

NO POVERTY

CONTRIBUTIONS OF EMBRAPA

Patricia da Costa
Joanne Régis Costa
Elisa Vieira Wandelli
Fabrício Bianchini
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Technical Editors



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



Sustainable Development Goal 1

NO POVERTY

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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 transversal themes for 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 partnership –, the so-called five 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 of 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 the 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 like society's vision about its problems and respective solutions, a wealth that 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 Sustainable Development Goals (SDG) comprises the sustainable development agenda entitled Transforming our World: the 2030 Agenda for Sustainable Development. It is a universal, integrated and transformative agenda that seeks to stimulate actions that eradicate poverty and build a more sustainable world, focusing on the three interconnected elements of sustainable development: economic growth, social inclusion, and environmental protection. Comprising 17 goals and 169 targets to be achieved within the next 12 years, the agenda was adopted by the 193 Member States of the United Nations (UN) in 2015 at the *UN Sustainable Development Summit*, at the UN headquarters in New York.

This is the first book in the Embrapa series composed of 17 volumes dealing with each SDG. In each book, Embrapa presents its contribution as an innovative company, whose vision is to be a world reference in the creation and supply of information, knowledge, and technologies, contributing to innovation, food security, and sustainability in agriculture.

Poverty eradication, the focus of this book, is addressed in SDG 1 and considered the greatest challenge to achieve global targets. This SDG aims to end poverty in all its forms everywhere. This publication is on the contributions of Embrapa related to SDG targets 1.1, 1.2, and 1.5, understanding that poverty should not only be seen as a deprivation of financial resources, but also, to a large extent, the deprivation of resources, capacities, choices, security, and power.

In order to present the theme, the [first chapter](#) provides a brief contextualization, which presents different metrics for the interpretation of poverty with an evaluation of income distribution in Brazil and within the world. The [second chapter](#) presents problematization focusing the discussion on the challenges for overcoming poverty in Brazil. The [third chapter](#) presents some contributions of Embrapa to poverty eradication (targets 1.1 and 1.2), while the [fourth chapter](#) presents contributions to increasing the resilience of the poor and reducing vulnerability to disasters (target 1.5). Finally, the [fifth and final chapter](#) presents the summaries, challenges, and conclusions on the topics discussed, considering Embrapa's strategic vision documents for the 2030 horizon.

Technical Editors

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Chapter 1

Poverty and development

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Introduction

This book is about poverty eradication, addressed in the first United Nations (UN) Sustainable Development Goal (SDG). Poverty is considered the main challenge to achieving global targets. This SDG aims to end poverty in all its forms everywhere.

According to the UN Committee on Economic, Social and Cultural Rights' definition (Substantive..., 2001, § 8), poverty should be understood not only as a deprivation of financial resources but more broadly as:

[...] a human condition characterized by sustained or chronic deprivation of the resources, capabilities, choices, security and power necessary for the enjoyment of an adequate standard of living and other civil, cultural, economic, political and social rights.

SDG 1 shows the importance of expanding the meaning of poverty, which is usually linked only to the individual income. The UN proposes to go beyond the international and national poverty lines and include human rights and access to different basic services, which means considering poverty in all its dimensions. Thus, there is a strong connection between SDG1 and the targets of other SDGs (Figure 1).

The next chapters will present contributions of Embrapa for achieving targets 1.1, 1.2, and 1.5 of SDG 1 (United Nations, 2018), namely:

Targets

1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day.

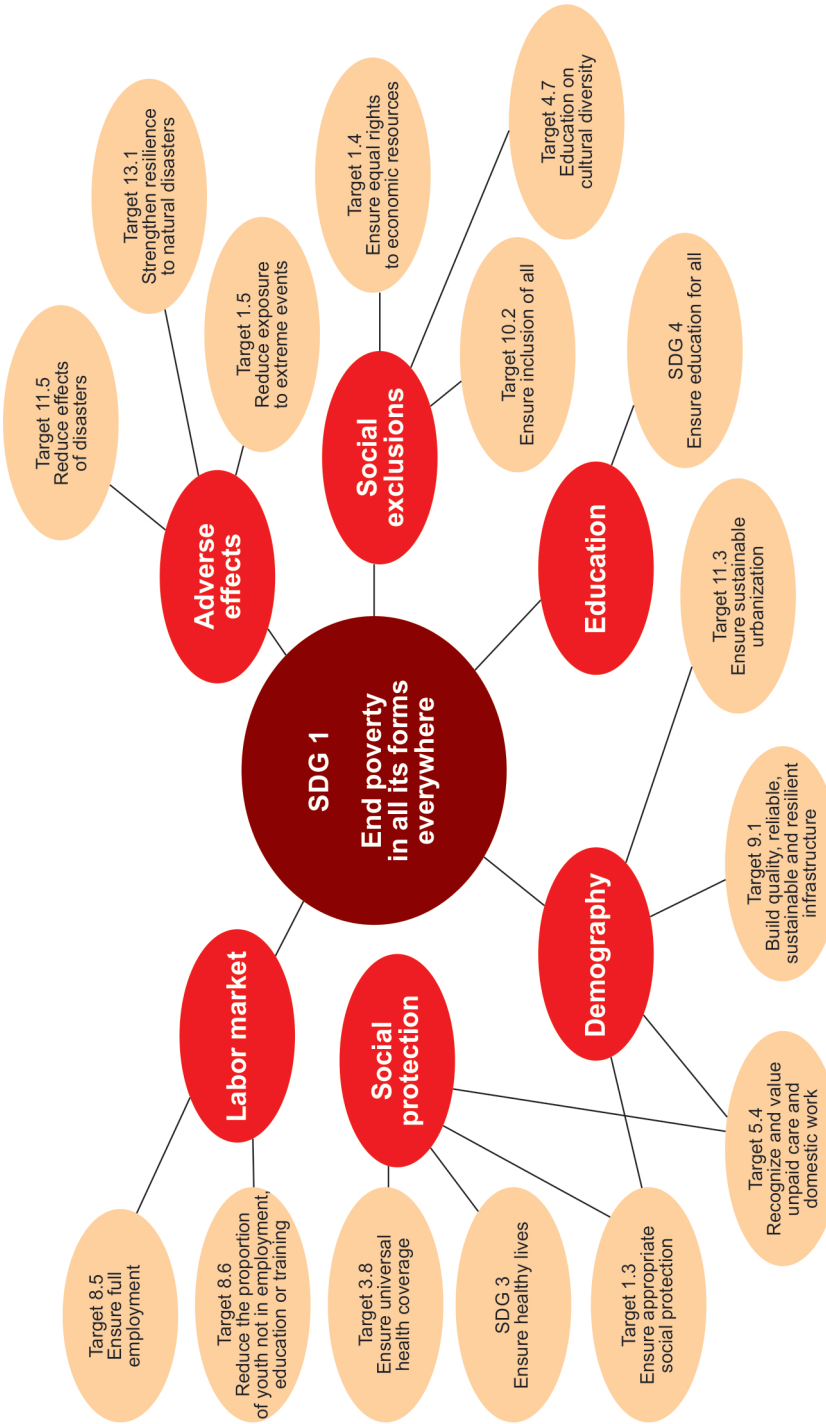


Figure 1. Relationship between SDG 1 and the targets of other SDGs, demonstrating poverty multidimensionality.

