in <u>Chapter 2</u> of this book. Nonetheless, many global and national initiatives have been successful, particularly those led by the federal government (through its institutions), the private sector, non-governmental organizations (NGOs) and the organized civil society.

Among Brazilian state-owned companies, Embrapa stands out for the countless initiatives presented below. They reveal partnerships established globally, nationally and within Embrapa which contribute to pursuing SDG 17.

Background

In 2000, by signing the *Millennium Declaration* (United Nations, 2000), the United Nations (UN) country members established a global commitment to act collectively to ensure the planet's sustainable development, paying special attention to developing countries and economies in transition. The *Millennium Declaration* culminated in 2002 with the Millennium Campaign, which strived to respond to major world problems that had been discussed in international conferences in the 1990s, in particular the poverty, hunger and diseases impacting billions of people worldwide.

The *Millennium Declaration* was adopted by the 191 member states. Its eight Millennium Development Goals (MDGs) represented an international effort to reduce hunger and extreme poverty, provide quality basic education, promote gender equality and empower women, reduce child mortality, improve pregnant women's health, combat AIDS, malaria and other diseases, ensure life quality and respect for the environment, and establish partnerships for development. MDGs, thus, became a new platform for global development, focused on the least developed countries, and effectively reduced poverty and hunger worldwide over the 10 following years (United Nations, 2019).

In 2015, several countries renewed their commitment to UN's MDGs, and the set of goals was expanded to 17, now known as Sustainable Development Goals (SDG), making up the 2030 Agenda for Sustainable Development.

In this transition, MDG 8, which dealt with the "global partnership for development", was extended to cover the areas of finance, trade rules, communication and technology transfer, thus targeting the efforts of developed countries towards developing countries. In this new structure, MDG 8 became SDG 17, *Partnerships for the goals*, based on strategies to "strengthen the means of implementation [of other SDGs] and revitalize the global partnership for sustainable development" (United Nations, 2017).

The main objective of SDG 17 is, therefore, to act on the capacities, resources, means of communication and other processes of the countries involved in order to ensure that other SDGs are achieved, especially in developing countries or in countries under vulnerable conditions. It involves resources and technology transfer, capacity-building, fairer and more balanced trade rules, support for financially troubled countries, among other initiatives (United Nations, 2018).

The United Nations set 19 targets in order to monitor SDG 17, and divided them into the following categories: finance, technology, capacity-building, trade and systemic issues. These include institutional and policy coherence, multisector partnerships, data, monitoring and accountability.

World context

In the context of global finance, assistance for development reached USD 135 billion in 2014 due to global partnerships. In addition, 79% of exports from developing countries to developed countries were free of customs duties,

and average debts of developing countries remained stable at around 3% of total export earnings (United Nations, 2018).

Other improvements in developing countries' finances have also been observed (World Bank, 2017). Thirty six countries among the most indebted in the world were provided debt reliefs, as part of the Multilateral Debt Relief Initiative (MDRI). This enabled an increase (from 6.5% to 10.4% of their GDPs between 2001 and 2013) in funds available for investments in healthcare, education, rural infrastructure, among other areas.

Projects in information technology (IT) have also been given priority, especially by the World Bank, as it involves partner private companies to act in developing countries. Internet access, for example, doubled in African countries, and 30% of the world's youth are "digital natives", that is, they have been born in the digital age and are well able to use digital media and platforms.

In terms of agriculture and adaptation to climate change, the United Nations Food and Agriculture Organization (FAO) plays a leading role as it establishes global partnerships to reduce rural poverty, end hunger and promote sustainable agricultural production systems. Together with its public and private partners, the organization carries out several studies on rural communities, whose information is of great relevance for designing projects, identifying suitable technological solutions or formulating policies. In addition, FAO has a number of multi-stakeholder actions for the sustainable development of agriculture, especially in developing countries (FAO, 2018). For example, in Asia, a project for the integrated management of natural resources in saline and drought-prone regions stands out. In Africa, there are initiatives to develop irrigation systems to improve productivity and adapt to climate change in Central and Western regions of the continent; to stimulate the production of roots, tubers and horticulture; to make integrated soil nutrient management in the Eastern region of Africa; to make integrated pest management; and to analyze land and water management strategies in the context of a changing climate. Many of these initiatives will be addressed throughout this book.

Brazilian context

The United Nations Conference on Sustainable Development (Rio+20) held in 2012 in Brazil, 20 years after the United Nations Conference on Environment and Development (Eco-92), resulted in a renewed countries' commitment to sustainable

development. The decisions of this conference and subsequent discussions were essential for designing SDGs, built on the success and problems of MDGs that they replaced.

In 2016, the Comissão Nacional para os Objetivos de Desenvolvimento Sustentável (Brazilian Commission for Sustainable Development Goals) was created by Decree No. 8,892/2016, which endorsed the official participation of Brazil in the 2030 Agenda (Brasil, 2016). This meant that, within public institutions, the 2016-2019 MAP goals were linked to SDG 17 targets and indicators; thus they became a basis for governmental action planning, with impacts on federal, state and municipal levels. At the commission inauguration, a document was also signed and opened a new phase of the Projeto Brasil ODS 2030 (2030 SDG Brazil Project), which will handle around USD 18 million from state-owned partner companies and public development banks.

Various initiatives reveal the Brazilian federal government stance towards SDGs. The Projeto de Desenvolvimento de Capacidades, de Justiça Econômica Sustentável e Promoção de Boas Práticas para o Alcance dos Objetivos de Desenvolvimento do Milênio no Brasil (Project for Capacity Building, Sustainable Economic Justice and Good Practices for Achieving the Millennium Development Goals in Brazil) is an example of a partnership to promote sustainable development. It was supported by the United Nations Development Programme (UNDP), the Brazilian President's Office (SG/PR) and several state-owned companies, so that MDGs could reach municipalities. In addition to promoting capacity building of peer educators and building state, regional and municipal centers, this partnership enabled over 100 municipalities to receive the MDG Seal and more than 1,000 to register MDG related activities (Nações Unidas, 2016).

UNDP has been working with Brazilian state governments to strengthen the territorialization of SDGs and encourage local initiatives guided by the 2030 Agenda implementation (Programa das Nações Unidas para o Desenvolvimento, 2017). Several states have already adopted the SDG Brazil Network and the 2030 Agenda or are preparing to align their public policies with SDGs, including: São Paulo, Minas Gerais, Distrito Federal, Pará, Piauí, Ceará, Paraíba, Bahia and Paraná. Another example of the territorialization of SDGs is the SDG Universities Network, launched in 2017 to encourage education, research and extension activities throughout Brazil in compliance with the 2030 Agenda. Organizing a database with practices, studies, research results and innovation related to the theme is among its objectives. The Federal Court of Accounts also included monitoring

SDGs in thematic public audits, in response to a request from the UN through the International Organization of Supreme Audit Institutions (Intosai).

According to UNDP (Programa das Nações Unidas para o Desenvolvimento, 2017), the private sector participation is key to ensuring that SDGs implementation takes place in different spheres of activity. *Fórum Pacto Global (Global Pact Forum)*, held in São Paulo in 2016, aimed at promoting SDGs and ensuring private companies' participation. This important event created opportunities for private companies, governments, foundations, NGOs and educational institutions to discuss how SDGs could be incorporated into their operations and, thereby, contribute to Brazil's alignment with the 2030 Agenda. A UNDP-coordinated study showed that, of the 21 public and private companies surveyed (out of a total of 36 that make up the Comitê Brasileiro do Pacto Global – Brazilian Committee of the Global Pact), 41% have initiatives aligned with the 2030 Agenda, and 35% are making adjustments. Therefore, many challenges are still to be met before SDGs are consolidated as a platform for sustainable development in Brazil.

Embrapa context

Embrapa, whose vision is to "<u>be a world reference in the generation and supply</u> of information, knowledge and technologies, and thus contribute to innovation and sustainability of agriculture and to food security"¹, stands out as a major party in following the UN's 2030 Agenda, given that food and agriculture play a crucial role in meeting SDGs.

As analyzed by Embrapa, its five action axes and its Strategic Goals are strongly connected to SDGs, particularly SDG 17 (Figure 1), which is referred to in the five axes.

SDG 17 goals are included in operations by Embrapa Research Units in all biomes and several states of Brazil. Embrapa is also joined by its networks of private partners, universities, national or international governmental agencies. Countless cooperation agreements have been signed; they currently amount to 11,500 agreements and 120 technological cooperation agreements. In addition, Embrapa provides important inputs to public policy formulation and makes available, through various manners and means, its technological solutions and

¹ Available at: <https://www.embrapa.br/missao-visao-e-valores>.

strategic information for Brazilian agribusiness, such as the Ecological Economic Zoning and maps of the use and occupancy of the Brazilian territory.

In addition, the Social Report of Embrapa (Embrapa, 2017) annually highlights technologies that make significant economic, social and/or environmental contribution, thus returning Brazilian society's investment in science and technology. They result in increased productivity, reduced production costs and added value to Brazilian agriculture, thus generating employment and income for the population and foreign earnings for Brazil.



Figure 1. Five impact axes of the *Master Plan of Embrapa* aligned with the 17 Sustainable Development Goals.

Source: Embrapa (2017).

Final considerations

The contribution of Embrapa and its partners to developing knowledge, especially on tropical agriculture, not only makes Brazilian production viable, but also impacts production in Latin American and African countries. These are the countries to which technology transfer actions are directed, such as those carried out within Agricultural Innovation Marketplace (MKTPlace) and Building

on Successes of the Marketplace (M-BoSs), both of which are discussed in <u>Chapter 5</u> of this book.

As discussed in this chapter, the development of tropical agriculture, fostered by Embrapa, its network of partners and other stakeholders, is clearly an important development platform for Brazil and the world. It provides a crosscutting contribution for compliance with all 17 SDGs proposed by the UN.

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Chapter 2

Challenges for establishing global partnerships: from biomes to people

Patrícia Maria Drumond Erich Gomes Schaitza

Introduction

Global development is at a critical moment. Despite progress made, the multiple dimensions of poverty and inequalities still remain a major challenge in several regions. Slow and unequal economic growth, inadequate supply of food, water and energy, low educational levels, lack of adequate working conditions for all, and situations of conflict, fragility and vulnerability due to economic factors, natural disasters and pandemics are also reasons of concern worldwide. Associated with climate change and the increasing demand for shared use of natural resources, these issues become even more complex. In this context of uncertainty and diversity, partnerships promote converging efforts to create, among other objectives, more concrete, lasting and effective opportunities and results to foster socioeconomic transformations and an equal sustainable future for all (Global Partnership for Effective Development Co-operation, 2014).

Specifically in Brazil, a continental-sized country, landscapes in various biomes are enormously diverse. Its South American border countries share ecosystems with Brazil. Much is said, for example, of the similarities between the Brazilian Cerrado and the African Savannas, between the Brazilian Rainforests and the African and Asian ones. Intersections, however, go beyond biomes, and also involve people. Brazilians on the border are closely connected with their foreign neighbors, with whom they share ecosystems, problems, challenges and opportunities. Brazil also has a highly diverse population in terms of origins; a significant share descends from various peoples, who have cultural and affective bonds with their regions of origin.

In this chapter we discuss the organization of global partnerships and behavioral changes in international cooperation, moving from a cooperative environment based on camaraderie to a more formal and professional one.

Challenges

The creation of global partnerships for sustainable development has been discussed in different international fora promoted by the Organisation for Economic Co-operation and Development (2017), by the United Nations Economic and Social Council (2017) and the Global Partnership for Effective Development Co-operation (2017), among others. Implementing decisions made in these fora requires dealing with several particular issues and, in many cases, negotiations can last years before actions are taken and expected impacts are felt. It involves, for example, issues of intellectual property and benefit sharing, particularly if developing new products with business appeal is a possibility. In this case, more national regulatory mechanisms are frequently introduced. Such mechanisms, while useful in their country of origin, are not necessarily equivalent to or compatible with those in other countries. Suggestions to minimize these discrepancies include, for example, establishing an international minimum standard for using genetic resources and related traditional knowledge or performing third party audits to ensure compliance with national legislation: it would be a slow process, because each country has its jurisdiction and, consequently, its sovereignty (Souza, 2014). In this case, political will must be combined with sustainable development actions that depend on recognizing international rights (The global..., 2013; Crigger, 2017; Global Partnership for Effective Development Co-operation, 2017), especially in studies focused on the various biomes and their potentialities, as a starting point for understanding the global importance of ecosystems.

International partnerships do not ensure that negotiations are conducted on equal conditions, and may even lead to dependency between countries and opportunistic exploitation of resources by these partners. It can be more critical when negotiation involves countries in different development degrees. Thus, it is not enough to simply transfer knowledge and technology from the one who knows more, who does more, who has greater purchasing power. From the onset, negotiation should be participatory and involve all parties. This type of negotiation usually requires more time and financial support, and specific methodologies, so that cultural, social, environmental, economic and institutional differences can be adequately and democratically addressed (The global..., 2013; Souza, 2014; Global Partnership for Effective Development Co-operation, 2017). Additionally, the work of collegiate authorities in charge of social, economic and environmental public policies, particularly those involved in international agreements, must be adequate, effective and transparent (Relatório..., 2017). Many of them are under public administration and subject to political appointments of people that are

not always committed to improving society's quality of life and the common good (Souza, 2014).

