THE **FUTURE** ON THE **TABLE**

Food and Nutrition Security Policies in the face of the climate emergency

MINISTRY OF
SOCIAL DEVELOPMENT
AND ASSISTANCE, FAMILY
AND FIGHT AGAINST HUNGER

GOVERNMENT OF BRAZIL
BRASIL
ALONGSIDE THE BRAZILIAN PEOPLE

Photo: Lyon Santos/MDS

THE **FUTURE** ON THE **TABLE**

Food and Nutrition Security Policies in the face
of the climate emergency

Luiz Inácio Lula da Silva
President of Brazil

José Wellington Barroso de Araújo Dias
Minister of Social Development and Assistance, Family, and Fight Against Hunger

Lilian dos Santos Rahal
National Secretary for Food and Nutrition Security

Sylvia Santiago Carneiro de Filippo
Chief of Staff

Márcia Muchagata
Project Manager

Erick Brigante Del Porto
Project Manager

Clarita Guimarães Rickli
Project Manager

Camile Marques Sahb
Director for the Promotion of Rural Productive Inclusion and Access to Water

Raimundo Nonato Soares Lima
Director for the Acquisition and Distribution of Healthy Foods

Patricia Chaves Gentil
Director for the Promotion of Adequate and Healthy Nutrition

F9969 The Future on the Table: Food and Nutrition Security Policies in the Face of the Climate Emergency / organized by Márcia Muchagata. – Brasília: Ministry of Social Development and Assistance, Family, and Fight Against Hunger; Zabelê Comunicação, 2025.
228 p.; ill.

ISBN: 978-65-998251-2-5

1. Food and Nutrition Security. 2. Climate Emergency. 3. Public Policies. 4. Right to Food. 5. Climate Change. 6. Challenges. 7. Climate Justice. 8. Social Programs. I. Title. II. Muchagata, Márcia.

UDC 304:613.2(81)

Librarian: Tatiane de Oliveira Dias – CRB1/2230

MINISTRY OF SOCIAL DEVELOPMENT AND ASSISTANCE, FAMILY, AND FIGHT AGAINST HUNGER
National Secretariat for Food and Nutrition Security
Esplanada dos Ministérios | Block C | 4th Floor
ZIP Code: 70.046-900 – Brasília, DF – Brazil

9 786599 825125

This publication was made possible with the support of the Food and Agriculture Organization of the United Nations (FAO), through project TCP/BRA/3902.

Editorial project: Gabriel Rizzo Hoewell
Manuscript preparation: Monica Rodrigues
Graphic design and layout: Gabriel Rizzo Hoewell
Supplementary texts: Monica Rodrigues and Thais Ferraz
Copyediting: Bruno Barros
English translation: Lígia Girão
Bibliographic cataloging: Tatiane Dias
Cover and inside cover photographs: Marcelo Curia

Photo: Sergio Amaral/MDS

Contents

Photo: Sérgio Amaral/MDS

Foreword

Wellington Dias
Minister of Social Development and Assistance,
Family, and Fight Against Hunger

In recent years, the country has taken bold steps to reduce inequality and poverty, revive the economy, and strengthen income transfer programs such as Bolsa Família, which support millions of families. Through initiatives such as *Programa Acredita*, the government has encouraged employment and entrepreneurship, while also working to stabilize food prices and support family farmers. These efforts mark a historic shift—a milestone that removes Brazil once again from the UN Hunger Map and reaffirms the power of coordinated action and social commitment.

Yet, as a global community, we continue to confront one of the greatest challenges of our time: ensuring food security for a growing population amid the accelerating impacts of a changing climate. These transformations have intensified poverty and social inequality, further hindering regular and adequate access to food.

The outlook is alarming. Global warming is approaching the critical threshold of 1.5°C, and its effects are already evident everywhere: widespread crop losses, persistent food price inflation, and the return of hunger to worrying levels—especially in the world's most vulnerable regions. Brazil is not immune to these realities. Prolonged droughts, destructive floods, and noticeable shifts in rainfall and temperature patterns now affect every region of the country.

This book emerges at a time when its insights are urgently needed, as it offers not only a rigorous diagnosis of these interconnected challenges but also showcases the concrete responses Brazil has built over recent years to address them. The Brazilian experience demonstrates that ambitious climate policies can coexist with the fulfillment of the human right to adequate food. Initiatives such as *Programa Cisternas*, *Programa de Aquisição de Alimentos*, *Fomento Rural*, and *Cozinhas Solidárias* form part of an integrated strategy that places climate justice at the center of government action.

The following pages reveal accumulated institutional learning—knowledge that enabled Brazil to leave the Hunger Map for the second time in 2025. Yet this achievement is not irreversible. As the authors of this important work rightly warn, the rising frequency and intensity of extreme weather events demand more robust and permanent financing mechanisms, with particular attention to family farming and vulnerable populations, alongside sustained efforts to correct historical imbalances in access to resources.

The originality of this book lies in its systemic vision, which understands food systems as extending far beyond production to encompass processing, distribution, consumption, and waste management. By

connecting topics such as urban food deserts, peri-urban agriculture, and food loss and waste, the authors offer a comprehensive view of the multiple fronts where resilience must be built.

In a world where billions still lack access to adequate and nutritious diets, the lessons gathered in this publication transcend national borders. They remind us that food security and climate action are not competing agendas, but two sides of the same challenge. The future of food is being shaped now. Let this book inspire continued action toward a world that is more just, sustainable, and resilient.

Photo: Roberta Aline/MDS

Presentation

Aloísio Lopes Pereira de Melo
Lilian dos Santos Rahal
Márcia Muchagata

Climate change is well underway, disrupting life in multiple forms across the planet. In 2024, global surface temperatures are likely to have surpassed 1.5 °C above pre-industrial levels. Human-driven warming is occurring at an unprecedented pace, and climate scientists warn that the 1.5 °C threshold could be reached—or even exceeded—within the next five years, without the cooling effects of major volcanic eruptions (Foster *et al.*, 2025).

In recent years, droughts, floods, tropical cyclones, and extreme heat and cold events have inflicted severe damage, claimed lives, and posed major obstacles to sustainable development across many regions of the world.

Among the most serious impacts of the climate crisis, the worsening of global food insecurity stands out:

- The combined effect of multiple shocks—including escalating conflicts, El Niño–driven drought, and high domestic food prices—has deepened food crises in at least 18 countries by mid-2024 (WMO, 2025).
- Global hunger levels, which rose sharply between 2019 and 2021 during the COVID-19 pandemic, showed a slight improvement in 2024 but remain above pre-pandemic levels. Around 8.2% of the world's population faced hunger in 2024, compared with 8.5% in 2023. This progress is largely attributable to gains in Latin America and South Asia. By contrast, food insecurity increased in Africa, where undernutrition affected 20.2% of the population in 2024, with even higher rates—around 30%—in Central and Eastern Africa (FAO; FIDA; UNICEF; PAM; OMS, 2025).
- The drop in global cereal harvests in 2024 was driven by widespread El Niño–related drought, which caused crop failures, steep declines in productivity, and reductions in harvested areas (WMO, 2025).
- Climate-related events have also fueled food inflation, which, since 2020, has outpaced overall inflation in many countries. Higher food prices have made healthy diets increasingly unaffordable, particularly in low-income nations. In 2024, an estimated 2.6 billion people were unable to afford a nutritious diet—still an alarmingly high number, though slightly lower than the 2.76 billion recorded in 2019 (FAO; FIDA; UNICEF; PAM; OMS, 2025).

We are living through a critical and decisive decade in which action is essential to prevent climate change from becoming even more severe (Marques, 2025). This is the period when global greenhouse gas (GHG) emissions are expected to peak and then begin to decline substantially (Foster *et al.*, 2025). Rapid and stringent reductions in GHG emissions—such as those pledged at COP28—could cut the rate of warming in half over the next 20 years (McKenna *et al.*, 2021). The trajectory of climate change and its impacts will ultimately depend on the social choices made

during this decade, which will determine whether the outcomes are moderated or far more extreme.

This book seeks to highlight some of the choices made by the Brazilian government—developed in close dialogue with multiple sectors of society—to ensure that climate change does not jeopardize a major achievement of the Brazilian people: the country's removal from the Hunger Map, as announced by the Food and Agriculture Organization of the United Nations (FAO) in July 2025 (FAO; IFAD; UNICEF; WFP; WHO, 2025). These choices reflect high-level political decisions that place both climate policy and Food Security policy at the forefront of national priorities. By their very nature, these two broad areas of public policy require intersectoral design and implementation. In Brazil, they are guided by two fundamental principles: climate justice and the human right to adequate food (HRtAF).

Climate justice is both an ethical and political framework that acknowledges how climate change exacerbates existing social inequalities (Barreiro *et al.*, 2025). Beyond this, the historical social and institutional disparities that contribute to climate change also increase people's vulnerability to its effects and shape how they are able to respond. The concept integrates human rights, equity, and sustainability, guiding the design of measures aimed at protecting the most exposed and vulnerable groups. It emphasizes that climate policies must account for differences across gender, race, class, age, and specific communities, including Indigenous peoples and traditional populations. Effective responses to climate change must be comprehensive, context-sensitive, and tailored to the unique needs of each community (MMA, 2024).

The recognition of food as a social right in the Constitution reflects Brazilian society's understanding that food insecurity constitutes an unacceptable violation of human dignity and requires collective action to be overcome. This human right encompasses not only situations of food deprivation but also other forms of poor nutrition that contribute to obesity and chronic diseases, such as diabetes, hypertension, and others (Leão, 2013).

Although Brazil remains a country marked by significant inequality, the past 20 years have seen a remarkably positive process of social inclusion. The country has successfully addressed its most severe food security challenges—the most recent being overcome in record time—demonstrating a learning curve that has translated into tangible results.

Nonetheless, the magnitude of the climate crisis and its already significant impacts compel urgent action to mitigate emissions and manage their effects. Mitigation and adaptation must be treated as complemen-

tary strategies and fully integrated. The slower the international community progresses on mitigation, the narrower the space for effective adaptation becomes, placing increasing responsibility on national governments to address loss and damage, provide relief, and offer assistance—often under conditions of constrained resources and capacity.

Brazil plays a central role in addressing the global environmental crisis, both as a key player in climate negotiations and as a country capable of leading by example. The reality is that we are all in the same boat, with interconnected and complex systems; even if Brazil takes strong action, the outcomes will still depend on the collective performance of all countries. Nevertheless, Brazil's experience demonstrates that viable pathways do exist.

Cross-Sector challenges in developing climate policy that guarantees climate justice and the right to adequate food (HRtAF)

In the field of climate policy, the government is making a concerted effort to develop a Climate Plan that spans the various sectors of the economy. Covering both mitigation and adaptation, and complementing the national strategy, seven sectoral mitigation plans and sixteen sectoral adaptation plans have been prepared. Chapter 3 details the development process, along with the main strategies and actions of the Sectoral Adaptation Plan for Food and Nutrition Security.

One of the key challenges in this process is reconciling often competing interests while ensuring that climate justice remains central in action planning. In the area of water resources, for example, conflicts over access and use are evident and likely to increase, particularly among energy, sanitation, and agricultural production objectives. These goals do not always align with environmental and climate concerns, including biodiversity protection and the conservation of aquatic habitats.

Another example concerns food systems, where climate change presents new challenges to ensuring the human right to adequate food (HRtAF), as the ability of these systems to provide healthy food consistently and equitably is inherently linked to climate stability. Current methods of food production, processing, distribution, and consumption have contributed to the intensification of the climate crisis. This feedback loop has led to violations of the HRtAF, particularly among the most vulnerable populations, highlighting the urgent need to integrate food, nutrition, and climate considerations into public policy.

However, initiatives in the area of food systems and climate have largely emphasized production, especially in the context of mitigation. As a major food producer and exporter, Brazil's primary sector holds considerable weight in the national GDP. At the same time, it is highly vulnerable to climate change and heavily reliant on international markets, leaving it exposed to price volatility, trade disputes, and shifts in global demand—factors that directly impact rural producers' incomes and the country's overall economic stability (MAPA, 2025). At the same time, the sector plays a major role in national emissions. According to the most recent official data, 30.5% of emissions are attributed to agriculture, while 39.5% stem from land use, land-use change, and forestry—primarily driven by deforestation (MCTI, 2024). The need to reconcile agricultural production with emissions reduction and environmental conservation brings into conflict stakeholders with differing political influence. Solutions such as strengthening family farming and promoting agroecological practices—key to enhancing the resilience of Brazil's food production capacity— carry far less weight in arenas such as the legislative branch. Similarly, the institutional capacities of the executive branch are considerably weaker for family farming than for the commodity-oriented agricultural sector.

Food systems and climate: far beyond production

It is important to emphasize that food systems extend far beyond production. A broader perspective is needed, one that also considers access, processing, distribution, and consumption of food. Several perspectives on these aspects are presented. Chapter 2 discusses the need for just transition policies to achieve healthy and sustainable food systems. The concept of a just transition recognizes that addressing climate change must be carried out in an equitable, fair, and inclusive manner. This requires creating decent work opportunities for all, avoiding risks such as unemployment and displacement, and adopting an inclusive approach to address the challenges associated with the transition to a low-carbon economy (Gómez *et al.*, 2025). Chapter 4 focuses on the Public Policy and Climate Reference Framework, an initiative of the Ministry of Social Development, Assistance, Family, and Fight Against Hunger (MDS). The framework aims to strengthen public policies at the national, state, district, and municipal levels for the organization of food systems in the context of climate change. It addresses the complexity of food system governance and its interconnections with climate change, emphasizing the

need for diverse approaches grounded in the systematization of existing knowledge on this topic.

Another issue that extends beyond production is food loss and waste (FLW), which contributes 8–10% of annual global greenhouse gas emissions—nearly five times the total from the aviation sector—while driving substantial biodiversity loss and occupying almost one-third of the world's agricultural land (UNFCCC, 2024). In the Brazilian context, ongoing actions to address FLW are explored in Chapter 5, and Chapter 6 examines the impact of the climate crisis on the country's food systems, including its role in rising food prices.

Policies aimed at promoting food access—and their vulnerability to the effects of climate change—are discussed throughout this book. A significant shift in Brazil's Food Security policy, consolidated from 2023 onward, has been the emphasis on ensuring access to healthy diets in urban areas. Although food and nutrition insecurity remain more acute in rural regions, 85% of the Brazilian population lives in cities, and 80% of the food produced globally is consumed in urban settings.

Urbanization poses unprecedented challenges to ensuring that city residents have stable and regular access to safe, healthy, and adequate diets, grounded in sustainable production practices that protect natural resources and biodiversity. In response, the *Alimenta Cidades Strategy* (National Strategy on Food and Nutrition Security in Cities) was launched — a partnership between the Ministry of Social Development (MDS), the Secretariat for Urban Peripheries of the Ministry of Cities, and the Ministry of Agrarian Development and Family Farming. The initiative includes mapping food deserts, where healthy food outlets are scarce, and food swamps, where unhealthy options — especially ultra-processed products — are abundant. This strategy fostered dialogue with the municipalities prioritized for action—home to 65% of Brazil's population—creating opportunities to plan initiatives such as the installation of Food Security facilities and other measures to facilitate and democratize access to healthy diets. The *Alimenta Cidades Strategy* is presented and discussed in Chapter 8.

Another initiative targeting urban peripheries is urban and peri-urban agriculture, which not only fosters short supply chains for food production and consumption but also helps increase biodiversity and mitigate heat in large cities. This theme is explored in Chapter 9. Finally, the issue of food access—particularly in urban areas—is addressed through the program *Cozinha Solidária* (Solidarity Kitchen Program). These civil society initiatives emerged during the COVID-19 pandemic, when communities self-organized to provide food for people facing food insecurity after their

incomes were severely affected by the economic shutdown. In 2024, these kitchens began receiving federal support through the Solidarity Kitchen Program. This social technology has also proven essential for ensuring food access in situations of crisis caused by extreme climate events. Chapter 7 details the experience of these kitchens in supporting the population during the 2024 climate emergency in Rio Grande do Sul

Strengthening the resilience of vulnerable rural populations to climate change is the focus of two major programs. The first is the Programa Cisternas (Cisterns Program), discussed in Chapter 10. This is likely one of the largest and most successful climate adaptation initiatives, internationally recognized for having provided access to water for more than 1.2 million families in Brazil's Semi-Arid region. Its positive impacts go far beyond water security, improving health and nutrition, increasing household income, expanding access to education, and enhancing living and working conditions for women and girls. The program has also proven highly valuable in the Amazon region, where it supports locally adapted social technologies for clean water access. Accounts from beneficiaries are particularly striking, underscoring how the implementation of these social technologies was crucial for ensuring water security for families during the severe 2023-2004 drought.

The *Programa Fomento Rural* (Rural Development Support Program), discussed in Chapter 12, is another initiative that strengthens climate resilience. Its primary objectives are to promote food security through the productive inclusion of rural families and to generate income, mainly through the sale of surplus production. To achieve these goals, the program combines two complementary measures: continuous family support provided through technical advisory services and a non-repayable financial transfer to each household.

Meanwhile, with over 20 years of implementation, the *Programa de Aquisição de Alimentos,* PAA (Food Acquisition Program)—one of the earliest and most successful initiatives in the field of Food Security—purchases products from family farmers, which are then donated to socially vulnerable populations. The program's beneficiary selection criteria have recently been revised to prioritize the poorest farmers, women, and traditional peoples and communities. Certain documentation requirements have also been made more flexible to ensure that no one is left behind, as discussed in Chapter 11. The program's new legal framework further allows PAA food to be delivered to solidarity kitchens.

In addition to the regulations establishing these priorities, the Indigenous PAA and Quilombola PAA were developed, enabling the delivery of

healthy food produced by these groups through existing structures in their villages and communities. These initiatives generate income for the farmers while improving food security within the communities themselves.

This approach has been adopted as a viable alternative, in many contexts, to the *Ação de Distribuição de Alimentos*, ADA (Brazilian Food Distribution Action), a policy initially designed to provide food baskets to the most vulnerable groups experiencing severe food insecurity, such as some Indigenous peoples, Quilombola communities, and people living in settlements. The ADA's initial objectives have since been expanded to offer complementary and emergency support to families facing temporary food and nutrition insecurity in municipalities or regions declared under emergency or public calamity status. Social assistance measures are also increasingly required to support displaced populations, which led to the creation of the Special Task Force of the Unified Social Assistance System. Chapter 7 further examines how the Brazilian government has sought to uphold the human right to adequate food (HRtAF) in contexts affected by extreme climate events.

Financing food system initiatives: is there potential for scale-up?

Food Security policies such as the Food Distribution Action, the Rural Development Support Program, the PAA, the Cisterns Program, and the Solidarity Kitchen Program have been primarily funded through the Federal Budget, as established by the annual budget law. However, over the past two years, these programs have also benefited from extraordinary credit allocations aimed at assisting populations impacted by extreme climate events. Such credits are specifically designed for unforeseen circumstances and fall outside the standard fiscal framework, which imposes spending limits based on revenue levels.

The *Fomento Rural Program*, initially focused on rural areas in the North and Northeast, received extraordinary funds to assist those affected by both the 2023 droughts and floods in Rio Grande do Sul. Areas affected by drought in the Amazon region were also prioritized through a combination of extraordinary funds and regular budg*et al*locations. Both the ADA and PAA programs provided support to solidarity kitchens during emergencies. The state of Rio Grande do Sul alone experienced four floods between 2023 and 2024, as well as droughts in different parts of the state.

These events align with projections by the Intergovernmental Panel on Climate Change (IPCC) for southern Brazil, which indicate that climate change, combined with regional factors such as the El Niño pheno-

menon, can produce a highly unstable scenario, with periods of intense rainfall followed by drier periods. Meanwhile, data from the Ministry of Science, Technology, and Innovation (MCTI), available on the *Adapta-Brasil* platform (Sistema..., [202-]), show that the areas' most at risk from the increasing frequency and intensity of consecutive dry days include the eastern Amazon and the Northeast—precisely the regions with the highest concentration of impoverished family farming and the most concerning levels of food and nutrition insecurity.

The guidelines for developing the sectoral Climate Adaptation Plans were primarily based on the budgets already outlined in the 2024–2027 Multi-Year Plan (PPA), with projections through 2035. However, many initiatives will remain underfunded—for example, the Cisterns Program—although it has managed to secure modest additional support from sources such as the Amazon Fund. The funds available through the Federal Budget are insufficient to meet the needs of more than 900,000 families registered in the *Cadastro Único* (Single Registry for social programs) who lack access to water for human consumption, while the demand for water-related technologies to support production is even greater.

Without a clear strategy for financing actions — especially mitigation measures — the use of extraordinary credits to support sectors and populations affected by extreme events risks being largely ineffective. Given the projected intensification of climate change, which is increasingly being confirmed, there is growing recognition within economic ministries, particularly the Ministry of Planning and Budget, that these recurring events can no longer be considered 'extraordinary' as scientific evidence shows they are fully anticipated. It is also necessary to account for the imbalance of power among different sectors and regions of the country. For example, farmers in Rio Grande do Sul are far better positioned to secure government support than riverine communities in the Amazon; as a result, the allocation of extraordinary credits has not always aligned with principles of climate justice.

Financing climate action—or more broadly, the means of implementation—remains the central unresolved issue in international climate negotiations and must also be addressed at the national level. In Brazil, particularly for mitigation measures, innovation has occurred where funding does not create fiscal pressure, as is the case with the Climate Fund's repayable resources, which have become one of the main instruments supporting Brazil's ecological transformation.

A study conducted by the Global Alliance for the Future of Food (2024) examined the state of financing for the transformation of food

systems worldwide. It found that between 2017 and 2022, public climate finance nearly doubled, rising from USD 321 billion to USD 640 billion. However, the share of climate finance directed toward food systems declined from 3% to 2.5% over the same period. Only 1.5% was allocated to interventions in sustainable and agroecological food systems. Of the USD 16.3 billion in public climate finance targeting food systems, just USD 9.1 billion could be classified as 'sustainable'. (Global Alliance for the Future of Food, 2024)

Key factors that enabled Brazil to exit the Hunger Map—first in 2014 and again in 2025—include, foremost, the prioritization of the fight against hunger security, which translated into a coordinated set of policies. These encompassed strengthening the social protection network, with significant increases in cash transfers under the *Bolsa Família Program*; support for family farming to ensure food production and distribution; and significant employment generation. A second factor was the revitalization of governance structures within the National Food and Nutrition Security System (SISAN), which features strong civil society participation in policy development, both through the National Food and Nutrition Security Council (CONSEA) and other mechanisms such as public consultations for the Food and Nutrition Security Adaptation Plan and the Reference Framework on Food Systems and Climate, among others.

At the international level, Brazil successfully encouraged the wealthier nations within the G20 to establish the Global Alliance Against Hunger and Poverty. Today, the Alliance brings together more than 100 countries, alongside numerous foundations, agencies, and international financial institutions. Its work is driven by a central mechanism known as the Policy Basket, which provides a set of evidence-based policy options and programs that countries can either adopt directly or adapt to their own national contexts, with both financial and technical support from Alliance members. The Alliance is also showing in practice that climate finance can—and should—be mobilized to advance its initiatives.

As highlighted throughout this introduction and detailed in the various chapters, the food security actions implemented by the federal government can now be understood as synonymous with climate policy. However, Brazil will remain outside the Hunger Map in the coming years only if more robust investment mechanisms for transforming food systems are in place, both within and beyond the federal budget.

Brazil's institutional framework, combined with its unique climate conditions and rich socio-biodiversity, places the country in a strong position to demonstrate that it is possible to promote social inclusion,

protect its population from the impacts of climate change, and generate solutions that meaningfully reduce the risk of even greater disasters. The ambition is clear: actions in Food Security, together with efforts to transform food systems, are already producing tangible results and emerging as a reference point for viable solutions.

REFERENCES

ALIANÇA GLOBAL PARA O FUTURO DA ALIMENTAÇÃO. *Public Climate Finance for Food Systems Transformation*. [s. l.]: Aliança Global para o Futuro da Alimentação, 2024. Available at: https://futureoffood.org/wp-content/uploads/2025/05/ga_climatefinancereport_2024.pdf. Accessed: 8 Sep. 2025.

BARREIRO, R. *et al*. Entenda o que é justiça climática. *WRI Brasil*, 11 fev. 2025. Available at: https://www.wribrasil.org.br/noticias/entenda-o-que-e-justica-climatica. Accessed: 8 Sep. 2025.

CONVENÇÃO-QUADRO DAS NAÇÕES UNIDAS SOBRE MUDANÇAS CLIMÁTICAS (UNFCCC). Food loss and waste account for 8-10% of annual global greenhouse gas emissions; cost USD 1 trillion annually. *United Nations Framework Convention on Climate Change*, 30 Sep. 2024. Available at: https://unfccc.int/news/food-loss-and-waste-account-for-8-10-of-annual-global-greenhouse-gas-emissions-cost-usd-1-trillion. Accessed: 8 Sep. 2025.

FOSTER, P. M. *et al*. Indicators of Global Climate Change 2024: annual update of key indicators of the state of the climate system and human influence. *Earth System Science Data*, v. 17, n. 6, p. 2641-2680, 2025. Disponível em: https://doi.org/10.5194/essd-17-2641-2025. Acesso em: 8 Sep. 2025.

GÓMEZ, C. *et al*. O que é uma "transição justa" e como está o progresso dos países. *WRI Brasil*, 22 de maio de 2025. Available in: https://www.wribrasil.org.br/noticias/o-que-e-uma-transicao-justa-e-como-esta-o-progresso-dos-paises. Accessed: 8 Sep. 2025.

LEÃO, M. *O direito humano à alimentação adequada e o Sistema Nacional de Segurança Alimentar e Nutricional*. Brasília: Abrandh, 2013.

MAPA. 2025. Plano Clima Setorial de Agricultura e Pecuária, (in press).

MARQUES, L. *O decênio decisivo*: propostas para uma política de sobrevivência. São Paulo: Editora Elefante, 2025.

MCKENNA, C. M. *et al*. Stringent mitigation substantially reduces risk of unprecedented near-term warming rates. *Nature Climate Change*, v. 11, p. 126-131, 2021. Disponível em: https://www.nature.com/articles/s41558-020-00957-9. Accessed: 8 Sep. 2025.

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÃO (MCTI). *Primeiro relatório bienal de transparência do Brasil à Convenção-Quadro das Nações Unidas sobre mudança do clima*. Brasília: MCTI, 2024. Available at: https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/publicacoes/relatorios-bienais-de-transparencia-btrs/Primeiro_Relatorio_Bienal_Transparencia_Brasil_BTR_2024_PORT.pdf. Accessed: 8 Sep. 2025.

MINISTÉRIO DO MEIO AMBIENTE E MUDANÇA DO CLIMA (MMA). Departamento de Políticas de Mitigação, Adaptação e Instrumentos de Implementação (DPMA). Secretaria Nacional de Mudança do Clima (SMC). *Plano Clima*: estratégias gerais e planos Setoriais para mitigação e adaptação. [s. l.]: MMA, 2024. Available at: https://www.gov.br/mma/pt-br/composicao/smc/plano-clima/apresentacao-plano-clima-atualizada-mai24-lgc-1.pdf. Accessed: 8 Sep. 2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA A ALIMENTAÇÃO E A AGRICULTURA (FAO); FUNDO INTERNACIONAL DE DESENVOLVIMENTO AGRÍCOLA (FIDA); FUNDO DAS NAÇÕES UNIDAS PARA A INFÂNCIA (UNICEF); PROGRAMA ALIMENTAR MUNDIAL (PAM); ORGANIZAÇÃO MUNDIAL DA SAÚDE (OMS). *The State of Food Security and Nutrition in the World (SOFI)*: addressing high food price inflation for food security and nutrition. Roma: FAO; FIDA; Unicef; PAM; OMS, 2025. Available at: https://doi.org/10.4060/cd6008en. Accessed: 8 Sep. 2025.

SISTEMA Adapta Brasil. *Ministério da Ciência, Tecnologia e Inovação*, [202-]. Available at: https://sistema.adaptabrasil.mcti.gov.br/. Accessed: 8 Sep. 2025.

WORLD METEOROLOGICAL ORGANIZATION (WMO). *State of the Global Climate 2024*. Geneva: World Meteorological Organization, 2025. Available at: https://wmo.int/sites/default/files/2025-03/WMO-1368-2024_en.pdf. Accessed: 8 Sep. 2025.

Photo: Claudio Verissimo

Healthy and Sustainable Food Systems: The Need for Policies for a Just Transition

Arilson Favareto
Estela Catunda Sanseverino
Nadine Marques Nunes-Galbes
Olívia Dórea
Fernanda Helena Marrocos-Leite

The interconnections between the global agri-food system and the climate agenda

In 2025, the Paris Agreement reaches its tenth anniversary, coinciding with a decade since the launch of the 2030 Agenda and the Sustainable Development Goals (SDGs). The assessment, however, is sobering. The year 2024 was the hottest on record worldwide and marked the first time that average global temperatures surpassed 1.5 °C above pre-industrial levels (WMO, 2025). Greenhouse gas (GHG) emissions also reached an all-time high in 2023 (WMO, 2025). The global agri-food system, responsible for roughly one-third of total GHG emissions (Crippa *et al.*, 2021), alone has the potential to jeopardize the achievement of the Paris Agreement targets. (Clark *et al.*, 2020).

The term "food system" is used by different authors to describe the complex network of food production, processing, distribution, and consumption (HLPE, 2017). More recently, the prefix "agri" has been added to emphasize the role of agricultural and livestock activities across the various stages of this system. Within the global agri-food system, multiple organizational models coexist. The most conventional are characterized by increasing integration across stages, including global value chains: large-scale and intensive use of chemical inputs; genetic standardization of crops and livestock; corporate control over different activities; and widespread consumption of ultra-processed foods. At the same time, alternative models challenge this approach by emphasizing diversity, fostering closer relationships between producers and consumers, and employing technologies that minimize environmental degradation. Despite this heterogeneity, the singular term "agri-food system" is used throughout this text to underscore the predominance of a single logic that continues to dominate the organizational models of the global system.