Source: PNUD (2016) cited by Objetivos... (2017).

1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.

[...]

1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.

This book concerns numerous actions developed by Embrapa that contribute to the achievement of SDG 1, as well as the advances and future challenges to ending poverty in Brazil.

Poverty definitions

In 2013, the World Bank defined people living below poverty line as those with daily per capita income of less than US\$ 1.25 per person (Monitoring..., 2017). This amount was revised and updated in 2015, thus establishing the amount of US\$ 1.90 daily per capita income in terms of purchasing power parity (PPP) for the year of 2011 (Monitoring..., 2017). As of October 2017, a new metric was adopted to determine the number of people living below poverty line, for which the amounts were adjusted to the realities of each country (Monitoring..., 2017). Two new lines were adopted: the amount of US\$ 3.20 per capita per day represents the median of the lines for lower middle income countries, while US\$ 5.50 per capita per day corresponds to the median for upper middle income countries, including Brazil (Monitoring..., 2017).

The UN, through the United Nations Development Program (UNDP), adopts the amounts established by the World Bank (Monitoring..., 2017) to decide if a person is subject to extreme poverty (Rethinking..., 2009) but, in some of its documents the amounts are still US\$ 1.25 (Nações Unidas, 2018) or US\$ 1.90 (United Nations, 2018) for daily per capita income.

For the purposes of the Plano Brasil Sem Miséria (Brazil Without Misery Plan – PBSM), the Ministry of Social Development (MDS) establishes that families with a per capita monthly income between R\$ 85.01 and R\$ 170.00 live in poverty, while families with a per capita income of less than R\$ 85.00 live in extreme poverty (Brasil, 2018). In turn, the Ministry of Finance Department for Social Security

establishes that the per capita income of up to a quarter of the minimum wage is a borderline to access the Elderly Aid Benefit (Brasil, 2017).

Poverty in Brazil and in the world

According to the World Bank, one in ten people, or 766 million worldwide, survive on less than US\$ 1.90 a day (Poverty..., 2016). Sub-Saharan Africa is the most affected region, where approximately 388 million people are living in extreme poverty, which represents more than 40% of the local population. In South Asia, there are 256 million, and in Latin America, there are 33 million poor people (Poverty..., 2016).

Out of 766 million people living in poverty, 385 million are children, of whom more than one fifth are under 5 years old. Again, Sub-Saharan Africa has the highest number, with almost 50% of children in this condition, followed by South Asia with 36%, and India with 30% (Poverty..., 2016). As a result, children die, and those who survive have healthy physical and mental development affected.

The report also notes that most of the world's poor live in rural areas (80%), are under the age of 14 (44%), have no formal education (39%), and are employed in agriculture (65%) (Poverty..., 2016). Poverty among workers is more common among young people aged 15 to 24. Approximately 16% of workers in this age group live below poverty line, earning less than US\$ 1.90 per day, while 9% of adults are in the same situation (Poverty..., 2016).

The study *Síntese de Indicadores Sociais: Uma Análise das Condições de Vida da População Brasileira* (Synthesis of Social Indicators: An Analysis of the Living Conditions of the Brazilian Population), done by the Brazilian Institute of Geography and Statistics (IBGE) (Síntese..., 2015), indicates that about 50 million Brazilians, corresponding to 25.4% of the population, live on poverty line and have an income equivalent to US\$ 5.5 PPP per day, reviewed for 2011. The study also indicates that the highest poverty index is in the Northeast region (43.5%), and the lowest is in the South region (12.3%). The states of Maranhão (52.4%), Amazonas (49.2%), and Alagoas (47.4%) have the highest percentages of poor Brazilian population (Síntese..., 2015).

The study concludes that Brazil is an unequal country. The total income of the richest top 10% (US\$ 1,646.56¹) was, in 2016, 3.4 times higher than the income

¹ US\$ 1.00 was equivalent to R\$ 3.98 on November 1, 2019.

of the poorest 40% (US\$ 100.79²), although the ratio varies according to the state (Síntese..., 2015). Among the people with the 10% lowest income in the country, the proportion of black or mixed-race individuals of the population reaches 78.5%, against 20.8% of whites. On the opposite side, on the top 10% with the highest income, black or mixed-race individuals accounted for only 24.8% (Síntese..., 2015).

According to the report *A Distância que nos Une – Um Retrato das Desigualdades Brasileiras* (The Distance that Unites Us – a Picture of Brazilian Inequalities), by Oxfam Brasil (*A distância...*, 2017), six people's wealth is equivalent to the patrimony of the 100 million poorest Brazilians; and the richest 5% income is equivalent to the remaining 95% of the population. Social inequality of a racist nature in Brazil is also reflected in the data from the National Survey by Continuous Household Sample (Pesquisa Nacional por Amostra de Domicílios Contínua, Pnad) released in November 2017 by IBGE, in which, out of the 13 million unemployed Brazilians in the third quarter of 2017, 8.3 million (63.7%) were black or mixed-race (IBGE, 2017).

Final considerations

Science and technology are essential for sustainable development. Knowledge can generate changes in current patterns of development and contribute to poverty eradication. Science and its constant evolution have become a key resource for the generation of wealth, the reduction of social inequalities, and the improvement of quality of life in all its dimensions.

Understanding the criteria used to define poverty, as well as its spatial and social shape, is essential in order to establish poverty eradication targets, in accordance with SDG 1.

In this context, Embrapa has dedicated resources for innovative studies in the areas of family farming, agribusiness, food security, fisheries, soil and water resources conservation, among others. Several more efficient technologies, such as improved cultivars and adapted production systems, are being developed and presented to Brazilian society. The dissemination of this knowledge produced by Embrapa targets different audiences at different levels and in all regions of the country. Besides, technologies generated by Embrapa have subsidized programs and public policies directed specifically to the reality and needs of those who live in rural areas and are the focus of Embrapa.

² US\$ 1.00 was equivalent to R\$ 3.98 on November 1, 2019.