In terms of knowledge and technology sharing, little progress has been made to integrate various existing bases. Results tend to be concentrated in scattered bases because there are no privacy and data usage policies to provide, maintain, develop, and protect information and its users. Furthermore, each country's economic and political situation can make data collection and integration difficult. In Brazil, for example, recent budget cuts and reduced operational capacity at the Brazilian Institute of Geography and Statistics (IBGE), in charge of censuses and economic indexes, certainly will jeopardize the main source of official data to evaluate progress on the goals outlined by the 2030 Agenda (Relatório..., 2017).

Differences between the partners regarding contributions and technical-scientific skills are also challenges in establishing global partnerships. Facing them requires enhancing professional skills and improving local institutions that will, at some point, be involved in designing, planning, enforcing and monitoring public policies aimed at the sustainable development of the planet (Souza, 2014; Global Partnership for Effective Development Co-operation, 2017; Relatório..., 2017).

Embrapa and its international partnerships

All these facts affect the Brazilian Agricultural Research Corporation (Embrapa) in establishing global partnerships. The simple, almost informal relationships in which groups of researchers with similar interests exchanged knowledge and genetic material not based on any legal framework have faded in this complex environment of benefit-sharing and intellectual property mechanisms.

Substantial investment in training researchers from Embrapa and the Sistema Nacional de Pesquisa Agropecuária (National Agricultural Research System) at universities around the world has been one of the driving forces of Brazil's agricultural development. Such investment returns were greatly enhanced as Embrapa researchers established formal and informal partnerships with the technical research staff of universities and research companies where they had been trained and as their former classmates and partners in laboratories and field experiments moved to prominent positions within the scientific community.

One can no longer bring foreign genetic material simply by collecting it with the support of the local scientific community and packing it in travelers' luggage or shipping it through international courier systems, without following legal

procedures. Sending abroad genetic material from Brazil has also become a complex process. The growing academic competitiveness and intellectual property mechanisms have also reduced the exchange of scientific knowledge and research data.

Therefore, the context changed from a simple and informal environment to a new one, under international agreement regulations in several areas and affected by knowledge economy competitiveness. This required Embrapa to take a corporative approach to cooperation: it hired professional experts on legal and international cooperation areas to join its research teams. Departments have been created to manage international cooperation, genetic heritage and intellectual property. The Agricultural Innovation Marketplace (MKTPlace) and Building on the Successes of the Marketplace (M-BoSs) cooperation platforms, presented in more detail in Chapter 5, emerged from this effort as mechanisms for promoting and organizing partnerships and for offering the support needed to overcome barriers of the new era. Embrapa has also launched a program to open offices and laboratories abroad as research interfaces with developed and developing countries.

Embrapa embraced the benefits of training its researchers abroad, but also realized that researchers from other countries could benefit from exchanging with Embrapa and its technical team. It paved the way for initiatives such as Embrapa Estudos e Capacitação (Cecat), a unit aimed at improving the skills of technical staff from developing countries. In that same vein, projects were organized by the Brazilian Cooperation Agency to send Embrapa researchers and technicians to partner countries to establish technical cooperation in varied areas.

Final considerations

This chapter covered different (such as regulatory, cultural, social, environmental, economic and institutional) aspects involved in establishing partnerships. As we move forward in the 21st century – a time when human activities are the primary causes of the planet's environmental and climatic changes (Waters et al., 2016) – all aspects (with no exception) become a part of the global sustainable development. Thus, partnerships must be able to reconcile individual and collective interests, even in highly competitive environments (Sullivan et al., 2018). From an institutional point of view, encouraging a greater connection between people, either by sending professionals abroad or by welcoming foreigners in Brazil or both, is highly recommended, despite the fact that international cooperation is currently much more regulated than in the 1980s and 1990s.

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Chapter 3

Mechanisms of capacity-building for implementing sustainable development

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Introduction

This chapter addresses Sustainable Development Goal 17 (SDG 17) targets more closely related with the mission of the Brazilian Agricultural Research Corporation (Embrapa). They will be connected with technological solutions that Embrapa has created or may come to create in order to help implementing sustainable development. SDG 17 targets (United Nations, 2018) related to this theme and that will be addressed here are:

- Target 17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation, and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism.
- Target 17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favorable terms, including on concessional and preferential terms, as mutually agreed.
- Target 17.8 Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017, and enhance the use of enabling technology, in particular information and communications technology.
- Target 17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation.

Specifically, the chapter addresses capacity-building mechanisms for implementing sustainable development. Based on the concept of "mechanism" in Physics (a set of rigid elements that move in relation to each other and that are linked together by different types of joints for the purpose of transmitting and/or transforming movements and forces), an analogy can be made: "cooperation" and "access to information" are the moving elements that make up the mechanisms of capacity-building, that is, they are key words for implementing sustainable development.

Cooperation and sharing for access to science, technology and innovation

Capacity-building in science, technology and innovation (ST&I) for sustainable development is related to several public policies which connect science and society and require citizens to act for the common good. Well-structured research, followed by capacity-building and communication for ST&I, are the grounds for sharing knowledge for the sake of environmental sustainability.

Nationwide, science popularization initiatives for the benefit of society should involve strategies to disseminate it among different social actors with a view to changing environmentally harmful actions. Thus, innovative forms of education and communication through capacity-building programs should be developed to empower the citizen, because sustainable development can only be achieved through social cohesion combined with environmental respect and economic growth as clear requirements for maintaining a given political and social structure.

Worldwide, cooperation is crucial in discussing a new international structure since the post-war period. In the 1945 Charter of the United Nations (United Nations, 1945, p. 3), of which Brazil is a signatory, the following is included among the principles of international cooperation:

> To achieve international cooperation in solving international problems of an economic, social, cultural or humanitarian character, and in promoting and encouraging respect for human rights and for fundamental freedoms for all without distinction as to race, sex, language, or religion.

International cooperation is, among other factors, made up of cooperation for international development, of international regimes in various sectors, and of international commitments and obligations of a State before other States, international organizations and civil society entities (Lima, 2016).

Speaking specifically of cooperation for international development, it is organized/ classified by the Brazilian Cooperation for International Development (Cobradi) into: scientific and technological cooperation; technical cooperation; educational cooperation; humanitarian cooperation; refugee support and protection; peacekeeping operations; and expenditures with international organizations.

According to the Brazilian Cooperation Agency (ABC) (Manual..., 2013), which is in charge of coordinating the Brazilian technical cooperation agenda, technical cooperation is focused on developing capacities, which involve identifying, mobilizing and expanding knowledge and skills available in the partner country with a view to enabling local autonomy for designing and implementing local solutions to face development challenges. Brazilian technical cooperation imposes no conditions and is driven by partner demands. It is always in tune with Brazilian foreign policy main lines of action, priority given to supporting countries' socioeconomic growth.

According to ABC, the characteristics of Brazilian South-South technical cooperation are adaptation of knowledge, emphasis on human resources capacity-building, use of local labor and project design taking peculiarities of each country into account. It is based on solidarity, which marks Brazil's relationship with other developing countries. It builds on the Brazilian constitutional principle of cooperation among peoples for the progress of humankind. And, finally, it relies on the relationship between governments, with respect for local culture and institutions. This type of cooperation is, therefore, understood as a horizontal exchange of knowledge and experiences from cooperating developing countries. The idea is to share lessons learned and successful practices available in Brazil that have been created and tested to face similar challenges with a view to promoting socioeconomic development.

South-South or trilateral cooperation activities offered by the Brazilian government do not depend on financial, economic or commercial advantages. Cooperation is required by developing countries, because Brazil's internal organizational structure and know-how in certain sectors enabled us to find our own solutions that can realistically help developing countries meet their own needs.

Within Embrapa, international activity is based on its <u>Statute</u> and Master Plan (Embrapa, 2015). Chapter III, article 5 of the Statute defines the goals of Embrapa international activities, among which the following stand out:

- Facilitating and accelerating solution to problems, search for opportunities and strengthening of Brazilian agriculture regarding international actions.
- Planning, guiding, promoting, conducting and supervising research and development, agricultural technology transfer and national talents encouragement activities to produce technological knowledge to strengthen Brazilian agriculture and that of developing countries.

In the Master Plan of Embrapa (Embrapa, 2015), Strategic Guideline 6, which is related to international action, establishes "Consolidating the international presence of Embrapa" as a premise. It essentially matches international cooperation for sharing and providing access to science technology in the following terms:

- Intensifying international cooperation for rapidly acquiring cutting-edge knowledge and technologies, and anticipating challenges, risks and trends for agricultural RD&I.
- Setting strategic agendas for scientific and technological cooperation that prioritize areas and themes, adequate professionals and preferred partners where Brazil already operates or intends to operate.
- Supporting the country's foreign policy by promoting synergic actions of interest to Brazilian agriculture.

It reveals that Embrapa has instruments to define and support international cooperation actions. How is it possible to put these goals into practice? Instruments for international, technical and scientific cooperation are described below.

International cooperation instruments of Embrapa

Over the years, Embrapa has developed several instruments for international cooperation organized in three main subareas: scientific cooperation, technical cooperation and support for global policies and public policies. The first two (technical and scientific cooperation) will be discussed below.

Instruments for scientific cooperation

The most relevant mechanisms that Embrapa uses in scientific cooperation when interacting with international institutions are the Visiting Scientists Program, the Embrapa Virtual Laboratory Abroad Program (Labex), co-funded projects and joint call programs. Each instrument and its peculiar characteristics should be

related to and help improve Embrapa research programs organized in portfolios and research arrangements, which reflect the priority themes for Embrapa.

The Visiting Scientists Program, a permanent initiative of the human resources department, primarily aims to increase researcher skills by developing human capital and adding value to the institution so that it can return investments as society expects. As required by the program, the researcher conducts highly relevant research studies, often at the frontier of knowledge, on a full-time basis for up to 1 year in an international institution. Historically, the program has been conducted by Embrapa from a capacity-building perspective. Although the learning component is present, this is an opportunity and a competitive advantage for inducing researcher-researcher cooperation, which goes beyond the teacher-student relationship. In this interaction, new ideas and strategies are discussed, including new long-term work plans.

Labex is a pioneering and outstanding initiative of Embrapa, which involves a long-term stay of a senior Brazilian researcher at an international world-class research institution and merges a set of actions planned (research, joint work and monitoring activities) that will have an impact on Embrapa activities. After 2 or 3 years, researchers are expected to return to Embrapa with their research results and improved network, thus bringing cutting-edge information of strategic relevance, and having developed joint research networks and encouraged new working groups in Embrapa, among others impacts.

Co-funded joint projects are a leading researchers initiative at Embrapa to develop international projects with foreign partners based on alternative funding (development agencies), not necessarily having a direct financial contribution from Embrapa. Therefore, these projects are an important research and development (R & D) initiative and cooperation instrument. Initiatives such as these allow external funding of Embrapa research programs, particularly from funding agencies such as the National Council for Scientific and Technological Development (CNPq) and Coordination for the Improvement of Higher Education Personnel (Capes), as well as state foundations such as the São Paulo Research Foundation (Fapesp), the Fundação de Amparo à Pesquisa do Estado de Minas Gerais (Minas Gerais Research Support Foundation – Fapemig), and the Fundação Araucária, among others. Research carried out is communicated and disseminated to promote change in the rural environment towards sustainability.

In the joint calls program (the so called bilateral calls), projects involve sharing data, material and people across country borders, but not funds. This instrument

does not necessarily require additional funds, as the projects may be already funded as originally established in the portfolio, with no transfer needed. Thus, the only item added to the portfolio is the foreign partner participation. In short, instead of being removed, an item is added ("doing more with the same resources"), and the participation of the international partner also ensures higher quality and efficiency. In order to allow joint calls, Embrapa and the international institution draw up an "internal call" under a formal agreement and encourage their researchers to be partners in designing a project (a single document) of common interest. The project is submitted to a joint evaluation committee focused on the respective research priorities (portfolios), with local funding.

One way of combining cooperation instruments and promoting joint corporate operation for international cooperation in Embrapa is by negotiating bilateral calls with Labex host institutions. It is also an opportunity to grant part of the Visiting Scientists Program scholarships and call the attention of leading researchers of international projects.