Over the years, this system has become increasingly reliant on chemical inputs. Intensive use to control pests and diseases has led to resistance in both crops and livestock. As a result, input use has grown steadily, while production has increased at a much slower pace (Elwin, 2025). This creates a self-reinforcing spiral, pushing levels of key elements—such as phosphorus and nitrogen—beyond the natural capacity for recycling, and generating economic unsustainability in the form of declining profit margins for producers and a corresponding concentration of economic power among suppliers of chemicals and agricultural machinery (Rattis *et al.*, in press).

Beyond the economic costs, the growing and indiscriminate use of these inputs adds to deforestation in threatening the so-called planetary

boundaries, within which Earth's natural systems can function stably. By 2023, six of the nine planetary boundaries had already been crossed: novel entities (chemical pollution), climate change, biosphere integrity, land and water use changes, and biogeochemical cycles (Richardson *et al.*, 2023).

The impacts of the global agri-food system are also directly felt on human health. Increasing consumption of ultra-processed foods, along with the standardization of dietary patterns, has led to a rise in non-communicable chronic diseases (NCDs), including obesity, type 2 diabetes, hypertension, and certain cancers (Lane *et al.*, 2024). At the same time, forms of undernutrition and food insecurity persist in many regions, highlighting the paradoxical coexistence of nutritional deficits and excesses (FAO; WHO; IFAD; UNICEF; WFP, 2024). Furthermore, the intensive use of pesticides, antibiotics, and chemical additives in food production has raised growing concerns about food contamination, antimicrobial resistance, and cumulative toxic effects on human populations (Banco Mundial, 2017; FAO; OMS, 2019).

The current organization of the global agri-food system carries annual costs of approximately USD 12 trillion, equivalent to roughly 10% of global GDP. These costs encompass environmental degradation, depletion of water resources, and public health impacts linked to poor diets and biodiversi-

The intensive use of pesticides to control pests and diseases has increased systematically, while production has grown at a much slower pace. Photo: Christiane Comas/EMBRAPA.

ty loss (Lord, 2023). A report by the Food System Economics Commission (Laderchi *et al*., 2024) highlights that these direct and indirect costs already exceed the total value of what the agri-food system produces globally, signaling that, beyond socio-environmental challenges, there is also economic irrationality in the way food is produced and consumed today. This situation persists largely because these costs remain hidden—they are not reflected in food prices but are instead externalized, borne indirectly by individuals and governments who must respond to environmental crises or public health burdens. In one way or another, these costs are ultimately paid by society as a whole (Laderchi *et al*., 2024).

Climate Impacts of Brazil's Agri-Food System

In Brazil, the agri-food system is responsible for nearly three-quarters (73.7%) of total gross emissions, including both direct and indirect contributions. While some industry stakeholders contend that this figure overestimates the sector's impact—arguing that most emissions arise from land-use change and forest conversion (49%) rather than productive activities, which accounts for 25%—the historical record tells a different story (Alencar *et al*., 2023). Between 1990 and 2021, 97% of national emissions linked to land-use change were associated with deforestation or the clearing of new areas for agricultural and livestock production. Beef production alone accounted for 92% of these emissions, with soybean cultivation contributing another 5% (Alencar *et al*., 2023).

Among productive activities, cattle farming is the largest contributor to Brazil's national emissions. The country has the world's largest cattle herd (FAO, 2024), with over 238 million head of cattle (IBGE, 2023). High emission rates directly linked to the animals—stemming from manure management and the digestive processes of ruminants—place the country as the fifth-largest global emitter of methane (Alencar *et al*., 2022).

Regarding the direct link with deforestation, a significant portion of pastures established after the clearing of native vegetation is highly degraded and extremely low-yielding, suggesting motivations that may be more related to land control and asset value than genuine economic need (Abramovay *et al*., 2025). This provides further evidence that improved management of natural resources could enhance the efficiency of the agri-food system.

The second-largest source of emissions from agricultural production is soil management, particularly the use of synthetic nitrogen fertilizers, liming, and the application of livestock manure as fertilizer (Alencar

et al., 2023). According to the National Fertilizer Plan 2050, Brazil ranks as the fourth-largest global consumer of fertilizers, accounting for 8% of worldwide use, after China, India, and the United States (Brasil, 2023).

The use of external inputs in agricultural production is increasing. A clear example is soybean production in Brazil, which has been the world's leading producer since 2019. Between 1993 and 2022, demand for pesticides increased by 2%, while demand for fertilizers rose by 734% to produce the same quantity of soy, indicating a decline in input efficiency. When combining average expenditures on pesticides, fertilizers, and seeds, the total costs rose by 113.9% between 2013 and 2023, which means producers are cutting costs on soil conservation, preparation, and analysis in order to maintain operating costs (Instituto Escolhas, 2025).

The agri-food system both influences and is affected by climate change. Extreme weather events are already disrupting food production. Between 2023 and 2024, severe droughts affected around 60% of Brazil's territory (CEMADEN, 2025). In the South, floods in 2024 destroyed infrastructure and entire communities, causing losses of approximately BRL 5.4 billion for the agricultural sector (CNM, 2024). In the Center-West, many areas produce food at the limit of available water. Changes in rainfall patterns could make it impossible to sustain three harvests per year in some regions. Farmers may have to rely more on irrigation, which would increase production costs and reduce competitiveness (Assad *et al.*, 2020).

Could the actions taken to date provide a foundation for a broader transition?

The data presented so far make it clear that the idea of Brazilian agriculture already being sustainable—as is often claimed—is highly misleading. This narrative is frequently promoted by industry leaders, who argue that the agricultural industry already employs environmentally friendly practices or that the sector's problems are limited to illegal deforestation practiced by a few landowners. However, an analysis of the relationship between Brazil's agri-food system and the use and conservation of natural resources shows that the overall trend is toward increasing and worsening environmental pressures, even if certain aspects have improved at a slower pace. The most notable example is the recent reduction in deforestation, which does not imply a reversal but merely a slowdown in its rate.

On the other hand, it would be inaccurate to say that Brazilian farmers show no concern for environmental issues. Paradoxically, while major agricultural organizations continue to promote climate denial or advocate

for reduced environmental requirements in licensing processes, they also call for improvements in instruments such as the new Rural Insurance Law (Agência Pública, 2023; Araújo, 2024), implicitly acknowledging the existence of the problem. Measures of this kind can help mitigate some impacts. Still, if they are not part of a broader strategy—including more effective adaptation measures and, critically, the replacement of conventional practices with sustainable technologies—they will lead to ever-increasing costs, as extreme events become more frequent and devastating.

Although ambiguous and insufficient, innovations are beginning to take shape. In livestock production, some systems are based on moderate intensification of livestock production combined with greater diversity in pastures (Valentim; Andrade, 2020). In grain production, the adoption of bio-inputs is spreading as an alternative to highly polluting chemical fertilizers and pesticides (Goulet, 2021). In the realm of regulation and public policy, the Dietary Guidelines for the Brazilian Population and the new food labeling rules have enhanced access to information and facilitated the dissemination of practices more consistent with healthy and sustainable diets (Jaime & Braga, 2025). In international trade, environmental requirements are already shaping agricultural production (Thorstensen & Mota, 2022). Although still insufficient, financing for regenerative practices—now expanding rapidly—is set to increase further in the years ahead. (FEM; Deloitte, 2023).

Why, then, can't these innovations be seen as placing Brazil's agri-food system on a clear path toward sustainability? The reason is that, so far, their combined impact has not been sufficient to counter the speed and scale of ecosystem destruction. These solutions remain largely confined to niche initiatives, without the reach or influence needed to spread across different types and scales of farmers or to replace conventional models of production, distribution, and consumption in a more systemic way and at a larger scale.

Another challenge lies in the lack of data to assess how widely these innovations have been adopted across different classes of farmers. Family farming accounts for 76.8% of all agricultural establishments in Brazil, employs 66.3% of the agricultural workforce, and covers only 23% of the total production area (IBGE, 2020). Yet major barriers remain to effectively including family farming in the Sectoral Plan for Adaptation and Climate Change – ABC+ Plan (Garcia *et al.*, 2021; Conceição, 2024). Even resources from the National Program for Strengthening Family Farming (PRONAF) often fail to reach the lowest-income producers, particularly those located in the North and Northeast of the country (Souza; Albuquerque, 2023).

Land concentration and the unequal distribution of food production are also central to the problem. Historically, the legacy of slavery has shaped patterns of land occupation and ownership in Brazil, leaving a deep mark on agrarian structures. The Gini coefficient—a standard measure of land inequality—stood at 0.867 in the country in 2020 (IBGE, 2020). At that time, the smallest 50% of farms controlled only 2.1% of total agricultural land, a figure virtually unchanged from 2.3% in 1995–1996 and 2006. By contrast, the largest 10% of farms accounted for 80.3% of the total area in 2017(Hoffmann, 2020).

In terms of production, 40% of food commodities such as soy and corn are grown on farms larger than 2,500 hectares. By contrast, the production of staple foods such as rice, beans, potatoes, and cassava is concentrated in smaller farms: 33.7%, 47.7%, 43.9%, and 91.2% of their output, respectively, comes from farms of up to 500 hectares (IBGE, 2020).

Although data on food purchasing habits in Brazil remain limited, a comparison of the IBGE's Household Budget Surveys (POF) from 1991–1992 and 1998–1999 shows a dramatic shift in fruit sales channels. Martins *et al.* (2007) estimated that supermarket sales of fruit increased by 577.1% over this period, while purchases from open-air markets declined by 41.1%. More recent data from the 2008 POF highlight the predominance of supermarkets as primary points of food purchase, surpassing open-air markets and other types of retail outlets. For example, the share of weekly vegetable purchases made in supermarkets rose from 28.9% in 2002 to 40.1% in 2008, while weekly fruit purchases increased from 30.8% to 43.4% over the same period. Also based on the 2008 POF, Machado *et al.* (2017) estimated that supermarkets play a central role in the purchase of ultra-processed foods, accounting for 60.4% of such purchases in terms of caloric value. At the same time, the authors found that supermarkets also account for 59.6% of purchases of fresh or minimally processed foods, likely reflecting the convenience of being able to complete an entire grocery trip in a single location.

The composition of Brazil's agri-food system suggests that it is no longer possible to frame the public debate in simple dichotomies. This is not to say that differences between family farms or small-scale producers and large agribusinesses are irrelevant; rather, it is difficult to envision a meaningful transition without engaging all types of producers—family and commercial, large and small—as well as all subsystems, from primary production to processing, distribution, and consumption. Achieving this will require instruments tailored to the specific needs of each segment. Otherwise, the available technological solutions for mitigation and adap-

tation may remain confined to certain groups, leaving the broader agri-food system unchanged. Paradoxically, this could deepen existing inequalities by excluding important segments from the transition toward a more sustainable model of production.

Approximately 40% of food commodity production, such as corn and soybeans, takes place on farms larger than 2,500 hectares. Photo: Renata Silva/Embrapa.

Pathways beyond the conventional agri-food system of production, distribution, and consumption

A transition in the agri-food system that can truly be called just and sustainable must build on existing innovations, while moving beyond their current confinement to niche initiatives that lack the strength to displace dominant practices driving socio-environmental degradation. It must also adapt available solutions to the realities of different groups of producers, so that the transition does not become yet another mechanism of exclusion. Removing barriers and creating the conditions for these two normative principles—justice and sustainability—to guide the ongoing transition should be at the core of international negotiations and of Brazil's own strategies to advance its commitments to both the climate agenda and social justice.

JUST AND SUSTAINABLE TRANSITION OF THE AGRI-FOOD SYSTEM

A **sustainable** transition requires adopting socio-technical changes that both conserve biomes and regenerate ecosystems degraded by current production practices. These measures are essential to maintain the ecosystem services that underpin life and the functioning of the agri-food system.

For a transition to be **just**, this criterion must be reflected in at least three dimensions: distributive justice, so that solutions addressing environmental challenges do not exacerbate existing inequalities; recognition (or cognitive) justice, which values the diversity of actors and practices within the agri-food system; and procedural justice, which seeks to minimize the power asymmetries that shape decision-making processes. A just and sustainable transition requires aligning these changes across **multiple scales**—regional, national, and global—while acknowledging the interdependencies, complementarities, and potential conflicts among different actors.

Source: Favareto *et al.*, 2025.

Equally important is recognizing that in countries like Brazil, reconfiguring these activities is not simply a matter of adopting new technical solutions, even in large-scale modern agriculture. There is also a kind of escape valve for addressing the exhaustion of the prevailing technological model of agriculture—particularly in grain production—through what the rural studies and agrarian tradition in Brazil refer to as agricultural frontier expansion (Martins, 1996). Rising production costs, coupled with the growing severity of extreme weather events and the resulting pressure on producers' profit margins, drive many to seek new lands. This typically involves acquiring low-cost property and pursuing economies of scale, which in turn fuels the ongoing advance into newly deforested areas, especially in the Cerrado and the Amazon biomes (Favareto, 2019).

All of these points point to a clear conclusion: there can be no solution to the climate agenda without a reconfiguration of the agri-food system; and such a reconfiguration, in turn, requires not only a transformation of the production model but also a fundamental shift in land-use patterns and in the relationship between the economy and nature.

To give the agri-food system its rightful place in climate strategies—and to align what it provides to societies with the requirements of healthy and sustainable diets—certain conditions must be met. The first is to elevate it within public debate on the ecological transition to the same level of attention afforded to other systems of goods and services that have increasingly come under scrutiny. The closest parallel is the discussion on energy transition: just as pathways are being charted to progressively and decisively reduce dependence on fossil fuels, similar thinking is needed for the global agri-food system. This means advancing a transition that gradually moves us away from the conventional models of food production, distribution, and consumption that have so far exacerbated environmental degradation and human health challenges.

The second condition is that a just and sustainable transition must have a clear focus, moving beyond the widespread yet vague notion that "something must change". One way to capture its essence is through the idea of overcoming the "triple monotony" that characterizes the agri-food system (Favareto *et al.*, 2025): The first is the monotony of agricultural landscapes, increasingly homogeneous and dominated by a handful of species, which attract pests and diseases that demand ever greater use of pesticides, raising costs and making production more vulnerable to climate extremes. The second is the monotony of animal production, shaped by genetic uniformity

and the concentration of livestock, which facilitates the spread of diseases only controllable through the intensifying use of antibiotics—causing animal suffering, driving up costs, and fueling antimicrobial resistance, one of the World Health Organization's most pressing concerns. Finally, there is the monotony of diets, increasingly marked by ultra-processed foods and excessive meat consumption, which has contributed to a global obesity pandemic, the rise of diet-related chronic diseases, and the erosion of culinary traditions and the social practices surrounding food.

For a just and sustainable transition in the agri-food system, it is essential to include diverse groups of producers. Photo: MDS.

If food and nutritional security depend on restoring the capacity of biomes to provide the ecosystem services essential both for human life and for agricultural production, and on ensuring broad access to quality food, then a diversified agenda is required. This agenda must encompass transformations across all subsystems, including livestock production, commodity crops, the food industry, and consumption patterns.

Finally, it is important to recognize that overcoming the triple monotony cannot rely solely on the introduction of new technological standards, as this may be insufficient to halt the expansion of the agricultural frontier. Achieving zero deforestation—whether legal or illegal—is an imperative not only because of its contribution to greenhouse gas emissions but also because of the entrenched interests it perpetuates, which do little to enhance the competitiveness of Brazilian agriculture. Likewise, adopting new technological models without addressing the concentration of properties and wealth may even exacerbate inequalities, unless measures of positive discrimination are put in place to ensure that family farmers and more vulnerable producers can access the resources and technologies aligned with a regenerative approach. In short, for the reconfiguration of the agri-food system to be truly just and sustainable, it must combine regenerative practices, diversification, and justice as guiding normative principles for the transition.

Final considerations

Over the course of five decades, Brazil moved from a deficit in food production to becoming one of the world's leading exporters. In many ways, this modern Brazilian agriculture was a "State invention". The government sent a generation of engineers to the best agronomy schools abroad and, upon their return, established a public technology institution—the Brazilian Agricultural Research Corporation (EMBRAPA)—which would become one of the most important in the world by adapting available technologies to tropical conditions. The State also created a public system of technical assistance and rural extension to disseminate these innovations, and it established public financing to support their adoption. While today, part of research, extension, and financing is in private hands, none of this would have been possible without that initial push. Crucially, the emergence of Brazil's extraordinary agri-food competitiveness was the result of a sustained commitment to change, upheld by social forces with enough power to maintain this agenda across different governments, political guidelines, and nearly a full generation. This is also what is at stake now: defining a clear agenda to guide the transition toward a fundamentally different organization and functioning of the agri-food system.

> In short, for the reconfiguration of the agri-food system to be truly just and sustainable, it must combine regenerative practices, diversification, and justice as guiding normative principles for the transition.

Photo: Claudio Verissimo

That mission was accomplished: the goal at the time was to increase food production and availability. Its negative effects, however, also became evident. For the 21st century, the ethical and normative objectives guiding the organization of the agri-food system must be different. The focus now is on overcoming the monotony that underpinned the expansion of supply and fostering changes that reintroduce diversity both within agricultural production and in the availability of healthier foods—while ensuring that these changes do not exacerbate existing inequalities or further concentrate land ownership and wealth.

Indeed, the context is also different in terms of the means available to achieve this. It is unrealistic to expect that the State alone can provide the same conditions that once drove the expansion of the current system. What will be required are better forms of coordination between the public and private sectors. Yet, as in the earlier phase, this must take the form of a transition agenda guided by shared normative objectives, sustained over at least two decades, and expressed not only through technological innovations—as is already beginning to occur—but also through institutional innovations in regulation, incentives, and financing, so that the agri-food system can move away from conventional practices and promote the overcoming of the triple monotony.

Two myths continue to hinder progress. The first is the illusion that Brazil's future is assured simply because it's considered the "world's breadbasket". Rising production costs, driven in part by the increasing use of chemical inputs controlled by large corporations, challenge that notion. Climate change is already altering production conditions and reshaping the map of agricultural supply. Shifts in consumer markets profile are also demanding ever greater—not less—attention to socio-environmental criteria in international trade. Even in the realm of demographic and economic change, the challenges are far from minor. Consider China, the destination for 80% of Brazil's main export, soy, whose economy now grows at half the rate it did two decades ago, and whose population, according to United Nations demographic projections, is expected to gradually decline over the coming decades (UN, 2025).

The second myth is the belief that Brazil's agri-food system is already sustainable and that it would be enough merely to demonstrate this to the world. Available indicators, as discussed throughout this article, do not support this claim. Suggesting that sustainability depends only on the actions of a few producers is equally misleading, since sector leadership has been reluctant to support measures that curb these harmful practices. A true transition cannot occur unless the alignment of interests between the old and the new is addressed. Progress on the climate agenda

depends not only on the adoption of emerging technologies, increasingly present in the system, but also on resolving the longstanding structural issues rooted in Brazil's history and its patterns of natural resource use and appropriation.

It would be neither rhetorical exaggeration nor naive pride to say that Brazil is likely the country best positioned to lead a global transition in the agri-food system. The antithesis of the monotony that must be overcome is the diversity that must be valued. In this regard, no other country is better placed. This diversity encompasses not only biological variety but also a rich set of practices and culinary traditions that uniquely embody ways of cultivating, processing, and consuming food in harmony with the ecosystem services that sustain them. Equally important, Brazil possesses significant institutional capacity and a repertoire of innovations already underway, which, however, must move beyond niche applications to become the new mainstream. Achieving this will require public policies and a comprehensive institutional reform.

REFERENCES

ABRAMOVAY, R. *et al*. Pecuária bovina regenerativa na América Latina e no Caribe, muito além do oximoro. *Revista de Economia e Sociologia Rural*, v. 63, 2025. Available at: https://www.scielo.br/j/resr/a/6rw3scQvFwTvyLdrWPgMjDx/?lang=pt. Accessed: 25 Aug., 2025.

ALENCAR, A. *et al*. *Desafios e oportunidades para redução das emissões de metano no Brasil*. [s. l.]: Observatório do Clima, 2022. Available at: https://www.oc.eco.br/wp-content/uploads/2023/10/SEEG-Sistemas-Alimentares.pdf. Accessed: 22 Aug., 2025.

ALENCAR, A. *et al*. *Estimativa de emissões de gases de efeito estufa dos sistemas alimentares no Brasil*. [s. l.]: Observatório do Clima, 2023. Available at: https://www.oc.eco.br/wp-content/uploads/2023/10/SEEG-Sistemas-Alimentares.pdf. Accessed: 22 Aug.,2025.

ARAÚJO, J. Evento em Mato Grosso debate projeto que altera seguro rural. *Rádio Senado*, 14 out. 2024. Available at: https://www12.senado.leg.br/radio/1/noticia/2024/10/14/evento-em-mato-grosso-debate-projeto-que-altera-seguro-rural. Accessed: 22 Aug.,2025.

ASSAD, E. D. *et al*. Efeito das mudanças climáticas na agricultura do Cerrado. *In*: BOLFE, E. L.; SANO, E. E.; CAMPOS, S. K. (eds.). *Dinâmica agrícola no cerrado*: análises e projeções. Brasília: Embrapa, 2020. p. 213-228. v. 1.

BANCO MUNDIAL. *An Overview of Links between Obesity and Food Systems*: Implications for the Food and Agriculture Global Practice Agenda. Washington: The World Bank Group, 2017.

BELIK, W. *Supermercados e produtores*: limites, possibilidades e desafios. Campinas: Unicamp, 2005. Available at: https://www.researchgate.net/publication/228435531_Supermercados_e_produtores_limites_possibilidades_e_desafios. Accessed: 12 Jun., 2025.

BRASIL. *Lei n. 15.070, de 23 de dezembro de 2024*. Dispõe sobre a produção, a importação, a exportação, o registro, a comercialização, o uso, a inspeção, a fiscalização, a pesquisa, a experimentação, a embalagem, a rotulagem, a propaganda, o transporte, o armazenamento, as taxas, a prestação de serviços, a destinação de resíduos e embalagens e os incentivos à produção de bioinsumos para uso agrícola, pecuário, aquícola e florestal; e altera as Leis n. 14.785, de 27 de dezembro de 2023, 10.603, de 17 de dezembro de 2002, e 6.894, de 16 de dezembro de 1980. Brasília, 2024. Available at: https://www2.camara.leg.br/legin/fed/lei/2024/lei-15070-23-dezembro-2024-796798-publicacaooriginal-173902-pl.html. Accessed: 17 de Jul., de 2025.

BRASIL. Ministério da Indústria, Comércio Exterior e Serviços. Secretaria de Desenvolvimento Industrial, Inovação, Comércio e Serviços. *Plano nacional de fertilizantes 2050*: uma estratégia para os fertilizantes no Brasil. Brasília: SDIC/MGI, 2023. Available at: https://www.gov.br/mdic/pt-br/assuntos/competitividade-industrial/confert/pnf/pnf-v-08-06-12-23.pdf. Accessed: 22 Aug., 2025.

CAMPAGNOLLA, C.; MACÊDO, M. M. C. Revolução Verde: passado e desafios atuais. *Cadernos de Ciência & Tecnologia*, v. 39, n. 1, p. 26952, 13 Jun., 2022. Available at: https://apct.sede.embrapa.br/index.php/cct/article/view/26952. Accessed: 22 Aug.,2025.

CENTRO NACIONAL DE MONITORAMENTO E ALERTAS DE DESASTRES NATURAIS (CEMADEN). Entre 2023 e 2024, cerca de 60% do território brasileiro foi afetado pela seca extensa e intensa, aponta Nota Técnica do Cemaden. *Centro Nacional de Monitoramento e Alertas de Desastres Naturais*, 7 abr. 2025. Available at: https://www.gov.br/cemaden/pt-br/assuntos/noticias-cemaden/entre-2023-e-2024-cerca-de-60-do-territorio-brasileiro-foi-afetado-seca-extensa-e-intensa-aponta-nota-tecnica-do-cemaden. Accessed: 22 Aug.,2025.

CLARK, M. A. *et al*. Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. *Science*, v. 370, n. 6517, p. 705-708, nov. 2020. Available at: https://www.science.org/doi/10.1126/science.aba7357. Accessed: 22 Aug.,2025.

CONCEIÇÃO, J. *Principais obstáculos enfrentados pela agricultura familiar para sua participação no plano ABC+*. Brasília: Ipea, fev. 2024. Available at: http://dx.doi.org/10.38116/td2966-port. Accessed: 22 Aug.,2025.

CONFEDERAÇÃO NACIONAL DE MUNICÍPIOS (CNM). CNM atualiza prejuízos dos municípios com as chuvas no RS; impacto é de R$ 13,3 bilhões. *Agência CNM de Notícias*, 20 Aug.,2024. Available at: https://cnm.org.br/comunicacao/noticias/cnm-atualiza-prejuizos-dos-municipios-com-as-chuvas-no-rs-impacto-e-de-r-13-3-bilhoes. Accessed: 22 Aug.,2025.

CONVENÇÃO-QUADRO DAS NAÇÕES UNIDAS SOBRE A MUDANÇA DO CLIMA (UNFCCC). *Sharm el-Sheikh Implementation Plan.* [s. l.]: UNFCCC, 2022. Available at: https://unfccc.int/documents/624444. Accessed: 25 Aug.,2025.

CONVENÇÃO-QUADRO DAS NAÇÕES UNIDAS SOBRE A MUDANÇA DO CLIMA (UNFCCC). COP28 UAE Declaration on Sustainable Agriculture, Resilient Food Systems and Climate Action. *COP28 UAE*, 2023. Available at: https://www.cop28.com/en/news/cop28-uae-declaration-on-sustainable-agriculture-resilient-food-systems-and-climate-action. Accessed: 25 Aug.,2025.

CONVENTION ON BIOLOGICAL DIVERSITY (CBD). COP 16 has fulfilled its promise to the world. *CBD*, 27 fev. 2025. Available at: https://www.cbd.int/article/cop16-resumed-session-closing-2025. Accessed: 22 Aug.,2025.

CONVENTION ON BIOLOGICAL DIVERSITY (CBD). *Decision adopted by the Conference of the Parties to the Convention on Biological Diversity*: 15/4 Kunming-Montreal Global Biodiversity Framework. Montreal: CBD, 2022. Available at: https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf. Accessed: 22 Aug.,2025.

CRIPPA, M. *et al*. Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food*, v. 2, n. 3, p. 198-209, Mar. 2021. Available at: https://www.nature.com/articles/s43016-021-00225-9. Accessed: 22 Aug., 2025.

ELWIN, P. *Brazil's fertiliser risks*: Identifying innovation and investment opportunities. [s. l.]: Planet Tracker, 2025. Available at: https://planet-tracker.org/wp-content/uploads/2025/04/Brazils-fertiliser-risks.pdf. Accessed: 22 Aug.,2025.

FARDET, A.; ROCK, E. Ultra-Processed Foods and Food System Sustainability: what are the links? *Sustainability*, v. 12, n. 15, p. 6280, Aug.,2020. Available at: https://www.mdpi.com/2071-1050/12/15/6280. Accessed: 22 Aug.,2025.

FAVARETO, A. (org.). *Entre chapadas e baixões do Matopiba*: dinâmicas territoriais e impactos socioeconômicos na fronteira da expansão agropecuária no cerrado. São Paulo: Prefixo Editorial, 2019. Available at: https://storage.googleapis.com/planet4-brasil-stateless/2019/05/49824d91-entre-chapadas-e-baix%C3%B5es-do-matopiba_vers%C3%A3o-ebook.pdf. Accessed: 22 Aug.,2025.

FAVARETO, A.; CARON, P. Articulating local and global processes to ensure the governance of food systems. *In*: REIS, C. F. B.; BERRINGER, T. (eds.). *South-North Dialogues on Democracy, Development and Sustainability.* Londres: Routledge, 2022. p. 127-138.

FAVARETO, A.; MARROCOS-LEITE, F. H. De Cali a Belém – os resultados da COP da Biodiversidade e seus impactos para a transição dos sistemas agroalimentares. *Nexo Jornal*, 7 nov. 2024. Available at: https://pp.nexojornal.com.br/opiniao/2024/11/07/de-cali-a-belem-os-resultados-da-cop-da-biodiversidade-e-seus-impactos-para-a-transicao-dos-sistemas-agroalimentares. Accessed: 22 Aug.,2025.

FAVARETO, A. *et al*. COP30 no Brasil – por uma transição justa e sustentável do sistema agroalimentar. Policy Brief. *Cátedra Josué de Castro USP*. 2025. Available at: https://catedrajc.fsp.usp.br/publicacao/cop30-no-brasil-por-uma-transicao-justa-e-sustentavel-do-sistema-agroalimentar/. Accessed: 16 Sep., 2025.

FÓRUM ECONÔMICO MUNDIAL (FEM); DELOITTE. *Green Returns*: Unleashing the Power of Finance for Sustainable Food Systems. Genebra: World Economic Forum, 2023. Available at: https://www3.weforum.org/docs/WEF_Green_Returns_2023.pdf. Accessed: 25 Aug.,2025.

FRIEDLAND, W. H. Commodity Systems Analysis: An Approach to the Sociology of Agriculture. *In*: SCHWARZWELLER, H. (ed.) *Research in Rural Sociology and Development*: A Research Annual. Connecticut: JAI Press, 1984.