As a future challenge, Embrapa has identified and prioritized efforts to establish quality-focused and value-added research on productive arrangements strategies for small- and medium-scale producers, including strategies for turning family farms into highly profitable enterprises. In addition, Embrapa identifies as a worldwide trend the need to focus efforts on research that contributes to the intensification and sustainability of production systems. It is also necessary to focus on the effect of climate change on agriculture and its associated risks, achieving the proposed poverty reduction targets and increasing the resilience of the poor and those in vulnerable situations against extreme events related to climate and to other economic, social, and environmental issues.

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Chapter 2

Challenges for a country without poverty

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Introduction

Brazil is the fifth most populous country in the world, with 209 million inhabitants (World..., 2017). Only 1.0% of this population has a monthly average household income per capita of more than US\$ 4,689.34¹, while 25.4% of the population lives on poverty line, with a per capita income below US\$ 5.5 per day in terms of purchasing power parity (PPP) (Síntese..., 2015). Even though Brazil has advanced in the last decade, with a significant decrease in the inequality indexes for personal income distribution in the worldwide ranking, the country is still among the top ten with high population income inequality (Síntese..., 2015).

Social inequalities in Brazil are expressed through the concentration of income, unemployment, hunger, malnutrition, infant mortality, low schooling, and violence (Camargo, 2017). The facts that imply poverty are the lack of necessary means that guarantee the maintenance of life, human dignity, and well-being, all of which depend on the life standard and culture of each community. Thus, poverty is relative to several temporal and spatial parameters. This way, one can designate as poor a person whose deficiency places them at the brink of death or the individual whose nutrition, housing, and clothing, although sufficient to survive, have a lower quality than that of the population in general (Mello, 2017).

The North and Northeast, which have the lowest human development index (HDI), are the regions of the country that concentrates the most significant number of people in extreme poverty. The North is home to the largest biological diversity in the world, which, together with other Brazilian biomes, places the country as the holder of the greatest biodiversity in the world, i.e., one-fifth of all biological diversity in the planet.

The Brazilian semiarid region is home to a population of more than 22 million people, one of the most populous rural environments on the planet; 91.45% of

¹ US\$ 1.00 was equivalent to R\$ 3.98 on November 1, 2019.

the cities located in this biome present extremely high values of socioeconomic and ecological vulnerability (Silva et al., 2014). The population of this environment depends on subsistence farming to survive and faces severe problems of lack of water supply and basic sanitation. Traditional production systems, which are the basis for generating employment and income for these populations, are highly vulnerable to climate change. Northeast semiarid region is the most vulnerable place to extreme weather events in Brazil, especially droughts. Drought is a natural phenomenon in arid and semiarid environments. The last droughts in Brazil caused losses of more than 26 billion dollars for the states in the Northeast region, affecting more heavily the rural population that inhabits this environment (Pereira, 2017). The *Caatinga* is the biome with livestock production in this environment, where high resilience patterns contrast with the fragility of the animal and anthropic components due to extended dry periods in the region. Government policies have been trying to provide the necessary minimum resources for the population of this region, but efforts are still insufficient to promote significant changes in the quality of life of Brazilian poorest and most marginalized population living in the semiarid region.

Despite the reduction of extreme poverty in Brazil, inequality persists in the country (Campello; Gentili, 2017). Hunger has been overcome as an endemic problem but there are still populations that experience food shortages and need increased schooling, said former Minister Tereza Campello during an interview with the UNDP (Nações Unidas, 2016). The level of inequality in Brazil can and must be changed, and for that, it is necessary to widen access not only to goods but also to public services that ensure population dignity. For Campello and Gentili (2017, our translation):

[...] access (or lack of access) to water, sanitation, energy, education, health, housing, and consumer goods such as refrigerators, telephones, among others, are not peripheral dimensions of inequality. The urgency and priority of access to these rights for the poorest can occur concurrently with structural changes that take time.

The promotion of policies to reduce social injustice and structural inequalities is the primary strategy to reduce poverty (Calixtre; Fagnani, 2017; Campello; Gentili, 2017). Understanding the gaps, failures, limits, and new challenges of this process of equality and justice are fundamental to reconstruct effective strategies to reduce and end poverty in Brazil.

In order to operationalize sustainable development, government actions, through public policies, need to consider the entire human population, the ecosystems, and their relationships. Thus, policies must be universal and have a social inclusion character.

In order to combat it, poverty must not be considered as a natural phenomenon and it should be analyzed in its various dimensions; however, the denaturalization of inequality requires understanding that it is a set of injustices. Social inequality is always a political relationship, in which State actions must combat it and collective struggles for rights must affirm, nevertheless, the democratic effect that can destabilize privileges historically reproduced by the elites.

According to the head of the Sustainable Development Center of the University of Brasília (UnB), Marcel Bursztyn, in an UNDP interview (Nações Unidas, 2016, our translation): "Poverty is associated with inequalities and, in order to reach a sustainable level of development, it is essential to work with these two concepts in an integrated way."

The winner of the 1998 Nobel Prize in Economics, Amartya Sen, sees development as a process of expanding substantive freedoms that people enjoy and, for that to happen, it is necessary to remove deprivations that limit the ability of individuals to choose. Thus, there is an appreciation of the agent subject, making him responsible for his choices. However, responsibility requires freedom. These freedoms, according to Sen (2000), will be obtained through effective public policies that improve the quality of life of the population by sharing the fruits of economic growth. However, despite the fact that world food production is greater than ever before, markets are increasingly improved, human and civil rights are part of most political leaders' discourse, and democracy has become a dominant government regime, people still die of collective hunger, chronic hunger, and there is still suppression of fundamental freedoms, such as political and economic freedoms (Sen, 2000).

For Rafael Osório, from the Institute for Applied Economic Research (Ipea) in the partnership with International Policy Center for Inclusive Growth (IPC), in an interview with UNDP, poverty eradication requires national planning in which environmental, social, and economic aspects must be integrated (Nações Unidas, 2016).

Poverty makes individuals, families, and communities fragile. Only public power can solve this situation through multi-sectorial public policies, such as universal access to health services and basic education, encouragement to create solidary economy organizations, community production groups, solidary funds, and the development of social technologies. However, the effectiveness of these policies

presupposes access to social life. Thus, to end or reduce extreme poverty, it is essential to socially include an expressive population contingent, recognizing its right to economic and cultural autonomy. Overcoming this situation requires the active participation of these men, women, and youths, strengthening existing social and community ties. This action must be universal and involve multiple actors and public institutions, non-governmental organizations, and social movements that already participate in actions of this nature.