In the multilateral context, Embrapa maintains close collaboration with several agriculture and research organizations. An important interaction is that with the Consultative Group on International Agricultural Research (CGIAR) and its research centers, such as the International Center for Tropical Agriculture (CIAT), International Food Policy Research Institute (IFPRI), International Livestock Research Institute (ILRI) and others. CGIAR is a strategic partnership of countries, international and regional organizations and private foundations to support 15 international agricultural centers working with national agricultural research systems, civil society organizations and the private sector. It involves the agricultural sciences to reduce poverty, promote human well-being, encourage agricultural growth and protect the environment. CGIAR has 15 research programs (CRPs), one of which deals with existing germplasm banks in 11 international centers. The partnership takes place through participation in CGIAR Committee activities and scientific interaction with its centers. An example of partnership between Embrapa and CGIAR is the Alternatives for Slash and Burn Programme (ASB), developed since 2003. Through the Amazon Initiative consortium, it grouped all Embrapa Units in the Amazon region and international institutions working in forests in countries such as Peru, Colombia, Bolivia, Venezuela, Ecuador and CGIAR centers. In Latin America and the Caribbean, Embrapa joined the Programa Cooperativo para o Desenvolvimento Tecnológico Agroalimentar (Cooperative Program for Agro-Food Technological Development – Procis), which gathers organizations and research networks to jointly define agricultural research

priorities. Among programs within Procis, the Programa Cooperativo para o Desenvolvimento Tecnológico Agroalimentar do Cone Sul (Cooperative Program for the Development of Agricultural Technology in the Southern Cone – Procisur) and the Programa Cooperativo para o Desenvolvimento e Inovação Agrícola para os Trópicos Sul-Americanos (Cooperative Program for Agricultural Development and Innovation for the South American Tropics – Procitrópicos) deserve special mention because they aim to respond to technological demands of the Southern Common Market (Mercosur) member countries and of the bloc as a whole.

Procisur is a joint initiative of national agricultural research institutes of the Southern Cone, based in four-year-long cooperation agreements. It aims to promote cooperation among the institutes and between them and the Inter-American Institute for Cooperation on Agriculture (IICA) and other global parties involved in ST&I to improve productivity, competitiveness, natural resources sustainability, food security, rural development and social equity of regional agriculture. The work of Procisur is organized in strategic topics, based on regional platforms, joined by program members. Through the platforms, cooperation projects, exchange and joint strategic activities to support the program are developed. Embrapa actively participates in these platforms and in the Steering Committee.

Procitrópicos involves the national agricultural research institutes in the tropics. It integrates the efforts of member country institutions for scientific and technological development and innovation in tropical South American rural areas (Amazon, Savanna and Banks).

Instruments for technical cooperation

Technical cooperation activities of Embrapa cover four dimensions, according to the *Manual de gestão da cooperação técnica Sul-Sul* (Manual..., 2013, our translation):

- Individual dimension related to the development of human resources.
- Organizational dimension, related to the improvement of the organizational structure, human and technical resources, production and management processes.
- Inter-institutional dimension, which encompasses inter-institutional arrangements among organizations or groups of individuals that interact with the purpose of achieving shared goals or fulfilling a common task.

• Social or contextual dimension, which involves the set of contextual – political, social, economic, legal, material and financial – factors that shape the individual and collective action of a society.

ABC leads Brazil's technical cooperation actions. Therefore, operations of Embrapa in this area take place in close partnership with that institution. They are organized and implemented through four cooperation instruments, namely:

- Structuring projects, focused mainly on strengthening research institutions. In this category, the Pró-Savana projects in Mozambique and the Cotton-4 projects in Burkina Faso, Chad, Mali and Niger are undoubtedly two of the best examples of Brazilian technical cooperation.
- Specific technical support or short-term projects aimed at training, delivering genetic material, validating varieties and research methodologies. Numerous projects carried out over the years by Embrapa fall into this category, among them are the Institutional Support for the Togolese Institute of Agronomic Research (Itra) and two technical cooperation projects (TCP) implemented to support the beekeeping chain in countries belonging to the Caribbean Community (Caricom) and Central America. Other examples of ongoing TCP are the strengthening of the cashew chain in Ghana and Guinea-Bissau and the strengthening of the cotton sector in Argentina, Colombia, and Paraguay.
- Regional technological platforms (Africa-Brazil Platform for Agricultural Innovation and the Latin-America-Caribbean-Brazil Platform for Agricultural Innovation, included in the Agricultural Innovation Marketplace) to establish South-South partnerships to promote agricultural research and innovation for development through debates on public policies and collaborative projects funding.
- Training and capacity building in tropical agriculture. Good examples are courses conducted under the Third Country Training Programme of the Japan International Cooperation Agency (Jica). Over several years, together with ABC, Jica brought to Brazil participants from various parts of the world to learn at Embrapa about technologies for cassava production, vegetable production and post-harvest and agroforestry management, among other themes.

It is worth mentioning that the international cooperation projects carried out by Brazil resulted from the development policies of the countries involved. Therefore, they are based on parameters, standards and regimes agreed between the partners.
Capacity-building and communication for science, technology and innovation

Capacity-building in ST&I for sustainable development is closely associated with communication strategies to popularize science and is strongly based on various Brazilian public policies, managed by the Ministry of Science, Technology, Innovation and Communications (MCTIC). Supporting R&D activities for innovation and technology transfer for adequately using natural resources is part of society's efforts to promote sustainable development, which depends on ensuring the capacity-building of parties involved in the production process.

Socio-environmental responsibility is part of the values of Embrapa, which seeks technological solutions in return for society's investments in favor of the environment. Based on communication and education strategies in training events, Embrapa encourages the use of environmentally friendly technologies and, therefore, provides citizens with information that will lead them to play a major role in sustainable development by encouraging changes in attitudes towards the environment.

This knowledge exchange may take place in both formal and informal settings. While the former is restricted to university or even regular technical courses, the latter involves a wide range of either face-to-face or distance short and long-term courses. In addition, effective researcher-society communication methods also improved.

As Internet use increased, even in rural areas, information and communication technologies (ICTs) played an important role in ST&I popularization. ICTs can be defined as a set of integrated technological resources for a common goal. They are used in several areas, such as education, teaching-learning process and distance education (Pacievitch, 2018). Information is disseminated mainly through the media and information literacy (MIL) achieved by various audience segments, which include agricultural sector (extension agents and farmers), formal educational sector and common citizens. MIL is a set of skills – knowledge, abilities and attitudes – necessary for life and work based on converging all media and sources of information on a single platform. In terms of formal education, the main MIL concepts, skills and abilities that teachers need to develop were defined in a document prepared by the United Nations Educational, Scientific and Cultural Organization (Unesco) (Wilson et al., 2013).

Nowadays, online education systems have gained prominence because of their advantages for the teaching and learning process (Ribeiro; Schons, 2008) and, consequently, because of the real possibility of disseminating technologies. A concrete example is the use of internet technologies for online teaching, such as Web 2.0 tools. According to Torres and Souza (2011), Web 2.0 drives the formation of interactive, horizontal and collaborative social networks; leverages the creation and dissemination of knowledge and learning; and provides the means for developing new individual and collective skills, which favor exploring new concepts. It is a flexible and collaborative space for exchanging information and knowledge. Additionally, it is a communication tool for people to share, disseminate and construct new meanings, senses and knowledge and an instrument for continuous education because, as an interactive tool, it encourages people's critical and reflective capacity, new rationalities and behavioral pattern changes.

Education and communication initiatives are developed by means of capacity-building programs so that knowledge can be acquired and new rationalities about space to ensure sustainable development can be built (Torres et al., 2013). These initiatives make more information available and allow monitoring and planning actions for implementing SDGs. After education events end, capacity-building activities go on as they turn into collectively designed products, whose reception is later surveyed. The expected result is providing teachers and students with didactic and pedagogical resources as tools for improving the communication flow between research and society.

Capacity-building strategies for the popularization of socioenvironmental science

Communication experts point out that the dialogue between scientists and communicators is a major route to encourage media coverage on science and thus achieve science popularization. Initiatives can be thus divided: those that provide people with scientific information in language that suits their understanding and those that encourage scientists and improve their capacity for scientific dissemination. As an educational action, scientific dissemination is important because it promotes citizenship, since:

[...] the most important [concern] is to form a critical society, with thinking minds who have the necessary tools to act for the benefit of all. Inspiring the youth is a great beginning for us on the path to the greatest adventure among all: learning and practicing science. (Mattos-Costa, 2000, our translation). One of the initiatives is developing "educommunicative" practices for scientific dissemination. The term "educommunication" is a neologism coined by Unesco in the 1990s as a synonym for media education and refers to all actions designed to improve the education of children and young people with the help of the media. Educommunication is a field of social intervention for improving opportunities for educators, communicators and social agents to discuss social and environmental problems using technological resources and everyday language. It is based on two principles: producing and developing educational and communicative ecosystems based on group communication and audiovisual language (form); and organizing and disseminating information on social and environmental issues based on the purpose of science and its applicability in the common citizen everyday life and using plain language (content) (Soares, 2002). Making the necessary and critical transformation of educational and communicational practices applied to students and professionals is a legacy of Paulo Freire. Although he did not use this neologism, he spread the seeds of educommunication in Brazil by disseminating the idea of "world reading" in adult literacy, by which reading should not be mechanically memorized, but should be challenging in order to help students think and analyze the surrounding reality (Freire, 1988, p. 32).

In addition to educommunication, strategies for capacity-building of farmers and technicians include methodological procedures that have been developed and adopted long ago, ranging from traditional technical assistance and rural extension (Ater) methods to innovations introduced as adaptations to a context in which ICTs are widely used. Thus, there are great advantages in introducing ICTs in the rural productive process, including distance education and technical assistance (Silveira, 2003). In the current rural context, ICTs are a new communication format that enhances human cognition, collaboration among people, facilitation and management of workflows, and organization of joint activities (Torres et al., 2013). According to Torres et al. (2013, p. 1224, our translation), they "enable small farmers, who play major roles in this space, to learn from each other using these technologies as mediators".

Technological equipment for technological capacity-building in science, technology and innovation

Internet popularization has enhanced the use of ICTs in various fields. New communication and information systems have been created, forming a true network of resources that enables exchanging information and creating new

knowledge through the collaborative work of geographically distant professional teams. Training courses have been offered through distance education and capacity-building events hosted in digital platforms in several portals, such as:

- Courses offered by the Ministry of the Environment (MMA) on the Ambiente Virtual de Aprendizagem (Virtual Learning Environment – AVA) platform: Cadastro Ambiental Rural (Rural Environmental Registry – CAR) and Capacitação para o Programa de Educação Ambiental e Agricultura Familiar (Capacity-building for the Environmental Education and Family Agriculture Program – Peaaf), which is made up of a series of distance learning courses offered.
- Programa de Informação para Gestão de Ciência, Tecnologia e Inovação do Instituto Brasileiro de Informação em Ciência e Tecnologia (Information for Science, Technology and Innovation Management Program of the Brazilian Institute of Science and Technology Information – Prossiga), whose objective is to increase the availability, visibility, access and organization of priority information in the ST&I network.
- Initiatives of MCTIC: Portal do <u>Livro Aberto</u> (Open Book Portal), in which the Programa Tecnologias para Cidades Sustentáveis (Technologies for Sustainable Cities Program) (ST&I for social development) stands out to develop and disseminate technologies that contribute to making economically feasible, socially fair and environmentally sustainable cities.

Technological capacity-building at Embrapa

Several strategies are adopted by Embrapa for capacity-building on scientific dissemination. They range from creating and producing broadcast materials based on studies of environmental perception, videolessons and field days to developing distance learning courses either alone or in partnership with public or private institutions.

Among other initiatives, the technical cooperation agreement to strengthen rural technology transfer, signed in 2011, between Embrapa and the Serviço Nacional de Aprendizagem Rural (National Rural Apprenticeship Service – Senar) deserves mention. This agreement aims at making rural education universal through distance courses offered in the areas such as dairy farming, beef cattle breeding and integrated crop-livestock-forestry systems. Another example is the course on irrigation use and management named IrrigaWeb, available at the Embrapa

distance learning platform. The course on improving agroecological principles, developed by Embrapa, is another example in this universe of distance learning capacity-building, which is an additional tool for empowering rural extension agents for effectively promoting sustainable development.

In addition to using ICTs, a traditional communication channel remains relevant in rural areas: the radio. In 2004, Embrapa created the Prosa Rural (Rural Prose) Program as an instrument of scientific dissemination in order to bring Embrapa research results to the attention of young people and family agriculture farmers. Currently recognized as a social technology, the program is broadcasted throughout Brazil by over 1,000 stations, who have become partners and receive and transmit the programs free of charge. Also worthy of note is the Programa Dia de Campo na TV (Field Day on TV Program), which, since 1998, disseminates technologies developed by Embrapa and partners to a diverse audience including farmers, extension agents, teachers, students and entrepreneurs. Aired on a weekly basis, the program addresses a main theme in clear, technical and precise language, thus promoting technologies and sustainability in the rural environment.

Final considerations

In view of the several examples presented in this chapter, one can see that Embrapa has been acting within SDG 17 targets 17.6, 17.7 and 17.8, seeking to promote international cooperation for capacity-building, technology transfer and knowledge exchange both in Brazil and in developing countries. Making the vast bank of technological solutions of Embrapa available is one example of such cooperation. Nevertheless, there is much to be improved. The universalization of ST&I depends, among other things, on improving the educational standard of rural and urban populations, on training various parties in sustainable development and on improving the quality of scientific communication between society and research institutions.

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Chapter 4

Developing countries and increased exports: contexts and challenges

Vanessa da Fonseca Pereira Erich Gomes Schaitza

Introduction

This chapter presents reflections on how the partnerships of the Brazilian Agricultural Research Corporation (Embrapa) contribute to increasing the exports of developing countries. Therefore, it addresses initiatives in the context of target 17.11 – "significantly increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020" (United Nations, 2018), which is part of Sustainable Development Goal 17 (SDG 17).