GARCIA, J. *et al. Desafios para a inserção da agricultura familiar no ABC+*. São Paulo: Agroicone, 2021. Available at: https://www.veredas.org/wordpveredas/wp-content/uploads/2022/02/Agroicone_Desafios-para-a-insercao-da-agricultura-familiar-no-ABC_2021-1.pdf. Accessed: 22 Aug.,2025.

GIRARDI, G. *et al*. Agronegócio e extrema direita impulsionam máquina de *fake news* sobre aquecimento global. *Agência Pública*, 30 Jun., 2023. Available at: https://apublica.org/2023/06/agronegocio-e-extrema-direita-impulsionam-maquina-de-fake-news-sobre-aquecimento-global/. Accessed: 22 Aug.,2025.

GOULET, F. Biological inputs and agricultural policies in South America: between disruptive innovation and continuity. *Perspective*, n. 55, p. 1-4, 2021. Available at: https://revues.cirad.fr/index.php/perspective/article/view/36383. Accessed: 25 Aug.,2025.

HIGH LEVEL PANEL OF EXPERTS (HLPE). *Nutrition and food systems*: A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Roma: HLPE, 2017. Available at: https://openknowledge.fao.org/server/api/core/bitstreams/4ac1286e-eef3-4f1d-b5bd-d92f5d1ce738/content. Accessed: 25 Aug.,2025.

HOFFMANN, R. A distribuição da posse de terra no Brasil (1985-2017). *In*: VIEIRA FILHO, J.; GASQUES, J. *Uma jornada pelos contrastes do Brasil:* cem anos do Censo Agropecuário. Brasília: IPEA, 2020. p. 77-90. Available at: http://dx.doi.org/10.38116/978-65-5635-011-0/cap5. Accessed: 25 Aug.,2025.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE) (ed.). *Atlas do espaço rural brasileiro*. 2. ed. Rio de Janeiro, 2020. Available at: https://biblioteca.ibge.gov.br/visualizacao/livros/liv101773.pdf. Accessed: 25 Aug.,2025.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). Painel de indicadores. *IBGE*, [2023]. Available at: https://www.ibge.gov.br/indicadores.html. Accessed: 25 Aug.,2025.

INSTITUTO ESCOLHAS. *Brasil como líder mundial em produção de soja*: até quando e a que custo? Relatório técnico. São Paulo: Instituto Escolhas, 2025. Available at: https://escolhas.org/wp-content/uploads/2025/06/Relatorio-Tecnico_Brasil-como-lider-mundial-em-producao-de-soja.pdf. Accessed: 25 Aug.,2025.

JAIME, P. C.; BRAGA, M. B. L. Dez anos do Guia Alimentar para a População Brasileira: história, ciência e política. *Epidemiologia e Serviços de Saúde,* v. 34, p. 1-11, 2025. Available at: https://www.scielo.br/j/ress/a/jhKxXWFLFL5sRRLqYv4dKrb/?lang=pt. Accessed: 25 Aug.,2025.

JOHN, D. A.; BABU, G. R. Lessons from the Aftermaths of Green Revolution on Food System and Health. *Frontiers In Sustainable Food Systems*, v. 5, fev. 2021. Available at: https://www.frontiersin.org/journals/sustainable-food-systems/articles/10.3389/fsufs.2021.644559/full. Accessed: 25 Aug.,2025.

LADERCHI, R. *et al. The Economics of the Food System Transformation.* [s. l.]: Food System Economics Commission, 2024. Available at: https://foodsystemeconomics.org/wp-content/uploads/FSEC-Global_Policy_Report.pdf. Accessed: 25 Aug.,2025.

LANE, M. M. *et al.* Ultra-processed food exposure and adverse health outcomes: umbrella review of epidemiological meta-analyses. *Bmj*, n. 384, fev. 2024. Available at: https://www.bmj.com/content/384/bmj-2023-077310. Accessed: 25 Aug.,2025.

LORD, S. *Hidden costs of agrifood systems and recent trends from 2016 to 2023*: background paper for the state of food and agriculture 2023. Roma: FAO, 2023. Available at: https://openknowledge.fao.org/bitstreams/3ab78b69-7d64-45ac-aa6b-8292af51cf71/download. Accessed: 25 Aug.,2025.

MACHADO, P. *et al*. Is food store type associated with the consumption of ultra-processed food and drink products in Brazil? *Public Health Nutrition*, v. 21, n. 1, p. 201-209, 2017. Available at: https://www.cambridge.org/core/services/aop-cambridge-core/content/view/19F8BEA5BD2BC1CABC82BF36083438A8/S1368980017001410a.pdf/is-food-store-type-associated-with-the-consumption-of-ultra-processed-food-and-drink-products-in-brazil.pdf. Accessed: 25 Aug.,2025.

MALUF, R. *et al*. Global value chains, food and just transition: a multi-scale approach to Brazilian soy value chains. *The Journal of Peasant Studies*, v. 50, n. 7, p. 2642-2665, 2023. Available at: https://www.tandfonline.com/doi/full/10.1080/03066150.2022.2105700#abstract. Accessed: 25 Aug.,2025.

MALUF, R. *et al*. Sustainability, justice and equity in food systems: ideas and proposals in dispute in Brazil. *Environmental Innovation and Societal Transitions*, v. 45, p. 183-199, dez. 2022. Available at: https://www.sciencedirect.com/science/article/pii/S2210422422000958?via%3Dihub. Accessed: 25 Aug.,2025.

MARSDEN, T. Contested ecological transitions in agri-food: emerging territorial systems in times of crisis and insecurity. *Rivista di Economia Agraria*, v. 79, n. 3, p. 69-81, dez. 2024.

MARSDEN, T. Sustainable Agri-Food Transformations and the Rise of Disruptive Governance. *Research In Rural Sociology and Development*, v. 26, p. 23-44, nov. 2022. Available at: https://www.emerald.com/books/edited-volume/10581/chapter-abstract/80151889/Sustainable-Agri-Food-Transformations-and-the-Rise?redirectedFrom=fulltext. Accessed: 25 Aug.,2025.

MARTINS, J. S. O tempo da fronteira retorno à controvérsia sobre o tempo histórico da frente de expansão e da frente pioneira. *Tempo Social*, v. 8, n. 1, p. 25-70, jan.-jun. 1996. Available at: https://www.scielo.br/j/ts/a/87HYbTyy3WqHHt49HTWJNJb/?lang=pt. Accessed: 25 ago. 2025.

MARTINS, V. *et al*. Análise econômica da produção agrícola no estado de São Paulo. *Informações Econômicas*, v. 37, n. 2, fev. 2007. Available at: http://www.iea.sp.gov.br/ftpiea/ie/2007/pag%2030-37.pdf. Accessed: 12 Jun., 2025.

MCMICHAEL, P. A food regime analysis of the 'world food crisis'. *Agriculture And Human Value*s, v. 26, n. 4, p. 281-295, Jul., 2009.

NAPOLITANO, G. National Convenors propel joint implementation of the food systems transformation and climate action agendas. *United Nations Food Systems Coordination Hub*, 6 dez. 2023. Available at: https://www.unfoodsystemshub.org/latest-updates/news/detail/national-convenors-propel-joint-implementation-of-the-food-systemstransformation-and-climate-action-agendas/en. Accessed: 25 Aug.,2025.

NUNES-GALBES, N. M.; FAVARETO, A.; ABRAMOVAY, R. Caminhos para a transformação dos sistemas alimentares: superando a monotonia agroalimentar. *In*: BORTOLETTO, A.; COUTINHO, D.; FONTES, M. (orgs.). *A regulação dos sistemas alimentares* [in press].

ORGANIZAÇÃO DAS NAÇÕES UNIDAS (*ONU*). Convention to Combat Desertification. ONU, 22 Aug.,2024. Available at: https://www.unccd.int/sites/default/files/2024-10/2415085E_0.pdf. Accessed: 5 fev. 2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA ALIMENTAÇÃO E AGRICULTURA (FAO); ORGANIZAÇÃO MUNDIAL DE SAÚDE (OMS). *Sustainable healthy diets*: guiding principles. Roma: FAO; OMS, 2019. Available at: https://iris.who.int/bitstream/handle/10665/329409/9789241516648-eng.pdf?sequence=1. Accessed: 22 Aug.,2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA ALIMENTAÇÃO E AGRICULTURA (FAO); ORGANIZAÇÃO MUNDIAL DE SAÚDE (OMS); FUNDO INTERNACIONAL DE DESENVOLVIMENTO AGRÍCOLA (FIDA); FUNDO DAS NAÇÕES UNIDAS PARA A INFÂNCIA (UNICEF); PROGRAMA ALIMENTAR MUNDIAL (PAM). *The State of Food Security and Nutrition in the World 2024*: Financing to end hunger, food insecurity and malnutrition in all its forms. Roma: FAO; OMS; FIDA; Unicef; PAM, 2024. Available at: https://openknowledge.fao.org/bitstreams/39dbc6d1-58eb-4aac-bd8a-47a8a2c07c67/download. Accessed: 22 Aug.,2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA ALIMENTAÇÃO E AGRICULTURA (FAO). *FAOSTAT*. FAO, 2024. Available at: https://www.fao.org/faostat/en/#data/EK. Accessed: 22 Aug.,2025.

ORGANIZAÇÃO METEOROLÓGICA MUNDIAL (OMM). *State of the Global Climate*: 2024. Genebra: OMM, 2025. Available at: https://library.wmo.int/idurl/4/69455. Accessed: 25 Aug.,2025.

OSTROM, E. Beyond Markets and States: Policentric Governance of Complex Economic Systems. *American Economic Review,* v. 100, n. 3, p. 641-672, 2010. Available at: https://www.jstor.org/stable/27871226. Accessed: 25 Aug.,2025.

RATTIS, L. *et al*. Monotonia nas produções agrícolas. *In*: ABRAMOVAY, R.; FAVARETO, A. (orgs.). *Caminhos para a transição do sistema agroalimentar* [in press].

RICHARDSON, K. *et al*. Earth beyond six of nine planetary boundaries. *Science Advances*, v. 9, n. 37, set. 2023. Available at: https://www.science.org/doi/10.1126/sciadv.adh2458. Accessed: 25 Aug.,2025.

SOUZA, P.; ALBUQUERQUE, A. *Agricultura Familiar Brasileira*: desigualdades no acesso ao crédito. Rio de Janeiro: Climate Policy Initiative, 2023. Available at: https://www.climatepolicyinitiative.org/wp-content/uploads/2023/11/Agricultura-Familiar-Brasileira.pdf. Accessed: 25 Aug.,2025.

THORSTENSEN, V.; MOTA, C. R. Os impactos das barreiras e das medidas ambientais no comércio internacional: desafios para o Brasil. *Boletim de Economia e Política Internacional*, n. 34, p. 94-105, set.-dez. 2022. Available at: https://repositorio.ipea.gov.br/bitstreams/d318afa8-4c69-4d2c-968a-aa1462a2d986/download. Accessed: 25 Aug.,2025.

TSAI, D. *et al*. *Análise das emissões de gases de efeito estufa e suas implicações para as metas climáticas do Brasil 1970-2023*. Piracicaba: SEEG, 2024. Available at: https://seeg.eco.br/wp-content/uploads/2024/11/SEEG-RELATORIO-ANALITICO-12.pdf. Accessed: 25 Aug.,2025.

UNITED NATIONS. 2024 *Revision of World Population Prospects*. New York: United Nations. 2025. Available at: https://population.un.org/wpp/. Accessed: 16 set 2025.

VALENTIM, J. F.; ANDRADE, C. M. S. Strategies leading to successful wide adoption of mixed grass-legume pastures for sustainable intensification of beef cattle production systems in the Brazilian Amazon. *In*: INTERNATIONAL SYMPOSIUM ON AGRICULTURAL TECHNOLOGY ADOPTION: STUDIES, METHODS AND EXPERIENCES, 1., 2019 Campo Grande. *Anais* […]. Campo Grande, Embrapa Gado de Corte, 2020. Available at: https://www.alice.cnptia.embrapa.br/alice/bitstream/doc/1130052/1/27099.pdf. Accessed: 25 Aug.,2025.

Food and Nutrition Security and the National Climate Change Adaptation Plan

Márcia Muchagata
Marcos Dal Fabbro
Gisele Bortolini
Thaís Fonseca Veloso de Oliveira
Patricia Chaves Gentil

Introduction

Brazil's recent removal from the Hunger Map, announced in 2025 by the United Nations Food and Agriculture Organization (FAO), stems from political commitment at the highest levels of government, which enabled the implementation of cross-sectoral policies grounded in evidence and with strong civil society participation. Yet, while food insecurity still affects parts of the population, this achievement is constantly threatened by climate change. The year 2024 was the hottest since the pre-industrial era (WMO, 2025), with impacts felt worldwide. In Brazil, for example, the country recorded the highest number of disasters in its historical series (Pimentel *et al*., 2025), and in the Amazon, peak average temperatures reached 5.1 °C above normal (Pereira, 2024).

In this context, the fight against hunger must be intrinsically tied to climate change adaptation policies that build the capacity to overcome the various barriers that hinder or limit social development and the realization of the Human Right to Adequate Food (HRtAF). The risks posed by climate change are felt most acutely in territories and communities that are more directly exposed to its impacts. Given the economic and social constraints faced by these groups, their vulnerability to climate effects is significantly more severe, making it essential that climate justice guide all initiatives.

The first steps toward promoting climate governance in Brazil date back to the publication of the Decree of July 7, 1999 (Brazil, 1999), which established the Interministerial Commission on Global Climate Change (CIM). In 2016, sectoral and thematic adaptation strategies were launched, including for Food and Nutrition Security (Brazil, 2016). Despite the undeniable worsening of climate change, climate policies were largely dismantled over the following years, including their governing bodies. However, in 2023, the Interministerial Commission on Climate Change (CIM) was restored, enabling a revision of the National Climate Change Policy. The new structure strengthened coordination mechanisms among ministries and consolidated instruments such as the Climate Plan, which guides the country's mitigation and adaptation targets and actions through 2035.

From that point onward, the federal government undertook a concerted effort to organize robust climate change mitigation and adaptation plans (History..., [202-]). Within this framework, led by the Ministry of Environment and Climate Change (MMA), the Ministry of Science, Technology, and Innovation (MCTI), and the Secretariat for Food and Nutrition Security (SESAN) under the Ministry of Development, Social Assistance, Family, and the Fight Against Hunger (MDS), the government coordina-

ted the development of the Sectoral Food and Nutrition Security Plan for Climate Change Adaptation. This represented an unprecedented effort to identify risks, vulnerabilities, resulting impacts, and adaptive response measures, which were incorporated into the current Multi-Year Plan (PPA) 2024–2027, with projections for the following two cycles (PPA 2028–2031 and PPA 2032–2035).

Given the multidimensional nature of the determinants of hunger, Food Security policies require coordination across government sectors and the three levels of public administration, as well as with civil society and the private sector, particularly in the context of an alarming climate crisis. This complexity highlights the challenge of anticipating and responding to the various fronts that shape the food system, particularly given Brazil's significant role as a major global food supplier, with commodities playing a prominent role in this context.

From this perspective, this chapter is structured into six sections that summarize how the adaptation plan was organized, highlight the importance of Food Security in the climate context, describe the process of developing the plan and its coordinated actions, and conclude with the challenges involved in its implementation.

The fight against hunger and food insecurity must be intrinsically linked to climate change adaptation policies. Photo: Jorge Volkmer Jr.

The Climate Plan – Adaptation

The development of the Climate Plan – Adaptation is grounded in Brazil's climate policy, with particular emphasis on the programmatic, organizational, and methodological measures established by Law No. 12,187 of 2009 (Brazil, 2009). This law enabled the reorganization of the CIM from 2023 onward, providing governance responsible for coordinating and monitoring climate actions at the national level, as well as mobilizing government efforts for long-term planning in response to the climate emergency.

In general, Brazil's climate policy consists of institutional arrangements (committees and working groups) providing for organization and planning through the development of mitigation and adaptation plans, as well as national and cross-cutting strategies for each of these areas of work. It also incorporates the new Nationally Determined Contribution (NDC), in line with Brazil's international commitments.

Adaptation involves taking "initiatives and measures to reduce the vulnerability of natural and human systems to the current and anticipated effects of climate change" (Brazil, 2009, art. 2). It requires understanding and acknowledging climate risks and vulnerabilities to design and implement actions that address both the present and projected impacts of climate change across the national territory.

Building on the regulatory framework and institutional arrangements already mentioned, the MMA and MCTI led the development of 16 adaptation plans, both thematic and sectoral, including the Food Security plan. The structure organizing this effort, which is both cross- and intra-sectoral, is anchored in national objectives that span sectors and thematic areas. As a result, ministries and other federal bodies, when developing their climate plans, addressed these overarching challenges using a common analytical framework, ensuring programmatic and methodological consistency in identifying key threats, risks, and vulnerabilities. This, in turn, shaped sectoral objectives, targets, and actions.

Specifically regarding Food Security, among the nine national objectives guiding the organization of the sectoral plan, the following stand out: (i) enhancing the resilience of populations, cities, territories, and infrastructure in the face of the climate emergency; (ii) promoting sustainable and resilient food production and ensuring regular access for the population to healthy food of adequate quality and quantity; (iii) strengthening water security by providing sufficient quality and quantity of water for multiple uses, including supply, production, energy, and ecosystems; and (iv) fostering socioeconomic development and reducing inequalities.

The process of developing the adaptation plan was guided by a series of activities coordinated by the MMA and MCTI, supported by a comprehensive informational and methodological framework. This represented an investment of approximately 12 months of preparation and planning, allowing all sectoral plans to develop analyses and adaptive responses aligned with the best available knowledge, as well as with international standards and guidelines relevant to the subject.

Within the Food Security framework, these guidelines and processes resulted in the identification of sector-specific risks, which in turn shaped the formulation of objectives, later translated into concrete targets and actions. In short, the following risks and objectives emerged from this process.

CLIMATIC RISKS
1. Decreased food availability.
2. Increased socioeconomic vulnerability.
3. Rising food prices.
4. Growth in the number of people experiencing food insecurity.
5. Compromised access to healthy food.
6. Decreased water availability for consumption and food production .

SECTORAL OBJECTIVES
1. Strengthen the social protection network in urban and rural communities most vulnerable to the negative impacts of adverse weather conditions, increasing the resilience of vulnerable families.
2. Increase the availability of and access to healthy food in areas most exposed to climate change.
3. Strengthen the network of public and social Food Security facilities in areas most exposed to extreme weather events.
4. Promote access to water for human and animal consumption and food production for the most vulnerable populations located in areas highly exposed to the effects of climate change.
5. Support the development of healthy and sustainable food systems by promoting and disseminating technical and scientific knowledge, ensuring its adoption by the communities most affected by climate change.

The Importance of an Adaptation Plan for Food and Nutrition Security

The climate risks identified as potentially affecting the Food Security of the Brazilian population impact the availability, accessibility, stability, and quality of food, ultimately undermining the fulfillment of the Human Right to Adequate Food (HRtAF).

Building on this understanding, the previously identified risks were analyzed in terms of food production, supply, and consumption, as well as water security, allowing climate risks to be addressed within the broader context of the food system.

It is well known that agricultural activities account for the majority of greenhouse gas (GHG) emissions in Brazil, and food production is also affected by the adverse effects of climate change. In 2021, food systems in the country are estimated to have accounted for 73.7% of gross GHG emissions (Alencar *et al.*, 2023).

Regarding the decrease in food availability between 2013 and 2022, damages to food production caused by rainfall and droughts (especially droughts) totaled BRL 260 billion, with droughts alone in 2022 accounting for losses of BRL 57.4 billion — equivalent to 22% of the total for the period. The Northeast and South regions experienced the greatest damage and losses, representing 38% and 31% of the total, respectively (Brazil, [2025]).

When the primary risk is **increased socioeconomic vulnerability**, the effects of climate change hit hardest those with limited socioeconomic resources, reflecting a combination of exposure and sensitivity. A climate justice perspective highlights these disparities, showing that those who contribute least to global warming — due to their limited capacity to consume goods and services — are the ones who suffer its most severe impacts (FBMC, 2011; Alpino *et al.*, 2022).

Between 2013 and 2022, natural disasters affected 91.7% of Brazilian municipalities, causing BRL 374.4 billion in material damages (adjusted to December 2022 values). Between December 2021 and May 2022 alone, heavy rains damaged or destroyed more than 117,000 homes, directly impacting over 350,000 people and causing approximately BRL 1.8 billion in losses in the Northeast region (Brazil, [2025]).

Regarding the **rise in food and nutrition insecurity**, Brazil's situation in 2023 showed that 9.4% of households (7.4 million) did not have sufficient food to meet the needs of their members — that is, they experienced moderate or severe food insecurity, with 4.1% facing hunger (IBGE, 2024). More recent FAO data indicate a significant reduction in undernourishment, showing that between 2022 and 2024 the country remained below

2.5%, the threshold used by FAO to consider a country outside the Hunger Map. According to the same report, the prevalence of severe food insecurity stands at 3.9% of the population (FAO; IFAD; WHO; WFP; UNICEF, 2025). As noted earlier, the pressure of climate change on the HRtAF is persistent and may worsen.

Climate change also poses a **risk to access to healthy food**. The dominant food systems, which serve the majority of the population, combine corporate profit interests, insufficient public food supply policies, and consumers' limited access to income and information, inevitably leading to increased consumption of processed and ultra-processed foods. Built on large-scale commodity production — such as soy, corn, wheat, and sugar — these monocultures, which are essential for producing ultra-processed foods of low nutritional quality, exacerbate biodiversity loss, soil fertility decline, and other socio-environmental impacts (Burigo, Porto, 2021; FAO; IFAD; WHO; WFP; UNICEF, 2023; Pineda *et al.*, 2023), with direct consequences for climate change.

Promoting sustainable production and ensuring the population's access to healthy food, of adequate quality and quantity, are goals that guide the sectoral plan for Food Security. Photo: Marcelo Curia.

Climate change and current food systems make it more difficult to access healthy, fresh foods. Photo: Felipe Goettenauer.

In turn, **rising food prices** are highly sensitive to climate variability, fluctuations that may become more pronounced due to climate change. Access to food is affected by these swings, depending on families' purchasing power or, in the case of subsistence producers, their capacity to produce. According to the 2017–2018 Household Budget Survey (POF) (IBGE, 2019), food expenditures account for only 5% of total income for wealthier families, while roughly a quarter (26%) of poorer families' budgets is spent on food. Such a high level of financial burden calls for measures to stabilize access to food, as in the period between late 2019 and late 2022, when food prices rose by 37.5%, compared with a 21.7% increase in the general consumer price index (Ibarra; Vale, 2023).

Regarding the **decline in water availability for human consumption and food production**, it is important to note that in recent decades, all regions of Brazil have experienced the impacts of water scarcity, largely due to changes in rainfall patterns. The increased frequency and intensity of extreme climate events, such as droughts and floods, have been linked to higher water use in agricultural areas, intensified deforestation, and other changes in land use and occupation. Between 2011 and 2017, severe droughts affected over 80% of municipalities in the Northeast region (Brazil, 2021). In 2012, a historic drought directly impacted the lives and livelihoods of some 30 million people (Novaes, Felix & Souza, 2013).

Participation in the Adaptation Plan Development Process

Key activities that broadened political, social, and technical dialogue included the open Food Security and climate change conferences held before and during the 6th National Conference on Food and Nutrition Security.

Key activities in the development of the adaptation plan included discussions within the National Council for Food and Nutrition Security (CONSEA), where the plan was presented and debated. Similar discussions took place with Standing Committee 2 – Food Environments, Adequate and Healthy Diets, and Nutrition, a body of the council. The Food Security plan was also presented and reviewed by the full executive of the Interministerial Chamber for Food and Nutrition Security (CAISAN), composed of 24 ministries, which contributed to the document.

Three meetings with invited experts were also held in the first half of 2024, bringing together 86 participants from government institutions, academia, and civil society. Discussions involving international organizations, multiple countries, and other stakeholders within the framework of COP 28 and COP 29 had already begun in 2023.

Additionally, the MDS promoted a government-led public consultation specifically for the Climate Adaptation Plan through the *Brasil Participativo* platform, resulting in 178 comments related to the Food Security adaptation plan. This accounted for approximately 6.5% of all contributions submitted across the 16 sectoral adaptation plans.

CONSEA debates have helped broaden dialogue and advance discussion on the adaptation plan. Photo: Ricardo Stuckert.

Planned actions: putting sectoral objectives into practice

As already mentioned, the sectoral objectives related to Food Security are translated into 34 targets and 60 actions. These initiatives address the climate risks and vulnerabilities identified during the development of the Sectoral Adaptation Plan for Food and Nutrition Security, as shown in the previous table.

Strengthen the social protection network in urban and rural communities most vulnerable to the negative impacts of extreme weather, enhancing the resilience of at-risk families (Objective 1): This objective organizes targets and actions to strengthen institutional capacities within the Unified Social Assistance System (SUAS), the National Food and Nutrition Security System (SISAN), and the Unified Health System (SUS), including integrated actions across these systems, aiming to expand social protection for families and individuals facing the adverse effects of climate change.

Complementing this effort, the Single Registry for Social Programs (CadÚnico)—the registration system for the Bolsa Família Program—will be leveraged as a tool to identify and register socioeconomically vulnerable families and individuals. In parallel, the *Alimenta Cidades Strategy*, which focuses Food Security policy on 60 municipalities with populations over 300,000, will mobilize public managers and other partners to strengthen capacities for addressing the climate crisis and coordinating Food Security actions. In this context, SISAN also plays a key role, operating nationwide to train participating municipalities in the use of the Integrated Response Protocol.

Also noteworthy is the specific initiative to strengthen and implement mechanisms and practices that promote the sustainability of artisanal fishing and the productive inclusion of these communities, which are particularly vulnerable to the impacts of climate change.

Expand the availability of and access to healthy food in areas most exposed to climate change (Objective 2): In line with the Brazil Without Hunger Plan ([202-]), this objective focuses on emergency contexts—when food distribution becomes unavoidable—by developing a protocol for food procurement and distribution that is both safe and effective. The initiative is anchored in Decree No. 11,936 of 2024 (Brazil, 2024), which regulates the national basic food basket.

In the same spirit of expanding food availability and access, the National Policy on Urban and Peri-urban Agriculture will be further strengthened, alongside the creation of new production units and the so-called *Sisteminhas* (little systems)—a project developed by the Brazilian Agricultural Research Corporation (EMBRAPA) designed to support the subsis-

tence production of the most impoverished families, with priority given to Traditional Peoples and Communities (PCTs). Aligned with Objective 2, this effort also includes expanding services for PCTs and extending the reach of the Rural Development Program, fostering productive inclusion, food security, and income generation. It further promotes access to traditional seeds and seedlings through water storage systems for seed houses. In addition, the Food Acquisition Program (PAA) will direct at least 20% of operations under its adhesion modality to PCT families, with a focus on regions most vulnerable to climate change.

Concerning the National School Feeding Program (PNAE), which provides meals to thousands of children and young people, plans include reinforcing strategies to expand and monitor the supply of organic and agroecological foods, as well as increasing purchases from specific groups such as Traditional Peoples and Communities (PCTs). The program will also focus on monitoring the procurement of ultra-processed foods and on building institutional capacity to address climate change.

Also aligned with this sectoral objective is the National Strategy on Food Loss and Waste, which seeks to reverse the current alarming situation in which roughly 30% of all food produced in Brazil is lost or wasted.

Bringing together food recovery and redistribution efforts, **Objective 3 focuses on strengthening the network of public and social Food Security facilities**. A key target under this objective is to support and modernize food banks across the country. Additionally, Brazil has been providing free meals to communities in peripheral areas, as well as during emergencies that require the provision of ready-to-eat, quality food. Of particular note are the solidarity kitchens, social facilities supported by the Solidarity Kitchen Program, a key measure to ensure access to nutritious food. In line with strengthening artisanal fisheries and promoting healthy diets, by 2027, at least one university cafeteria in each Brazilian state will be supplied with meals sourced from these sustainable food systems.

Droughts and dry spells are among the most severe threats to food security, and climate change has greatly intensified their impact. **Objective 4 focuses on ensuring access to water for human and animal consumption and for food production in the most vulnerable and climate-exposed areas**. This includes targets to expand water access and strengthen productive capacity through efficient water collection and storage systems.

Finally, to achieve Food Security, it is essential to address production, supply, and consumption patterns that drive unhealthy diets. **Objective 5 focuses on supporting sustainable food systems, promoting and sharing scientific and technical knowledge, and ensuring its use by the**

populations most vulnerable to climate impacts. The global syndemic highlights the links between climate, obesity, and undernutrition, which are reinforced by dominant food systems. This has driven collaborative discussions that resulted in the development of a Food Systems and Climate Framework for Public Policy, centered on climate justice.

At the same time, technical and scientific knowledge enables the creation of post-climate-disaster protocols to coordinate Food Security initiatives in response to extreme events. Similarly, national and international experiences should be systematized and adapted to local realities through the development of a food systems policy laboratory within the framework of South-South cooperation. Investment in new research is also needed to support the identification of effective mitigation and adaptation actions. Simultaneously, initiatives such as courses on food systems and climate, along with programs aimed at youth—especially in peripheral and highly climate-vulnerable communities—help the population engage with and apply knowledge on these topics. Equally important are efforts to assess traditional food systems, which are essential for maintaining and promoting healthy, sustainable practices, as well as the development of intersectoral action plans to enhance Food Security in Indigenous territories.

To complete the set of targets for this objective, the Young Scientist in Artisanal Fishing program will be implemented across all 26 Brazilian states and the Federal District by 2027, aiming to promote scientific knowledge and access to information on food systems.