Innovation in family farming

Innovation in family farming is essential to ensure, in the long term, global food security, according to the Food and Agriculture Organization of the United Nations (FAO), in *The State of Food and Agriculture: innovations in family farming* (The State..., 2014). In that document, FAO lists necessary contributions to strengthen and enable family agriculture: farmers' organizations that can encourage and support innovation among their members; public investment in agricultural research and development (R&D); extended education and consulting services; environment conducive to innovation, such as good governance, stable macroeconomic conditions, transparent legal and regulatory regimes, secure property rights, risk management tools, and a structured market.

According to FAO, feeding the world in the coming decades will depend on the more than 500 million family farmers who form the backbone of agriculture in most countries (Figure 1). At the same time, family farming will have to take a leadership role in the continuous struggle, not only against hunger and poverty but also in preserving the environment against degradation (Figure 2).

Family farming represents an opportunity to boost local economies, especially when combined with specific policies designed to promote the social protection and well-being of communities.

In 2013, Embrapa held an event called *Agricultura Familiar: Construindo uma Agenda com Visão de Futuro* (Family Farming: Developing a Forward-Looking Agenda). It aimed at promoting debate and subsidizing the construction of a future agenda that contemplates the development of social technologies and subsidies to public policies for family farmers.

In this scenario, Embrapa develops numerous studies and technologies aimed at serving this relevant public (Figure 3). The goal is to strengthen family farming



Photos: Felipe Santos da Rosa

Figure 1. The contribution of family farming to food supply.



Photo: Henrique de Oliveira

Figure 2. Family farming area: interplanting of beans, rice, sunflower, and corn in Pirenópolis, GO.



Photos: Secom-PR

Figure 3. Training and transfer of technologies for vegetable production in family farming in the Northeast of Brazil.

through the introduction of technologies based on social, economic, and environmental sustainability.

Innovation in agribusiness

Gross domestic product (GDP) data indicated that the accumulated growth of agriculture and livestock production in the year of 2017 was 14.5%, with industry and services showing a negative contribution to GDP formation, with cumulative rates of -0.9% and -0.2%, respectively (Brasil, 2017).

According to Lopes (2013), the president of Embrapa, the modernization of agriculture showed that, with the intensive use of knowledge, it is possible to improve the quality of decisions and generate the desired benefits. After 4 decades using this model, it is possible to notice that knowledge is a powerful tool for equating the conflicts of economic and social development and reducing poverty. The production of knowledge, which enabled intensification of agriculture and reduction of its risks, also created biological nitrogen fixation, no-tillage farming (Figure 4), biological pest control, conventional and genetically modified soybean

Photo: Pedro Luiz de Freitas



Figure 4. No-tillage farming of soybeans in sugarcane straw, Observation Unit of Usina Guaíra, SP. Embrapa projects: Rotcana e Cana.

varieties, integrated crop-livestock-forest systems (ICLFS) (Figure 5), tropical wheat, among others, as well as optimized climate risk zoning in support of the agricultural insurance program, financing of agricultural mechanization, and public safety actions (Lopes, 2013).

The introduction of the concept of innovation as a management tool is a strategic positioning by Embrapa that contributed to the provision of information and technologies that allow, among other actions, the production of high quantity and quality foods.



Photo: Gabriel Rezende Faria

Figure 5. Beef cattle in an integrated crop-livestock-forest system (ICLFS), Fazenda Gamada, in Nova Canaã do Norte, MT. ICLFS Technological Reference Unit accompanied by Embrapa Agrossilvopastoral.

Final considerations

Actions to reduce poverty are essential in order to achieve sustainable development. The present and the future require the recognition of rights and the fulfillment of duties.

For the operationalization of the development that we aim for, policies that cover the social, economic, and environmental pillars are necessary.

Innovation in both family farming and agribusiness is strategically inserted in the management of Embrapa to deliver technological solutions and expertise to

continue transforming the different Brazilian realities and contribute to the end of poverty.

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Chapter 3

Contributions of Embrapa to poverty eradication

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Introduction

This chapter presents solutions related to the sustainable agrifood systems developed by Embrapa that contribute to the following targets of the Sustainable Development Goal 1 (SDG 1) (United Nations, 2018): Target 1.1 “By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day”; and target 1.2 “By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions.”

In addition to the contributions directly related to agrifood systems, Embrapa has accumulated several experiences and processes related to technological innovations, which enabled the inclusion of part of the population living in poverty and extreme poverty. Among these, it is important to mention that Embrapa recently participated in Brazil Without Misery Plan (Plano Brasil Sem Miséria, PBSM). It has worked in several territories of the Brazilian semi-arid region, being integrated with technical assistance and rural extended education networks, and public managers at the municipal, state, and federal levels. In a survey carried out to evaluate the families that were part of this program, access to the various public policies was indicated as one of the leading factors in improving the lives of the families. Among others, they mentioned the Light for All Program (Programa Luz para Todos); the programs that granted access and production of water – 1 Milhão de Cisternas (1 Million Cisternas) and Uma Terra Duas Águas (One Earth Two Waters); the policy of income transfer Bolsa Família; the Política de Assistência Técnica e Extensão Rural, Crédito e Fomento (Rural Policy of Technical Assistance and Rural Extension, Credit, and Rural Development); the Política de Aquisição de Alimentos, Educação (Food and Education Acquisition Policy); and the Sistema Único de Saúde (Unified Health

System – SUS). Embrapa has contributed to the execution and implementation of many of these policies, such as the National Policy on Agroecology and Organic Production, with the creation of Agroecology Centers in ten Embrapa Units, with the participation in the creation of Innovation Plans for Family Agriculture in all states within the National Policy of Technical Assistance and Rural Extension, as well as in the Policies for the Development of Traditional Peoples and Communities, and in the National Plan for the Promotion of Socio-Biodiversity Networks.

In the scope of agroecology, Embrapa has worked with projects aligned with agroecological innovation arrangements and portfolios, participating in the construction of knowledge and exchanges with family agriculture, indigenous peoples, and traditional communities. Embrapa has also been working to identify and strengthen the generation and availability of knowledge for ecologically-based production systems to achieve food, technological, energy, water, and agricultural and livestock sovereignty for family farming.

SDGs have been achieved through training actions with communities that live the reality of poverty. In this sense, actions of Embrapa focused on the continuous training of young farmers, graduate students, community leaders, and cooperators in concepts and practices in the field of disseminating technological information in rural communities, strengthening social life and community self-organization, as well as supporting productive rural inclusion.

Access to information on social principles and technologies suitable for family farming that allow the production of high quality and quantity food, without dependence on external inputs, stimulates short production to marketing circuits and strengthens the local economy starting from community organizations. Some of these actions of Embrapa will be covered in more detail in the next topics.