Knowledge exchange and trade between countries are ways by which global partnerships lead to sustainable development. By expanding their export capacity, the least developed countries are taking further steps towards growth and development. This is because access to international markets leads to income and employment generation, whose multiplier effects impact the whole economy. Thus, if the grain sector of a least developed nation is able to export, for example, more people are hired in that sector; thus, their income enters and broadly moves the economy via consumption. Income from exports can also be used to increase domestic savings, which may result in greater investment capacity in the future. In addition, being a product supplier to international markets encourages countries to modernize their export sector in order to be more competitive in terms of quality and price. Lessons and technical progress come as a consequence of this modernization.

However, a least developed country that seeks to enter the international market by selling its products faces a number of difficulties. The first one is to produce surpluses, which does not always happen. Once this issue is overcome, exportable surpluses need to achieve competitive added value, quality and price standards. In addition, in the case of agricultural products, having storage and logistics infrastructures and skilled workforce, and overcoming specific international trade restrictions (such as tariff and non-tariff market barriers, and participation in international agreements) are required. Accessing technologies and knowledge is essential in this process and may be beneficial, especially because it leads to higher process efficiency, reduced production costs, improved product quality and higher workforce capacity. If these factors are not taken into account, entering in the international market becomes difficult, as currently seen in relation to the least developed countries.

Agricultural research and innovation institutions can help least developed countries improve their production systems and, thus, move towards achieving food security and poverty reduction while, at the same time, being able to export. In this context, Embrapa can contribute with over 2,500 technological solutions (among validated and qualified products, processes, services, methodologies, agricultural practices and systems) and with climate (ecosystems and agricultural practices similar to those of many least developed countries in tropical areas). Thus, it is clear that Embrapa has much to share in terms of technical cooperation. Just as Embrapa has contributed to transform Brazilian agriculture, it may help encourage a similar transformation in the least developed countries.

Contributions to increase the exports of least developed countries

Embrapa has been one of the main Brazilian parties in international cooperation in agriculture. After the rapid evolution of Brazilian agriculture, from the end of the 1990s, Brazil also began sharing knowledge through capacity-building programs for technicians from developing countries (especially Latin America and Portuguese-speaking countries of Africa) and through development support projects, coordinated by the Brazilian Cooperation Agency (ABC) of the Ministry of Foreign Affairs.

Since 1998, ABC has coordinated 352 projects in agriculture within the framework of South-South cooperation. These were technical cooperation projects to varying extents, some focused on capacity-building and technical visits, others on technology development, introduction of higher-quality genetic material or strengthening of production systems. Embrapa joined <u>190 of these projects</u> as the main Brazilian party. Most of these cooperation initiatives are based on the fact that these countries grow the same species as Brazil under similar soil and climate conditions, but with less structured production sectors and with low technological development.

In addition to projects demanded by Brazilian diplomatic commitments, Embrapa has opened cooperation offices in Venezuela, Panama (Embrapa Américas) and Ghana (Embrapa África) as part of its internationalization. These offices were designed as direct channels to contact national research and extension institutions and support the Brazilian diplomatic structure. In addition, scientific cooperation with countries of the South has also been strengthened over the last years.

In an important South-South cooperation action, Embrapa and a number of national and foreign partners established the Africa-Brazil Agricultural Innovation Marketplace (MKTPlace), through which African institutions observed their own demands and annually had the opportunity to present projects in cooperation with Embrapa Research Units. It was, thus, a completely horizontal process. Later, this platform was expanded to include Latin American and Caribbean countries. In 2016, the United Nations Office for South-South Cooperation (UNOSSC) recognized MKTPlace as one of the most effective cooperation strategies in the world. As a continuation of developing cooperative processes, a new phase for project support was started within MKTPlace in 2016: it was called Building on the Successes of the Marketplace (*M-BoSs*). <u>Chapter 5</u> of this book details MKTPlace and M-BoSs dynamics.

In this context, some initiatives have already started contributing to expand the exports of least developed countries and deserve mention. Two of them were performed within MKTPlace and, because of their positive results, were selected to be continued in M-BoSs. The first initiative deals with bee diversity and honey production for food security in Ethiopia; the second, with small farmers' increased production of cowpea in Ghana by using symbiotic nitrogen fixation.

As a partnership between Embrapa Acre and the University of Mekelle, in Ethiopia, the honey production project was run in two phases: the first between 2011 and 2013 and the second (lasting 3 years) from 2017 to 2019. According to the Agricultural Growth Program of Ethiopia, the role of beekeeping for sustainable development in different agro-ecological zones is widely recognized, as beekeeping is less affected by drought than other activities. There are approximately 1.5 million beekeepers in the country. In terms of honey production, Ethiopia ranks 1st among African countries and 10th among all countries in the world. In terms of exports, Ethiopia ranks 2nd in Africa and 46th in the world (FAO, 2013). The beekeeping sector is far from reaching its potential in the country, mainly due to the low level of technology, which reduces the competitiveness of Ethiopian honey.

The initiative undertaken jointly by the University of Mekelle and Embrapa allowed the molecular and morphological identification and characterization of bee species of the genus *Apis* kept in the apiaries and the physical-chemical and microbiological characterization of properties of honey produced by local beekeepers. Additionally, beekeeping Demonstration Units were installed, production capacities of queen bees were improved (Figure 1) and events to present, disseminate and discuss the results achieved were held. Advances were easily incorporated by beekeepers and continued to be passed on to other local producers. In its first phase, the project helped lay the foundations for a center of excellence in bee research in Ethiopia.

In its second phase, the project aims to promote a 20% increase in honey production in managed colonies and train 1,500 beekeepers and 17 professionals from partner institutions. Five Ethiopian professionals will be trained in beekeeping in Brazil. Together with the community and local institutions, the most productive colonies will be selected, multiplied and distributed. It is expected that trained beekeepers and improved local food security will positively influence other



Figure 1. Ethiopian beekeepers replicating techniques learned in capacity-building course jointly conducted by the University of Mekelle and Embrapa Acre.

beekeepers in Ethiopia, thus contributing to implement the National Agricultural Transformation Agenda currently in force in that country, which includes the development of domestic and export markets as one of its main goals.

The project for increasing cowpea yield in Ghana is an initiative carried out within MKTPlace and continued as part of M-BoSs and stands out for potentially contributing to expand least developed countries exports. The Embrapa team had developed a technology using an inoculant that resulted in significant production gains in Brazil's Northern and Northeastern regions. Then, Embrapa Agrobiology decided to introduce and encourage the use of this technology in northern Ghana (Figure 2). This is the most important region for the production of cereals (corn, millet, sorghum and cassava) and grain legumes (cowpea, peanuts, soybeans) in the country, but its degraded soils lack nutrients, which limits crop growth. The first phase of the project showed that good quality inoculants improve nodulation and increase grain yield by 30% to 50%. Based on this finding, the second phase aims to promote increased cowpea, peanut and soybean production by small farmers in northern Ghana through the use of locally produced high quality rhizobia inoculants along with strategic phosphorus applications. Peanuts and soybeans are crops with high potential for export.

The Cotton Sector Development Support in Cotton-4 Countries Project (also called Cotton-4) is a technical cooperation initiative of the Brazilian government, coordinated by ABC and implemented by Embrapa with a contribution from public research institutions in Benin, Burkina Faso, Chad and Mali. Held between March 2009 and December 2013, this has been one of the largest Brazilian technical cooperation projects. Its main objective was to contribute to increased competitiveness of the cotton production chain of the four partner African countries.

Cotton is a commercial crop that significantly impacts agricultural development and poverty reduction in West Africa. In Benin, Burkina Faso and Mali, cotton accounts for 30%, 80% and 85% of the total agricultural export value respectively, and the three countries are among the ten largest exporters in the world. In this context, Cotton-4 aimed to support the development of cotton crops in all four countries by increasing productivity, increasing genetic diversity and improving product quality. These benefits tend to affect competitiveness in the global cotton market because it is a sector with broad export potential. Among the main results, the following stand out: using and adapting Brazilian cultivars, advancing production potential under no-tillage experimental conditions, and training researchers, technicians and leading farmers in new cotton production technologies (Centro de Estudos e Articulação da Cooperação Sul-Sul, 2015).



Figures 2. Experimental cowpea production areas in Ghana.

46

Final considerations

Accessing technologies and knowledge can undeniably be a significant contribution to expanding the agricultural production capacity in the least developed countries and, thus, to producing exportable surpluses. However, increasing these countries share in world exports also requires a wide range of initiatives. In order to export, a competitive production is needed, and it depends on storage and logistics infrastructure, public policies and institutions jointly acting in favor of exports, in addition to internal conditions favorable to production (inputs, processes, costs and quality). Other important issues include opening up international markets, linking countries and signing international agreements.

Despite the limited potential of technological advances to boost exports, scientific and technological development can be a bridge for trade between two worlds by opening up opportunities for cooperation and commercial development in low per capita income countries. By establishing global partnerships, many possibilities for growth open up (such as exploring synchronized food production seasonality), so that, together, partners are able to supply consumer markets and even share export and marketing facilities in importing countries. This is the real case of cashew production, whose crop in Africa coincides with off-season in Brazil; or that of mango, whose harvesting season in Africa and Central America takes place when Brazil has no fruit to offer. Such actions result in joint wealth and food security. This is a tangible challenge, and Embrapa could greatly contribute to jointly advancing knowledge and sharing technologies so that products could reach similar quality and homogeneity levels, regardless of their geographical origin. Other parties would be needed to minimize bottlenecks in funding, negotiation, logistics and storage processes.

The experiences reported here and others show that Embrapa can share technologies and knowledge through technical cooperation, and can organize and coordinate actions. To this date, in partnership with dozens of institutions, Embrapa has contributed to developing and improving the agricultural production capacity of least developed countries by establishing bases for production, productivity gains and value added products. This action allows these countries to progress in a continuum that begins with poverty reduction and food security and reaches surplus production. These initiatives are examples of the potential of global partnerships for sustainable development.

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Chapter 5

Joining forces, gathering competencies: partnerships for sustainable development

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Introduction

Multisector partnerships are specially addressed in by the <u>Sustainable</u> <u>Development Goal (SDG) 17</u> for their potential to leverage development. Among its systemic issues, two targets are specifically aimed at establishing partnerships:

- Target 17.16 Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries.
- Target 17.17 Encourage and promote effective public, private-public, and civil society partnerships, building on the experience and resourcing strategies of partnerships.

Although they involve distinct specific themes, both targets are focused on gathering resources and sharing and using knowledge and experiences. If, on the one hand, resources are essential to perform any action, on the other hand, sharing and using stocks of knowledge and experiences will lead to a more effective journey towards achieving SDGs. It is not only a question of copying successful models of cooperation, but of using knowledge acquired in day-to-day partnerships to adapt good strategies to new demands and geographies. Where it is not possible, it is the case of going further: creating innovative models which include critical elements of previously successful experiences.

In this chapter, we present some multisector partnerships joined by the Brazilian Agricultural Research Corporation (Embrapa). We do not intend to list all partnerships Embrapa established, nor to describe their many and relevant results obtained, but to highlight some successful cooperation strategies. Thus, we intend to describe some paths and possibilities to inspire and encourage institutions similar to Embrapa.

Developing and sharing solutions in Brazil

A dynamic and competitive world, with complex challenges, requires players capable of thinking and acting comprehensively. Partnership, cooperation, and relationships are indispensable conditions for building the future by overcoming obstacles, and creating possibilities by means of projects, actions, and support for public policies, so as to make them more effective and make innovation systems more dynamic. It is not enough to produce knowledge; it is also necessary to manage relationships.

The State is fundamental to ensure an institutional environment conducive to risk-taking arrangements, in which public and private organizations can seek revolutionary innovations, especially in science and technology. Organizations must act jointly and have institutional mechanisms that enable innovations so as to overcome single state provision models in order to meet future challenges. Arrangements that favor partnerships and relationships, in an agile, reliable, and flexible institutional environment, are the key to providing the necessary conditions for innovation. Arrangements foster the establishment of multi-stakeholder institutional networks – including civil society and the private sector – in joint actions with intersectoral, intergovernmental, and State, market and civil society parties, which represents an essential advance in the quality of State action.

Embrapa has sought to reach out to external partners to enhance its prospecting and innovation processes when setting up strategies to accomplish its mission. Here are three partnership initiatives that have been achieving relevant results for innovation in agriculture.

The Organization of Brazilian Cooperatives and Embrapa

The Organization of Brazilian Cooperatives (OCB), the National Service of Cooperative Learning (Sescoop) and Embrapa signed a protocol of intentions with a 6-year term in April 2012, to join efforts to carry out cooperative-themed projects with agrarian science professionals (veterinarians, forestry engineers, agronomists, biologists, animal scientists, agricultural technicians, among others) linked to agricultural cooperatives. Several actions have been carried out, in particular:

- Studies and research of common interest to the three institutions.
- Continuous training of peer educators within the agricultural science staff linked to the cooperatives, particularly in the area of technological innovations, focused on monitoring, application, and impact of the adopted technologies.
- Implementation and adaptation of participatory methodologies to promote sustainable development.
- Prospecting and systematizing technological solutions demand and business opportunities for the cooperative sector.
- Implementation of joint communication actions for technology transfer.
- Encouraging the participation of cooperatives in the process of validating and adapting research-based innovative technologies and knowledge.