Challenges in designing and implementing Food Security actions for climate change adaptation

The development of the Food and Nutrition Security Adaptation Plan and the outcomes achieved demonstrate that SESAN's programs and initiatives are largely aligned with national climate policy. Contributions from other MDS secretariats and partner ministries in shaping the plan's targets and actions have further strengthened its reach, reflecting the federal government's priority on this agenda. Nevertheless, two major challenges remain in the implementation and continuous improvement of climate adaptation and Food Security measures.

On one hand, although the fight against hunger is inherently cross-sectoral, significant tensions exist between sectors, particularly in food production. For instance, the area planted with commodities such

as corn, soy, and sugarcane has grown steadily, driven by tax incentives along the production chains and investments in storage and transport logistics. These same mechanisms are not equally available for staple foods or socio-biodiversity products. Disputes over issues such as pesticide use, the sustainability of meat production and consumption, and water access for irrigation continue to generate controversy due to differing or hard--to-reconcile positions.

Ensuring Food Security requires promoting actions to support sustainable food systems and the dissemination of technical knowledge, as well as its adoption by the most vulnerable groups. Photo: Marcelo Curia.

On the other hand, as at the international level, there is intense debate over who should bear the costs of adaptation and how resources should be accessed. The Food Security plan, like the others, had to account for the budgetary constraints of the PAA and its projections, with no new funding allocated. Support for families and farmers severely affected by extreme climate events—such as the floods in Rio Grande do Sul or the drought in the Amazon—was made possible through extraordinary credits. So far, there are no plans to expand essential programs in the context of the climate crisis, such as the Cisterns Program.

Designed with a horizon of at least ten years, implementing the proposed actions will require continuous monitoring and periodic review, given the dynamic nature of the climate and its impacts. Equally important is maintaining dialogue with other sectoral plans through CAISAN and other institutional coordination mechanisms established by Brazil's climate policy, particularly through the CIM. Framing the food system as the context for climate planning within the Food Security policy requires close tracking of the agendas outlined in the sectoral adaptation plans for family farming and livestock production.

Clearly, dialogue with CONSEA provides valuable opportunities for evaluation and potential course corrections, as the council and its member organizations have demonstrated strong analytical capacity and an ability to reflect the country's realities. It also opens avenues to enhance social participation. Anchored in the SISAN, the Food Security policy further supports expanded federal dialogue, engaging states and municipalities that are themselves developing climate planning initiatives.

Ultimately, the challenges of implementing, monitoring, and continuously updating the targets and actions set out in the Food and Nutrition Security Adaptation Plan represent an exceptional opportunity to work collectively toward climate justice and to strengthen responses to climate change.

REFERENCES

ALENCAR, A. *et al*. *Estimativa de emissões de gases de efeito estufa dos sistemas alimentares no Brasil*. [s. l.]: SEEG, 2023. Available at: https://www.oc.eco.br/wp-content/uploads/2023/10/SEEG_alimentares.pdf . Accessed: 18 Aug. 2025.

ALPINO, T. M. A. *et al*. Os impactos das mudanças climáticas na Segurança Alimentar e Nutricional: uma revisão da literatura. *Ciência & Saúde Coletiva*, v. 27, n. 1, p. 273-286, jan. 2022. Available at: https://www.scielo.br/j/csc/a/Rdr4LGpjWwGfmkgxMs6pLSL/?format=html&lang=pt. Accessed: 15 Aug. 2025.

BRASIL. *Decreto n. 11.936, de 5 de março de 2024*. Dispõe sobre a composição da cesta básica de alimentos no âmbito da Política Nacional de Segurança Alimentar e Nutricional e da Política Nacional de Abastecimento Alimentar. Brasília, 2024. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2024/decreto/d11936.htm. Accessed: 18 Aug. 2025.

BRASIL. *Decreto de 7 de julho de 1999*. Cria a Comissão Interministerial de Mudança Global do Clima, com a finalidade de articular as ações de governo nessa área. Brasília, 1999. Available at: https://www.planalto.gov.br/ccivil_03/DNN/Anterior_a_2000/Dnn07-07-99-2.htm. Accessed: 18 Aug. 2025.

BRASIL. *Lei n. 12.187, de 29 de dezembro de 2009*. Institui a Política Nacional sobre Mudança do Clima – PNMC e dá outras providências. Brasília, 2009. Available at: https://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/lei/l12187.htm. Accessed: 15 Aug. 2025.

BRASIL. Ministério da Ciência, Tecnologia e Inovações. Secretaria de Pesquisa e Formação Científica. *Quarta Comunicação Nacional do Brasil à Convenção-Quadro das Nações Unidas sobre Mudança do Clima*. Brasília: Ministério da Ciência, Tecnologia e Inovações, 2021. Available at: https://repositorio.mctic.gov.br/handle/mctic/4782. Accessed: 15 Aug. 2025.

BRASIL. Ministério da Integração e do Desenvolvimento Regional. Secretaria de Proteção e Defesa Civil. Universidade Federal de Santa Catarina. Centro de Estudos e Pesquisas em Engenharia e Defesa Civil. Atlas Digital de Desastres no Brasil. *MIDR*, [2025]. Available at: https://atlasdigital.mdr.gov.br/. Accessed: 15 Aug. 2025.

BRASIL. Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. Plano Brasil sem Fome. *Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome*, [202-]. Available at: https://www.gov.br/mds/pt-br/acoes-e-programas/brasil-sem-fome. Accessed: 15 Aug. 2025.BRASIL. Ministério do Meio Ambiente. *Plano Nacional de Adaptação à Mudança do Clima*: estratégias setoriais e temáticas. Brasília: MMA, 2016. v. 2. Available at: https://www.gov.br/mma/pt-br/assuntos/mudanca-do-clima/clima/arquivos/livro_pna_plano-nacional_v2_copy_copy.pdf. Accessed: 15 Aug. 2025.

BURIGO, A. C.; PORTO, M. F. Agenda 2030, saúde e sistemas alimentares em tempos de sindemia: da vulnerabilização à transformação necessária. *Ciência & Saúde Coletiva*, v. 26, n. 10, p. 4411-4424, out. 2021.

FÓRUM BRASILEIRO DE MUDANÇAS CLIMÁTICAS (FBMC). *Subsídios para a elaboração do plano nacional de adaptação aos impactos humanos das mudanças climáticas*. Brasília: Grupo de Trabalho Mudanças Climáticas, Pobreza e Desigualdade, 2011. Available at: https://coepbrasil.org.br/wp-content/uploads/2017/03/Subsidios-Plano-Nacional-de-Adaptacao.pdf. Accessed: 18 Aug. 2025.

HISTÓRIA do CIM. BRASIL. *Ministério do Meio Ambiente e Mudança do Clima*, [202-]. Available at: https://www.gov.br/mma/pt-br/composicao/smc/dgov/cim/historia. Accessed: 15 Aug. 2025.

IBARRA, G.; VALE, R. C. Inflação de alimentos e insegurança alimentar no Brasil. *World Bank Group*, 19 jun. 2023. Available at: https://www.worldbank.org/pt/country/brazil/publication/brazil-food-insecurity-and-food--inflation. Accessed: 18 Aug. 2025.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). *Pesquisa Nacional por Amostra de Domicílios Contínua*: segurança alimentar: 2023. Rio de Janeiro: IBGE, 2024. Available at: https://biblioteca.ibge.gov.br/visualizacao/livros/liv102084.pdf. Accessed: 18 Aug. 2025.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). *Pesquisa nacional de saúde*: 2019: atenção primária à saúde e informações antropométricas. Rio de Janeiro: IBGE, 2020.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). *POF 2017-2018*: famílias com até R$ 1,9 mil destinam 61,2% de seus gastos a alimentação e habitação. *IBGE*, 2019. Available at: https://agenciadenoticias.ibge.gov.br/agencia-sala-de-imprensa/2013-agencia-de-noticias/releases/25598-pof-2017-2018-familias-com-ate-r-1-9-mil-destinam-61-2-de-seus-gastos-a-alimentacao-e-habitacao. Accessed: 18 Aug. 2025.

NOVAES, R.; FELIX, S.; SOUZA, R. Save Caatinga from drought disaster. *Nature*, v. 498, n. 170, 2013. Available at: https://www.nature.com/articles/498170a. Accessed: 18 Aug. 2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA ALIMENTAÇÃO E AGRICULTURA (FAO); FUNDO INTERNACIONAL DE DESENVOLVIMENTO AGRÍCOLA (FIDA); ORGANIZAÇÃO MUNDIAL DE SAÚDE (OMS); PROGRAMA MUNDIAL DE ALIMENTOS (PMA); FUNDO DAS NAÇÕES UNIDAS PARA A INFÂNCIA (UNICEF). *El estado de la seguridad alimentaria y la nutrición en el mundo:* Urbanización, transformación de los sistemas agroalimentarios y dietas saludables a lo largo del continuo rural-urbano. Roma: FAO; FIDA; OMS; PMA; UNICEF, 2023. Available at: https://openknowledge.fao.org/server/api/core/bitstreams/62edbe6e-fcb9-477d-8a88-e35613dbf4db/content/cc3017es.html. Accessed: 18 Aug. 2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA ALIMENTAÇÃO E AGRICULTURA (FAO); FUNDO INTERNACIONAL DE DESENVOLVIMENTO AGRÍCOLA (FIDA); ORGANIZAÇÃO MUNDIAL DE SAÚDE (OMS); PROGRAMA MUNDIAL DE ALIMENTOS (PMA); FUNDO DAS NAÇÕES UNIDAS PARA A INFÂNCIA (UNICEF). *The State of Food Security and Nutrition in the World (SOFI) 2025*. Roma: FAO; FIDA; OMS; PMA; UNICEF, 2025. Available at: https://openknowledge.fao.org/bitstreams/4eed749b-81f8-49c9-ba32-f09c66988d54/download. Accessed: 18 Aug. 2025.

PEREIRA, J. Amazônia vive claro extremo em 2024 com alta de até 5,1º C nas temperaturas máximas. *InfoAmazônia*, 23 nov. 2024. Available at: https://infoamazonia.org/2024/11/23/amazonia-vive-calor-extremo-em-2024-com-alta-de-ate-51oc-nas-temperaturas-maximas/. Accessed: 18 Aug. 2025.

PIMENTEL, A. *et al*. *Nota Técnica n. 19/2025/SEI-Cemaden*. [s. l.]: Cemaden, 2025. Available at: https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/noticias/2025/01/201ca-era-dos-extremos-ja-chegou-ao-brasil201d-avalia-pesquisador-do-cemaden/nota-tecnica-cemaden-sei_mcti-12567552-sumario-2024.pdf. Accessed: 15 Aug. 2025.

PINEDA, A. M. R. *et al*. Da produção aos impactos na saúde e no ambiente: uma análise dos sistemas alimentares de Brasil, Colômbia e Panamá. *Ciência & Saúde Coletiva*, v. 28, n. 4, p. 1101-1112, abr. 2023.

ORGANIZAÇÃO METEOROLÓGICA MUNDIAL (OMM). *State of the Global Climate 2024*. Genebra: OMM, 2025. Available at: https://library.wmo.int/idurl/4/69455. Accessed: 18 Aug. 2025.

Food Systems and Climate: a Reference Framework for Public Policy

Gisele Bortolini
Rafael Rioja Arantes
Tatiane Nunes Pereira
Janine Giuberti Coutinho
Thaís Fonseca Veloso de Oliveira
Patricia Chaves Gentil
Elisabetta Recine
Márcia Muchagata
Marcos Dal Fabbro

Why a Reference Framework on Food Systems and Climate for Public Policy?

This chapter introduces the Reference Framework on Climate and Food Systems for Public Policy. Its development reflects a commitment by the National Secretariat for Food and Nutrition Security and the Ministry of Social Development and Assistance, Family and the Fight against Hunger (MDS), within the Federal Government's Multi-Year Plan for 2024–2027. This commitment is further reinforced in the Brazil Without Hunger Plan and the Third National Plan for Food and Nutrition Security. Confronting hunger and food and nutritional insecurity requires addressing new and complex challenges in public policy design and implementation, with urbanization and climate change emerging as particularly pressing issues. On a global scale, all nations share the urgent task of limiting the rise in Earth's temperature to 1.5 °C, yet 2024 marked the hottest year in the past 175 years, with average global temperatures already surpassing this critical threshold (OMM, 2025).

Economic activities that are major sources of greenhouse gas (GHG) emissions are the primary drivers of climate change. Unsustainable energy use, shifts in land and forest use, and the intensification of industrial practices for producing and consuming goods and services are among the most significant contributors to these impacts (IPCC, 2023). In Brazil, food systems play a particularly prominent role in GHG emissions, accounting for roughly 61% of total emissions when considering both the land-use change and forestry sector and agriculture (Brazil, 2024a). Critical biomes such as the Amazon and the Cerrado (MapBiomas, 2024) face ongoing deforestation and mounting pressures from the expansion of the dominant agricultural model, which emphasizes commodity crops, ultra-processed products, and livestock production (Favareto *et al.*, 2025).

Among the most significant GHG-emitting activities within food systems are deforestation, the conversion of forests into cropland and pasture, livestock production, and commodity crop cultivation. Substantial emissions also result from livestock, specifically due to enteric fermentation in ruminant animals, and from agricultural production systems that rely on nitrogen-based inputs (Brazil, 2024a). Regarding the stages of food distribution and consumption, emissions largely accumulate through food waste (Favareto *et al.*, 2025).

On the other hand, climate impacts—such as extreme events including droughts, floods, and natural disasters—affect food production, distribution, and access, amplifying their effects across the social fabric,

including food and nutrition insecurity, particularly among vulnerable populations, with intersections of gender and race. Within this context, Indigenous peoples, traditional communities, family farmers, and populations living in urban peripheries are disproportionately affected by the climate crisis, making it urgent to implement policies that integrate climate justice with the human right to adequate food (HRtAF).

The Reference Framework on Food Systems and Climate for Public Policy

This document is intended to foster the alignment and coordination of public policies and actions on Food Security across sectors, enabling a transition toward healthy and sustainable food systems anchored in the human right to adequate food (HRtAF) and climate justice. The framework seeks to expand the dialogue on the intersection of food systems and climate, offer guiding principles and recommendations to advance equity, and promote coordinated adaptation and mitigation efforts across sectors in response to the climate crisis.

The document is grounded in several key premises: the urgency of climate change, the intrinsic link between climate and food systems, the deepening of social injustices, and existing socioeconomic imbalances. These premises are supported by robust evidence on the scope and magnitude of climate change impacts, highlighting it as an urgent global problem with particular implications for Brazil. The document underscores how dominant food system arrangements contribute to accelerating climate change and exacerbating social inequalities, while also demonstrating that climate impacts affect food systems and disproportionately burden vulnerable populations, groups, and territories. It further emphasizes that the current model of incentives and investment continues to favor production, supply, and consumption patterns that undermine both environmental and socioeconomic sustainability.

This framework also presents guiding principles that underpin the understanding and approaches needed to drive the transition of food systems and reverse climate change, ensuring the human right to adequate food (HRtAF). These principles serve as a basis for the formulation, implementation, and evaluation of public policies on food systems and climate, as outlined in Table 1.

TABLE 1 Guiding Principles of the Reference Framework on Food Systems and Climate for Public Policy

PRINCIPLE	CONCEPT
Human right to adequate food (HRtAF)	Constitutional guarantee of regular and permanent access to adequate, quality food in sufficient quantities, with the State responsible for ensuring that everyone is free from hunger.
Food sovereignty	Right of peoples to define their own food policies, prioritizing small- and medium-scale production, cultural diversity, and local autonomy (FMSA, 2001).
Climate justice	Recognition that climate change affects vulnerable populations the most, advocating for equitable policies that address environmental racism and structural inequalities in food systems.
Social, environmental, economic, and cultural sustainability	Emphasis on the connection between social justice, environmental protection, economic development, and cultural preservation, ensuring rights and dignified conditions for all generations.
Systemic approaches	Promotion of integrated and intersectoral solutions to transform food systems in the face of the climate crisis, focusing on the realization of HRtAF (Swinburn *et al.*, 2019; FAO, 2025).
Climate federalism	Coordination between the federal government, states, and municipalities in climate actions, based on territorial planning and integration among public systems in line with international commitments (Brasil, 2024b).
Social participation	Constitutional right of civil society to participate in the formulation, monitoring, and evaluation of public policies, strengthening democratic and transparent processes.

Food sovereignty is one of the key principles for promoting the transition to sustainable food systems and reversing climate change. Photo: Danillo França/MDS.

Finally, the section on pathways puts forward a set of recommendations to help address current challenges and drive the transformations needed in food systems and climate policy, building on the principles established in this framework. These proposed pathways guide public policies and actions essential to this transition. They call for the strengthening of democratic governance through greater intersectoral coordination and commitment across all levels of government, the creation of mechanisms to prevent conflicts of interest, the reinforcement of social participation as a central element in policy design, and the provision of adequate financing. The pathways also point to the need for adapting modes of production, distribution, and consumption, as in the following table.

TABLE 2 Pathways for democratic governance and the adaptation of production, supply, and consumption patterns are presented in the Reference Framework on Food Systems and Climate for Public Policy

DEMOCRATIC GOVERNANCE
1. Promote intersectoral coordination and commitments across all levels of government.
2. Ensure democratic governance with mechanisms to prevent conflicts of interest.
3. Strengthen social participation as a central element of policies, strategies, and actions.
4. Implement information, education, and communication strategies to foster social mobilization.
5. Secure adequate financing and incentives for the transformation of food systems.
6. Engage in international policy and technical cooperation through intergovernmental and multilateral forums.

ADAPTATION OF PRODUCTION, SUPPLY, AND CONSUMPTION
1. Reorient production and land-use practices to mitigate the impacts of climate change.
2. Promote the agroecological transition.
3. Ensure water security for food production and human consumption.
4. Strengthen socio-biodiversity as an integral part of food systems.
5. Frame food supply as a state policy, safeguarding national sovereignty and climate resilience.
6. Foster resilient and circular city models to enhance social and environmental benefits.
7. Promote environments that support healthy and sustainable food practices for people and ecosystems.
8. Reduce food loss and waste.
9. Investing in science, technology, and innovation to promote sustainable food systems.

Link between the Reference Framework on Food Systems and Climate for Public Policy and Climate Plans

The Climate Plan is Brazil's main instrument for climate policy planning and plays a central domestic role in coordinating mitigation and adaptation measures. It sets out the pathways to fulfill Brazil's commitments under the United Nations Framework Convention on Climate Change within the scope of the Paris Agreement. In its most recent Nationally Determined Contribution (NDC), Brazil set a target of reducing net GHG emissions by 59% to 67% by 2035. These contributions are determined sovereignly by each country according to its national context and must be updated every five years with rising ambition. In its latest submission, Brazil highlighted **hunger**, **poverty**, and **inequality** as central challenges in building **climate resilience** and advancing social justice—issues that are intrinsically connected to the debate on food systems.

To meet these targets, the Climate Plan lays out a coordinated set of actions across sectors, structured around two main pillars: a National Mitigation Strategy and a National Adaptation Strategy. The mitigation pillar encompasses seven sectoral plans aimed at cutting emissions in key areas such as agriculture, energy, and transport. The adaptation pillar focuses on preparing society for the impacts of climate change through risk management and ecosystem protection, addressing challenges such as droughts, floods, and other extreme events, with measures detailed in sixteen sectoral plans. Designed through an intersectoral process with broad social participation, the Climate Plan outlines practical measures deemed feasible within available budgetary resources, guiding action over the next decade.

In this sense, the Climate Plan, which complements the Reference Framework on Food Systems and Climate for Public Policy, brings together actions and commitments from multiple sectors, distributed across twenty--three sectoral plans in addition to those dedicated to adaptation and mitigation. The Framework, in turn, as previously described, sets out principles and pathways to guide different sectors at the federal, state, and municipal levels to promote healthier, more sustainable, and climate-resilient food systems. It provides an integrated vision that spans all stages of the food system. As the first national document to address food systems and climate in an integrated manner within the scope of public policy, the Framework represents an initial step toward ensuring that future national and international commitments fully account for every dimension of food systems.

Farmer Francisca Silva Diniz in the Marudá Quilombo, in Alcântara (MA). Traditional peoples and communities are disproportionately affected by the impacts of the climate crisis. Photo: Claudio Verissimo.

Reference Framework Development Process

The development of the Reference Framework was guided by a participatory, intersectoral, and evidence-based methodology, reflecting the Brazilian government's commitment to strengthening public policies grounded in the human right to adequate food (HRtAF) and climate justice. Recognizing the complexity of food systems and the urgency of responding to the climate crisis, the process sought to bring together diverse knowledge, stakeholders, and institutional levels, fostering broad, informed, and meaningful engagement across all sectors involved.

The work on the Reference Framework was coordinated by the National Secretariat for Food and Nutrition Security (SESAN), in partnership with the Food and Nutrition Security Policy Observatory (OPSAN) at the University of Brasília, with support from the Climate and Society Institute (ICS). The process began with a comprehensive review of literature and documents, including legal frameworks, national and international plans, scientific reports, and practical experiences at the intersection of climate and food systems, as well as climate commitments and targets such as the Paris Agreement, the UNFCCC Conferences of the Parties, and Nationally Determined Contributions (NDCs). Over 250 references were analyzed to inform the Framework's development. This review helped identify gaps, synergies, and opportunities for integration, providing the foundation for the initial diagnosis, the establishment of guiding premises, the formulation of principles, and the design of pathways to transition toward healthier, more equitable, sustainable, and climate-resilient food systems, with a strong focus on public policy.

Following this, the virtual seminar "Food Systems and Climate Justice: Evidence, Policies, and Actions" was held on October 3 and 10, 2024, via YouTube, to enrich the debate and provide inputs for the initial drafting of the document based on data, evidence, and practical experiences from initiatives carried out in Brazil. The seminar featured ten experts from academia, civil society, and government representatives. Across both days, the sessions received more than 2,700 views as of July 2025.

Using the consolidated information, the first version of the Reference Framework on Food Systems and Climate for Public Policy was drafted and discussed in an in-person workshop in Brasília on April 14–15, 2025. Around 50 participants—including experts, ministry representatives, academics, civil society organizations, international organizations, and social movements—collaborated to shape the Framework's conceptual foundations and validate its core structure. Based on their contributions, a second version was developed and went through several rounds of review, involving invited authors,

technical reviewers, and representatives from different government sectors, ensuring a thorough and collaborative refinement process.

The preliminary version of the Framework was subsequently opened for public consultation through the platform "Participa + Brasil" (Brazil's National Citizen Participation Platform) between May and June 2025. On June 16, 2025, a webinar was held to promote the consultation and encourage broader social participation. In total, 309 contributions were received from 52 participants, including 35 individuals, seven public sector representatives, six from civil society, and four from the private sector. The consultation aimed to enhance the legitimacy and representativeness of the document by providing an opportunity for all interested parties to contribute. The feedback was systematically analyzed, resulting in a final version that reflects the main consensus and recommendations emerging from the participatory process. Additionally, a social media profile was created to publicize the drafting process and the public consultation, supporting the Framework's overarching goal of fostering debate on food systems and climate.

The Food Systems and Climate Reference Framework was discussed at a workshop in Brasilia in April 2025, which brought together experts and representatives from ministries, universities, CSOs, international organizations, and social movements. Photo: André Oliveira/MDS.

Key challenges included the complexity of the topic, requiring coordination among historically fragmented sectors, the translation of technical concepts into accessible, action-oriented language, and balancing diverse institutional expectations. The limited time to gather and incorporate contributions also demanded considerable effort to synthesize inputs. At the same time, the process highlighted the transformative potential of a participatory, intersectoral approach, strengthening the legitimacy of and ownership over public policies. Direct engagement of multiple stakeholders helped align agendas, deepen understanding of the interconnections between food and climate, and foster collaboration across sectors.

Potential Uses

The participatory process, which incorporated input from diverse stakeholders, gives the Framework legitimacy and enhances its potential for practical use. In addition to existing instruments such as the Climate Plan (Mitigation and Adaptation), and other national policies—including Food Security, food supply, agroecology, and organic production—actions addressing the climate crisis are also considered. Furthermore, the Framework serves as a guiding document for planning and implementing integrated initiatives, providing an additional tool to support coordination and coherence, ultimately aiming to maximize outcomes and impact.

The Reference Framework on Food Systems and Climate for Public Policy is primarily intended for federal, state, and municipal sectors; however, its principles can—and should—guide decisions and actions across different social sectors, as they are grounded in the overarching goals of social and climate justice. At the state and municipal levels, the Framework serves as a reference, allowing for adaptations considering local realities and needs. Given the multidimensional and complex nature of the climate crisis, addressing this agenda requires both immediate commitment to medium- and long-term planning. Perhaps the greatest challenge is ensuring consistency between principles and actions so that tangible results reach people. Fortunately, numerous platforms—many of them intersectoral—exist to facilitate coordination between civil society and government, providing a promising basis for proposing and monitoring actions.

As a strategic step, the MDS will seek to institutionalize the Reference Framework on Food Systems and Climate for Public Policy as both a technical and policy reference for designing intersectoral public policies. This includes

disseminating it among public managers, enhancing its international visibility, and establishing mechanisms to monitor its implementation. The Framework may also guide the integration of food systems approaches into state and municipal policies, fostering greater alignment across levels of government. Additionally, it serves as an instrument for Brazil's international cooperation, particularly with countries in the Global South, promoting the exchange of experiences and strengthening the global agenda for climate and food justice.

Final Considerations

The Reference Framework on Food Systems and Climate for Public Policy sets a new horizon for aligning public policies on Food Security with actions to address the climate crisis, consolidating convergence among diverse sectors and social actors. Built on a solid foundation of scientific evidence, extensive intersectoral consultation, and social participation, the document sets guiding principles and strategic pathways for transitioning toward healthy, sustainable, and climate-resilient food systems.

Accordingly, the Framework establishes itself as a collective instrument—born from dialogue among science, public policy, and society—and serves as a strategic document to guide the integration of agendas in support of more equitable, resilient, and sustainable food systems in the face of climate change.

REFERENCES

BRASIL. Ministério da Ciência, Tecnologia e Inovação (MCTI). *Relatório do inventário nacional das emissões antrópicas por fontes e das remoções por sumidouros de gases de efeito estufa do Brasil*: primeiro relatório bienal de transparência à convenção-quadro das nações unidas sobre mudança do clima. 4. ed. Brasília: MCTI, 2024a. Available at: https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/sirene/publicacoes/relatorios-bienais-de-transparencia-btrs/Relatorio_deInventario_NacionalNIR_2024_PORT.pdf. Accessed: 9 Aug. 2025.

BRASIL. Presidência da República. Conselho da Federação. *Resolução n. 3, de 3 de julho de 2024.* Estabelece o compromisso para o federalismo climático. Brasília, 2024b. Available at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://ses.sp.bvs.br/wp-content/uploads/2024/07/U_RS-PR-CF-3_030724.pdf. Accessed: 9 Aug. 2025.

FAVARETO, A. *et al. COP30 no Brasil:* por uma transição justa e sustentável do sistema agroalimentar. São Paulo: Cátedra Josué de Castro de Sistemas Alimentares Saudáveis e Sustentáveis (FSP/USP), 2025.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO). *Transforming food and agriculture through a systems approach*. Roma: FAO, 2025. Available at: https://openknowledge.fao.org/bitstreams/06171954-e6f1-47f7-844b-d65b0d01798c/download. Accessed: 9 Aug. 2025.

FÓRUM MUNDIAL SOBRE SOBERANIA ALIMENTAR (FMSA). *Declaración Final del Foro Mundial sobre Soberanía Alimentaria*. Havana: Fórum Mundial sobre Soberania Alimentar, 2001. Available at: https://acervo.socioambiental.org/acervo/documentos/declaracion-final-del-foro-mundial-sobre-soberania-alimentaria. Accessed: 9 Aug. 2025.

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC). *Climate Change 2023*: Synthesis Report: Summary for Policymakers. Genebra: IPCC, 2023. Available at: https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf. Accessed: 9 Aug. 2025.

MAPBIOMAS. *Destaques do mapeamento anual de cobertura e uso da terra*: agricultura e irrigação. [s. l.]: MapBiomas, 2024. Available at: https://brasil.mapbiomas.org/wp-content/uploads/sites/4/2024/12/Factsheet-Agricultura_C9_05.12_v2.pdf. Accessed: 9 Aug. 2025.

ORGANIZAÇÃO METEOROLÓGICA MUNDIAL (OMM). *State of the Global Climate 2024*. Genebra: OMM, 2025. Available at: https://library.wmo.int/viewer/69455/?offset=#page=1&viewer=picture&o=bookmark&n=0&q=. Accessed: 9 Aug. 2025.

SWINBURN, B. A. *et al*. The global syndemic of obesity, undernutrition, and climate change: the Lancet Commission report. *The Lancet*, v. 393, n. 10.173, p. 791-846, 2019. Available at: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)32822-8/fulltext. Accessed: 9 Aug. 2025.

Climate Action: Reducing Food Loss and Waste as a Strategy to Expand Access to Healthy Food and Cut Greenhouse Gas Emissions

Gustavo Porpino
Carmem Priscila Bocchi

Introduction

Food loss and waste (FLW) have become a central focus in the global conversation on sustainable food systems, due to the wide-ranging benefits of addressing this issue (Hoogeveen & Verghese, 2024). Besides increasing the availability of fruits and vegetables, reducing FLW also helps cut greenhouse gas emissions—especially methane—fosters entrepreneurial opportunities within a circular food economy, and enhances the connection between efforts to fight hunger and climate action. Moreover, it is a powerful multisectoral agenda, capable of connecting different levels of government, civil society, and actors across the food chain, from farm to table. According to the Waste and Resources Action Program (WRAP, 2025), the World Resources Institute (WRI) (Hanson & Mitchell, 2017), and the Food and Agriculture Organization (FAO) (Rolle, 2022), tackling food loss and waste (FLW) presents a triple opportunity: benefiting the climate, strengthening Food Security, and enhancing the sustainability of our food systems.