Optimization of agrifood systems

Some of Embrapa's research, development, and innovation contributions for the sustainability of agrifood systems are:

- Subsidies for the formation of universal public policies and social inclusion.
- Agrifood systems technology and technology that uses low-input resources that value local and traditional knowledge.
- Technologies for the production of locally produced healthy foods and appreciation of plant products from agrobiodiversity.

- Technologies to reduce the costs of food production.
- Expansion of access to knowledge and information that contribute to the improvement of the quality of life, food, and nutritional security, as well as to the development of citizenship.
- Research, training, and autonomous and participatory organizational systems.
- Research and support for social and solidarity economies.
- Collective construction of knowledge, and socialization and systematization of traditional and scientific knowledge for sustainable agrifood systems.
- Subsidies for public policies on food and nutritional security and sustainable agrifood systems.
- Technologies and training for urban agriculture and family self-consumption (see SDG 11).
- Certification of products from traditional production systems (Figure 1).
- Marking of origin and geographical origin identification for products from traditional production systems in the Brazilian semiarid region.

Optimization of water resources

Brazil has a coastal dimension of more than 8,000 km and a continental potential that includes 13% of the world's freshwater, including the largest hydrographic basins (Joly et al., 2011; Conjuntura..., 2012). About more than 1 million people live directly, and 4 million people indirectly from the extraction of fishing resources in Brazil, whether marine or continental (Brasil, 2012). Artisanal fishing still plays a key role in maintaining the local economy, food security, and culture of thousands of traditional communities, and is a vector for socioeconomic standards and poverty reduction. However, predatory exploitation threatens most fishing resources of economic interest and environments in which they are located.

Embrapa conducts research and development actions that optimize sustainable use of water resources and contributes to increasing the resilience of historically marginalized riverine and fishers populations. These actions seek to reduce their vulnerability to environmental and mainly socioeconomic and political externalities in several regions of Brazil, for example:



Figure 1. Family farming products, including seeds and traditional cultivars.

- Participatory creation/adaptation of technologies to improve the efficiency on gillnets of artisanal fisheries in the Araguaia-Tocantins Basin, focusing on target species and minimizing losses in the productive chain.
- Monitoring of landings and the incentive to management and participatory management of artisanal fishing, aiming at recovery, conservation, and sustainable use of fishing resources and the productive chain in the Brazilian Amazon region communities (Pará, Tocantins, and Roraima).
- Fishing monitoring in the Upper Paraguay Basin and appreciation of the ethno-knowledge of fishing communities in order to develop a fish conservation strategy in the Pantanal Basin, thus contributing to public policies and decision-making related to the sustainable management of fishery resources. It is worth noting the importance of the *Pantanal*, a biome rich in fish resources, used both by amateur and professional fishing, and a source of subsistence for riverine families. The monitoring system addresses research data in order to Embrapa Pantanal understand the biological and socioeconomic trends of fishery, generating subsidies for fisheries management, under the responsibility of the environmental agencies.
- Development of protocols to estimate the shelf life of fish preserved in ice, serving as a tool to evaluate fish freshness.

Support of Embrapa for Brazil Without Misery Plan

The search for protagonism of rural workers, the promotion of a critical reading of the world, as well as the access to technological and scientific information are considered part of the elements capable of contributing to the creation of citizens committed to social and environmental sustainability. For this, Embrapa develops projects and actions that adapt to different social contexts and synergize with the country's targets of combating poverty, especially rural poverty, as will be addressed in this book.

In 2011, the federal government instituted, through Decree 7,492/2011, Brazil Without Misery Plan (PBSM) (Brasil, 2011) to overcome extreme poverty. The initiative was organized in three axes: the first one to guarantee income, for immediate relief of extreme poverty; the second to access public services, to improve the conditions of education, health, and citizenship of families; and the

third to promote inclusion, to increase the capacities and opportunities of work and income generation among the poorest rural and urban families (Brasil, 2015).

Embrapa participated in the first phase of the plan with seeds and print material (leaflets and booklets) distribution for family farmers in the Brazilian semiarid region. In 2014, it started to integrate the BSM institutional arrangement in the rural production inclusion axis through 12 territorial projects and five cross-cut projects, whose challenges were: find technological solutions; create spaces for socio-technical experimentation by the population living in extreme poverty in the Brazilian semiarid region; innovate its methodologies and strategies, as well as its organizational structure for a better sharing of knowledge; and disseminate technologies (Beltrão et al., 2017).

Training and information dissemination

Embrapa performs different training actions and for different audiences (see SDG 4: Quality Education). One of the cross-cutting training projects highlighted was *Ações de Capacitação e de Divulgação de Informações Tecnológicas para Apoio à Inclusão Produtiva Rural, no Plano Brasil Sem Miséria* (Actions for Training and Dissemination of Technological Information to Support Rural Production Inclusion in Brazil Without Misery Plan – Acar), led by Embrapa. Among the main actions of Acar project is the community communication training for local development with development agents (community leaders, rural youth, radio broadcasters, and extensionists) in the 14 territórios da cidadania (territories of citizenship) to strengthen and integrate communities with rural production inclusion projects, coordinated by Embrapa.

Embrapa has made it possible for family farmers, *quilombola* communities, and rural young people to access technological solutions and innovations that are inexpensive, easy to apply and can be adapted locally. Many of these technologies were addressed in the community communication training workshops. “Comunicação comunitária para o fortalecimento do desenvolvimento local” (community communication for the strengthening of local development) methodology was certified as a social technology by the Banco do Brasil Foundation (FBB) as it applies to different socio-cultural realities and contexts.

Another important action of Embrapa developed directly with the schools are the [Mini Libraries](#), an institutional initiative to encourage reading and productive inclusion in rural areas (Figure 2). In order to do this, the Mini Libraries are organized

regionally, according to the interest of the intended audience, and gather, in a traveling collection, printed publications (books, booklets, manuals, etc.), videos, and audios of radio and TV programs, providing technological information generated by Embrapa and its partners on agricultural crops, small animal husbandry, environment, family agroindustry, among many other topics. There was also an expansion of the Mini Libraries in schools and communities in these territories, in more than 1,200 municipalities in the country. The Mini Library was certified as a social technology by the FBB because it helps a public policy, is complementary with other local actions that stimulate social participation, and contributes to the development of key alliances to eradicate poverty.



Photo: Mauricilija Pereira da Silva

Figure 2. Mini Library in a rural school in the municipality of Xapuri, state of Acre, Brazil.