Some relevant results have already been obtained among the initiatives that have just been or that are about to be concluded, especially in terms of knowledge and technology exchange. Among them, the professional qualification of cooperative technicians in winter grain production chain (2016 and 2017 editions) and dairy cattle breeding (version 2017) stands out.

Rural community radio stations and Embrapa

Prosa Rural is a radio program produced in partnership between Embrapa and rural local community radio stations throughout Brazil. It is a tool for capacity-building

and social inclusion with global reach, especially for family farmers. The program presents technologies of proven sustainability, which can be used by farmers, and also tips on cultivation, environmental management and conservation, as well as useful information for the farming family. Prosa Rural is a 15-minute weekly radio program broadcast free of charge by community and commercial radio stations in the five geographical regions of Brazil. Programs are regionally tailored to meet small farmers local needs. Prosa Rural airs interviews with researchers, farmers' testimonials, culinary recipes, and tips on technologies and services, as well as songs, poetry, and short stories that value regional culture.

This technological solution was developed by Embrapa in partnership with other institutions and can be broadcasted to support capacity building, technology transfer, and knowledge sharing in several countries. In 2017, Prosa Rural gained more audience and visibility through the ProsaWeb radio that broadcasts the programs on the Internet using the Brazilian Network for Education and Research (RNP) platform, 24 hours a day, 7 days a week. Besides, the <u>Rede Nacional de Rádio</u> (National Radio Network) – which is part of Empresa Brasil de Comunicação (Brazilian Communication Company) – broadcasts Prosa Rural through its system, which gathers over 9 thousand stations.

Sebrae, UN Environment Programme and Embrapa

The purpose of this partnership was to support two crucial segments of the Brazilian economy: agriculture and small businesses. In line with the 2030 Agenda, it is aimed at fostering the development of innovative projects and technologies to strengthen agricultural production sustainable management, urgent efforts and measures related to climate change, sustainable water management, and promotion of innovative business opportunities (SDGs 6, 8, 9, 12 and 13).

The Brazilian Micro and Small Business Support Service (Sebrae), the United Nations Environment Programme (Unep) and Embrapa launched the first challenge of ideas and startups with sustainable solutions for the grain production chain at the event Agrotech Ecoinnovation Camp: Sustainability for the Grain Chain. It aimed to encourage the development of startups and potential entrepreneurs interested in solving problems or identifying opportunities to create socio-environmental improvements for the grain production chain. Solutions addressed issues such as carbon emission reduction, reduced losses and inefficiencies, waste management, efficient use of energy, controlled or reduced use of agrochemicals, efficient use of water resources, soil conservation, and collaborative solutions. The contest of ideas and startups took place from August 17th to 20th, 2017 in Londrina, state of Paraná. The audience included potential entrepreneurs in an initial stage, transforming ideas into businesses; as well as startups in a more advanced stage, adapting their solutions to the market based on interaction and mentoring with teams from the local innovation ecosystem, Embrapa, Unep and Sebrae. The direct connection among technicians, peer educators, potential entrepreneurs, and researchers fosters new partnerships between these key players in the innovation ecosystem and enhances the opportunity for entrepreneurship initiatives to be in line with SDGs.

ICLFS Fostering Network and Embrapa

The Integrated Crop-Livestock-Forest Systems (ICLFS) Fostering Network began in 2012 based on a public-private partnership involving Embrapa and the following companies: Cocamar, Dow AgroScience, John Deere, Parker and Syngenta. The network aims to encourage the sustainable intensification of Brazilian agriculture by promoting the adoption of ICLFS, so as to help Brazil to meet commitments made in international fora to reduce greenhouse gas emissions (GEG) without weakening its agricultural production. Domestically, the ICLFS Network promotes initiatives that meet the Sectoral Plan for Mitigation and Adaptation to Climate Change in Order to Consolidate a Low Carbon Emission Agriculture (ABC Plan). Since its creation, the network has promoted field days, courses, continuous training of technicians, lectures at national and international events, technical and informative publications (e.g., *Newsletter ICLFS*), among other actions. In addition, the network supports 107 Technological Reference Units (URTs), established throughout Brazil, which are monitored by 22 Embrapa Research Units. URTs are local partnerships between the network and farmers to validate, demonstrate, and adjust ICLFS to the Brazilian biomes. URTs are, therefore, relevant displays for farmers and technicians interested in learning "with the ones who adopt" ICLFS.

The partnership's success is already revealed by the exponential growth of ICLFS in Brazil in recent years, far exceeding the initially stipulated targets (4 million hectares by 2020). According to Kleffmann Group, there are already more than 11.5 million hectares using ICLFS throughout Brazil, particularly in the Midwestern region, which accounts for 39.5% of these systems (ILPF..., 2016).

The network governance in phase 1, completed in 2017, involved three decision-making levels: the General Assembly of Cooperators; the Managing Council; and the Foundation. The General Assembly was the board for strategic

decisions with equal participation of all cooperating companies. The Managing Council was working at the tactical-operational level and gathered four representatives elected by companies participating in the Network. In phase 2, which began in 2018, the governance structure will be redefined, as the ICLFS Network has just become the ICLFS Network Association. The association will welcome new public and private partners and it will also act abroad.

Developing solutions with the world

Embrapa has a long tradition of international cooperation and partnerships and was itself created to look at and be part of the world. This initial *modus operandi* remained and was broadened. Embrapa has mechanisms to encourage the partnership between its researchers and peers in other countries to produce collaborative solutions for common challenges. Two of these institutional mechanisms are Embrapa Virtual Laboratory Abroad Program (Labex) and joint calls with foreign institutions to support projects. Also worthy of note is the HarvestPlus project, an international effort to develop technological solutions to fight malnutrition that operates in Brazil and other countries. Finally, it is worth highlighting strategies based on foreign funds to develop solutions for Brazil, such as the Bem Diverso Project and the Projeto Integrado para a Produção e Manejo Sustentável do Bioma Amazônia (Integrated Project for the Sustainable Production and Management of the Amazon Biome).

Embrapa Virtual Laboratory Abroad Program

The Embrapa Virtual Laboratory Abroad Program (Labex) was conceived in the 1990s as a mechanism for international scientific cooperation, with the primary objective of being a channel for scientific interaction with cutting-edge organizations and groups on topics at the frontier of knowledge. This mechanism strengthens Embrapa research, development, and innovation programs, thus contributing to create technologies and solutions for agricultural production chains in Brazil.

The cooperation happens through the interaction between senior researchers from Embrapa and from their partner institution to jointly develop scientific activities. To support these activities, the concept of a virtual laboratory is relevant to enable research teams of the cooperating institutions to share space and infrastructure. It is interesting to note that this mechanism allows both Embrapa researchers to come to foreign institutions and counterpart researchers to come to Embrapa.

Since the program started, in 1998, 47 Embrapa researchers were selected to carry out research projects and scientific activities in cutting-edge groups located in the United States, Europe, and Asia, covering more than 15 research areas, with nanotechnology, biotechnology, genetic resources, agro-food technologies, and natural resource management standing out.

The establishment, support, or strengthening of multidisciplinary and interinstitutional research networks are among the main developments expected from the Embrapa-Labex Program. These research networks are expected to develop even further after researchers return to their home institutes. Some examples of these developments are the International Consortium on Advanced Biology (Ciba) and the joint calls in partnership with institutions that have welcomed Labex researchers.

Joint calls

One of the strategies used by Embrapa to cooperate and establish international partnerships are joint calls to support research, development, and innovation (RD&I) projects. Joint calls start by identifying shared interests among Embrapa and partners abroad and can involve either partners with whom there is already some collaboration, such as the Instituto Nacional de Tecnología Agropecuaria (National Institute of Agricultural Technology – Inta), from Argentina, or Agropolis Fondation, from France; or with new partners, such as UK's Biotechnology and Biological Sciences Research Council (BBSRC). In the latter case, the interaction between teams that had no prior history of collaboration was encouraged by a specific call (Newton Fund Call), which allowed the development of robust joint projects, later submitted to the main call.

The technical scope of each call, that is, the research themes included, are based on the interests of the partners. In the case of Embrapa, the joint calls cover topics defined in institutional documents such as the 2014-2034 Vision Document (Embrapa, 2014) and the Embrapa Master Plan (Embrapa, 2015). Joint calls are ruled by technical cooperation agreements between Embrapa and the international partner, and each approved project is ruled by a specific agreement between the executing institutions. The submitted proposals are generally assessed in two phases. In the first, each institution internally assesses the technical and strategic merits. In the second phase,

a binational committee meets to jointly decide which proposals should be approved. The partner institutions coordinate the joint calls. Each institution manages, monitors, and assesses their respective actions in the project. Each partner delivers funds needed to carry out the activities under its responsibility, and shares human resources, biological material, data, and information.

Joint calls with Inta, Agropolis Fondation and BBSRC involved approximately USD 6 million. The 22 projects supported by these calls address diverse themes, such as genetic tools and efficiency of biofuel production (Inta/Embrapa); biotechnology, pest control and genetic control of relevant plant characteristics (Agropolis/Embrapa); and risk prediction, genetic sequencing technologies and disease control (BBSRC/Embrapa).

Biofortification, HarvestPlus and BioFORT Network

An estimated 2 billion people suffer the effects of micronutrient deficiency because they lack the means to eat protein, fruits, and vegetables in the required amounts. Developing countries have achieved results in fighting malnutrition by providing vitamin and mineral supplements for pregnant women and children and by adding these nutrients to food. However, there are limits to providing commercial supplements and fortifying foods. Also, supplementation depends on extensive healthcare systems, rarely found in developing countries. Likewise, fortified foods do not reach a large part of the target population due to insufficient market infrastructure. Thus, new approaches are needed to complement these actions. Biofortified foods is one option. It consists on food with higher contents of minerals and vitamins produced by improved cultivars. This strategy complements existing nutrition initiatives and provides a sustainable and low-cost way to reach populations with limited access to formal healthcare and market systems. The HarvestPlus project was created in 2003 to meet this demand.

The first phase of the project was completed in 2009 and was followed by the second (2009-2013) and third phases (2014-2018). HarvestPlus relies on an alliance of institutions coordinated by the International Food Policy Research Institute (IFPRI) and the International Center for Tropical Agriculture (Ciat). It is funded, among others, by the Bill & Melinda Gates Foundation, the UK Department for International Development (DFID), the United States Agency for International Development (Usaid), the Canadian International Development Agency (Cida), and the World Bank. HarvestPlus is linked to the Consultative Group on International Agricultural Research (CGIAR), a multilateral organization of the United Nations.

In Brazil, the objectives are to obtain biofortified agricultural products and assess their potential nutritional, economic, and social impact. A steering committee (SC) made up of those responsible for the action plans manages the project and its internal and external communication plans. The project leader chairs the SC. From its inception to today, HarvestPlus has mobilized about USD 5 million in financial resources.

Since 2012, Embrapa has been coordinating the biofortification activities in Latin America and the Caribbean, with 50,000 beneficiaries in Bolivia, Colombia, El Salvador, Guatemala, Haiti, Honduras, Nicaragua, and Panama. In Brazil, the project gathers more than 200 people among researchers, agricultural and rural extension agents, nutritionists, doctors and economists, among other professionals, distributed in 15 research units of Embrapa, 10 universities, 1 state research institute, state and municipal agencies, and non-governmental organizations (NGOs), as well as international partners, all in support of the <u>BioFORT Network</u>.

BioFORT is responsible for the biofortification of basic foods such as squash, rice, sweet potato (Figure 1), cowpea (Figure 2), beans, cassava, corn (Figure 3),



Figure 1. Appearance of the pulp of a biofortified sweet potato cultivar, with high beta-carotene concentration.

Photo: Tarcila Viana



Figure 2. Biofortified cowpea soon after harvest.



Figure 3. Presentation of biofortified products, with BRS 4104 corn cultivar in the foreground.

and wheat. The network has a comprehensive and broad scope and needs a coordination capable enough of encouraging farmers to apply this knowledge. Therefore, it will succeed in expanding the production and supply of biofortified foods, improving its presence in the daily diet of populations with deep nutritional deficiencies. BioFORT activities are funded by public sources: Embrapa, the National Council for Scientific and Technological Development (CNPq), and the Programa Nacional de Formação e Empregabilidade (National Training and Employability Program – Pronafe) and Redes Nacionais de Pesquisa em Agrobiodiversidade e Sustentabilidade Agropecuária (National Networks of Research in Agrobiodiversity and Agricultural Sustainability – Repensa). As a result, it reached an estimated value of BRL 17.5 million. Since 2017, the government of the state of Maranhão has been contributing with an amount that, until 2019, will have reached BRL 3 million to strengthen family agriculture in the state through transference of technology involving biofortified crops.