Globally, it is estimated that 34% of GHG emissions are linked to food production, storage, transport, processing, marketing, consumption, and disposal (Crippa *et al.*, 2021). In Latin America, the share of emissions from food systems rises to 66% (Crippa *et al.*, 2021). In the United States, 58% of methane emissions released into the atmosphere from municipal solid waste landfills come from discarded food (US EPA, 2023). Food loss and waste (FLW) accounts for 8–10% of global annual GHG emissions—nearly five times the total emissions from the aviation sector—and drives significant biodiversity loss, using almost a third of the world's agricultural land (UNFCCC, 2024). Beyond occupying valuable farmland, food waste also entails the unnecessary use of water, fertilizers, energy, and labor, resulting in serious economic, social, and environmental costs. The total global economic cost of FLW is estimated at around USD 1 trillion per year (UNFCCC, 2024).

In response to the urgent demands on governments posed by the climate crisis, food systems have taken on a more prominent role in intersectoral programs. National strategies and political commitments for sustainable food systems are increasingly embedded in development plans and legal frameworks, reinforcing the constitutional right to adequate food. At the same time, governance mechanisms are being strengthened, characterized by stronger political commitment and a more inclusive, multistakeholder approach that brings together government, civil society, and actors across the food chain (UNFSS; +4 Stocktake, 2025).

Reducing food loss and waste benefits the climate, Food Security, and the sustainability of our food systems. Photo: Elias Rodrigues.

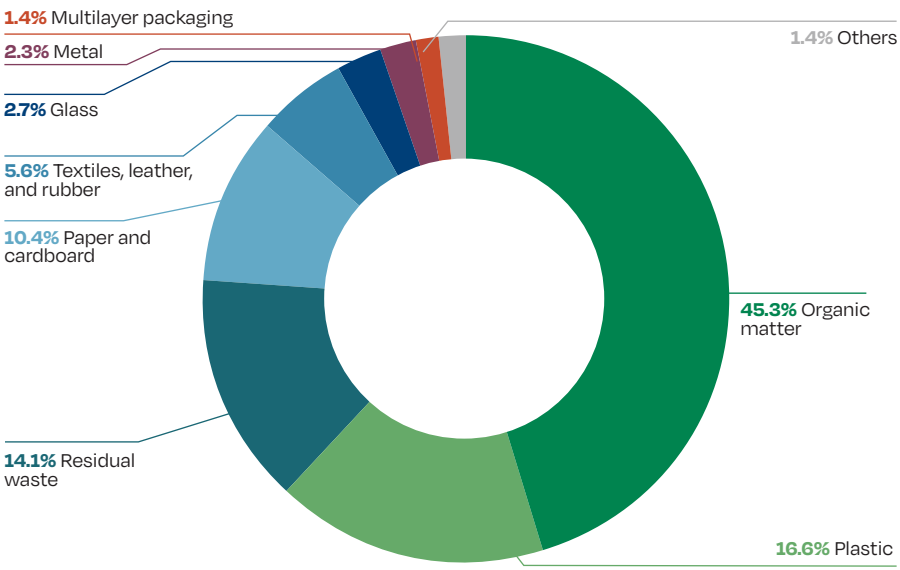
Even with growing global attention to the issue, few countries explicitly address food loss and waste (FLW) in their Nationally Determined Contributions (NDCs). According to the Champions 12.3 network report (Hoogeveen, Verghese, 2024), only 25 countries include actions to reduce FLW in their NDCs, leaving the majority without this consideration in their climate strategies. Tackling FLW represents a strategic opportunity for countries to achieve significant GHG emission reductions while simultaneously advancing broader efforts to strengthen sustainable food systems.

The Brazilian context

In Brazil, there are no precise data on methane emissions from organic waste disposal. However, considering that 32% of municipalities still dump solid waste in open-air landfills (Britto, 2024) and that organic matter accounts for an estimated 45% of municipal solid waste (MSW)—as shown in the following graph—it is clear that food waste is a major source of greenhouse gas emissions in the country. In 2023 alone, inadequate waste disposal sites were present in every region of Brazil and received approximately 28.7 million tons of waste, representing 41.5% of all waste sent for final disposal nationwide (Abrema, 2024).

Brazil generates around 81 million tons of municipal solid waste (MSW) each year, equivalent to more than 221,000 tons per day or approximately 382 kg of waste per person annually (Abrema, 2024). Of this total, about 45% is organic material, meaning that nearly 172 kg per person per year consists of discarded organics. Reliable national estimates of food waste across different stages of the food supply chain are still scarce. The most recent data on waste at the consumption stage—based on a pilot study in Rio de Janeiro—show that over 60% of household waste consists of food leftovers, averaging 77 kg per person annually (Enap, 2024). Similar figures have been reported in studies conducted in São Paulo, Brasília, and Osasco.

GRAPH 1 Composition of Municipal Solid Waste in Brazil



Source: Abrelpe (2020).

Beyond the urgent need to reduce food loss and waste, the sheer volume of solid waste generated in Brazil highlights the untapped potential for investment in waste-to-energy, composting, and recycling initiatives. According to Abrema (2024), an estimated 47,600 tons of refuse-derived fuel (RDF) were produced in the country in 2023—less than 0.2% of the total MSW generated. Recycling accounts for 8.3% of MSW, with more than two-thirds of this material collected by independent waste pickers. Composting remains even more limited: in 2023, about 300,000 tons of material were processed in composting facilities, representing only 0.4% of total MSW nationwide (Abrema, 2024).

Pathways forward

Reducing food loss and waste must be closely linked to robust measures that strengthen sustainable food systems. According to the final report of the recent Food Systems Summit (UNFSS; +4 STOCKTAKE, 2025), it is essential to increase investment in scientific capacity, improve the frequency and accessibility of data, and promote the adoption of context-specific technologies. To support nationwide data generation efforts, knowledge-sharing platforms and multistakeholder partnerships should be expanded to bridge research, policy, and practice. Brazil is well-positioned to formalize a coalition to address food loss and waste, engaging the World Wide Fund for Nature (WWF) and WRAP, together with government actors, civil society, and the private sector (WRAP, [2025]). Furthermore, the recent update of Brazil's Intersectoral Strategy for Reducing Food Loss and Waste, coordinated by the Ministry of Social Development, Family, and Fight against Hunger (MDS) and the Brazilian Agricultural Research Corporation (Embrapa), opens opportunities for new research initiatives and the strengthening of public policies aligned with this agenda.

Beyond the need for a multistakeholder approach, the complexity of food loss and waste demands a systemic perspective to design more effective solutions. Traditional analyses and interventions, which focus on isolated links in the food supply chain, should give way to approaches that consider the connections between, for example, rural producers and retail, or retail and industry, while assessing how interventions affect social well-being (FAO, 2025). A systemic perspective should also guide governance and financing (Figure 1), highlighting the importance of fostering coalitions and multistakeholder arrangements to implement higher-impact actions.

According to Broeze, Guo, and Axmann (2023), reducing FLW has significant potential to lower food-related GHG emissions. However, many

interventions may also generate additional emissions. These trade-offs make assessing solutions complex, as reducing losses at one stage of the food supply chain could inadvertently increase losses or emissions at a later stage. Priority should be given to interventions that simultaneously reduce FLW and associated GHG emissions across the entire food supply chain (Broeze, Guo & Axmann, 2023).

As a practical example reflecting the observations of Broeze, Guo, and Axmann (2023) in the Brazilian context, trade-off analyses are necessary to evaluate how the redistribution of surplus food from supermarkets or open-air markets can follow models with low operational costs, particularly in terms of fuel consumption, thereby minimizing carbon emissions. Connecting public wholesale markets (CEASAS)—which are typically major generators of organic waste—to composting programs or community kitchens is a promising initiative. Such actions can reduce improper food disposal while simultaneously addressing food insecurity by sorting and redirecting safe, nutritious surplus food for consumption.

FIGURE 1 Key Elements of a Systemic Approach to Food System Transformation

SIX MAIN COMPONENTS OF THE SYSTEMS APPROACH

	ELEMENT	SILO APPROACH	SYSTEMIC APPROACH
1	**SYSTEMIC THINKING** Mindset that visualizes systems	Viewing goals, priorities, problems, and solutions in isolation	Think beyond organizational silos to see interconnections and multiple effects
2	**SYSTEMS KNOWLEDGE** Data for Systemic Change	Addressing problems, causes, and solutions separately	Foster shared leadership, joint planning, and balanced power dynamics
3	**SYSTEMS GOVERNANCE** Joint cross-sector efforts	Fragmented institutions and decision-making	Implement actions that are reinforcing and multifunctional
4	**SYSTEMIC IMPLEMENTATION** Harnessing actions that leverage interconnections	Isolated interventions	Pursue long-term, coordinated implementation with flexible resources
5	**SYSTEMS INVESTMENT** Resources directed toward long-term transformations	Short-term, inflexible, and uncoordinated funding	Embed continuous collective learning and real-time adaptation
6	**SYSTEMS LEARNING** Continuous learning and adaptation	Prescriptive actions, rigid procedures, and isolated learning	Think beyond organizational silos to see interconnections and multiple effects

Source: adaptada de FAO (2025).

As highlighted by the United Nations Industrial Development Organization (UNIDO), efforts to reduce the environmental impact of packaging can unintentionally increase food loss and waste (FLW), and consequently, GHG emissions. To make informed decisions on strategies for improving sustainability, it is crucial to account for these trade-offs (UNIDO, 2025).

Scaling up food loss and waste reduction requires strong political leadership, coherent legal frameworks, and intersectoral coordination (One Planet Network, 2025). According to the outcomes of the FLW workshop held during the Global Conference on Sustainable Food Systems (One Planet Network, 2025), governments should start by setting measurable targets and implementing FLW reduction policies focused on critical points within major food supply chains. These measures include regulations on food donations, composting, retailer accountability, and incentives for food redistribution. Moreover, investments in storage, packaging, and transportation infrastructure are crucial for improving the quality and shelf life of fresh foods. According to the One Planet Network (2025), integrating FLW reduction priorities into climate, food systems, agriculture, and development agendas accelerates progress toward Sustainable Development Goal (SDG) 12.3 and fosters initiatives with greater social and environmental impact.

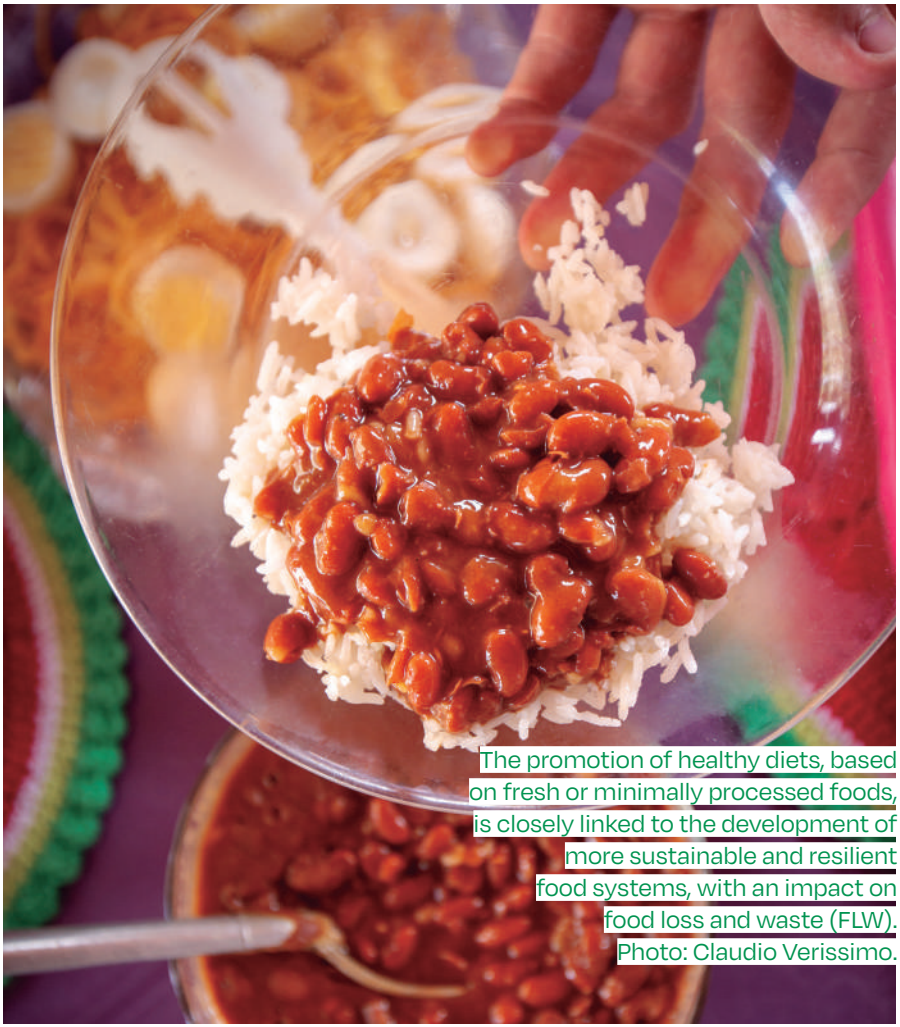
States must also work closely with local governments to develop strategic policies that expand access to healthy, fresh, and minimally processed foods, while reducing waste and fostering circularity (Porpino *et al*., 2025). In countries as vast and diverse as Brazil, the engagement of local governments is critical to designing and implementing solutions that respond to the specific realities of each territory. In this regard, it is worth highlighting the innovative character of the *Alimenta Cidades Strategy*, which operates in 91 Brazilian municipalities, focusing on increasing the production, availability, access, and consumption of healthy foods, while also making food loss and waste reduction one of its key pillars.

Coordinated strategies across different levels of government can also foster food recovery and redistribution, promote healthy and sustainable diets through short supply chains, and strengthen the integration of production, distribution, and consumption across different territories. The priority should be to design and implement the so-called circular food systems, with municipalities serving as the starting point (Porpino *et al*., 2025).

Promoting innovation and behavioral change is also essential to reducing loss and waste throughout the food system. Smart technologies and digital tools are improving tracking, redistribution, and loss reduction; innovations in food environments—such as improved packaging and dynamic pricing—are helping to prevent waste; and public awareness campaigns, edu-

cation initiatives, and consumer engagement are fostering more sustainable consumption habits. Yet important challenges remain, particularly the need to scale up many of these innovations and ensure that solutions reach small and medium-sized farmers.

Collaboration across a wide range of stakeholders is essential to designing and scaling effective solutions to tackle food loss and waste. Multi-stakeholder platforms that bring together government institutions, the private sector, civil society, and local communities enable data-driven planning, alignment of efforts, and the replication of successful models—such as food banks, community composting, social gastronomy initiatives, and public–private partnerships that translate policies into tangible impact.



The promotion of healthy diets, based on fresh or minimally processed foods, is closely linked to the development of more sustainable and resilient food systems, with an impact on food loss and waste (FLW). Photo: Claudio Verissimo.

Collaboration across a wide range of stakeholders is essential to designing and scaling effective solutions to tackle food loss and waste.

Photo: Marcelo Curia

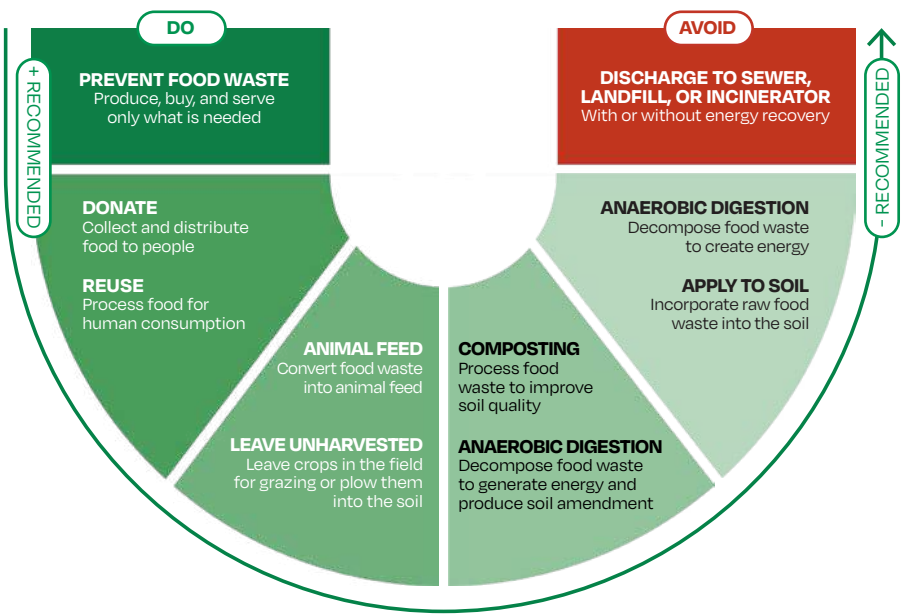
Intersectoral Strategy for the Reduction of Food Loss and Waste in Brazil

Faced with the challenges outlined above, and recognizing the need for an intersectoral approach to reduce food and waste loss, the Brazilian government—through the Interministerial Chamber for Food and Nutrition Security (CAISAN)—decided in 2024 to draft the Second Intersectoral Strategy for Reducing Food Loss and Waste in Brazil, scheduled for launch in the second half of 2025. An earlier version of this strategy had been developed in 2018, but it was never implemented.

Approved by CAISAN in November 2024, the Second Intersectoral Strategy for Reducing Food Loss and Waste in Brazil is driven in large part by climate considerations. It builds on the premise that integrating Food Security, sustainable food systems, and environmental protection is a critical challenge for the country.

To this end, the strategy adopts a hierarchy for FLW prevention, as illustrated in the figure below. Minimizing environmental impact requires prioritizing waste prevention by reducing food loss at its source. Circularity should be promoted, ideally through food donations or the repurposing of by-products (upcycling).

FIGURE 2 Hierarchy for prioritizing FLW reduction



Source: US EPA (2023).

Key objectives of the 2024 strategy include:

I – Reduce losses throughout the food supply chain, including post-harvest losses and food waste at the retail and consumption levels;

II – Encourage the redistribution of fresh or minimally processed foods;

III – Increase access to healthy foods, particularly for low-income populations, in line with the Brazilian Dietary Guidelines (Ministry of Health, 2021) and the national basic food basket, based on fresh or minimally processed foods;

IV – Strengthen data, information, and monitoring of food loss and waste through improved measurement methods, research support, and the promotion of technological and social innovations;

V – Coordinate and strengthen the network of food banks, enhancing the performance of the Brazilian Food Bank Network;

VI – Implement measures to reduce the environmental impacts associated with the disposal of organic waste from FLW;

VII – Promote circular food systems.

Two aspects of the objectives above merit emphasis. The concerns the national basic food basket, established by Decree No. 11,936 of March 5, 2024 (Brazil, 2024). This decree is notable for defining the composition of the basket with fresh or minimally processed foods and culinary ingredients —an initiative that enhances diet quality and helps boost demand for fruits and vegetables. Expanding public procurement of fresh foods, for instance, can reduce losses caused by limited market access—a challenge still faced by many small-scale rural producers. Furthermore, promoting healthy diets based on fresh or minimally processed foods is closely linked to building more sustainable and resilient food systems, with direct benefits for reducing FLW.

The second aspect to highlight is the role of food banks and the Brazilian Food Bank Network. According to the Ministry of Social Development (MDS), Brazil has approximately 300 food banks, including public ones (mostly municipal), private non-profit institutions, and SESC Mesa Brasil, the food bank program of the Social Service of Commerce (SESC).

Food banks are Food Security facilities that collect, receive, and distribute food donations from both public and private sectors, prioritizing sustainable management of available resources. Their work focuses on reducing food loss and waste while ensuring that donations reach organizations supporting food-insecure families. In recent years, food banks have also been embracing innovative practices, including nutrition education programs and sustainable management of organic waste, further strengthening their impact on communities and local food systems.

Food banks play a pivotal role in structuring a network for the redistribution of unsold food. The II Intersectoral Strategy for the Reduction of Food

Loss and Waste in Brazil is expected to strengthen this network, fostering closer connections with both the wholesale sector (food banks located in public wholesale markets [CEASAS]) and the retail sector, including supermarkets and open-air markets.

Final considerations

Efforts to reduce food loss and waste need to be clearly embedded in countries' climate commitments and, in the context of the Global South, can be aligned with initiatives to combat hunger. Given the complexity of the issue—which spans from improving agricultural practices to fostering behavioral changes among consumers—meaningful progress in reducing FLW can only be achieved through coordination across different levels of government, engagement of diverse actors from farm to table, and systemic analyses to implement solutions that simultaneously strengthen Food Security, minimize organic waste, and create opportunities for socio-environmental entrepreneurship.

REFERENCES

ASSOCIAÇÃO BRASILEIRA DE EMPRESAS DE LIMPEZA PÚBLICA E RESÍDUOS ESPECIAIS (ABRELPE). *Panorama dos resíduos sólidos Brasil 2020*. São Paulo: Abrelpe, 2020. Available at: https://www.abrema.org.br/download/90934/?tmstv=1718136285. Accessed: 11 Aug. 2025.

ASSOCIAÇÃO BRASILEIRA DE RESÍDUOS E MEIO AMBIENTE (ABREMA). *Panorama dos resíduos sólidos Brasil 2024. São Paulo*: Abrema, 2024. Available at: https://www.abrema.org.br/download/96475/?tmstv=1733786378. Accessed: 11 Aug. 2025.

BRASIL. *Decreto n. 11.936, de 5 de março de 2024.* Dispõe sobre a composição da cesta básica de alimentos no âmbito da Política Nacional de Segurança Alimentar e Nutricional e da Política Nacional de Abastecimento Alimentar. Brasília, 2024. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2024/decreto/d11936.htm. Accessed: 11 Aug. 2025.

BRITTO, V. *MUNIC 2023*: 31,9% dos municípios brasileiros ainda despejam resíduos sólidos em lixões. Agência IBGE notícias, 28 nov. 2024. Available at: https://agenciadenoticias.ibge.gov.br/agencia-noticias/2012-agencia-de-noticias/noticias/41994-munic-2023-31-9-dos-municipios-brasileiros-ainda-despejam-residuos-solidos-em-lixoes. Accessed: 11 Aug. 2025.

BROEZE, J.; GUO, X.; AXMANN, H. Trade-Off Analyses of Food Loss and Waste Reduction and Greenhouse Gas Emissions in Food Supply Chains. *Sustainability*, v. 15, n. 11, p. 8531, 2023. Available at: https://www.mdpi.com/2071-1050/15/11/8531. Accessed: 11 Aug. 2025.

CONVENÇÃO-QUADRO DAS NAÇÕES UNIDAS SOBRE MUDANÇAS CLIMÁTICAS (UNFCCC). *Food loss and waste account for 8-10% of annual global greenhouse gas emissions; cost USD 1 trillion annually.* United Nations Framework Convention on Climate Change, 30 set. 2024. Available at: https://unfccc.int/news/food-loss-and-waste-account-for-8-10-of-annual-global-greenhouse-gas-emissions-cost-usd-1-trillion. Accessed: 11 Aug. 2025.

CRIPPA, M. *et al*. Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food*, n. 2, p. 198-209, 2021. Available at: https://www.nature.com/articles/s43016-021-00225-9. Accessed: 11 Aug. 2025.

HANSON, C.; MITCHELL, P. The business case for reducing food losses and waste: a report on behalf of Champions 12.3. *Champions* 12.3, mar. 2017. Available at: https://champions123.org/sites/default/files/2020-08/business-case-for-reducing-food-loss-and-waste.pdf. Accessed: 11 Aug. 2025.

HOOGEVEEN, H.; VERGHESE, S. SDG target 12.3 on food loss and waste: 2024 progress report. Letter from the Co-Chairs of Champions 12.3. *Champions* 12.3, Washington, 2024. Available at: https://champions123.org/2024-progress-report. Accessed: 11 Aug. 2025.

KOHLI, K. *et al*. (2024). Food waste: environmental impact and possible solutions. *Sustainable Food Technology*, v. 2, p. 70-80, 2024. Available at: https://pubs.rsc.org/en/content/articlelanding/2024/fb/d3fb00141e. Accessed: 10 Aug. 2025.

MINISTÉRIO DA SAÚDE (2O21). *Guia Alimentar para a População Brasileira*. Brasília, DF: Ministério da Saúde. Available at: https://www.gov.br/saude/pt-br/assuntos/saude-brasil/publicacoes-para-promocao-a-saude/guia_alimentar_populacao_brasileira_2ed.pdf/view. Accessed: 13 Aug. 2025.

ONE PLANET NETWORK. *Outcome Document of the 5th Global Conference of the One Planet Network's (10yfp) Sustainable Food Systems (Sfs) Programme*. Brasília: One Planet Network, 2025. Available at: https://www.oneplanetnetwork.org/sites/default/files/2025-06/Final%20Outcome%20Document_5th%20Global%20Conference%20SFS%20Programme.pdf. Accessed: 11 Aug. 2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA ALIMENTAÇÃO E AGRICULTURA (FAO). *Update on Food Systems Transformation work at the FAO.* Roma: FAO, 2025. Available at: https://openknowledge.fao.org/server/api/core/bitstreams/fb66feeb-13cc-4aa7-a2b4-a08a3073faab/content. Accessed: 11 Aug. 2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA O DESENVOLVIMENTO INDUSTRIAL (UNIDO). *Navigating the food loss and waste paradox.* Vienna: Unido, 2025. Available at: https://www.unido.org/sites/default/files/unido-publications/2025-05/Navigating%20the%20food%20loss%20and%20waste%20paradox_Final.pdf. Accessed: 11 Aug. 2025.

PORPINO, G. *et al*. Transição para sistemas alimentares circulares: Um estudo dos stakeholders em cinco cidades brasileiras. R*evista de Administração de Empresas*, v. 65, n. 4, 2025. Available at: https://www.scielo.br/j/rae/a/8KcYSryJbmBPZTh9qVj5s3z/?lang=pt. Accessed: 11 Aug. 2025.

PROGRAMA DAS NAÇÕES UNIDAS PARA O MEIO AMBIENTE (UNEP). *Food waste index report*. Nairobi: Unep, 2024. Available at: https://wedocs.unep.org/handle/20.500.11822/45230. Accessed: 11 Aug. 2025.

ROLLE, R. *We can all help reduce food loss and waste*. United Nations Chronicle, 28 set. 2022. Available at: https://www.un.org/en/un-chronicle/we-can-all-help-reduce-food-loss-and-waste. Accessed: 11 Aug. 2025.

UNITED NATIONS FOOD SYSTEMS SUMMIT(UNFSS); +4 STOCKTAKE. *Accelerating Inclusive, Resilient and Sustainable Food Systems Transitions for People and Planet*. Adis Abeba: Report of the Secretary-General, 2025. Available at: https://www.unfoodsystemshub.org/media/docs/unfoodsystemslibraries/unfss-4/unfss4_en_sg_report.pdf?sfvrsn=6058e01b_1. Accessed: 11 Aug. 2025.

US ENVIRONMENTAL PROTECTION AGENCY (US EPA). *Quantifying Methane Emissions from Landfilled Food Waste.* US EPA, 2023. Available at: https://www.epa.gov/land-research/quantifying-methane-emissions-landfilled-food-waste. Accessed: 11 Aug. 2025.

VÁZQUEZ-ROWE, I. *et al*. Climate action and food security: Strategies to reduce GHG emissions from food loss and waste in emerging economies. Resources, *Conservation and Recycling*, v. 170, jul. 2021. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0921344921001695?via%3Dihub. Accessed: 11 Aug. 2025.

WASTE AND RESOURCES ACTION PROGRAMME (WRAP). *Food Pact network: global collaboration to reduce food losses and waste*. The Waste and Resources Action Programme, [2025]. Available at: https://www.wrap.ngo/taking-action/food-drink/food-pact-network. Accessed: 11 Aug. 2025.

Challenges to Food and Nutrition Security Policies Amid Recurring Climate Emergencies

Elisângela Sanches Januário
Erick Brigante Del Porto

Brief background

Climate change has been increasingly undermining access to food, with the greatest impacts falling on socially vulnerable groups. This trend threatens the food security of a significant share of the Brazilian population, particularly those living in peripheral areas and belonging to traditional peoples and communities (PCT). Extreme weather events such as droughts, heatwaves, and floods reduce agricultural output, drive up production costs, and disrupt supply chains—leading to higher food prices and reduced access to healthy diets.

Food prices, which had declined substantially worldwide during the latter half of the 20th century—largely due to technological advances and productivity gains—began to rise sharply from the 2000s onward, even as global food production continued to expand. Several factors help explain this shift in price behavior, including the rapid growth in food demand—particularly for protein sources—in highly populated countries, as well as the effects of climate change driven by food systems that exploit natural resources intensively and unsustainably.

In recent years, food price inflation has become a growing concern. The United Nations Food and Agriculture Organization (FAO)[1], together with other international agencies, notes that since 2020, global food price inflation has outpaced overall inflation, highlighting persistent pressures on agricultural and food markets (FAO *et al.*, 2025; p. 13In Brazil, the prices of the food and beverage group—one of the components of the Broad Consumer Price Index (IPCA) published by the Brazilian Institute of Geography and Statistics (IBGE)—rose by 282.4% between 2007 and 2024, compared with a 171.5% increase in the IPCA overall (Baccarin, 2025).

In addition to the pandemic, shocks from wars and rising energy costs have also been affecting food security levels, particularly among the most vulnerable populations. In its 2025 annual report on the state of Food Security worldwide, the FAO and other international agencies highlight how high inflation in many countries has undermined purchasing power and access to healthy diets, especially for low-income populations.