The expansion of access to knowledge and information that contribute to the improvement of the quality of life, food, and nutritional security, as well as to the formation of citizenship, occurred through actions such as:

- The [weekly radio program Prosa Rural](#) (Figure 3), which presents, in all regions, topics that reinforce technologies and good practices for the production of safe food. Each week, for 15 minutes, thousands of Brazilian homes receive the sounds of Prosa Rural and learn about the low-cost and

easy-to-use technologies and products developed by Embrapa for young and family farmers of the Brazilian semi-arid, Vale do Jequitinhonha, and the North, Midwest, Southeast, and South regions. Prosa Rural was conceived in 2003, based on Embrapa's interest in creating an environment to disseminate technologies and other information that could be useful for the day-to-day life of numerous rural families in the Northeastern semi-arid as one of several lines of action of the federal government Fome Zero (Zero Hunger) program.



Photo: Kátia Simone Marsicano Corrêa

Figure 3. Announcers of the Prosa Rural program recording at the Embrapa studio, Brasília, DF, Brazil.

- Development of a communication methodology for the protagonism of young people, farmers, and community leaders in the local communication process. A methodology that is re-applicable through training, it combines communication and education strategies, both face-to-face and long-distance, with the use of social media and digital platform resources (Agropedia brasilis), aimed at promoting better interaction between research, extension, and agriculture. It is applied to the technology transfer projects developed by Embrapa and its main goal is continuous training of farmers, graduate students, and community leaders, all cooperating in concepts and practices in the field of agriculture/agroecology and

communication. After the training process, the participants are supposed to have a broader understanding of the technological projects in which they are inserted and, at the same time, to the use of communication resources (audios, videos, texts, Facebook, WhatsApp), to systematize their experiences, collaborate in the production of pedagogical materials in the field of agriculture, and integrate technological networks.

- Distribution of free and open access repositories of thousands of publications by Embrapa. These repositories include Infoteca-e, Alice repositior, and Agricultural Research Database (Base de Dados da Pesquisa Agropecuária, BDPA).

[Infoteca-e](#) is an open access repository of technological information that provides rural producers, extended education workers, agricultural technicians, students and teachers of rural schools, cooperatives, and other segments of agricultural production, with information on Embrapa and its partners' technologies. These publications have been edited – in easily readable language – into booklets, books, manuals, and radio and television programs.

The [Alice repository](#) is composed of scientific information produced by Embrapa researchers and edited into book chapters, articles in indexed journals, articles in congress proceedings, theses and dissertations, white papers, among other types of publications, contributing to increasing the impact of search results.

[BDPA](#) is a database that gathers the documents that compose the collection of Embrapa libraries, including the literature generated and the literature acquired: books, pamphlets, theses, papers presented at technical-scientific events, digital documents, maps, etc.

Final considerations

The mission of Embrapa is to enable research, development, and innovative solutions for agricultural sustainability to benefit Brazilian society. The concern with food security is also clearly defined in its Institutional Vision, namely: “being a global reference in the generation and supply of information, knowledge, and technologies, contributing to the innovation and sustainability of agriculture and food security.” It is clear, therefore, that the great action focus of Embrapa is related to the generation of value in agriculture, focusing on food security, in favor of Brazilian and the world’s society. As a result, its research system contains 25 Portfolios and 93 Arrangements composed of several research projects that

directly or transversally deal with topics such as food production, food security, and human capacity improvement. Some of the results obtained from these projects were presented throughout this chapter, notably those with contribution directly linked to the fulfillment of targets 1.1 and 1.2 of SDG 1. There is much more being done by Embrapa to eradicate poverty when considering its multidimensional character, and many of the contributions presented in other e-books in the series are also related to achieving these targets.

Finally, it should be pointed out that, thinking about observing the 2030 Agenda for Sustainable Development (Nações Unidas, 2018), Embrapa has identified macro trends for agriculture, among which the focus is on establishing research that contributes to quality and aggregation of value in strategies of productive arrangements of small- and medium-scale producers, including strategies to evolve family farms to turn into highly profitable enterprises, which undoubtedly presents itself as a substantial contribution to eradicating poverty in the Brazilian rural environment. Thus, it is expected that the innovative information, products, and processes developed by Embrapa will make it possible to include part of the Brazilian population that lives in poverty and extreme poverty conditions in different regions of the country.

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Chapter 4

Increasing resilience of the poor and reducing their vulnerability to disasters

Joanne Régis Costa

Patricia da Costa

Introduction

Climate change is the biggest challenge of the 21st century and is at the center of the global political debate (Giddens, 2010). The intensification of extreme weather events, one of the expected effects of global climate change, will affect everyone, especially peoples and populations that are already vulnerable to access to basic rights (Olsson et al., 2014). Poverty is considered the main factor contributing to the increase in population vulnerability to the effects of climate change, helping reduce their adaptive capacity (Plano..., 2016). As factors that contribute to social vulnerability to climate change, we can add: gender, color, race, and traditional and specific population groups issues, inserted in a context of social, regional and structural inequalities (Subsídios..., 2011).

Target 1.5 of the Sustainable Development Goal 1 (SDG 1) addresses building the resilience of the poor and vulnerable people and reducing their exposure and vulnerability to climate-related extreme events and other economic, social, and environmental shocks and disasters by 2030. Next, the technological solutions developed by Embrapa related to climate change that can help achieve this target are presented.

Agropensa: the construction of future scenarios

The Strategic Intelligence System of Embrapa (Sistema de Inteligência Estratégica da Embrapa, [Agropensa](#)) seeks to present to Embrapa and to society prospective studies to help explore possible future scenarios. The studies conducted by Agropensa have the important function of supporting the continuous reflection on, and possible revision of, Embrapa's research, development, and innovation (PD&I) agenda, besides providing knowledge and information to the different actors and agents of agricultural and livestock production chains.

GuiaClima – Web service

[GuiaClima](#) is an agroclimatic monitoring system that provides real-time information on weather conditions (temperature, air humidity, etc.) and warnings (low air humidity, strong winds, frost, etc.) that can be used to assist in decision making. The system can be accessed through the Embrapa Western Agriculture Unit Portal, both by computer and smartphone. Currently, more than 100 visitors access GuiaClima a day. People from all over Brazil and even from abroad consult GuiaClima.

Development of management decision support systems

Embrapa has developed software, applications, information systems, information and communication technologies, databases, maps, among others, to evaluate scenarios using technologies, analyze the impacts of technology use in the field and optimize the use of technologies (see SDG 11).