Results obtained so far confirmed the potential impact of biofortification and the need for continued efforts. Eleven cultivars with higher levels of iron, zinc, or beta-carotene in foods such as sweet potatoes, cowpea, beans, cassava, and corn have already been recommended within biofortification projects. In partnership with universities, (in vitro and in vivo) retention and bioavailability of iron were assessed in the recommended cowpea and beans cultivars. Studies on retention and bioaccessibility of provitamin A in the recommended sweet potato, cassava, and corn cultivars; and retention of carotenoids in bakery products and pasta, have also been conducted. About 200 field days were held covering not only the cropping technology but also the use of biofortified products (Figure 4); 1,500 media spots, and 120 demonstration units were implemented. To date, around 20,000 Brazilian beneficiaries have received or tested biofortified crops.

Bem Diverso Project

The <u>Bem Diverso Project</u> general objective is to promote biodiversity conservation through its sustainable use, while its specific objectives are contributing to the development of the territories where it operates and providing input for public policies for the sustainable use and conservation of both the biodiversity and environmental services. The project covers the Amazon, Caatinga, and Cerrado territories, in multi-use landscapes that are important in terms of biodiversity conservation. It works directly on developing and adapting technologies for agro-extractivist communities, improving forest production and agroforestry



Figure 4. Preparation of food with biofortified products in a BioFORT Network field day.

systems, developing local capacities, obtaining data and information on agro-extractive production economy, and providing access to markets and credit. The project develops context-sensitive solutions blending scientific and traditional knowledge, and provides capacity-building for the next generation as a strategy to keep the youth in the field, improve the quality of life and encourage sustainable development.

Bem Diverso is a partnership between Embrapa and the United Nations Development Program (UNDP) and has received USD 6 million from the Global Environment Facility (GEF). The project is carried out by partners distributed in 12 units of Embrapa, and in several federal, state, district and municipal governmental institutions, Brazilian and foreign universities, NGOs and organizations based in the territories, such as agricultural family schools, rural unions, and farmers' cooperatives and associations.

The project has strengthened the capacity of over 1,000 technicians, students, and agro-extractivism farmers in the Amazon, Caatinga, and Cerrado since its beginning, in 2016. Initiatives were based on the use of techniques and tools for biodiversity conservation and sustainable use, including management of

assai and licuri palm plantations; proper sanitary practices in processing assai; the management of agroforestry systems; and the restoration of biodiversity and environmental services (springs and hydrographic basins), among others. It also implemented demonstration units for capacity-building in management and restoration of biodiversity and environmental services. Bem Diverso defined sustainable levels of fruit harvesting and the impact of land use on the conservation of fruit tree populations in the Cerrado in order to establish good practice standards for the sustainable management and conservation of species harvested by agro-extractivist farmers. The productive potential of the main socio-biodiversity species was determined in a federal biodiversity conservation unit in order to encourage the sustainable use of the resources exploited by traditional communities.

Sustainable production and management of the Amazon biome

The Projeto Integrado para a Produção e Manejo Sustentável do Bioma Amazônia (Integrated Project for the Sustainable Production and Management of the Amazon Biome) is aimed at creating and disseminating knowledge and technologies for recovery, conservation, and sustainable use of the biome. It allows Embrapa to contribute directly to achieve the targets Brazil has committed to under the United Nations Framework Convention on Climate Change (UNFCCC). The project falls within the context of the intended nationally determined contribution (iNDC), which includes long-term targets (2025 and 2030) on climate change, reduction of deforestation in the Amazon biome and encouragement to natural resources sustainable use. Brazil's effort towards achieving the targets has been internationally recognized. The project, included in the global agenda, has received funds from the Amazon Fund amounting to BRL 30 million.

The Fund is operated through funds raised from voluntary donations. Norway's government has been the primary donor (98%), but the fund has also received resources from the German government through KfW Entwicklungsbank. The management of the Amazon Fund is carried out by the Brazilian Development Bank (BNDES) and funding depends on proof of reduced carbon emissions from deforestation. Once the effective reduction is attested, BNDES is authorized to raise donations and issue recognition certificates to the donors' contribution to the Fund.

The project for the sustainable management of the Amazon biome involves an extensive network of partners in almost 20 Embrapa Research Units and in public and private institutions located in the various areas covered by the project. In addition to Embrapa, higher education institutions, state research institutes, other federal, state and municipal governmental institutions, public and private rural extension agencies, cooperatives, and farmer federations participate in the project. The project has just begun and will use learning and technological reference units as tools for knowledge sharing. These units are meant to encourage exchange and interaction between the scientific and the local knowledge involved in the production and sustainable management of environmental resources.

Sharing solutions with the world

It is important to highlight the progress that Brazilian agriculture experienced in the last decades, becoming more efficient and seeking to be increasingly more competitive and more sustainable. Much of the knowledge produced in Brazil to foster and support agriculture is undoubtedly useful to other nations, especially in the Tropics, to achieve SDGs, and Brazil has not refrained from playing this role. Embrapa has been an important operational party of the Brazilian international technical cooperation by not only sharing technologies, but also supporting countries in locally adapting solutions and developing their own solutions. Some strategies that allow Embrapa to contribute to Brazilian technical cooperation are presented below.

Technical cooperation projects

Technical cooperation projects (PCTs) are among the main operational instruments of Brazilian international cooperation for development. Coordinated by the Brazilian Cooperation Agency (ABC) of the Ministry of Foreign Affairs, PCTs usually follow a dynamic and fluid process, from design to signature. ABC receives requests for cooperation in specific areas from friend countries or international organizations, analyzes the demand and verifies if cooperation agreements support them. If the demand is accepted, the project proposal is prepared together with the executing institutions.

The Institute for Applied Economic Research (Ipea), in partnership with ABC, published in 2016 a new report on the Brazilian cooperation for international development (Cobradi), presenting data from international cooperation led by the federal government between 2011 and 2013 (Cooperação..., 2016). The report is based on information collected in 95 different governmental institutions and shows that Brazilian cooperation was present in all continents, with operations

in more than 150 countries and expenditures of approximately BRL 2.8 billion; expenses on international organizations stand out.

<u>ABC Projects'</u> database indicates that Embrapa participated or participates in more than 300 completed or ongoing PCTs. From 2011 to 2013, Embrapa was the second institution that most contributed to Brazilian technical cooperation (Cooperação..., 2016). By December 2017, Embrapa was taking part in 31 PCTs and isolated activities in partnership with ABC (covering negotiation and execution), which involved 29 Embrapa Central and Decentralized Units. These actions are carried out in countries of Central and South America, Africa, and Oceania, and deal with varied products and services, such as beekeeping, rice, vegetables, forests, forages and pastures, tropical and temperate fruits, cassava, dairy cattle, and soy. PCT themes range from integrated production systems and acid soil management to climatic zoning and food safety. Some are focused on capacity-building, but most address adaptation and transference of technology.

An example of an ongoing Embrapa PCT is the Institutional Support for the Togolese Institute of Agronomic Research (Itra) Project. Implemented by Embrapa Cassava and Fruits, this PCT was recently finished. It aimed at supporting the policy of agricultural modernization in Togo and assisting Itra in promoting rural development and employment and income generation. Concrete results were achieved in training technicians in cassava production and processing and in introducing new cultivars for testing in Togo. A new phase of the project is under discussion by the Brazilian and Togolese sides.

Another example of Embrapa PCT is the support for the beekeeping chain in the Caribbean Community (Caricom) and Central America countries. The first PCT involved welcoming Trinidad and Tobago technicians in Brazil for a visit, led by a local farmer (Figure 5) to learn about the Brazilian beekeeping reality and evaluate the possibility of using the experience to remedy technological and non-technological bottlenecks that interfere with the development of beekeeping in their home country. One of these bottlenecks is the need to attest to the quality of the honey produced. Following this first experience, demands came from El Salvador and Honduras. In the case of El Salvador, technicians came from the Centro Nacional de Tecnología Agropecuaria y Forestal "Enrique Álvarez Córdova" (National Center for Agricultural and Forestry Technology "Enrique Álvarez Córdova" – Centa), a research and extension agency linked to the Salvadorean Ministry of Agriculture and Livestock (Figure 6). In the case of Honduras (Figure 7), activities were carried out within the Brazil-Honduras-United States trilateral project (Figure 8), with the participation of technicians from the Dirección



Figure 5. Technical visit of the Trinidad and Tobago mission to the beekeepers cooperative of Simplício Mendes Microregion (Coomapi) in Simplício Mendes, state of Piauí.



Figure 6. Training of Salvadorean technicians in the analysis of quality control in honey at Embrapa laboratories in Teresina, state of Piauí.

64



Figure 7. Training of Honduran technician in selecting and rearing queen bees.



Figure 8. Brazil-Honduras-United States trilateral technical cooperation project: Unit for Validation and Training in Renewable Energy, Food Security, and Nutrition. Beekeeping Module. Nacaome, Honduras.

de Ciencia y Tecnología Agropecuaria (Dicta) on the Honduran side, and the University of Florida on the American side.

Several Embrapa Research Units gathered their expertise in distinct fields specifically for this Trilateral PCT. This enabled local capacity strengthening through validation and training units in renewable energy, food security and nutrition, in connection with the themes of nutrition, beekeeping, cashew and sesame crop technology, family farming and the use of earthworms.

The USA-Brazil Cotton dispute

Embrapa is involved in implementing five technical cooperation projects on cotton in the African countries of the Cotton-4 Project (Benin, Burkina Faso, Chad, and Mali), in Togo and in the Shire and Zambezi Rivers Basin, as well as in South America. All these projects are results of Brazil's successful cotton dispute in the World Trade Organization (WTO), according to dispute settlement WT/DS267. Compensation agreements signed by Brazil and the United States in 2010 and 2014 established that 10% of the funds paid by the United States to Brazil would go to technical cooperation projects in Africa, in member countries and associates of the Southern Common Market (Mercosur) and in Haiti. After the dispute was finally settled in 2014, these 10% for technical cooperation amounted to about USD 80 million. Funds are managed by the Instituto Brasileiro do Algodão (Brazilian Cotton Institute – IBA), leaving ABC to supervise international technical cooperation activities. The cotton dispute stands out as an innovative and important instrument due to two factors: it was the first time that a developing country won a WTO case against a developed country; and two Brazilian foreign policy agendas (trade and international cooperation), traditionally handled separately, were dealt with in interaction with one another.

Within the scope of the cotton dispute beneficiaries, two projects conducted in West Africa stand out: the Cotton Sector Development Support in Cotton-4 Countries (Benin, Burkina Faso, Chad and Mali) Project, or simply Cotton-4 (2009-2013), which, in the first 3 years, was also funded by ABC's budget resources; and the Technological Strengthening and Dissemination of Good Agricultural Practices for Cotton in Cotton-4 Countries and Togo (2014-2018), which, unlike the first project, is fully funded by IBA resources, except for Embrapa technical staff hours. Both projects respond to demands from the five African countries. The first project, finished in 2013, involved the on-site presence of an Embrapa technical coordinator throughout the project, and was implemented in partnership with the Institut National des Recherches Agricoles du Bénin (in our translation, National Institute of Agricultural Research of Benin - Inrab), the Institut de l'Environnement et de Recherches Agricoles (in our translation, Environment and Agricultural Research Institute – Inera) of Burkina Faso, the Institut Tchadien de Recherche Agricole pour le Développement (in our translation, Chadian Institute of Agronomic Research for Development – Itrad) and the Institut d'Economie Rurale (in our translation, Institute of Rural Economy - IER) of Mali. The collaboration started in 2009 and focused on strengthening local capacities, training people and sharing experiences based on the adaptation of Brazilian technologies. Cotton-4 three technological pillars – cotton genetic breeding, development of integrated pest management, and introduction of the no-tillage system – were the foundations for implementing horizontality, one of the basic principles of Brazilian technical cooperation. During its 4 years, the Cotton-4 project updated the Sotuba research station in Mali, providing laboratory and administrative infrastructure for its activities; introduced 10 Brazilian cotton cultivars; carried out collaborative trials based on the three pillars already mentioned; carried out 22 training courses in Brazil and in partner countries for researchers and extension agents; and released, together with partner institutions, 3 manuals on good agricultural practices and five technical reports.

Because of the successful cooperation strategy within Cotton-4 Project and the positive consequences of the cotton dispute, other countries demanded Brazilian cooperation for cotton farming, and Embrapa was once again called to contribute. These were the cases of the Regional Project to Strengthen the Cotton Sector in the Shire-Zambeze Basin (also known as Cotton Shire-Zambeze), with Malawi and Mozambique, and of the Project Más Algodón, joined by several South American countries and conducted within the Brazilian South-South Cooperation Program to Strengthen the Cotton Sector, a partnership between IBA, ABC and the Food and Agriculture Organization of the United Nations (FAO), through its Regional Office in Chile. Argentina, Bolivia, Colombia, Ecuador, Haiti, Paraguay, and Peru officially expressed their will to join. Embrapa is part of the technical operation of country projects in Paraguay, Peru, Colombia (in progress) and Argentina (under development). The Más Algodón country projects aim to encourage efficient and integrated family farming systems through assessment of cotton farming technologies, institutional strengthening, rural extension, and rural cooperation. Objectives are to improve cotton fiber quality and increase crop yield, thus contributing to reduce rural poverty.