In recent years, the recurrence of extreme events in Brazil has been increasing, including droughts in the Pantanal and the Amazon, as well as heavy rainfall in Rio Grande do Sul. In 2024 alone, these events affected

1 According to FAO *et al.* (2025, p. 13): "High food price inflation may worsen food security, particularly in low-income countries. A 10 percent increase in food prices is associated with a 3.5 percent rise in moderate to severe food insecurity, and a 1.8 percent increase in severe food insecurity."

more than 70% of municipalities in Rio Grande do Sul and the Amazon states, impacting millions of people.

Some recent initiatives

Policies aimed at promoting Food Security should incorporate the capacity to anticipate, implement, and coordinate social protection actions that respond promptly to socio-environmental disasters. This includes, on one hand, ensuring access to adequate and healthy food, and on the other, promoting healthier, more resilient, and sustainable food systems to mitigate the impacts of inevitable climate emergencies[2]. It is worth noting that these issues have been addressed in various public policy plans developed by the federal government in recent years, such as the Sectoral Plan for Food and Nutrition Security Adaptation.

The third PLANSAN (2025–2027) incorporated the issue of climate change and its impacts on Food Security. One of its strategic announcements—"ANNOUNCEMENT 4: FOOD SYSTEMS INCREASE THEIR RESILIENCE AND REDUCE VULNERABILITY TO THE IMPACTS OF CLIMATE CHANGE, ENSURING HEALTHY FOOD FOR THE ENTIRE POPULATION" (p. 66)—defined three major challenges to be addressed:

> I. Create mechanisms to ensure the stability of food production, availability, and access in the face of the increasing effects of climate change;
> II. Strengthen government capacity to respond and guarantee Food Security for territories and populations affected by extreme climate events
> III. Mitigate and promote the adaptation of food systems to climate change, encouraging the adoption of sustainable and agroecological production practices that reduce environmental impacts and protect human health.

To achieve this goal, the Climate Adaptation Plan, the National Agroecology and Organic Production Plan (PLANAPO), the Family Farming Crop Plan (*Plano Safra*), and the Strategy for Reducing Food Loss and Waste were identified as cross-sectoral strategies aimed at fulfilling this overarching objective.

In response to the impacts of climate change, a Reference Framework on Food Systems and Climate for Public Policies is currently being develo-

---

2 The Sectoral Plan for Food and Nutrition Security Adaptation sets out a series of adaptive measures organized around five key sectoral objectives. All aligned with the guiding principles of the Climate Adaptation Plan. The launch of the Sectoral Plan is scheduled to take place at the UN Climate Change Conference (COP30) in Belém (PA) in November 2025.

ped. This process is led by the Ministry of Social Development and Assistance, Family and the Fight against Hunger (MDS) in partnership with the Food and Nutrition Security Policy Observatory (OPSAN) at the University of Brasília (UnB) and the Institute for Climate and Society (ICS)— and it is guided by principles such as the promotion of the human right to adequate food (HRtAF), food security and sovereignty, and climate justice, among other principles. The purpose of this document is to foster convergence and coordination of policies and public actions across different sectors, thereby supporting the transition to healthy and sustainable food systems in the face of the challenges posed by climate change.

Another initiative worth highlighting is the creation of a Basic Food Basket Price Observatory[3]. This goal is included in the first National Food Supply Plan – Food Plate (*Alimento Prato*)[4] covering the period 2025–2028, under the priority area of information, strategic intelligence, and communication. It focuses on developing strategic information systems to guide public policies related to food supply. Monitoring the price trends of items in the basic food basket is essential to support Food Security policies, including during emergencies and public calamities.

The *Alimenta Cidades Strategy* (National Strategy on Food and Nutrition Security in Cities), established by Decree No. 11,822 of December 12, 2023 (Brazil, 2023), aims to coordinate, strengthen, and support the implementation of various initiatives in Brazilian cities, including the Climate Plan. Strategy 5 of the document recognizes that current urban food environments do not promote adequate and healthy eating, instead creating significant barriers to achieving Food Security, especially in peripheral areas. Additionally, since climate impacts both food production and prices, large cities—home to millions—are heavily affected by climate change, with the most vulnerable populations suffering the most.

---

3 The New Basic Food Basket was established with the enactment of Decree No. 11,936, dated March 5, 2024 (Brazil, 2024), which provides for the composition of the basic food basket within the framework of the National Food and Nutrition Security Policy and the National Food Supply Policy. Its purpose is to guarantee the human right to adequate and healthy food, while promoting food sovereignty and Food Security. It is also part of the goals established under the 'Food and Nutrition Security: Adequate Food from Production to Consumption' pillars of the Brazil Without Hunger Plan, launched in 2023.

4 One of the main goals of the National Food Supply Plan is to establish supply mechanisms that ensure vulnerable populations are supported during climate-related emergencies.

Managing Risks and Disasters in Brazil

Risk and disaster management services, carried out by the Civil Protection and Defense teams, have been in place in Brazil since the 1960s. However, it was only in 2007 that the National Policy on Civil Protection and Defense was approved, and only in 2012—following the tragedy in the mountainous region of Rio de Janeiro—that the National System for Civil Protection and Defense (SINPDEC) was effectively established. This consolidation ensured inter-institutional and intergovernmental coordination, while also improving technical data for decision-making through the creation of the National Center for Monitoring and Early Warning of Natural Disasters (CEMADEN).

In the field of social assistance, the MDS has been internally organizing itself to respond to crises and emergencies at least since 2008, when floods in the Itajaí Valley affected over 1.5 million people. That year also saw the first transfers from the National Social Assistance Fund (FNAS) to municipalities affected by emergencies, with the sole purpose of supporting crisis response.

In May 2025, the Protection Force of the Unified Social Assistance System (FORSUAS) was created, which serves as a cooperative strategy to mobilize human and logistical resources for municipalities facing social assistance emergencies. It consists of a multidisciplinary support team—regionally deployed and trained to respond to social assistance needs during disasters and crises—which reinforces the workforce of the Unified Social Assistance System (SUAS) at the municipal level.

Disaster response policies in the field of humanitarian assistance

Civil protection and defense actions are structured around five main fields: prevention, mitigation, preparedness, response, and reconstruction. Existing policies and financing mechanisms are better developed for the fields of preparedness and response, particularly in fast-onset emergencies such as floods and flash floods, and inundations. Financing mechanisms for prevention and mitigation, however, remain incipient, even though the necessary actions are well understood, especially concerning risk areas. At the same time, current policies have not proven adequate for slow-onset events such as droughts and dry spells, which are no longer limited to the Northeast but are becoming increasingly frequent and severe in the North and South regions of the country.

Extreme weather events, such as the floods in Rio Grande do Sul in 2024, reduce food production, increase production costs, and disrupt supply chains. Photo: Gustavo Mansur/Palácio Piratini.

The two types of events—fast-onset and slow-onset—have very different consequences and impacts on society and require different responses. Fast-onset shocks generally occur in specific areas and affect the local population indiscriminately, although they tend to be more frequent in areas with higher concentrations of low-income and/or vulnerable populations.

Slow-onset disasters, in turn, follow a different dynamic. Advances in climate science now allow these events to be predicted well in advance, and Brazil already has technology in place to identify both the areas and the families that will be most affected. In the case of droughts and dry spells, the impact falls primarily on rural populations, with severe consequences for Food Security as families lose both their subsistence production capacity and the surplus needed to generate income. In the Amazon, the situation is even more severe due to river droughts, which isolate communities and seriously impact access to food—driving up prices—as well as education and health services.

The federal government has few measures in place to respond to droughts and dry spells, such as the *Carro-Pipa Operation* (Water Delivery Program) in the South and Northeast regions, and the distribution of food baskets nationwide. However, both are largely palliative, with high operational costs and potential for political misuse. An important program focused on family farming is the *Garantia-Safra Program*, which is part of the National Program for Strengthening Family Agriculture (PRONAF). The *Garantia-Safra* was initially designed for family farmers in the semi-arid region, who suffered systematic crop losses due to drought and dry spells.

In 2012, the program was expanded to other regions of the country to address the growing incidence of climate-related crop losses. However, its reach is limited: it only benefits family farmers who have access to credit, depends on co-financing from municipalities and beneficiaries, and payments are made only after losses are verified in partnership with CEMADEN. Although the program is extremely important, its implementation falls short of what is needed and does not reach the lowest-income producers or Traditional Peoples and Communities (TPCs).

Also in 2012, in response to the severe drought that began that year in the Brazilian Semi-Arid region, the federal government created the Bolsa Estiagem Program (Drought Grant) under Law No. 10,954 of 2004 (Brazil, 2004), as part of the Disaster Response Program of the former Ministry of National Integration. This was temporary financial assistance to those affected by the drought and included technical support as well as measures to implement mitigation and adaptation strategies for climate change. Although this was an extremely important policy, particularly for low-income families,

the program faced implementation challenges and was ultimately discontinued, although the law is still in force.

With current knowledge and technological resources, the program could be redesigned to function, for example, as a type of parametric insurance, without requiring prior verification of losses, and with payments made before the event occurs. This would ensure that families have a guaranteed income to meet their needs, particularly for food. In the Amazon region, where river droughts occur, artisanal fishermen would also require adjustments to the *Seguro-Defeso Program*—a fishing season protection program—to allow emergency payments, given that they are similarly unable to fish during these periods.

Given that slow-onset disasters have severe impacts on household Food Security—particularly due to the rising costs of food in the family budget—some actions and programs that did not directly respond to climate emergencies began to do so, as in the cases of the Food Acquisition Program (PAA) and the *Fomento Rural Program* of the MDS.

The PAA is a policy for purchasing and distributing food from family farming, with the primary goal of promoting Food Security for vulnerable families. During the floods in Rio Grande do Sul (2024), the program provided part of the food supply for the operation of emergency solidarity kitchens, which were essential for the food security of affected families and the teams responding to the disaster. Additionally, after the event, the PAA supported the resumption of production on the affected farms by guaranteeing the purchase of family farmers' produce. Given the significant disruption in the region's production chains, this measure also helped stabilize the local prices.

In the Amazon, the program has proven to be even more important, as food supply in the region is highly dependent on river transport. Even during river droughts, shortages can occur not only in rural communities but also in smaller cities. With the intensification of droughts, the problem is worsening. It is therefore necessary to find solutions that ensure local food production and availability, reducing dependence on food brought in from outside the region.

In addition to supporting food production by family farming, the PAA can also stimulate local economies in isolated areas, since producers have little incentive to cultivate crops if they foresee the impossibility of distributing or selling them. By guaranteeing purchases for donation within the same territory, the program encourages local food production and helps stabilize local prices. In contrast, during the river flooding in 2025, the PAA enabled local managers in Acre to buy food from riverside producers who

During the floods in Rio Grande do Sul (2024), the program provided part of the food supply for the operation of emergency solidarity kitchens, which were essential for the food security of affected families and the teams responding to the disaster.

Photo: ASCOM/SGPR

would otherwise have lost their entire harvest. These examples demonstrate how the PAA can support preparedness, response, and recovery efforts in slow-onset disasters.

The Rural Productive Activities Support Program (*Fomento Rural*) has also been used in emergencies, particularly in the recovery phase. The program combines two actions—social and productive monitoring and direct non-reimbursable financial transfers of BRL 4,600—enabling the poorest rural families to implement productive projects.

In the state of Rio Grande do Sul, the program secured resources to help rural families affected by floods and landslides restore their productive capacity. In the Northern region, the program could potentially work in conjunction with the Cisterns Program[5], also run by the MDS, to adapt productive areas to the new cycles of flooding and drought, which have become more intense in the region and are affecting traditional ways of life and production.

Thus, to improve and make social protection policy responses to emergencies more effective—especially those intensified by climate change—it is first necessary to move toward income transfer models, such as parametric insurance, which provide resources to families before a disaster occurs. This would allow them to prepare for and cope with periods of drought in a context of rising food prices and income loss among rural households.

Furthermore, it is necessary to expand investments in mitigation and adaptation. In the case of the MDS, this could be done through the Cisterns Program and the *Fomento Rural Program*. It also requires establishing food storage facilities in remote areas of the Amazon and strengthening a broader food supply policy—including, but not limited to, the PAA—that ensures the availability of food at fair prices in affected areas. Droughts and dry spells, particularly in the Amazon, tend to drive up food prices, making access more difficult for the most vulnerable populations.

---

5 The Cisterns Program aims to promote access to water for human consumption and food production through the implementation of simple, low-cost social technologies. The program, regulated by Law No. 12,873/2013 (Brazil, 2013) and Decree No. 9,606/2018 (Brazil, 2018), targets low-income rural families (with a per capita income of up to half a minimum wage) as well as rural public facilities affected by drought or water scarcity, giving priority to traditional peoples and communities. To participate, families must be registered in the Unified Registry (*Cadastro Único*) for federal social programs.

Final Considerations

Recurring climate emergencies in Brazil have exposed weaknesses in public policies aimed at Food Security, particularly regarding the capacity for a rapid and effective response to natural disasters. Persistent increases in food prices, exacerbated by extreme events such as droughts, floods, and heatwaves, undermine access to adequate food, especially for vulnerable populations and traditional communities. The lack of structured mechanisms to address slow-onset disasters, such as prolonged dry spells, highlights a critical gap in social protection, which is further exacerbated by the limited coverage of programs like *Garantia-Safra* (Crop Insurance Program) and the discontinuation of important initiatives such as *Bolsa Estiagem* (Drought Grant). Reliance on palliative measures with high operational costs, such as the distribution of food baskets and the *Carro-Pipa Operation* (Water Supply operation), underscores the urgent need to reform strategies that ensure the human right to food in crisis situations.

Ultimately, Food Security policies face the challenge of building resilient and sustainable food systems adapted to respond to the changing climate across different regions. Expanding investments in mitigation and adaptation, through programs like the Cisterns Program and the *Fomento Rural Program*, and strengthening local food production and supply initiatives, such as the Food Acquisition Program (PAA), are essential steps. Early income transfer mechanisms, inspired by parametric insurance models, are a necessary innovation that could help vulnerable families prepare for disasters before they strike. Specifically, consolidating price monitoring systems and strategic food storage in remote regions, like the Amazon, is crucial to ensure continuous access to healthy food at fair prices, even during crises.

REFERENCES

BACCARIN, J. Panorama da inflação de alimentos no Brasil, de 2007 a 2024 – aumento duradouro e generalizado de preços. *Instituto Fome Zero*, 17 mar. 2025. Available at: https://ifz.org.br/panorama-da-inflacao-de-alimentos-no-brasil-de-2007-a-2024-aumento-duradouro-e-generalizado-de-precos/. Accessed: 9 Sep. 2025.

BRASIL. *Decreto n. 9.606, de 10 de dezembro de 2018.* Regulamenta o Programa Nacional de Apoio à Captação de Água de Chuva e Outras Tecnologias Sociais de Acesso à Água - Programa Cisternas. Brasília, 2018. Available at: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/decreto/d9606.htm. Accessed: 9 Sep. 2025.

BRASIL. *Decreto n. 11.822, de 12 de dezembro de 2023*. Institui a Estratégia Nacional de Segurança Alimentar e Nutricional nas Cidades. Brasília, 2023. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/d11822.htm. Accessed: 9 Sep. 2025.

BRASIL. *Decreto n. 11.936, de 5 de março de 2024.* Dispõe sobre a composição da cesta básica de alimentos no âmbito da Política Nacional de Segurança Alimentar e Nutricional e da Política Nacional de Abastecimento Alimentar. Brasília, 2024. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2024/decreto/d11936.htm. Accessed: 9 Sep. 2025.

BRASIL. *Decreto n. 11.679, de 31 de agosto de 2023.* Institui o Plano Brasil Sem Fome. Brasília. 2023. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/d11679.htm. Accessed: 12 Sep. 2025.

BRASIL. *Lei n. 12.873, de 24 de outubro de 2013.* Autoriza a Companhia Nacional de Abastecimento a utilizar o Regime Diferenciado de Contratações Públicas – RDC [...]; dispõe sobre os contratos de financiamento do Fundo de Terras e da Reforma Agrária [...]; institui o Programa Nacional de Apoio à Captação de Água de Chuva e Outras Tecnologias Sociais de Acesso à Água - Programa Cisternas [...]; autoriza a União a conceder subvenção econômica [...]; institui o Programa de Fortalecimento das Entidades Privadas Filantrópicas e das Entidades sem Fins Lucrativos [...]; dispõe sobre a utilização [...] dos registros de preços realizados pelo Ministério da Saúde; autoriza a União [...] a conceder o uso de bens públicos imobiliários dominicais [...]; dispõe sobre as dívidas originárias de perdas constatadas nas armazenagens de produtos [...]; autoriza o Poder Executivo a declarar estado de

emergência fitossanitária ou zoossanitária [...]; dispõe sobre o repasse pelas entidades privadas filantrópicas e entidades sem fins lucrativos às suas mantenedoras de recursos financeiros recebidos dos entes públicos [...] e dá outras providências. Brasília, 2013. Available at: https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2013/Lei/L12873.htm. Accessed: 9 Sep. 2025.

BRASIL. *Plano Brasil Sem Fome*. Câmara Interministerial de Segurança Alimentar e Nutricional. 2023. Available at: https://www.gov.br/mds/pt-br/acoes-e-programas/brasil-sem-fome/plano-brasil-sem-fome/documento_tecnico-plano_brasil_sem_fome.pdf. Accessed: 12 Sep. 2025.

MINISTÉRIO DO DESENVOLVIMENTO E ASSISTÊNCIA SOCIAL, FAMÍLIA E COMBATE À FOME (MDS). *Portaria MDS n. 907, de 7 de agosto de 2023*. Aprova o Planejamento Estratégico Institucional do Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome para os anos 2023-2026. Brasília, 2023. Available at: https://aplicacoes.mds.gov.br/snas/regulacao/visualizar.php?codigo=6593. Accessed: 9 Sep. 2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA AGRICULTURA E ALIMENTAÇÃO (FAO) *et al. The State of Food Security and Nutrition in the World (SOFI)*: addressing high food price inflation for food security and nutrition. Roma: FAO, 2025. Available at: https://doi.org/10.4060/cd6008en. Accessed: 8 Sep. 2025.

PEREIRA, R. H. M. *et al. Uma estimativa da população atingida pelas enchentes do Rio Grande do Sul em 2024*. Rio de Janeiro: Ipea, 2024.

Solidarity Kitchens and Climate Crises in Rio Grande do Sul, Brazil: Strengthening Civil Action Through Public Policy

Catia Grisa
Fernanda Castilhos França de Vasconcellos
Potira Preiss
Juliano Ferreira de Sá
Sergio Schneider
Márcia Muchagata
Patricia Chaves Gentil
Ana Carolina Silva e Souza

Introduction

Em In May 2024, the state of Rio Grande do Sul (RS) faced the most severe climate emergency in its history. Over a span of 35 days, rainfall reached 652 mm—and up to 900 mm in some areas—an amount typically expected over six months. Numerous municipalities were affected, with neighborhoods and large parts of their territories left underwater. Several state and federal highways, including the main access routes to Porto Alegre, the state capital, suffered partial or total damage, leading to prolonged closures caused by landslides and flooding. The transportation of essential supplies—including food and water—along with the flow of goods, access to emergency services, and the production of certain foods was severely disrupted. Across Rio Grande do Sul, 2.4 million people were affected: 600,000 were forced to leave their homes, 81,000 sought shelters in temporary facilities, and 183 lives were lost. Economic losses were estimated at between BRL 80 and 100 billion, with roughly BRL 15–20 billion of that tied to agriculture and food production (Pillar, Overbeck, 2024).

One of the greatest challenges in this context was ensuring access to food for the affected population. Emergency kitchens set up in shelters and public spaces, along with the strengthening of solidarity kitchens (*cozinhas solidárias*), became vital strategies to address this need. Run by community initiatives, volunteer networks, social movements, or even individual efforts, solidarity kitchens prepare and distribute free meals to people facing socioeconomic and food insecurity. Often located in vulnerable areas, they operate as social technologies to combat hunger and frequently extend their role by offering training workshops, nutrition and food education activities, and other community-oriented initiatives. Their defining strengths lie in flexibility and adaptability, while also fostering collective solidarity, a sense of belonging, and community cohesion in times of crisis.

Although they have existed for decades, solidarity kitchens gained greater visibility and significance during the COVID-19 pandemic and were once again mobilized during the climate emergency in Rio Grande do Sul. Today, more than 2,000 units operate across different regions of Brazil—and similar initiatives exist in other countries under different names[1]. They have achieved both national and international recognition, with the UN Committee on World Food Security's High Level Panel of Experts highlighting them as a non-commercial mechanism to address food and nutrition insecurity (FAO, 2024).

---

1 *Ollas populares* in Argentina and Uruguai, *comedores populares* in Peru, *ollas comunitárias* in Colômbia etc.

Driven by the leadership and solidarity of civil society, community kitchens can also be supported and scaled up through state action and public policies—as seen during the climate crisis in Rio Grande do Sul. These kitchens serve not only as spaces for the production and reproduction of social solidarity but also become platforms for implementing public food policies. The complementarity between grassroots solidarity and government action has proven powerful in expanding access to food and strengthening Food Security.

To report on this experience, this article is organized into three sections. The first provides context and presents data on the role of solidarity kitchens during the climate emergency in Rio Grande do Sul. The second introduces the Solidarity Kitchen Program, created by the Ministry of Social Development, Family, and the Fight against Hunger (MDS) to support these initiatives. The final section highlights key lessons learned at the intersection of climate emergencies, Food Security, and the role of solidarity kitchens.

Recognizing the vital role of solidarity kitchens in advancing Food Security in Brazil, the MDS established the Solidarity Kitchen Program to support these initiatives. Photo: Roberta Aline/MDS.

The Role of Solidarity Kitchens During the Climate Emergency in Rio Grande do Sul

According to the registry maintained by the Ministry of Social Development (MDS), approximately 400 solidarity kitchens were operating across Rio Grande do Sul as of June 2025. To better understand their characteristics and significance, we surveyed 153 solidarity kitchens located in four regions of the state that were severely affected by the climate emergency: the metropolitan region (Porto Alegre, Alvorada, Canoas, Eldorado do Sul, Esteio, Gravataí, and Viamão); Vale dos Sinos (São Leopoldo and Novo Hamburgo); the southern region (Pelotas, Jaguarão, Rio Grande, and São Lourenço do Sul); and the central region (Santa Maria).

According to the data collected, 13 solidarity kitchens were established before 1999, and 12 between 2000 and 2010. In the following decade—particularly from 2015 onward, amid Brazil's political and economic crisis—an additional 41 kitchens (27%) were created. During the pandemic (2020–2023), 51 more solidarity kitchens were established in Rio Grande do Sul, and from January to June 2024, another 26 initiatives were launched (17 of them in May alone, as a rapid response to the climate emergency). Compared to previous periods, this represents the highest number of solidarity kitchens established per year.

The majority (81%) of these solidarity kitchens are linked to social organizations, including religious institutions (notably Afro-Brazilian faith communities), social movements, community associations, or other collectives, and are predominantly located in peripheral neighborhoods. Beyond providing meals, these kitchens serve as hubs for community support, fostering social ties, and functioning as spaces for political engagement and the exercise of citizenship.

Most solidarity kitchens (66%) operate one to three days per week, while 31% run four to seven days weekly. A major constraint limiting their operations is the shortage of human, financial, and infrastructural resources, as well as food supplies needed for meal preparation. To illustrate, 93% of these kitchens rely entirely on volunteer labor, predominantly women. In 68% of the kitchens, women are either solely responsible or constitute more than 75% of the workforce. While this volunteerism reflects "social solidarity, reciprocity, and civic engagement interested in democratizing

public space" (Leetoy & Gravante, 2022, p. 258)—as well as the central role of women in Food Security —it can also translate into work overload and the reproduction of gendered inequalities –

> […] as the historical role women have played in caregiving and in managing their family and local environments. Although these responsibilities often begin in the private sphere, they extend into public and community life, as seen in the central role women assume in solidarity kitchens (Fuentes, Jimenez & Mlynarz, 2022, p. 45).

The average number of meals prepared weekly by solidarity kitchens in Rio Grande do Sul varies widely, reflecting not only their material and structural conditions but also the specific dynamics of each community in terms of local demand and organizational capacity. A significant share of kitchens (32%) produce between 101 and 200 meals per week, followed by 22% that prepare 51 to 100 meals weekly. Some kitchens reach higher volumes, producing 201 to 400 meals per week (21%), indicating strong organizational capacity, often supported by close ties with social movements or more consistent institutional support.

Drawing on data about operations and average meal output, we estimate that the 153 solidarity kitchens together prepare nearly 140,000 meals each week. While these kitchens do not m*eet al*l the food needs of the populations they serve, they nonetheless represent a significant effort in advancing Food Security, both in scale and geographic reach, making a substantial contribution to ensuring access to adequate food.

This estimate becomes even more significant when considering the profile of those served: in most cases, solidarity kitchens support socially vulnerable groups such as unemployed youth, children, women, and the elderly. They also reach unhoused populations, traditional communities, and communities of African descent. For this article, it is particularly relevant to note that 89 solidarity kitchens provided meals to people displaced or directly affected by the May 2024 climate emergency.

It is also worth noting that 120 solidarity kitchen workers planned their menus based on whatever food was available each day, reflecting their dependence on donations and the lack of stable or long-term partnerships. In this context, government food donation programs play a crucial role, as they are in line with the Dietary Guidelines for the Brazilian Population (Brazil, 2014) and help ensure the provision of fresh and minimally processed foods.

When it comes to available infrastructure, most kitchens surveyed (56%, or 85 kitchens) felt their facilities were adequate but in need of improvement. Another 25% reported their infrastructure as inadequate, citing a lack of equipment and utensils, difficulties in transporting meals, and other operational challenges that hindered their work. Only 20% rated their infrastructure as sufficient or excellent. These findings highlight the potential role of the Solidarity Kitchen Program in covering operating costs, maintenance, and small-scale investments.

Solidarity kitchens prepare and provide free meals to people experiencing social and economic vulnerability and food insecurity. Photo: Roberta Aline/MDS.

The reach of solidarity kitchens remains constrained by limited human and financial resources, inadequate infrastructure, and scarce food supplies. Most operate solely through volunteer work, predominantly carried out by women. Photo: Roberta Aline/MDS.

The Solidarity Kitchens Program and the role of public policies in Supporting solidarity kitchens

Considering the vital role solidarity kitchens play in ensuring Food Security in Brazil, the federal government launched the Solidarity Kitchen Program in July 2023, later formalized by Decree No. 11,937 of March 5, 2024 (Brazil, 2024a). While recognizing the leadership and autonomy of civil society in driving these initiatives, the Ministry of Social Development (MDS) supports them through three main measures: i) financial assistance to help cover operating costs, staffing, maintenance, and small-scale investments; ii) provision of fresh and minimally processed foods through the Food Acquisition Program (PAA); and iii) support for collective training projects aimed at strengthening the management and effectiveness of solidarity kitchens.

Between 2023 and 2024, the Solidarity Kitchen Program developed a national model to support these initiatives, establishing mechanisms for the accreditation of solidarity kitchens – Ordinance No. 977, dated April 5, 2024 (Brazil, 2024b) – and operational methods that include the participation of civil society organizations with experience in Food Security actions, observing their potential to qualify initiatives of solidarity kitchens.

The entire process of implementing this public policy was strengthened by lessons learned from supporting solidarity and emergency kitchens in Rio Grande do Sul. When the climate disaster struck, the program was still in its early stages, yet its significance became evident quickly. It provided financial resources to sustain 33 solidarity and emergency kitchens directly involved in feeding people affected by the floods, while also mobilizing the Food Acquisition Program (PAA) to supply the kitchens operating in the state at that time.

According to survey data, which covered a broader set of kitchens, the food prepared in solidarity kitchens came mainly from three sources. The largest share originated from donations by civil society and social movements, followed by government donations through the Food Acquisition Program (PAA), food basket distributions, and the Food Distribution Action (ADA), and, lastly, private sector donations mediated by the federal government.

Although donations remain a key source of food, most solidarity kitchens lack stable or long-term partnerships, which could undermine the regularity of meal preparation. Among the more consistent partnerships, two stand out: the Solidarity Kitchen Supply Center (*Central de Abaste-*

cimento de Cozinhas Solidárias), an organizational innovation created in May 2024 to coordinate the distribution of food—especially government donations—to kitchens in the metropolitan region; and the National Supply Company (CONAB), which distributed food baskets through the PAA and ADA as part of the mobilization under the Solidarity Kitchen Program.

Lessons learned about climate emergency, Food Security, and solidarity kitchen

1. Confirming what science had long warned, the climate emergency in Rio Grande do Sul demonstrated that the impacts of extreme events on Food Security can be severe and multifaceted, with the most vulnerable populations disproportionately affected. Such events can disrupt food production and logistics, with immediate repercussions on urban supply and food prices; they can damage food supply infrastructure and compromise its functioning—as in the case of the Central Supply Center of Rio Grande do Sul (CEASA-RS), which was flooded and had to be temporarily relocated within the capital, Porto Alegre; and they can displace thousands of people from their homes, particularly those already living in vulnerable conditions, creating urgent demands for ensuring access to food.

2. Having been present and mobilized during previous crises of various kinds, solidarity kitchens have proven to be facilities capable of responding quickly and adapting flexibly to emergency contexts, such as the major floods in May 2024 in Rio Grande do Sul. It is worth noting that Brazil has roughly 2,000 solidarity kitchens nationwide, with 400 operating in Rio Grande do Sul as of June 2024. Research conducted with 153 of these kitchens showed that they collectively produced around 137,000 meals per week, making a substantial contribution to food access and nutrition security (Food Security).