Rede Saltus

Embrapa, through Embrapa Forestry and partner institutions, fostered the formation of the [Rede Saltus](#) to generate information on the dynamics of greenhouse gas emissions and carbon stocks in natural and planted Brazilian forests. The goal is to bridge the gaps in the subject, as well as to advance on the use of mathematical simulation and remote sensing techniques in the estimates of greenhouse gas emissions/removals of greenhouse gases (GHG) in the country, and economic evaluation of mitigating alternatives. Current scenarios, both political and scientific, show that Brazil will soon have to enter into a phase of preparing and publishing national inventories and monitoring actions to reduce GHG emissions, starting to publish more frequently audited inventories. Thus, it is necessary to develop and improve technical and scientific indicators related to GHG emissions and removals from forests, as well as to master technological tools that allow greater integration of national information.

Sustainable use of natural resources in critical Brazilian regions

Embrapa develops studies on the sustainable use of natural resources. In *Agricultura tropical: quatro décadas de inovações tecnológicas, institucionais e*

políticas (Albuquerque; Silva, 2008), published by Embrapa, the sustainable use of natural resources is addressed in Volume 2. Many natural resources have already been incorporated into the production process, but others still rely on specific knowledge for their use. From the semiarid region to the Amazon Forest, through the *Cerrado*, the Coastal Tablelands, and the *Pantanal*, problems must be faced, and diverse solutions must be found. Demographic pressure, urban expansion, environmental preservation, demands for welfare, and demands for quality and quantity must be considered when it is necessary to use the available resources to benefit the different segments of Brazilian society in a sustainable way. The book *Agricultura tropical: quatro décadas de inovações tecnológicas* (Albuquerque; Silva, 2008) provides an inventory of useful challenges and options, and an opportunity to evaluate the results and think about the future prospects to transform agriculture in the tropics.

Protocol to measure and estimate biomass and forest carbon

Among the research carried out by Embrapa on the subject, it is important to highlight *Protocolo de medição e estimativa de biomassa e carbono florestal* (Higa et al., 2014), in which the procedures for collecting information, estimating biomass above and below the ground, plant litter, and necromass of natural forests, planted forests, and integration systems involving the forest component. This work considers the main carbon reservoirs in forest formations in Brazil for measurement (Figure 1).

Impacts and vulnerabilities of Brazilian agriculture to climate change

Studies by Embrapa and its partners have evaluated the main impacts of greenhouse gas emission scenarios. It is important to mention the studies published in the book *Modelagem climática e vulnerabilidades setoriais à mudança do clima no Brasil* (Teixeira et al., 2016). This book analyzes, in addition to agriculture, Brazilian biomes vulnerabilities and the sectors of water resources, renewable energies, health, and Brazilian biodiesel production. Other studies on impacts and adaptation measures in cities, metropolitan regions, and states in Brazil indicate how the changes will affect the regions from physical, economic, and social points of view, especially in the city of Rio de Janeiro. The Ministry



Figure 1. Measurement of diameter at breast height (DBH) of eucalyptus to estimate carbon stocks in aerial biomass in delimited plots in the eucalyptus forest, a remnant of a mixed ombrophilous forest and ICLF system, conducted by Embrapa Forestry, to estimate carbon stocks in biomass in these land use systems.

of Science, Technology and Innovation (MCTI, currently Ministry of Science, Technology, Innovations, and Communications) launched the book, as a result of studies developed by researchers from Embrapa, the Rede Clima (Climate Network), in partnership with the National Institute for Space Research (Inpe) and the Centro Nacional de Monitoramento e Alertas aos Desastres Naturais (National Center for Natural Disaster Monitoring and Alerts – Cemaden).

Actions to fight desertification

Embrapa has developed several actions to combat desertification. It is a member of the [Comissão Nacional de Combate à Desertificação](#) (National Commission to Combat Desertification – CNDC), which discusses initiatives for coping with drought in Brazil, especially in the semi-arid region. The work developed by

Embrapa Goats & Sheep with actions to reverse desertified areas in Irauçuba, near Sobral, state of Ceará has stood out. This is the region of Ceará that is most affected by desertification, and Embrapa's work has shown that it is possible to reverse the degradation process through available technologies.

Among the technologies already studied and made available by Embrapa and its partners that contribute to the fight against desertification, must be highlighted: Riparian forest recovery; Reforestation; Production backyards; Agroforestry Systems (AFSs); Underground dam; Successive dams; Barraginha/Barreiro; Barreiro trench; Rainwater harvesting; Banding; Pre-planting furrow; Post-planting furrow; Barred furrow; Flat plowing and planting; Boardwalk cistern; Shallow wells; Contouring stone strings, among others. For further information about projects, technological solutions, publications, and others, see the Embrapa Thematic Space on [Coping with Droughts](#).

Evaluation of extreme events and their impacts

Embrapa has conducted studies on extreme events in Brazil. It is important to highlight a short-term extreme hydrometeorological events (EHE) study carried out by Embrapa Soils (Monteiro, 2014), which have been considered one of the most frequent and most impactful on society in the climate change scenario. This study highlighted the need for greater emphasis on prevention strategies such as land management, strengthening of rural communities, slope containment, improvement of alert systems, and other adaptation measures that increase the resilience of rural communities to extreme hydrometeorological events.

Agricultural Zoning of Climate Risk (Zarc)

The [Zoneamento Agrícola de Risco Climático](#) (Agricultural Zoning of Climate Risk – Zarc) turned 20 years in 2016. It is one of the main organization tools of Brazilian agricultural production and was developed by the Ministry of Agriculture, Livestock and Food Supply (Mapa), by Embrapa and partner research institutions to offer benefits to both farmers and financial sector.

The [first Zarc](#), published in 1996, was on wheat. Subsequently, 59 cultures and 80 different culture systems were studied in a research involving approximately 80 professionals from 21 Embrapa Units.

Two government programs use Zarc information to frame its operations: the Programa de Garantia de Atividade Agropecuária (Agricultural Guarantee Program – Proagro) and the Programa de Subvenção ao Prêmio do Seguro Rural (Rural Insurance Premium Grant Program – PSR). By using this tool, it is possible to reduce risks and improve family income and production. The system allows the banking system to make more precise use of credit and rural insurance systems.