Cooperation Platform in Research for Development

The Agricultural Innovation Marketplace (MKTPlace) and its second phase, the Building on the Successes of the MKTPlace (M-BoSs), are international initiatives supported by several partners whose aim is to contribute to agricultural development in Africa, Latin America and the Caribbean (LAC), with particular attention to small farmers. The platform is open to any public or private institution involved in developing innovations for agriculture, in the research, education and rural extension segments, including farmers and NGOs (Reifschneider et al., 2016). MKTPlace and M-BoSs were designed to promote knowledge development and exchange, foster investments in agricultural research and development, and contribute to achieving UN's SDGs. The platform covers four major themes: increased productivity; management of natural resources; strengthening public policies, institutions and markets and knowledge management; and technologies to reduce poverty. Since the beginning, the platform encourages the active participation of women. The full MKTPlace story is on book Agricultural Innovation Marketplace: South-South Cooperation beyond Theory, available in print (Reifschneider et al., 2016) and online. Besides, the platform can be followed on its website and on Facebook.

The strategy of MKTPlace and M-BoSs is to enable specialists in Africa, LAC and Brazil to find colleagues in other countries with shared interests and complementary skills through a virtual matching system available on the platform's web page. The specialists jointly prepare projects on research for development that are submitted to the platform's competitive calls. Approved proposals enter the platform as MKTPlace projects. After two years, when the first phase ends, teams have the opportunity to continue cooperating and scale-up their results by submitting a new proposal, again in a competitive process, to M-BoSs.

This strategy encouraged strongly demand-driven proposals and ensured a similar status to its leaders (called co-leaders), factors that significantly contributed to commitment and, consequently, to the success of the projects. Success was also due to funds having been directly sent to projects' technical teams and to restrictions in using resources in support activities. MKTPlace supports 2-year-long projects with a budget of up to USD 80,000. M-BoSs supports 3-year-long projects with a budget of up to USD 700,000.

In addition to supporting joint projects, the platform's strategy includes regular face-to-face fora, when team members of all running projects are present. Fora are specially designed to enhance interaction and horizontal sharing of

knowledge (Figure 9). In the fora, participants play the main role, and the most advanced projects are models for those about to start. Results achieved by the projects are transparently presented, discussed and analyzed by all participants, and, consequently, unexpected views are presented, innovative perspectives are shared, and dense relationship networks are established. Representatives of partner institutions also actively participate in the fora, not having any privileged status in relation to project teams. Fora are also the occasion for participants and coordinators to enhance capacities in specific competencies demanded by the platform, either by the participants or by the coordination.



Figure 9. Agricultural Innovation Marketplace (MKTPlace) Forum held at Embrapa facilities, Brasília, Federal District.

MKTPlace, which began in 2010, and M-BoSs, launched in 2016, have been supported by an open group of partner institutions. Together, the two initiatives have already involved USD 32.9 million in cash and financial resources. Partners, to date, are the Forum for Agricultural Research in Africa (Fara), the Inter-American Institute for Cooperation on Agriculture (IICA), UK's Department of International Development, the Bill & Melinda Gates Foundation, the International Fund for Agricultural Development (Ifad), World Bank, FAO, Inter-American Development

Bank (IDB), International Center for Tropical Agriculture (Ciat), the University of California – Davis (UC Davis) and the Brazilian institutions ABC, Ministry of Agriculture, Livestock and Food Supply (Mapa) and Embrapa. The platform also has the support of the Arthur Bernardes Foundation (Funarbe). The technical coordination is in charge of Fara, IICA, and Embrapa, and all partners have seats in steering committees.

From 2010 to 2017, out of over 800 MKTPlace project pre-submissions from 54 countries, 82 were selected for implementation, of which 64 were in Africa and 18 in LAC, involving 53 different institutions (Reifschneider et al., 2016). The 48 projects finished so far resulted in 226 technologies, products or services; 4,744 people trained; 1,119 germplasm exchanges; 123 specific knowledge products; 142 events organized; and 145 publications. Some examples among the many results achieved are:

- Identification of probiotics that can potentially replace antibiotics in poultry farming in Ethiopia.
- Capacity-building of traditional potato farmers in Bolivia to place their native varieties competitively in the market (Figure 10).
- Use of insects as a protein source in feeds for poultry and fish in Cameroon (Figure 11).



Figure 11. Larvae obtained in insect farming for the specific purpose of serving as a protein source for feeding fish.

• Efficient production of healthy cassava and plantain (*Musa* x *paradisiaca* L.) seedlings using specific thermotherapy protocols developed in Colombia and now also disseminated to Costa Rica, El Salvador, and Paraguay (Figure 12).

In 2016, M-BoSs – which currently only covers African countries – launched the first competitive call for projects. Of the 30 eligible MKTPlace projects, 21 submitted proposals and 6 were selected for implementation. The 6 newly initiated projects cover eight African nations, involve 22 institutions, and deal with:

- Training peer extensionists, farmers, and small plant owners (where appropriate) to identify soil quality by using local indicators.
- Continuous improvement of goat breeding and farming.
- Disseminating technologies for the production of honey with exporting quality and to improve swarm genetics (Figure 13).
- Making symbiotic fixation as a source of nitrogen for cowpea technically and commercially available (Figure 14).

Photo: Juan Manuel Pardo Garcia



Figure 12. Plantain seedlings treated with thermotherapy being acclimatized on a sterile substrate under controlled conditions.



Figure 13. Beekeepers transferring bees from the traditional system to new frames in Ethiopia.



Figure 14. Inoculant with *Rhizobium* prepared for application in cowpea, Ghana.

- Making high protein value foods, obtained from fermented millet, technically and commercially available.
- Disseminating the principles and use of family-farming specific integrated food production systems (Figure 15).





Figure 15. Detail of a cabbage production plot as part of an integrated production system for family farmers in Uganda.

Cooperation with international multilateral organizations

Embrapa, as a public company, often contributes, on behalf of Brazil, with multilateral organizations to follow its sustainable development agenda and reduce global inequalities. Among the partnership and cooperation strategies with international multilateral organizations, the most important is the Globally Important Ingenious Agricultural Heritage Systems, to protect traditional food production systems, and support conventions and treaties.

Globally Important Ingenious Agricultural Heritage Systems

International recognition of the importance of traditional knowledge for innovation led FAO to launch a global partnership initiative on the conservation and management of Globally Important Ingenious Agricultural Heritage Systems (GIAHS). GIAHS are globally significant and diverse land use and landscape systems that have evolved as communities adapted to their environment and to their needs and aspirations for sustainable development.

GIAHS were based on the objectives of the 2002 World Summit on Sustainable Development and in response to global developments that undermine the foundations of family agriculture and traditional farming systems. The initiative aims to identify and safeguard these systems and their associated landscapes (totaling around 5 million hectares worldwide), as well as agricultural biodiversity and knowledge systems. The systems provide humankind with a vital set of social, cultural, ecological, and economic services. In 2015, the GIAHS were converted into a FAO program.

With the support of FAO Brazil, in April 2016, Embrapa and the Instituto do Patrimônio Histórico e Artístico Nacional (Institute of National Historical and Artistic Heritage – Iphan) signed a technical cooperation agreement to create an institutional space to file applications and recognition of GIAHS sites in Brazil. Besides, Embrapa and Iphan, in partnership with FAO Brazil, have undertaken a set of actions to disseminate GIAHS Program concepts and approaches. FAO contributes to gather human resources to support the implementation and governance design, offering funds to begin designing an application to GIAHS, and sharing information and knowledge via various capacity-building initiatives and presentations. Embrapa and Iphan have also contributed by making specialists available to take part in the steering committee.

In Brazil, the program is running for 2 years now. So far, tentative GIAHS applications have been identified, including several traditional agricultural systems (TAS), such as those of the Krahô indigenous people (state of Tocantins), of the quilombolas of Vale do Ribeira (state of São Paulo), the caiçara (states of São Paulo/Paraná), the sempre-viva flower pickers (state of Minas Gerais), and the Bailique Archipelago (state of Amapá). Based on the surveys and interviews coordinated by FAO, Iphan, and Embrapa, the steering committee recommended the sempre-viva flower pickers TAS as the first Brazilian GIAHS candidate. Proposal documents are being prepared with FAO funds. They should address the following characteristics of the systems: food and nutritional security; agro-biodiversity; local and

traditional knowledge systems; cultures, value systems and social organizations; and landscape features. Proposals should also include an action plan for the TAS dynamic conservation containing the analysis of threats and challenges; policies, strategies, actions and results that are already underway or that will be implemented to promote the TAS dynamic conservation.

Conventions, protocols, international treaties and UN agencies

Embrapa has supported Brazilian State international activities by debating and assisting other governmental bodies in designing global public policies with agricultural interface. Embrapa is continuously involved in interministerial meetings coordinated by the Ministry of Foreign Affairs (MRE), after discussing internally and with Mapa, to establish the Brazilian position on agriculture-related demands from global fora, mostly those of the United Nations Organization. Embrapa also follows the developments of international working groups and committees between sessions.

Embrapa joins discussions at the federal level to design and implement national policies aimed at incorporating decisions approved by international instruments ratified by Brazil. Thus, Embrapa plays a leading role in these debates through its representatives, who are well acquainted with the subject. In addition to following up SDG-related themes, Embrapa participates in other international agriculture-related fora: Convention on Biological Diversity (CBD), FAO Commission on Genetic Resources for Food and Agriculture (CGRFA), Convention on Wetlands of International Importance (Ramsar), International Treaty on Plant Genetic Resources for Food and Agriculture (Tirfaa), United Nations Convention to Combat Desertification (UNCCD), United Nations Convention on Climate Change (UNFCCC), the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Forum on Forests (UNFF), and the International Union for the Protection of New Varieties of Plants (Upov).

An excellent example to be highlighted is the work of Embrapa in CGRFA, a FAO agency that reports on the state of the world's biodiversity. Embrapa collaboration is essential in CGRFA, given the international relevance of Brazil on this theme. The main reports were on the following issues: world biodiversity status for food and agriculture; plant genetic resources for food and agriculture; animal genetic resources for food and agriculture. National reports, continuously updated, are based on meetings between Embrapa and state partners, such as Mapa, at the request of MRE, which

is triggered by FAO, the institution to which Brazilian documents are submitted to compose world data.

Embrapa also participates in WTO negotiations on agricultural issues and in talks on genetic resources (mainly concerning traditional knowledge and benefit sharing) of the World Intellectual Property Organization (Wipo). The World Health Organization (WHO) is followed as a model for sharing benefits based on the humanitarian use of vaccines.

Final considerations

There are many and varied ways of establishing partnerships for sustainable global development, just as there are multiple SDGs addressed directly or indirectly by each of these partnerships (Table 1), as well as multiple purposes and paths leading us to them. Embrapa practices various partnership strategies and, so far, their success has had a positive impact on both the institution and its partners. Together with its partners, Embrapa has contributed to the economic, social, and environmental sustainability in the rural world. However, although the many good examples of partnership presented here indicate otherwise, the current context for partnerships is difficult and, of course, far from ideal. The severe economic crisis that Brazil is undergoing has made it difficult for the Brazilian state to move forward more vigorously and, consequently, for Embrapa to establish partnerships.

The good news is that a lot more is learned in times of crisis. And a lot has been learned! As Brazil is a world leader in agriculture and agricultural research is one of its essential pillars, many institutions see Embrapa as a preferred partner. Embrapa has sought to promote synergies, join efforts, gather partners, find complementarities, and establish collaborative networks, while keeping a future perspective, which poses new challenges – and this is very good! – and leads to developing new knowledge and exploring new themes, in a new way. Embrapa, with its partners, is ready for work!

Table 1. Correspondence between the United Nations (UN) Sustainable Development Goals (SDGs) and multisectoral partnerships with the participation of the Brazilian Agricultural Research Corporation (Embrapa).⁽¹⁾

| SDG | Embrapa Embrapa | Prosa Rural | Sebrae, UN Environment and Embrapa | тарех | Joint calls | Biofortification | Bem Diverso Project | əmoi 8 nozsmA | PCTs | Cotton Dispute | MKTPlace and 820Ss | GIAHS | and protocols |
|--|--------------------|-------------|--|----------|-------------|------------------|------------------------|----------------------|------------|----------------|-----------------------|--------|---------------|
| 1. No Poverty | × | × | | | | | × | | × | × | × | × | × |
| 2. Zero Hunger | × | × | | | | | × | | | | | | × |
| 3. Good Health and Well-Being | | × | | | | × | | | × | | × | | × |
| 4. Quality Education | | | | | | | × | | | | | | |
| 5. Gender Equality | | | | | | × | × | × | | | × | × | |
| 6. Clean Water and Sanitation | | × | × | | | | | | | | | | |
| 7. Affordable and Clean Energy | | | | × | × | | | | × | | × | | |
| 8. Decent Work and Economic Growth | × | | × | | | | × | | × | × | × | × | |
| 9. Industry, Innovation and Infrastructure | | | × | × | × | | × | | | | × | | |
| 10. Reduced Inequalities | | | | | | | × | | × | × | × | × | × |
| 11. Sustainable Cities and Communities | | × | | × | × | | | | | | | | |
| 12. Responsible Consumption and Production | × | × | × | × | × | × | × | × | × | × | × | × | × |
| 13. Climate Action | × | × | × | × | × | | × | × | × | | × | | × |
| 14. Life Below Water | | | | | | | | | | | × | | × |
| 15. Life on Land | × | × | × | × | × | × | × | × | × | × | × | × | × |
| 16. Peace, Justice and Strong Institutions | | | | | | | × | | | | | | × |
| 17. Partnerships for the Goals | × | × | × | × | × | × | × | × | × | × | × | × | \times |
| (1) OCB: Organization of Brazilian Cooperatives; Sebrae: Brazilian | n Micro ar | nd Smal | ll Business St | upport S | service; | United N | Vations El | nvironm | ent: Unite | ed Natic | ons Envir | onment | |

Programme; Labex: Embrapa Virtual Laboratory Abroad Program; PCTs: technical cooperation project; MKTPlace: Agricultural Innovation Marketplace; M-BoSs: Building on the Successes of the Marketplace; GIAHS: Globally Important Ingenious Agricultural Heritage Systems.