3. Solidarity kitchens are initiatives developed by civil society to respond to crises—including climate-related ones—illustrating what Lang, Neumann, and So (2025) describe as "civil food resilience." In other words, these are actions taken by individuals and communities to prepare and organize themselves so that society can maintain access to adequate food during and after crises. Importantly, this civil food resilience does not need to operate in isolation. The experience in Rio Grande do Sul demonstrated that, when the autonomy of civil society is respected, complementing grassroots solidarity with public action—through various programs and instruments—can amplify results and reinforce democratic values in public governance.

4. Beyond supporting civil society-driven food resilience initiatives, it is crucial for governments to actively engage in climate mitigation and adaptation strategies that prioritize Food Security. By leveraging regulatory, incentive-based, and governance mechanisms, states can foster sustainable, healthy, and inclusive food systems while simultaneously reducing vulnerability and enhancing climate resilience. At the same time, given the immediacy of extreme events, it is urgent to strengthen contingency plans and emergency response frameworks, ensuring rapid and effective action—especially in marginalized and high-risk communities.

Solidarity kitchens such as the one in Azenha, Porto Alegre, played a vital role in ensuring that people affected by the 2024 climate emergency had access to food. Photo: Roberta Aline/MDS.

REFERENCES

BRASIL. *Decreto n. 11.936, de 5 de março de 2024.* Dispõe sobre a composição da cesta básica de alimentos no âmbito da Política Nacional de Segurança Alimentar e Nutricional e da Política Nacional de Abastecimento Alimentar. Brasília, 2024a. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2024/decreto/d11936.htm. Accessed: 11 Aug. 2025.

BRASIL. Ministério da Saúde. *Guia alimentar para a população brasileira.* 2. ed. Brasília, DF: Ministério da Saúde, 2014. Available at: https://bvsms.saude.gov.br/bvs/publicacoes/guia_alimentar_populacao_brasileira_2ed.pdf. Accessed: 13 Aug. 2025.

BRASIL. Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. *Portaria MDS n. 977, de 5 de abril de 2024.* Estabelece regras e procedimentos para o cadastro e habilitação de cozinhas solidárias no âmbito do Programa Cozinha Solidária. Brasília, 2024b. Available at: https://mds.gov.br/webarquivos/MDS/2_Acoes_e_Programas/Programa_Cozinha_Solidaria/Legislacao/Portaria_MDS_N_977_DE_5_DE_ABRIL_DE_2024.pdf. Accessed: 12 Aug. 2025.

DE SORDI, D. *Na cozinha não há só comida*: Segurança Alimentar e Nutricional e Soberania Alimentar nas experiências de cozinhas solidárias na Argentina, Colômbia, Uruguai e Brasil: síntese e apontamentos para a regulamentação do Programa Nacional Cozinha Solidária (PNCS) brasileiro. Rio de Janeiro; Brasília: Fiocruz-VPAAPS; Fiocruz-GEREB, 2023. Available at: https://fiocruz.br/sites/fiocruz.br/files/documentos_2/relatorio_gt_cozinhas_vpaaps_2023_final_02_web-2.pdf. Accessed: 12 Aug. 2025.

FUENTES, V.; JIMENEZ, J.; MLYNARZ, D. Olla comunes: iniciativas de respuestas comunitaria ante el hambre en SantiAug de Chile en el contexto de pandemia por covid-19. *Rimisp*, [2022]. Available at: https://www.rimisp.org/wp-content/uploads/2022/10/Documento_en_proceso-Ollas-Comunes-Iniciativas-Respuesta-Comunitaria-Hambre-SantiAug-Chile-Contexto-Pandemia-COVID-19.pdf. Accessed: 12 Aug. 2025.

LANG, T.; NEUMANN, N.; SO, A. Just in case: narrowing the UK civil food resilience gap. *Main report to the National Preparedness Commission,* fev. 2025. Available at: https://nationalpreparednesscommission.uk/wp-content/uploads/2025/02/NPC-Just-in-Case-Main-Report_PDF-Download.pdf. Accessed: 12 Aug. 2025.

LEETOY, S.; GRAVANTE, T. Ciudadanía y cuidado: ollas populares en América Latina como laboratorios sociales de solidaridad durante la pandemia de covid-19. *In*: GRAVANTE, T.; SANTILLÁN, J.; POMA, A. *Viralizar la esperanza en la cuidad*: alternativas, resistencias y autocuidado colectivo frente a la covid-19 y a la crisis socioambiental. Cidade do México: Centro de Interdisciplinares en Ciencias y Humanidades; UNAM, 2022. Available at: https://ru.ceiich.unam.mx/handle/123456789/3777. Accessed: 12 Aug. 2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA ALIMENTAÇÃO E AGRICULTURA (FAO). *Strengthening urban and peri-urban food systems to achieve food security and nutrition, in the context of urbanization and rural transformation*. Roma: FAO, 2024.

PILLAR, V.; OBERBECK, G. Learning from a climate disaster: the catastrophic floods in southern Brazil. *Science*, v. 385, n. 6713, set. 2024. Available at: https://www.science.org/doi/10.1126/science.adr8356. Accessed: 12 Aug. 2025.

Food Deserts, Urbanization, and Climate Emergency: The *Alimenta Cidades Strategy* as an Intersectoral Public Response

Gisele Bortolini
Cláudia Bocca
Lorrana Nascimento Grimes
Bruna Pitasi Arguelhes
Naila de Freitas Takahashi
Sergio Paganini Martins
Patricia Chaves Gentil

Introduction

Addressing food and nutrition insecurity (FNI) and all forms of malnutrition in Brazil requires confronting two pressing challenges: climate change and rapid urban growth. Urbanization, often accompanied by structural inequalities and social exclusion, creates conditions where consistent access to adequate and healthy food is limited, particularly in the outskirts of major cities. At the same time, the impacts of climate change—such as extreme weather events, agricultural losses, and disruptions in supply chains—disproportionately affect urban populations already facing vulnerability (FAO, 2020; FAO, 2023; HLPE, 2024; BRASIL, 2025a).

These factors—urbanization and climate change—have become integral to the structure of contemporary food systems and are now recognized as central dimensions in shaping public policies on Food Security, such as the National Strategy on Food and Nutrition Security in Cities – *Alimenta Cidades*. The strategy is grounded in the understanding that ensuring the human right to adequate food requires policies that move toward intersectoral and territorial responses, integrating social justice, climate adaptation, and the strengthening of sustainable, resilient, and equitable urban food systems (BRASIL, 2023; BRASIL, 2024a; BRASIL, 2025a).

Why focus on cities?

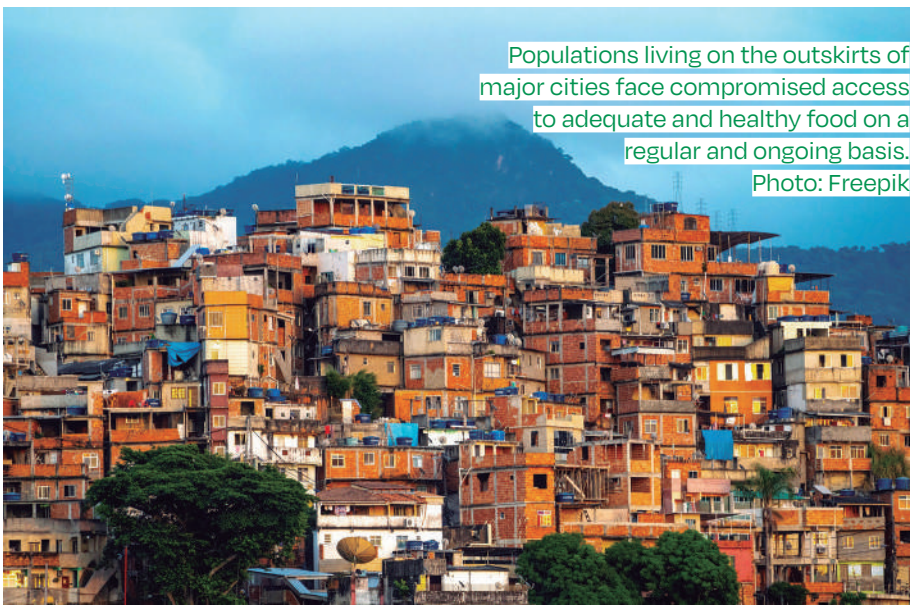
In Brazil, more than 87% of the population lives in urban areas, making cities key arenas of profound food and nutrition inequalities (IBGE, 2023). By the end of 2022, 27 million of the over 33 million Brazilians facing severe food and nutrition insecurity resided in urban centers (REDE PENSSAN, 2022). These figures, together with a renewed political-institutional context marked by the revitalization of governance and intergovernmental dialogue within the National Food and Nutrition Security System (SISAN), supported the development of a new perspective and the design of an innovative strategy. More recently, Brazil has reduced the prevalence of food and nutrition insecurity, achieving the milestone of leaving the Hunger Map in 2025 (FAO, 2025). Despite this progress, by the end of 2023, seven million of the eight million Brazilians living in severe food insecurity were in large urban centers. Peri-urban areas, in particular, face serious physical and economic barriers to accessing adequate food (IBGE, 2024). Understanding urban food systems is therefore crucial for crafting effective, integrated, and equitable responses.

The climate emergency and growing food inequalities

The climate crisis has been intensifying pre-existing inequalities in cities, hitting the most vulnerable areas the hardest. Extreme events such as floods, droughts, and heatwaves directly disrupt food production, distribution, and access, while also damaging urban infrastructure and essential public services (ALPINO, 2022). The 2024 floods in Rio Grande do Sul, for instance, highlighted how environmental disasters can severely compromise urban Food Security. Strengthening the resilience of urban food systems is therefore a central focus of climate adaptation strategies(BRASIL, 2025a).

Cities at the forefront of tackling food insecurity and climate change

In the face of converging social, food, and climate crises, urban areas have become strategic spaces for transforming food systems. City-focused public policies have the potential to coordinate cross-sector actions that advance social justice, environmental sustainability, and public health. By recognizing this central role, the *Alimenta Cidades Strategy* adopts a systemic, territorially grounded approach, fostering local innovation, strengthening urban governance, and promoting cooperation among municipalities (BRASIL, 2023).



Populations living on the outskirts of major cities face compromised access to adequate and healthy food on a regular and ongoing basis. Photo: Freepik

Urban food deserts: an expression of inequality and the crisis in food systems

Food deserts represent one of the main contemporary challenges to ensuring the human right to adequate food in Brazilian cities. These are areas with limited availability of fresh and nutritious foods, disproportionately affecting urban populations in vulnerable situations. Compounding this problem are the so-called food swamps, where highly processed products dominate the market at the expense of healthier options. Limited geographic, economic, and cultural access to quality food exacerbates social, health, and nutritional inequalities in urban settings (BRASIL, 2024b).

To map food deserts and swamps, the National Secretariat for Food and Nutrition Security (Sesan) partnered with the Public Policy Group at Luiz de Queiroz College of Agriculture (GPP/ESALQ) and the Luiz de Queiroz Agrarian Studies Foundation (FEALQ) at the University of São Paulo (USP) to conduct the technical study 'Mapping food deserts and swamps: challenges for expanding access to healthy foods in Brazil' (BRASIL, 2024b). The initiative also involved researchers from the Center for Metropolitan Studies (CEM) and the Polytechnic School, both at USP, bringing together expertise in geoprocessing, public policy design, and food systems analysis[1].

The study mapped the density of healthy and unhealthy food outlets per 10,000 inhabitants at the municipal level across Brazil, as well as food deserts and swamps within the 91 Brazilian cities with populations above 300,000, at an intramunicipal scale. The mapping, available on the *Plataforma Alimenta Cidades* (BRASIL, 2024c), is designed to support public action in planning, implementing, monitoring, and evaluating food access, supply, and consumption policies in the most vulnerable urban territories.

The first key finding, based on data from the 2017–2018 Household Budget Survey (POF/IBGE), is that supermarkets are the main retail outlets for food purchases in Brazil. They account for 34.2% of overall food acquisitions, 40.6% of fresh or minimally processed items, and 42.8% of ultra-processed products. Following them in importance are local markets, which play a major role in sales of both fresh/minimally processed foods (48.6%) and ultra-processed items (31.3%). Bakeries also stand out, representing 22.1% of outlets where ultra-processed products are acquired (BRASIL, 2024b).

---

1 The study was conducted as part of the Technical Cooperation Project for Food and Nutritional Security: availability and access to healthy foods and combating rural poverty – IICA/BRA/17/001.

At the municipal level, the analysis showed that the North and Northeast regions concentrate most of the municipalities with the lowest density of outlets selling healthy foods, offering fewer options per 10,000 inhabitants. Among these, 26.8% have populations of up to 50,000. In contrast, in the South and Southeast, around 88% of municipalities have the highest density of outlets selling unhealthy foods, and 75.6% of them have over 500,000 inhabitants (BRASIL, 2024b).

In the 91 municipalities analyzed at the intramunicipal level, an estimated 25 million of the 77 million residents live in food deserts[2], meaning that one in three people in these cities have limited access to fresh or minimally processed foods. Of this group, around 5.4 million live in areas that include favelas and urban communities, underscoring the barriers to accessing healthy food in peripheral neighborhoods. Another 6.7 million low-income and impoverished people are also concentrated in food deserts, highlighting the deep inequities in access to adequate nutrition among Brazil's poorest populations (BRASIL, 2024b).

On the other hand, the mapping of food swamps[3] estimated that around 15 million Brazilians live in areas with a high availability of ultra-processed foods, equivalent to one in every five people. Of these, 1.8 million are low-income individuals living in poverty, and 104,000 reside in neighborhoods with favelas or informal urban communities (BRASIL, 2024b).

The mapping provides valuable insights into territorial dynamics and helps pinpoint areas that require stronger government intervention. This is especially important for guiding the implementation of Food Security policies and supply strategies in regions identified as food deserts or food swamps, with priority given to the most vulnerable territories (BRASIL, 2024b).

The study marks a step forward in producing a more accurate diagnosis of territories affected by limited access to healthy foods and the overabundance of ultra-processed products. It provides stronger technical evidence to support the design of effective public policies. The findings reveal a situation that goes beyond the uneven distribution of retail outlets, reflecting deeper social, economic, and territorial inequa-

---

2 Food deserts are defined as urban areas with limited physical access to outlets offering fresh or minimally processed foods, measured as having between zero and five such outlets within a 15-minute walk per thousand residents (BRASIL, 2024b).

3 Food swamps are defined as areas with a high concentration of outlets primarily offering ultra-processed foods. Their density and walkability are measured, considering locations with more than 15 such establishments within a 15-minute walking distance. See (BRASIL, 2024b).

lities that shape urban life. In this context, the mapping serves as a tool for developing solutions that integrate food production, distribution, and access — prioritizing food deserts and swamps in the most vulnerable territories.

By identifying these priority areas, public managers are better equipped to implement measures that increase access to healthy foods, promote their availability, and encourage healthier eating habits—thereby advancing Food Security, especially for groups most impacted by social inequalities. Public policies that can be enhanced or introduced include support for urban and peri-urban agriculture (UPA), establishing Food Security facilities, promoting farmers' open-air markets, expanding affordable food networks, and restricting the availability of ultra-processed products in public spaces.

The public sector holds a fundamental responsibility in fostering healthier food environments and in leading the formulation and implementation of policies that guarantee the human right to adequate and healthy food for all. Tackling urban food deserts requires structural actions that integrate urban planning with the food agenda, strengthen local production and distribution networks, support agroecological farming, and implement public policies that ensure universal and equitable access to healthy food. Addressing this challenge is essential for promoting fairer, more sustainable, and inclusive food systems in cities.

Alimenta Cidades Strategy: an intersectoral policy for vulnerable urban territories

The *Alimenta Cidades Strategy* is a federal government initiative designed to help Brazilian municipalities build urban food systems that are healthier, fairer, and more sustainable. Launched as part of the national effort to guarantee the Human Right to Adequate Food (HRtAF), the strategy takes an intersectoral and territorialized approach, fostering dialogue between different public policies and encouraging social participation. Its goal is to promote the production, supply, and consumption of healthy foods in cities, with a focus on peripheral areas and vulnerable populations. Additionally, it seeks to strengthen local urban food governance, addressing inequalities and urban challenges in combating hunger and poor nutrition—particularly in the context of urbanization and climate change—targeting the city outskirts that are most affected by climate-related emergencies (BRASIL, 2024a).

> The *Alimenta Cidades Strategy* aims to promote the production, supply, and consumption of healthy foods in cities, with a focus on peripheral areas and vulnerable populations

Photo: Yako Guerra/MDS

To achieve this, the strategy relies on a set of supportive measures for municipal implementation, including federal programs, policies, financial resources, technical assistance, and training opportunities. These measures are coordinated to promote local innovation while respecting each city's unique context and diagnostic findings. The strategy also encourages cooperation between municipalities and the sharing of experiences, fostering the development of integrated and participatory solutions in urban food systems (BRASIL, 2024a).

The first phase of the strategy began in 2024, covering 60 cities, including all Brazilian capitals, all cities with over 300,000 inhabitants in the North, Northeast, and Central-West regions, and similarly sized cities in the South and Southeast with the highest concentrations of people experiencing homelessness. In 2025, the strategy expanded to 91 municipalities, encompassing all cities with more than 300,000 residents, with a focus on supporting local efforts to reduce urban food deserts and swamps. Additionally, 18 cities in Rio Grande do Sul affected by the 2024 climate emergency were prioritized, aiming to address the impacts of climate change while considering its intersection with urban food systems. By the end of 2025, the plan is expected to engage approximately 1,000 municipalities, reinforcing horizontal cooperation and fostering knowledge sharing among participating cities.

The strategy's implementation starts with a diagnostic process on the urban food agenda developed by each city with support from the Ministry of Development and Social Assistance, Family and Fight against Hunger (MDS) and the *Instituto Comida do Amanhã* (Food for Tomorrow Institute). Additionally, a baseline assessment is conducted for each city in collaboration with the Study and Research Group on Advanced Health Practices (GEPPAS) at the Federal University of Minas Gerais (BRASIL, 2024a).

This survey showed that, in 2024, among the 60 participating cities, 12 had not yet joined the National System of Food and Nutrition Security (SISAN), 43 had a municipal Food and Nutrition Security plan (SAN), and 46 reported having a Municipal Council for Food and Nutrition Security. Most cities (75%) had initiatives to promote and support organic and/or agroecological production. The majority of municipalities reported having solidarity kitchens (75%), popular restaurants (76%), public or local markets (78%), and conventional open-air markets (97%). Less common infrastructures included community kitchens (22%) and small public fruit and greengrocers (9%). Half of the municipalities had supply centers, state supply centers (CEASAs), or wholesale hubs (50%), and one-third had family farming reception centers (33%). Across the 60 cities, there was an average of 5.9 public or local markets per city (BRASIL, 2025b – in press).

Food and Nutrition Security facilities (EqSAN) are more concentrated in the Southeast region. However, 38.3% of public markets and 46.1% of community kitchens are located in the Northeast, while 60% of small public produce outlets and greengrocers are in the South. More than half of the municipalities (55%) reported having food banks, and 45% indicated carrying out other initiatives aimed at reducing food loss and waste. Only 30% of cities reported having a Climate Mitigation or Adaptation Plan, and among these, 67% incorporated Food and Nutrition Security actions into their plans (BRASIL, 2025b – in press).

The baseline situational assessment highlights both opportunities and challenges for the urban food agenda across the 60 cities. While most cities reported having EqSAN and implementing activities related to food production, significant gaps remain in popular food supply initiatives in the peripheries, in food loss and waste reduction, and in climate-related actions. Additionally, there is a marked regional disparity in the distribution of EqSAN, which affects access to adequate and healthy food for vulnerable populations.

To carry out the diagnosis and identify each city's needs and priorities, virtual mentoring sessions and an in-person workshop were conducted with the participation of diverse social actors in each city. The aim was to complete the situational assessment and collaboratively identify opportunities, challenges, and priority actions (BRASIL, 2025c – in press). This information is summarized in the following table.

As observed, the main challenges identified by municipalities in implementing the *Alimenta Cidades Strategy* are rooted in structural weaknesses that hinder consistent and adequate access to food in urban areas, particularly in territories marked by inequalities. Key obstacles include limited visibility of the urban food agenda, difficulties in setting priorities, shortages of trained personnel, constraints in allocating dedicated budgets, changes in local management, and the need to address emergency demands at the expense of long-term, structural actions.

Despite these challenges, the opportunities identified by social actors during the workshops highlight that many municipalities already have functioning school, community, or institutional gardens, self-managed or locally supported solidarity kitchens, and inspiring food and nutrition education (FNE) initiatives led by schools, Social Assistance Reference Centers (CRAS), collectives, and associations. The involvement of universities, federal institutes, and civil society organizations was also recognized as a key ally in supporting training, outreach, and technical assistance.

The actions prioritized by cities during the workshops show a direct alignment with the pillars of the *Alimenta Cidades Strategy*: access to food; sustainable production and supply; food and nutrition education (FNE); healthy food environments; and intersectoral coordination. A key highlight was the creation, expansion, and strengthening of solidarity kitchens, seen not only as spaces for providing meals but as direct responses to the social needs of the most vulnerable communities. Urban and peri-urban agriculture (UPA) also emerged as a priority, with initiatives focused on activating underused public spaces, creating gardens, and providing technical support—reflecting a shared commitment to building greener, more resilient, and food-sovereign cities.

TABLE 1 Key challenges, opportunities, and priority actions for implementing the *Alimenta Cidades Strategy*, identified in the 58 in-person workshops held up to July 2025

OPPORTUNITIES
Strengthened urban and peri-urban agriculture (UPA).
Functioning public Food Security facilities.
Opportunities for public procurement from family farms.
Engagement of universities and research institutions.
Committed and mobilized local technical teams.
Active civil society participation.
Experience in food and nutrition education (FNE).
Coordination via local networks and councils.
Local food waste reduction initiatives.
Public spaces available for Food Security actions.

CHALLENGES
Lack of financial and budgetary resources for Food Security.
Limited structure and coverage of public Food Security facilities.
Constraints of urban, peri-urban, and family farming.
Insufficient data and a lack of integrated information systems.
Low or limited social participation.
Inadequate infrastructure and inefficient logistics.
Absence of continuous nutrition and food education initiatives.
Territorial inequality in access to healthy foods.
Bureaucratic and legal obstacles in public procurement and policy implementation.
Weak intersectoral coordination and governance.

PRIORITY ACTIONS
Strengthen, expand, or restructure community kitchens.
Promote FNE through training of agents and integration into public services.
Strengthen Urban and Peri-Urban Agriculture (UPA).
Strengthen and expand the Food Acquisition Program (PAA), with municipal-level initiatives and advance funding.
Establish and expand public food marketing facilities for healthy foods (markets, produce stores, solidarity warehouses).
Set up or strengthen food banks and initiatives to reduce food loss and waste.
Develop communication strategies to increase visibility of Food Security actions.
Implement emergency food access actions (e.g., food vouchers, baskets, decentralized warehouses).
Promote integration between the Unified Health System (SUS), Unified Social Assistance System (SUAS), and SISAN with coordinated flows, protocols, and systems.
Strengthen municipal Food Security governance: Municipal Council on Food and Nutrition Security (COMSEA), Interministerial Chamber on Food and Nutrition Security (CAISAN), and Municipal Food and Nutrition Security Plan (PLAMSAN).
Establish a municipal Food Security fund.

Other priority actions include strengthening the PAA, establishing solidarity food warehouses, and actions against food waste—highlighting the focus on ensuring a steady supply of healthy foods and reducing losses along the supply chain. Efforts in public communication and emergency access to food vouchers and baskets demonstrate municipalities' responsiveness to both urgent needs and long-term structural transformations.

These priorities demonstrate that municipalities are attuned not only to institutional limitations but, above all, to the social realities of their territories. The selected actions result from a process of active listening, intermunicipal exchange, and recognition of ongoing practices. They point toward an urban Food Security policy that integrates the fight against hunger and malnutrition, community empowerment, the right to the city, and local production with equitable food supply and climate-responsive measures. Together, these elements lay the groundwork for a more territorialized, participatory, and responsive urban Food Security policy that addresses the persistent food inequalities in Brazilian cities.

Community gardens can help make cities greener and strengthen Food Security, especially for groups most affected by inequality.
Photo: José Fernando Ogura/SMCS.

Final considerations

The *Alimenta Cidades Strategy* seeks to engage municipal governments—with the support of states and organized civil society—to reflect on and implement integrated public policies that address the complex challenges of urban food systems. Within this context, ensuring both intra- and intersectoral coordination remains an ongoing challenge, requiring commitment, openness to dialogue, and genuine collaboration among all stakeholders.

Throughout its first year of implementation, the strategy fostered dialogue among a wide range of actors—both governmental and non-governmental—encouraging intra- and intersectoral coordination from the outset of the situational assessments. Ultimately, the *Alimenta Cidades Strategy* strengthens the growing debate in Brazil on the central role of cities and supports municipalities in advancing actions that build more just, resilient, and equitable local food systems, ensuring access to adequate and healthy food for all.

REFERENCES

ALPINO, T. de M. Z.; *et al*. Os impactos das mudanças climáticas na Segurança Alimentar e Nutricional: uma revisão da literatura. *Ciência & Saúde Coletiva*, v. 27, n. 1, p. 273-286, 2022.

BRASIL. *Decreto nº 11.822, de 12 de dezembro de 2023.* Institui a Estratégia Nacional de Segurança Alimentar e Nutricional nas Cidades. Diário Oficial da União: Brasília, DF, 12 dez. 2023. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023 2026/2023/decreto/d11822.htm. Accessed on: 31 maio 2025.

BRASIL. *Elementos-chave sobre sistemas alimentares urbanos e orientações para implementação da Estratégia Alimenta Cidades pelos governos locais.* Brasília, DF: [s.n.], 2024a.

BRASIL. Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. *Mapeamento dos desertos e pântanos alimentares:* principais achados. Brasília: MDS; USP/ESALQ; FEALQ, 2024b. Available at: https://www.gov.br/mds/pt-br/acesso-a informacao/internacional/produtos/produto/Produto_FEALQ.pdf Accessed on: 14 agosto 2025.

BRASIL. Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. *Plataforma Alimenta Cidades,* 2024c. Available at: https://www.gov.br/mds/pt-br/acoes-e-programas/promocao-da-alimentacao-adequada-e-saudavel/alimenta-cidades/plataforma-alimenta-cidades/. Accessed on: 11 ago. 2025.

BRASIL. Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. *Marco de Referência para Sistemas Alimentares e Clima.* Brasília, DF: MDS, 2025a. Versão para consulta pública. Accessed on: 27 mai. 2025

BRASIL. Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. *Diagnóstico Situacional dos Municípios Participantes do I Ciclo da Estratégia Alimenta Cidades (2024-2026)* - Linha de Base. Brasília, DF: MDS, 2025b [no prelo].

BRASIL. Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. *Estratégia Alimenta Cidades*: Um ano de caminhos trilhados: reflexões sobre seu processo de implementação. Brasília, DF: MDS, 2025c [no prelo].

FAO. *Climate action and nutrition* – Pathways to impact. Rome, 2023.

FAO. *Marco da FAO para a Agenda Alimentar Urbana*: Aproveitamento de medidas dos governos subnacionais e locais para garantir sistemas alimentares sustentáveis e uma melhor nutrição. Rome, 2020.

FAO, IFAD, UNICEF, WFP, and WHO. 2025. *The State of Food Security and Nutrition in the World 2025* – Addressing high food price inflation for food security and nutrition. Rome. https://doi.org/10.4060/cd6008en

HLPE – HIGH LEVEL PANEL OF EXPERTS ON FOOD SECURITY AND NUTRITION. *Transforming Food Systems for Equitable, Resilient and Sustainable Cities.* Roma: [s.n.], 2024. Available at: https://openknowledge.fao.org/server/api/core/bitstreams/cf8cd142-cceb 4e81-8764-c8fbc291ce1b/content. Accessed on: 11 julho 2025

IBGE. *Censo Demográfico 2022*: população e domicílios: primeiros resultados. Rio de Janeiro, 2023.

IBGE – INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. *Pesquisa Nacional por Amostra de Domicílios Contínua*: Segurança Alimentar 2023. Rio de Janeiro: IBGE, 2024. Available at: https://sidra.ibge.gov.br/tabela/9552#resultado. Accessed on: 6 julho 2025.

REDE PENSSAN. *II Inquérito Nacional sobre Insegurança Alimentar no Contexto da Pandemia da COVID-19 no Brasil*: II VIGISAN: relatório final. São Paulo, 2022.

Urban and Peri-urban Agriculture: Transforming Food Systems for Resilient and Equitable Cities

Jay M. N. van Amstel
Kelliane da Consolação Fuscaldi
Jaqueline Lima Liskoski
Elisa Carvalho Lauer
Carlos Roberto Sanquetta
Fernanda Romero
Jéssica Chryssafidis
Ana Moraes Coelho

Introduction

Large cities face heightened vulnerability to climate change due to high population densities, pronounced food insecurity, the concentration of material and cultural assets (Shukla *et al*., 2022), and the degradation and artificialization of urban environments and ecosystems. Globally, 80% of food production is consumed in urban areas (C40, Arup & University of Leeds, 2019), and by 2050, an estimated 9 billion people will inhabit the planet, with 70% living in cities (ONU, [2015]; 2019).

Considering that demand-side strategies could reduce global greenhouse gas emissions by 40–70% by 2050 (Shukla *et al*., 2022) and that urban consumption patterns account for one of the largest sources of material flows and carbon footprints (Shukla *et al*., 2022; Masson-Delmotte *et al*., 2019), cities play a central role in driving the necessary transformations in production and consumption systems. Furthermore, given that food systems contribute to roughly one-third of global emissions (GAFF, 2023), promoting short food supply chains can help mitigate emissions while reducing dependence on non-renewable energy sources (Shukla *et al*., 2022).