Final considerations

In addition to the contributions mentioned to SDG1 target 1.5, Embrapa has several other contributions that have subsidized policies to eradicate and reduce poverty and hunger and which contribute to reducing regional asymmetries, such as the Zero Hunger Program and Brazil Without Misery Plan, and policies to mitigate climate change. Other international and regional contributions include: the participation of Embrapa in events and international documents on climate change, poverty, and related issues; studies on management, inventory, and dynamics in Brazilian biomes carbon flow; development of models and methods to estimate GHG emissions; analysis of climate scenarios and risk estimates for agriculture; development of low carbon agriculture systems and other technologies for climate change adaptation and mitigation; identification of biome potential due to climate change; research with plant species managed by local populations that resist environmental stresses, with potential for use in climate change adaptation programs; in addition to the development of [AgritempoMóvel](#) – a mobile agrometeorological monitoring app that creates date recommendations for planting. On the other hand, there are several local contributions that deserve mention, such as the Geoviticulture Multicriteria Climate Classification System; the Climatic Macro zoning for Irrigated Rice in Rio Grande do Sul; the [climatic zoning of coffee cultivation](#); [projections of water demand for melon irrigation in the Submédio São Francisco under climatic changes scenarios](#); the [climatic agricultural zoning of corn and soybean](#); the [calculation of the fire risk index for the Nhecolândia subregion based on the climate data information system](#); the [agroclimatic aptitude map for the cultivation of *Coffea arabica* in the cities of Rio de Janeiro](#); the [agroclimatic zoning for citrus crop](#). Thus, Embrapa demonstrates its alignment with local realities and the global agenda related to the resilience of the poor and vulnerable populations to climate-related extreme events and other economic, social, and environmental shocks and disasters.

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Chapter 5

Advances and future challenges

Joanne Régis Costa

Patricia da Costa

Introduction

Although the main indicators of poverty and extreme poverty are associated with daily per capita income (Brasil, 2017, 2018; Monitoring..., 2017), poverty in its expanded concept is not limited to income but also the extension human capacities (Sen, 2000). The increase in human capacities can promote the expansion of productivity and the power to earn income, making hardships rarer and less chronic. Hence, reducing poverty means raising income, but also providing the means to defend human rights, access to different basic services, and the enhancement of human capacities.

In Brazil, it is estimated that 50 million people, about 25% of the population, live on poverty line (Síntese..., 2015). With continental dimensions, the country has a structure marked by regional and social inequalities. Northeastern states have the largest population living on poverty line (Síntese..., 2015), which can also be associated with vulnerable groups according to gender, color, race, and others (Subsídios..., 2011; IBGE, 2017).

These regions and social groups are especially subject to food insecurity and malnutrition, which can be aggravated by global climate change. Climate change can lead to material and housing losses and the reduction of the means of production and sources of income, further aggravating the poverty and extreme poverty situation of vulnerable populations.

Understanding this scenario is essential so that priority lines can be established for the feasibility of research, development, and innovative solutions for agriculture sustainability, to benefit Brazilian society, focusing on regions or social groups in situations of poverty and extreme poverty, and when facing global climate change.

Embrapa highlights

Embrapa is recognized as a provider of new technologies and processes, as well as qualified information to support decisions in agriculture and expand human capabilities.

Rada and Valdes (2012), in the Policy, Technology, and Efficiency of Brazilian Agriculture study (United States Department of Agriculture), reinforced that, between 1985 and 2006, Brazilian agricultural production increased by 77% and the country emerged as a major international agricultural exporter. Brazilian agricultural productivity was driven by sustained public investments in science and technology, leading to a flow of new technologies. In that study, they emphasized that Embrapa was crucial in increasing the country's agricultural productivity.

Embrapa has made it possible for family farmers, *quilombola* communities, and rural youth to access technological solutions and innovations that are inexpensive, easy to apply, and can be adapted locally.

The knowledge produced by Embrapa consists in seed technologies, soil preparation techniques, planting and harvesting, phytosanitary treatments, climatic risk zoning, improved genetic materials, agricultural practices resilient to climate change, sustainable practices for critical regions, the construction of several systems to support management decisions, among other solutions, in all Brazilian biomes.

Besides, Embrapa has contributed to the discussion and development of social interest policies. Contributions of Embrapa related to the poverty reduction theme include its participation in the Programa Brasil Sem Miséria (Brazil Without Misery Program), the National Policy on Agroecology and Organic Production (Política Nacional de Agroecologia e Produção Orgânica), the National Policy on Technical Assistance and Rural Extension (Política Nacional de Assistência Técnica e Extensão Rural), as well as on the policies for the development of peoples and traditional communities, and in the National Plan for the Promotion of Socio-Biodiversity Chains (Plano Nacional de Promoção das Cadeias da Sociobiodiversidade). In this sense, Brazil has benefited in a sustainable way from improved products and processes and innovative technologies made available to all, but especially to those responsible for strategic decisions aimed at improving Brazilian life.

Future challenges

Sustainable development and poverty are divergent concepts since poverty is a condition of social inequality. According to Marcel Bursztyin, a professor at the Center for Sustainable Development of the University of Brasília (UnB), in an

interview with UNDP, in order to promote a sustainable level of development, both concepts must be integrated to try to end poverty (Nações Unidas, 2016).

The mission of Embrapa is to enable research, development, and innovative solutions for agricultural sustainability to benefit Brazilian society. Its focus is the sustainable development of the rural environment, contributing to raise income and promote food security. Among the various future challenges to poverty reduction in Brazil and the promotion of food security in a scenario of global climate change, Embrapa has made efforts to:

- Amplify regionalized analyses on the new technological, social, economic, and demographic trends to diminish the process of “social differentiation” in the Brazilian rural environment.
- Expand research on technological solutions for agricultural production in regions with rising agricultural risk associated with production chains, with emphasis on the Northeastern semiarid region, especially in the face of global climate change.
- Carry out further studies and analyzes about agricultural production and the different technological levels of Brazilian rural settlements with potential optimization of the use of lands converted anthropically.
- Integrate new forms of institutional articulation, such as the Núcleos Territoriais de Inovação e Referência Tecnológica (Territorial Nuclei of Innovation and Technological Reference – Nutir/Embrapa), Reference Units and Multiuser Laboratories, etc., for the characterization and regionalization of rural producers, more sustainable production systems and new technological standards.
- Support the restructuring of the Technical Assistance and Rural and Social Extended Education (Aters) for regionalized technology transfer actions to provide qualified and sufficient information to rural producers to ensure “broad access” and integration into markets, thereby developing their entrepreneurship.
- Develop new production systems that consider aspects of rural multifunctionality, integrating food, fiber, and energy production into non-agricultural economic activities (e.g., rural tourism and ecosystem services).
- Develop studies on the diversity of national livestock systems and their territorial occupation, identifying more efficient, sustainable systems and with the minimum application of external inputs.

This way, Embrapa hopes to amplify its operation, generating impressive results capable of contributing to the farmer's role, fighting poverty, and tackling social inequalities in Brazil.

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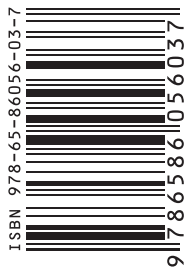
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