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Chapter 6

Partnerships and cooperation: lessons, challenges and perspectives of joint work

Selma Cavalcanti Cruz de Holanda Tavares Paulo Eduardo de Melo

Introduction

The <u>Millenium Development Goals Report</u> (MDG), published in 2015, showed the success achieved over 15 years to reach the goals set out in the <u>Millenium</u> <u>Declaration</u>, in 2000. Progress was so great and so widespread that it led the Secretary-General of the United Nations at the time, Mr. Ban Ki-Moon, to consider MDGs as "the most successful anti-poverty movement in history"¹. However, despite progress, much remains to be achieved. Brazil, for example, until the end of 2014, had not met all MDGs, with a deficit mainly on the targets related to socioeconomic development and human rights. Targets related to eradicating hunger, providing universal primary education, reducing child mortality, reducing HIV/AIDS incidence and developing partnerships and supporting actions with developing countries had already been fully achieved.

After MDGs, the UN defined 17 <u>Sustainable Development Goals</u> (SDG) as part of the <u>2030 Agenda</u>. In Brazil, the local office of the United Nations Development Programme (UNDP) strengthens territorial and private integration and supports SDG Brasil National Network, made up of representatives of governmental, non-governmental and civil society organizations. As part of this network, several Brazilian states have already created their state networks and incorporated SDG targets, as have many companies. These networks are a strong link to integrate common interests, decisions, plans, expertise, monitoring and implementation of actions and processes with great potential for success. In order to support all these initiatives, the Brazilian federal government, through the Government Secretariat (Segov), created the Comissão Nacional para os Objetivos de Desenvolvimento Sustentável (Brazilian Commission for Sustainable Development Goals) (Brasil, 2016) with the purposes of incorporating, disseminating and making the implementation of the 2030 Agenda in Brazil transparent.

¹ Available at: <<u>https://www.br.undp.org/content/brazil/pt/home/presscenter/articles/2015/07/06/quinze-anos-de-esfor-os-produziram-maior-movimento-antipobreza-da-hist-ria</u>>.

The Brazilian Agricultural Research Corporation (Embrapa), committed to the economic, social and environmental sustainability of Brazilian agriculture in the search for increasingly safe and efficient products, services and technologies, has brought SDGs to the heart of its discussions and institutional guidelines by aligning all of its Strategic Objectives with SDGs, particularly SDG 17, which promotes global partnerships. Embrapa contributions aligned with targets 17.6, 17.7, 17.8, 17.11, 17.16 and 17.17, as presented throughout the chapters of this book, go beyond advancing knowledge and producing technologies for Brazilian agriculture; they also positively impact the rural environment worldwide, especially in tropical countries, which Brazil maintains intense technical cooperation with.

Lessons

Establishing partnerships and working in cooperation are not new to Embrapa. Over 4 decades, if there is an indelible practice in the Company's institutional culture, this practice is certainly the setting up of national and international partnerships. In fact, the pulse of the Company, understood here as its human capacity for research, since its beginning in the 1970s, was shaped worldwide, in good universities abroad, where employees had the opportunity to advance their academic studies. From there, they brought not only their diplomas, but also professional networks and the ability to face challenges in collaboration, through partnerships. As subsequent generations followed the same path, many of these networks still remain and, having strengthened over time, produced various results, from joint projects to new researchers who come and go. This has been, for a long time, the strategy of Embrapa and certainly an important component of the achievements and successes so far.

Because Embrapa is institutionally prone to partnerships, various sort of cooperative work have been and continue to be established. <u>Chapter 5</u> presents several examples, that do not have to be repeated here. However, it must be highlighted that, regardless of the type of cooperation and from what side, at the outset or at first glance, the main beneficiary is, there are always many lessons and benefits for all partners.

From cooperation and partnership strategies that link Embrapa directly to the production sector or to dissemination and technology transfer agents, such as farmer associations and the network of state-owned technical assistance and rural extension companies, the gain for Embrapa is evident: the production sector adopts technologies, products or services that, when transformed into innovation, have an impact on agriculture and the life of Brazilians, whether they are only a few, or several on a progressive scale. This is how Embrapa, by acting in cooperation with its partners, accomplishes its mission. Even in these cases when the main gain is evident, there are also other very relevant benefits. As a feedback to the research and development process, this set of pertinent information allows checking the compass and steering the course, so that Embrapa can sail precisely and keep meeting expectations. If it were not for these partners' collaborations, Embrapa's costs (in many senses) would be too high.

In the case of global partnerships, benefits for Embrapa are also great. In cooperation models such as the <u>Embrapa Virtual Laboratory Abroad Program</u> (Labex) and the joint calls, discussed in detail in <u>Chapter 5</u>, gains for Embrapa are clear. Based on the mission to "promote and develop international scientific cooperation opportunities at the frontier of knowledge and monitor science, innovative technologies, and innovation in agriculture, whilst anticipating risks and opportunities"², Labex has been contributing for advancing the work of Embrapa in favor of Brazilian agriculture since 1998 in the United States and since 2002 in Europe. Over the years, the lines of research addressed in Labex have been very diverse and relevant, including topics such as genetic resources, animal health, precision farming and system modeling.

Gains are brought not only by institutionally formalized strategies. Embrapa participation in international multilateral organizations and fora also opens a path for collaboration opportunities for the Company. Several Embrapa employees worked in organizations such as the United Nations Food and Agriculture Organization (FAO), the World Bank, or the CGIAR centers, for example. During their stay in these agencies and after their return to Embrapa, they provided the Company with the opportunity to establish partnerships and develop cooperative work with institutions around the world, often involving significant financial resources to carry out the work. It is also important to keep in mind that, although Embrapa is affected by the current economic situation in Brazil, the participation of its specialists in multilateral global fora displays the capacity of Embrapa, and also creates a great opportunity for enhancing or establishing new networks that will eventually allow a new cooperative action to be undertaken.

Another source of benefits for Embrapa and, with it, for Brazilian agriculture, although less evident, but no less relevant, are technical cooperation actions. They include an intense exchange of knowledge among inhabitants of socioeconomic

² Available at: <<u>https://www.embrapa.br/en/embrapa-labex</u>>.

contexts that are often very distinct, but with similar agroecosystems that pose similar challenges (such as acid and nutrient deficient soils, long drought periods and enormous pressure of pests and diseases on the plantations, just to name a few). A simple unique attitude in facing these challenges represents valuable opportunities for the attentive researcher. Many technologies developed by Embrapa, after having been challenged in cooperation with partners, could be improved. In many actions that began as technical cooperation, the spark of scientific interest shone, ignited by unanswered questions which drive the advancement of knowledge. Although it is not possible, or rather not simple, to trace these events, mostly preserved only tacitly by individuals, many palpable solutions developed by Embrapa and nowadays commonly used in Brazilian agriculture come from partnerships with fellow citizens of the tropical world.

Challenges and perspectives

If yesterday the challenge of agriculture was to achieve production efficiency, today the challenge is not only to keep the efficiency levels achieved, but also to advance even more, in a sustainable way, with people and the environment as the first priority. These are new paradigms in a changing and ever complex world. The present already requires efficient, sustainable technologies that meet the demands for food, fiber, energy and other raw materials for green processing and chemical industries and that produce surplus for export. Thus, national food, technology and energy security and, at the same time, world progress are achieved. This is why technological development of agriculture strongly relies on identifying relevant signs of changes and producing information to support public and private sectors decision-making, thus enhancing its capacity to take opportunities and mitigate risks to agriculture. This is the challenge of Agropensa, Embrapa Strategic Intelligence System. Based on signals from its network of observatories, Agropensa monitors and detects trends and conducts studies to find relevant futures for agricultural research and development in Brazil and abroad (Embrapa, 2014).

The presence of Embrapa in national and international partnerships, whether in its effective implementation or simply in supporting it, brings challenges and reveals a successful institutional history enhanced by the positive perspectives for technological and scientific development which is increasingly faster and more widespread around the world. The projected scenario indicates that technology will play an increasingly important role in future agricultural production chains. The challenge is to outline strategies that consider different contexts, while favoring the multiple (technical, economic, environmental and social) dimensions of sustainability. In this context, Embrapa <u>Ambitec-Agro</u>, which assesses these parameters through a multidimensional approach to the impacts of each technology, emerges as an efficient impact assessment tool, distinct from other existing instruments.

Scientific communication and journalism, regardless of their media, are equally a challenge and a perspective. Their role in raising the population's awareness and their territorial coverage are uncontested and crucial for a truly sustainable future. Prosa Rural is a good example of this potential. It is a radio program produced by Embrapa and broadcasted by Brazilian community radio stations. Its purpose is to encourage ideas and spread knowledge to farmers, as well as to promote family engagement through guidelines and indications of good practices focused on maintaining the environmental, economic and social sustainability of family agribusiness, based on technologies assessed by Ambitec-Agro (Jesus et al., 2012). The intelligent use of natural resources in the agricultural production process is a collective responsibility, since agriculture is an activity that contributes a lot to environmental degradation when carried out improperly. Therefore, educommunication is important, as it provides citizens with information that makes them leaders of sustainable development, thus encouraging them to change their attitude towards the environment.

Despite the advances, the multiple dimensions of poverty and inequalities are still a great challenge in several regions of the planet. With 208.6 million inhabitants and a population growth rate of 0.86% from 2016 to 2017, Brazil has 15.6% of its population living in rural areas, where family agriculture meets challenges of competitiveness in ever-growing market demands. It is imperative to produce efficiently and in harmony with the biomes, especially due to the challenges posed by the global climate change and the need to guarantee food security for the population. This is the case of the Brazilian Northeastern region, where almost half the Brazilian rural population lives and produces a significant amount of food, in an environment with many restrictions. In the Northeastern region, Embrapa and partners joined efforts to boost productivity while making rational use of the natural resources available in the region. Abundant sunlight in the region points to possible technological innovations based on using solar radiation, such as local generation of photovoltaic energy. To approach the water issue, efforts are focused on water collection and treatment. The proposal Socioeconomia Verde no Bioma Caatinga frente às Mudanças Climáticas (Green Socioeconomics in the Caatinga Biome against Climate Change), approved by CNPg/EditalNexos - 2017, emerges

as a catalyzing element of the new paradigm of socioeconomic development, a new perspective to face the challenge of transforming the secular framework of dependence and poverty of the Northeastern population.

Turning to the international environment, partnerships are opportunities for joint technological development and lead to common and continuous perspectives between countries, thus opening up opportunities for cooperation and commercial development, including low-income countries. Embrapa has always played an important role in running technical cooperation projects of the Brazilian State. Embrapa is nationally and internationally recognized as a center for knowledge and technology production, leveling and facilitating opportunities and independence. Several examples of cooperation are presented in this book in Chapters 3, 4 and 5.

Finally, addressing future perspectives call for taking the new generations into consideration. Efforts towards educating and training individuals, children and young people, who will be the future leaders in opinion making, political decisions and the workforce, is timely to support the achievement of SDGs. In this context, partnerships also play a major role. An example is the playful work with millions of students in the Brazilian public education system focusing previously on MDGs, now on SDGs, carried out by the Comitê de Entidades Públicas no Combate à Fome e pela Vida (Public Entities Committee Against Hunger and for Life – Coep) of the Rede Nacional de Mobilização Social (Social Mobilization National Network), in which the Embrapa Escola (Embrapa School) project is integrated. Besides developing specific skills, this initiative seeks to inspire the youth by contributing to prepare critical individuals, with adequate social skills to act for the benefit of all.

Lessons, challenges and perspectives: the former create opportunities for the latter to multiply, the latter allow the former to become more and more comprehensive. And they all impose a reality on us: the need not only to make room for national and international partnerships, but also to amplify them so that new partnerships can be established. If they bring so many benefits to cooperating partners, as seen throughout this book, there is no reason to back down, specially if everyone looks for a larger goal: sustainable actions to end hunger and poverty worldwide. This book has been written with the aim of contributing to this goal. By presenting a little of Embrapa's background on working in partnership, we intend to inspire other institutions and, thus, support efforts of all towards the 2030 Agenda. Successfully following the agenda will depend on aligning suitable processes, tools and management to targets and goals at all levels. A country's developmental stage changes if it is able to significantly and sustainably change key indicators towards a desirable direction over long periods. In order to successfully follow a development agenda, we need to set clear targets and goals for different scenarios, to have discipline and a firm commitment to go along medium and long term paths.

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