In this context, urban and peri-urban agriculture (UPA) has emerged as a strategic response to the multiple challenges faced by cities, addressing climate change while advancing circular economy practices, fostering social justice, and providing vital ecosystem services (FGVces, Ministry of Citizenship, 2022). Studies highlight its potential to enhance Food Security, reduce flooding and carbon footprints, regulate soil erosion, and improve thermal comfort. UPA also contributes to social cohesion, environmental education, and climate resilience by mitigating the impacts of urban heat islands and heatwaves, while expanding access to nature and reinforcing the right to the city (*Instituto Escolhas*, [2021]; FGVces; PNUMA; Ministry of Citizenship, 2023; Türker *et al*., 2022; Al-Qubati, Zhang & Forkel, 2024). By stimulating local economies and easing pressure on public infrastructure, urban and peri-urban agriculture stands out as a multifunctional solution increasingly adopted by municipalities seeking greater autonomy and improved well-being for their populations (FGVces; UNEP; Ministry of Citizenship, 2023). At the same time, certain models—particularly energy--intensive forms practiced in controlled environments—can inadvertently increase greenhouse gas emissions when reliant on non-renewable energy sources (Al-Qubati, Zhang, & Forkel, 2024). This underscores the need for evidence-based assessments that take into account the diverse contexts, scales, and production models of UPA, with careful attention to both its synergies and trade-offs in relation to climate change.

Thus, the purpose of this text is to systematize national and international data, evidence, and experiences on the strategic role of urban and peri-urban agriculture in the face of climate change and food and nutrition insecurity. It highlights UPA's potential to reduce greenhouse gas (GHG) emissions while fostering climate adaptation and resilience.

Urban and peri-urban agriculture (UPA) plays an important role in addressing climate change and food and nutrition insecurity. Photo: Yako Guerra/MDS.

The role of urban and peri-urban agriculture in climate change mitigation, adaptation, and food system resilience

Global reports underscore the close connection between urbanization and climate change. Cities account for disproportionately high levels of greenhouse gas emissions, largely from the burning of fossil fuels to power industry, commerce, households, and transport activities (Ayuk *et al.*, 2021; Shukla *et al.*, 2022). At the same time, because cities concentrate consumption, markets, and decision-making, the transition to sustainable urban food systems can play a pivotal role in both climate mitigation and adaptation.

The sustainability—or even regenerative potential—of urban and peri-urban agriculture depends directly on the techniques employed, the inputs used, the actors involved, its territorial location, and the ecosystems it affects, whether positively or negatively (UNEP, 2024a; Ayuk *et al.*, 2021). At the production level, practices such as no-till farming, agroforestry, polycultures, green manuring, and mulching can enhance the soil's carbon storage capacity while reducing dependence on external inputs. In Brazil's Federal District, an experiment conducted by the Brazilian Agricultural Research Corporation (EMBRAPA) demonstrated that no-till vegetable farming, after six years, incorporated an additional 5 tons of carbon into the soil compared with conventional systems, reaching a total of 62 tons per hectare (Lima *et al.*, 2016). Other studies focusing on agroforestry systems and alternative carbon sequestration pathways report an average carbon potential in above-ground biomass of up to 32 tons per hectare (Froufe, Rachwal & Seoane, 2011).

Shortening the distance and time between food production and consumption plays a direct role in reducing the carbon footprint of urban diets (Dubbeling, Veenhuizen, & Halliday, 2019), particularly by limiting the reliance on fossil fuels for long-distance transport, refrigeration, and storage (Lwasa *et al.*, 2014). The environmental costs of extended food supply chains are well documented. For example, Bueno *et al.* (2023) quantified emissions from food transportation under public procurement contracts in Rio de Janeiro between 2012 and 2021. The total origin-to-destination distance for transported food reached 89,000 km, corresponding to a consumption of 26,000 liters of diesel. Emissions were estimated at 67.5 tons of CO_2 per trip, highlighting the potential for transport-related emission reductions if suppliers are replaced with local urban and peri-urban agriculture sources. Cleveland *et al.* (2017) demonstrated that local food production reduces "food miles" and, when combined with practices such as composting and graywater reuse, can lower emissions by up to 2 kg of CO_2 per kilogram of vegetables produced compared to the same products purchased from conventional retail stores.

Another benefit of closer links between production and consumption is the reduction of food loss and waste. By connecting producers directly with local consumers, losses related to cosmetic imperfections or distribution inefficiencies are minimized, while dietary habits can better align with seasonal, climatic, and ecosystem conditions. With shorter intervals between harvest and purchase, food stays fresher for longer, reducing the need for large-scale storage and premature disposal. In this way, urban food systems demonstrate greater efficiency by better aligning supply and demand. This is particularly significant given that food loss and waste currently account for 8–10% of global greenhouse gas emissions. A study conducted in Rio de Janeiro found that 77 kilograms per capita of food are wasted annually, with 39% still edible (UNEP, 2024b). Consequently, public markets and fairs emerge as key spaces for raising awareness among both farmers and consumers.

The value chain of urban and peri-urban agriculture (UPA) is also characterized by circular practices, such as composting, waste valorization, and the donation of surplus food to food banks. This circularity helps prevent emissions associated with landfill disposal and food waste. A study conducted in São Paulo showed that a 0.6-hectare agroecological production unit can process up to 125 tons of organic waste per year from markets and urban pruning (Instituto Escolhas, [2021]), thereby reducing the reliance on chemical fertilizers. Each ton of organic waste composted can offset an estimated 7.6 tons of CO_2 equivalent (Inácio, Bettio & Miller, 2010). Emission reductions may be even greater when composting replaces synthetic fertilizers, avoiding emissions from their industrial production and nitrogen oxide release during soil application. Decentralized composting systems integrated with urban and peri-urban agriculture thus hold considerable potential to lower cities' carbon footprints.

The role of UPA in improving urban climate adaptation has been well documented, with research emphasizing specific practices and traditional knowledge that boost resilience while providing economic advantages. Protecting soils by enhancing their infiltration capacity reduces flood risks and improves both water quality and supply (Ayambire *et al.*, 2019). Higher levels of soil organic matter also help increase water infiltration and retention. In São Paulo, for instance, agroecological soil management has been estimated to produce infiltration volumes equivalent to three large flood-control reservoirs (Instituto Escolhas, [2021]). Such urban infrastructure costs the public treasury around BRL 150 million per unit. By contrast, practices like mulching and contour farming can prevent up to 8.5 tons of soil loss per hectare each year, also reducing public expenditures on water treatment and river dredging—estimated at BRL 28.60 per ton of sediment removed. Another

notable contribution of UPA lies in urban cooling: agroforestry systems have been shown to lower temperatures by as much as 0.2°C in some cities (Instituto Escolhas, [2021]).

Climate adaptation in cities is inextricably linked to the conservation and enhancement of biodiversity. Diverse and multifunctional urban ecosystems play a crucial role in providing the ecological services that underpin urban resilience. Both flora and fauna require spaces that allow them to adjust to shifting climatic conditions, which calls for urban planning that integrates green areas connected across the landscape. In this context, UPA can serve a strategic function by creating habitats for native species and pollinators—often supporting higher levels of biodiversity than traditional urban green spaces (Lin, Philpott & Jha, 2015; Zhao, Sander & Hendrix, 2019). A survey of 25 urban backyards in the city of Santarém, Pará, identified 176 plant species (Winkler-Prins & Oliveira, 2010), highlighting the potential of UPA for agrobiodiversity conservation.

It is important to recognize that not all forms of UPA offer the same level of resilience to climate change impacts, nor do they contribute equally to the provision of ecosystem services that support urban adaptation. While urban agriculture can enhance adaptive capacity, it also relies on a minimum level of ecosystem quality, which can be constrained in contexts of contaminated water, soil, or air. Moreover, climate-related events directly affect agricultural production, driving up input and distribution costs, reducing food availability, and making access more difficult—particularly for the most vulnerable populations.

Urban and Peri-urban Agriculture can also compete for critical resources such as water, creating potential trade-offs. Although agroecological systems generally consume less water than conventional models, their expansion—particularly in vegetable production—may increase overall demand. Higher levels of soil organic matter, up to 19% greater in some cases (Teófilo *et al.*, 2012; Marouelli, Da Silva & Madeira, 2010), enhance water retention, yet scaling up UPA still requires complementary solutions. Efficient irrigation methods, such as drip or micro-sprinkling systems (Instituto Escolhas, [2021]), can cut water use by as much as 15% (ANA, 2019). In addition, cultivating underutilized or non-conventional edible plants (PANCs), better adapted to local climate conditions, alongside rainwater harvesting and water reuse systems, can further reduce pressure on urban water supplies.

The COVID-19 pandemic, coupled with the rising frequency of extreme events such as droughts, storms, and floods, has laid bare the fragility of urban food systems and deepened historical inequalities in access and distribution. In this context, producing food closer to consumption hubs emerges

as a critical resilience strategy, reducing vulnerability to crises ranging from supply chain disruptions to pandemics and climate shocks (FAO, 2024). Notably, during the pandemic, a quarter of Brazilian cities with urban agriculture policies mobilized these initiatives to safeguard fresh food access, underscoring their strategic importance in times of disruption(FGVces; PNUMA; Ministério da Cidadania, 2023).

Local food production helps prevent supply disruptions (Fidalgo *et al.*, 2023), ensures more reliable access to food, and can strengthen community bonds by fostering networks of solidarity and reciprocity in informal settlements and urban peripheries (Amstel; Carneiro, 2020)—all of which are vital in recovering from extreme events. In addition, UPA can: promote healthier and more appropriate diets (Jacob, 2020); address food deserts and swamps (Instituto Escolhas, [2021]); revitalize local food cultures; and transform neglected urban areas—once breeding grounds for disease and vectors (Ribeiro, Bógus & Watanabe, 2015)—into spaces that actively support public health (Burigo, Porto, 2019).

Moreover, rapid urbanization combined with structural inequality and the climate emergency presents additional challenges to feeding urban populations (Ayuk *et al.*, 2021). In this context, UPA can be integrated into urban planning instruments as a strategy to limit urban sprawl, particularly in watershed areas. Payment for ecosystem services (Ayuk *et al.*, 2021) is crucial to support agricultural activities in the face of intense real estate speculation. In some cases, large-scale agroecological transitions have proven capable of buffering the impacts of urban growth projections on the provision of vital ecosystem services that underpin human well-being (Instituto Escolhas, [2021]).

Future Directions and Challenges for Public Policy

For urban and peri-urban agriculture to effectively support climate mitigation and adaptation, it must become more resilient and strategically robust. This involves cultivating crop varieties that withstand pests, droughts, and heat, while weaving green spaces and nature-based solutions into urban planning to enhance both climate and food system resilience (Ayuk *et al.*, 2021). Evidence underscores the importance of investing in policies and research that foster sustainable local production adapted to urban realities, strengthen capacities and infrastructure, expand market access, and promote environmental stewardship alongside improved quality of life in cities.

Over the past decades, Brazil has experienced successive waves of public policies targeting urban and peri-urban agriculture, reflecting an

Reducing the time and distance between food production and consumption helps decrease food loss and waste, and lowers the carbon footprint of food consumed in cities. Photo: André Oliveira/MDS.

evolving understanding of its strategic role (Pinheiro & Ferrareto, 2010; Soares, Búrigo & Souza, 2022; Almeida *et al*., 2022; Lauer, 2023; Bógus & Coelho, 2024; Rio de Janeiro, 2024; Alencar *et al*., 2023). The first wave focused on the occupation of underutilized urban spaces, establishing community gardens to address conflicts over land use. The second wave emphasized food and nutritional security, positioning UPA as a tool to expand access to fresh, healthy foods, often linked to programs to combat hunger, promoting social inclusion, and generating employment and income. More recently, a third wave has emerged with a broader perspective, integrating public health, climate change, circular economy, biodiversity conservation, and socio-environmental justice.

Urban and peri-urban agriculture is a tangible reality in Brazil. Recent research indicates that 67 Brazilian cities have urban agriculture agendas, varying in their level of development and maturity (FGVces; UNEP; Ministry of Citizenship, 2023). In addition, around 100 local government initiatives aim to strengthen UPA (Instituto Escolhas, 2022); 23.1% of municipalities actively implement urban agriculture activities; and 44.2% of municipalities run school garden programs (Britto, 2024).

The national consolidation of the agenda was strongly driven by the creation of the National Urban and Peri-Urban Agriculture Program by the Ministry of Social Development in 2018 (Ordinance No. 467, Brazil, 2018) and by the publication of the Guide for Municipal Urban and Peri-Urban Agriculture Agendas (FGVces; Ministry of Citizenship, 2022), coordinated by the United Nations Environment Program (UNEP) with support from the federal government. The guide, which synthesizes innovations implemented by various Brazilian municipalities under the international TEEBAgriFood framework, marked a milestone in coordinating local and national efforts, enabling best practices to serve as benchmarks for the design of more robust and comprehensive policies (UNEP, 2024a).

In 2023, Brazil strengthened its national policy framework for urban and peri-urban agriculture through two presidential decrees: the updated National Program for Urban and Peri-Urban Agriculture (Decree No. 11,700; Brazil, 2023a) and the National Strategy for Food and Nutrition Security in Cities (Decree No. 11,822; Brazil, 2023b). The following year, these initiatives were further reinforced by the enactment of Law No. 14,935 (Brazil, 2024a), which establishes clear national guidelines for advancing urban and peri-urban agriculture across the country. These laws mark a significant step forward in formally institutionalizing urban and peri-urban agriculture, officially recognizing its role in promoting food security, strengthening local economies, and enhancing the environmental sustainability

of urban areas. In addition to the *Alimenta Cidades Strategy*, the National Urban and Peri-Urban Agriculture Program has been aligned with other federal initiatives, including the Solidarity Kitchens (Cozinhas Solidárias) Program, the National Policy for Technical Assistance and Rural Extension (PNATER), the Resilient Green Cities (Cidades Verdes) Program, and the Family Farming Registry.

Beyond the federal level, 222 municipal and state laws related to urban and peri-urban agriculture or city-based food production are currently in force in Brazil (Lauer, 2023). Cities such as São Paulo, Belo Horizonte, and Curitiba stand out for their innovative regulatory frameworks and comprehensive municipal programs. Notable examples include the integration of UPA into Master Plans, Annual Budget Laws, and Multi-Year Planning instruments.

Since 2023, the Ministry of Social Development and Fight against Hunger (MDS) has strategically focused its support for urban and peri-urban agriculture on the 60 cities participating in Phase I of the *Alimenta Cidades Strategy* (Brazil, 2024b). This effort aims to establish a network linking the federal government and municipalities, with activities tailored to the development stage and maturity of each city's urban agriculture agenda. Under this framework, 48 cities will participate in training programs for policy managers. In 12 municipalities, 96 model production units will be established, featuring social technologies such as rainwater harvesting, water reuse, and composting. Additionally, 20 cities will receive 300 "sisteminha" (little system) units, a technology integrating crop and livestock production with recycling. Across both policy initiatives and social technologies, the connection to climate action is central, highlighting the strategic role of urban and peri-urban agriculture in reducing carbon footprints and enhancing urban resilience.

Conclusions and Future Directions

By synthesizing national and international evidence on the multiple benefits of urban and peri-urban agriculture in the face of climate change, this text aims to support the development of more integrated, cross-sectoral, and territorially grounded public policies. The evidence indicates that, when guided by specific practices—particularly agroecological approaches—and underpinned by proximity and circularity, UPA can play a meaningful role in climate action. In this sense, UPA can be seen as a nature-based solution that delivers intertwined climatic, social, and economic benefits, positioning it as a strategic tool for sustainable urban planning in the context of escalating climate emergencies and interconnected crises.

Urban community gardens can foster greater autonomy and well-being among local populations, while strengthening local economies and reinforcing social ties. Photo: Ricardo Marajó/SECOM/Curitiba City Hall

Urban food systems play a key role in helping Brazil meet its Nationally Determined Contributions (NDCs), which target a 59–67% reduction in greenhouse gas emissions by 2035 compared to 2005 levels. Achieving this goal involves the active engagement of multiple sectors. In the agricultural sector, the productive restoration of degraded lands—including those in urban and peri-urban settings—combined with the adoption of low-carbon systems, can enhance productivity and efficiency while reducing pressure to convert additional land for agriculture. In urban areas, UPA contributes to nature-based solutions that sequester carbon, improve the urban microclimate, and lower emissions. It can also reduce truck traffic supplying the city, thereby enhancing urban mobility. In terms of logistics and transportation, producing food close to consumers immediately reduces fossil fuel use and emissions associated with long-distance transport, while also helping to cut food waste. Within the waste sector, integrating composting with agriculture lowers the volume of organic waste sent to landfills, mitigating methane emissions. However, a critical gap remains: there are no consolidated estimates of UPA's precise contribution to Brazil's emissions reduction targets—a strategic knowledge gap that, if addressed, could attract climate finance and drive the agenda forward.

There are significant opportunities to strengthen the integration between public food security policies and the climate agenda. The Brazilian Emissions Trading System, combined with climate finance funds and programs, could channel resources toward UPA initiatives that reduce emissions and enhance resilience. Composting emerges as a strategic lever, with the potential to generate carbon credits and attract private-sector investment, thereby expanding collaborative action between government and market actors. Public procurement programs, such as the Food Acquisition Program (PAA) and the National School Feeding Program (PNAE), can reduce food miles and strengthen short supply chains when they incorporate UPA production. This approach promotes low-carbon and socially inclusive agricultural practices and fosters a synergistic environment where food and climate policies no longer operate in parallel but reinforce and amplify each other.

Therefore, urban and peri-urban agriculture is recognized as a strategic tool for addressing climate change and food insecurity, supported by existing legislative frameworks. In recent years, UPA and its regulating policies in Brazil have moved beyond a sole focus on food production and income generation, increasingly embracing objectives related to environmental conservation, sustainable management, and the development of healthier,

more sustainable, and climate-resilient cities. However, for UPA to expand, become more structured, and establish itself in a greater number of municipalities—and for public policies to be increasingly strengthened—several challenges must be addressed. These include the continuous expansion of cities over agricultural and environmentally protected areas; growing demand for food and housing due to population increases; high land costs in urban and peri-urban areas; limited natural resources; supply chains dominated by oligopolies; and restricted access to healthy foods, particularly for vulnerable populations.

REFERENCES

AGÊNCIA NACIONAL DE ÁGUAS (ANA). *Conjuntura recursos hídricos no Brasil 2019:* informe anual. Brasília: ANA, 2019. Available at: https://www.gov.br/ana/pt-br/todos-os-documentos-do-portal/documentos-aud/relatorio-de-gestao/relatorioanual2019_ana.pdf. Accessed: 13 Aug.2025.

ALENCAR, V. *et al.* (eds.). Instituto de Geociências da Universidade Federal de Minas Gerais. AUÊ! Estudos em Agricultura Urbana. *Anuário das agriculturas metropolitanas 2022-2023*: uma publicação sobre a Região Metropolitana de Belo Horizonte. Belo Horizonte: UFMG/IGC, 2025.197p.

ALMEIDA, D. *et al.* (eds.). Instituto de Geociências da Universidade Federal de Minas Gerais. AUÊ! Estudos em Agricultura Urbana. *Anuário das agriculturas metropolitanas 2020/2021*: uma publicação sobre a Região Metropolitana de Belo Horizonte. Belo Horizonte: UFMG/IGC, 2022. Available at: https://drive.google.com/file/d/1DFCppPdNiQVMEVTgbgQeOmnYxLqZEzGq/view?usp=sharing. Accessed:13 Aug.2025.

AL-QUBATI, A.; ZHANG, L.; FORKEL, M. Urban and peri-urban agriculture under climate change: a review on carbon emissions and sequestration. *Sustainable Cities and Society*, v. 115, nov. 2024. Available at: https://www.sciencedirect.com/science/article/pii/S2210670724006541. Accessed: 13 Aug.2025.

AMSTEL, J. M. N.; CARNEIRO, M. J. T. The construction of environmental knowledge and practices in the favela: challenges of an intercognitive production. *Innovation: The European Journal of Social Science Research*, v. 37, n. 2, p. 278-297, 2020. Available at: https://www.tandfonline.com/doi/full/10.1080/13511610.2020.1785276. Accessed: 13 Aug.2025.

AYAMBIRE, R. A. *et al.* A review of practices for sustaining urban and peri-urban agriculture: Implications for land use planning in rapidly urbanising Ghanaian cities. *Land Use Policy,* v. 84, p. 260-277, maio 2019. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0264837718301844. Accessed: 13 Aug.2025.

AYUK, E. T. *et al. Urban agriculture's potential to advance multiple sustainability goals:* An International Resource Panel Think Piece. Nairobi: Unep, 2021. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/38398/urban_agriculture.pdf. Accessed: 13 Aug.2025.

BÓGUS, C. M.; COELHO, D. E. P. (orgs.). *Hortas comunitárias urbanas:* promovendo a saúde e a segurança alimentar e nutricional nas cidades. São Paulo: Instituto de Saúde, 2024.

BRASIL. *Decreto n. 11.700, de 12 de setembro de 2023*. Institui o Programa Nacional de Agricultura Urbana e Periurbana e o Grupo de Trabalho do Programa Nacional de Agricultura Urbana e Periurbana. Brasília, 2023a. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/D11700.htm. Accessed: 13 Aug.2025.

BRASIL. *Decreto n. 11.822, de 12 de dezembro de 2023*. Institui a Estratégia Nacional de Segurança Alimentar e Nutricional nas Cidades. Brasília, 2023b. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/d11822.htm. Accessed: 13 Aug.2025.

BRASIL. *Lei n. 14.935, de 26 de julho de 2024*. Institui a Política Nacional de Agricultura Urbana e Periurbana. Brasília, 2024a. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2024/lei/l14935.htm. Accessed: 13 Aug.2025.

BRASIL. Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. *Portaria n. 972, de 26 de março de 2024*. Define os municípios e o Distrito Federal prioritários para a implementação da Estratégia Nacional de Segurança Alimentar e Nutricional nas Cidades – Alimenta Cidades. Brasília, 2024b. Available at: https://www.sas.sc.gov.br/images/Portaria_n%C2%BA_972-2024_-_Munic%C3%ADpios_priorit%C3%A1rios_Alimenta_Cidades.pdf. Accessed: 13 Aug.2025.

BRASIL. Ministério do Desenvolvimento Social. *Portaria n. 467, de 29 de novembro de 2018*. Institui o Programa de Agricultura Urbana e Periurbana no âmbito do Sistema Nacional de Segurança Alimentar e Nutricional – SISAN. Brasília, 2018. Available at: https://www.mds.gov.br/webarquivos/arquivo/seguranca_alimentar/Portaria%20n.%20467%20-%20Institui%20o%20Programa%20Nacional%20de%20AUP%20e%20suas%20retifica%C3%A7%C3%B5es.pdf. Accessed: 13 Aug.2025.

BRITTO, V. MUNIC 2023: 31,9% dos municípios brasileiros ainda despejam resíduos sólidos em lixões. *Agência IBGE Notícias*, 28 nov. 2024. Available at: https://agenciadenoticias.ibge.gov.br/agencia-noticias/2012-agencia-de-noticias/noticias/41994-munic-2023-31-9-dos-municipios-brasileiros-ainda-despejam-residuos-solidos-em-lixoes. Accessed: 11 Aug.2025.

BUENO, C. S. *et al*. *Agricultura urbana e periurbana no estado do Rio de Janeiro*: as compras públicas de alimentos como um instrumento estratégico para promover desenvolvimento econômico sustentável e cidades inclusivas e resilientes às mudanças climáticas. Campinas: Unicamp IE, 2023.

BURIGO, A. C.; PORTO, M. F. de S. Trajetórias e aproximações entre a saúde coletiva e a agroecologia. *Saúde em Debate*, v. 43, ed. esp. 8, p. 248-262, 2019. Available at: https://www.scielo.br/j/sdeb/a/Qsg8HMWDTqBPtgGys7Krm3P/abstract/?lang=pt. Accessed: 13 Aug.2025.

C40; ARUP; UNIVERSIDADE DE LEEDS. *Addressing food-related consumption-based emissions in C40 cities*. Leeds: Universidade de Leeds; C40; ARUP, 2019.

CENTRO DE ESTUDOS EM SUSTENTABILIDADE DA FUNDAÇÃO GETULIO VARGAS (FGVCES); PROGRAMA DAS NAÇÕES UNIDAS PARA O MEIO AMBIENTE (PNUMA); MINISTÉRIO DA CIDADANIA. *Panorama de agendas municipais de agricultura urbana e periurbana:* sumário executivo. São Paulo: FGVces; PNUMA; Ministério da Cidadania, 2023. Available at: https://eaesp.fgv.br/sites/eaesp.fgv.br/files/u1087/panorama_de_agendas_municipais_de_agricultura_urbana_e_periurbana.pdf. Accessed: 13 Aug. 2025.

CENTRO DE ESTUDOS EM SUSTENTABILIDADE DA FUNDAÇÃO GETÚLIO VARGAS (FGVCES); MINISTÉRIO DA CIDADANIA. *Agendas municipais de agricultura urbana e periurbana*: um guia para inserir a agricultura nos processos de planejamento urbano. São Paulo: FGVces, 2022. Available at: https://eaesp.fgv.br/sites/eaesp.fgv.br/files/u641/fgvces_-_agendas_municipais_de_agricultura_urbana_e_periurbana.pdf. Accessed: 13 Aug.2025.

CLEVELAND, D. A. *et al*. The potential for urban household vegetable gardens to reduce greenhouse gas emissions. *Landscape and Urban Planning*, v. 157, p. 365-374, Jan. 2017. Available at: https://doi.org/10.1016/j.landurbplan.2016.07.008. Accessed: 13 Aug.2025.

DUBBELING, M.; VEENHUIZEN, R.; HALLIDAY, J. Urban agriculture as a climate change and disaster risk reduction strategy. *Field Actions Science Reports*, n. 27, ed. esp. 20, p. 32-39, 2019. Available at: https://journals.openedition.org/factsreports/5650. Accessed: 13 Aug.2025.

FIDALGO, E. C. C. *et al*. O papel da agricultura urbana como promotora da resiliência socioeconômica e ambiental das cidades: destaque ao município de Nova Friburgo, RJ. *Embrapa Solos*, n. 239, out. 2023. Available at: https://www.infoteca.cnptia.embrapa.br/infoteca/bitstream/doc/1158240/1/CNPS-DOC-239-2023.pdf. Accessed: 13 Aug.2025.

FROUFE, L.; RACHWAL, M.; SEOANE, C. Potencial de sistemas agroflorestais multiestrata para sequestro de carbono em áreas de ocorrência de Floresta Atlântica. *Pesquisa Florestal Brasileira*, Colombo, v. 31, n. 66, p. 143-154, abr.-jun. 2011. Available at: https://www.embrapa.br/busca-de-publicacoes/-/publicacao/895462/potencial-de-sistemas-agroflorestais-multiestrata-para-sequestro-de-carbono-em-areas-de-ocorrencia-de-floresta-atlantica. Accessed: 13 Aug.2025.

GLOBAL ALLIANCE FOR THE FUTURE OF FOOD (GAFF). *Power Shift:* Why we Need to Wean Industrial Food Systems off Fossil Fuels. [s.l.]: GAFF, 2023. Available at: https://futureoffood.org/wp-content/uploads/2023/11/ga_food-energy-nexus_report.pdf. Accessed: 13 Aug.2025.

INÁCIO, C. T.; BETTIO, D. B.; MILLER, P. R. *O papel da compostagem de resíduos orgânicos urbanos na mitigação de emissão de metano.* Rio de Janeiro: Embrapa Solos, 2010.

INSTITUTO ESCOLHAS. Além dos alimentos: a contribuição da agricultura urbana para o bem-estar na metrópole de São Paulo. *Instituto Escolhas*, [2021]. Available at: https://alemdosalimentos.escolhas.org. Accessed: 13 Aug.2021.

INSTITUTO ESCOLHAS. Políticas públicas de agricultura urbana. *Instituto Escolhas*, 2022. Available at: https://100politicas.escolhas.org/. Accessed: 13 Aug.2025.

JACOB, M. C. M. Biodiversity of underutilized food plants in a community-based learning garden/Biodiversidade de plantas alimentícias não convencionais em uma horta comunitária com fins educativos. *Demetra*, v. 15, 2020. Available at: https://www.e-publicacoes.uerj.br/index.php/demetra/article/view/44037. Accessed: 13 Aug.2025.

LAUER, E. C. *Projeto de Cooperação Técnica MDS Segurança Alimentar e Nutricional:* estudo e análise documental sobre leis, decretos e projetos de lei (estadual, municipal e nacional) existentes e em tramitação, com identificação de elementos importantes e estratégicos para estruturar a agricultura urbana e periurbana nas três esferas do governo. [s. l.]: Instituto Interamericano de Cooperação para a Agricultura, 2023.

LIMA, C. E. P. *et al*. Compartimentos de carbono orgânico em Latossolo cultivado com hortaliças sob diferentes manejos. *Pesquisa Agropecuária Brasileira,* Brasília, v. 51, n. 4, p. 378-387, abr. 2016. Available at: https://apct.sede.embrapa.br/index.php/pab/article/view/21416/13268. Accessed: 13 Aug.2025.

LIN, B. B.; PHILPOTT, S. M.; JHA, S. The future of urban agriculture and biodiversity-ecosystem services: Challenges and next steps. *Basic and Applied Ecology*, v. 16, n. 3, p. 189-201, 2015.

LWASA, S. *et al*. Urban and peri-urban agriculture and forestry: Transcending poverty alleviation to climate change mitigation and adaptation. *Urban Climate*, v. 7, p. 92-106, 2014. Available at: https://www.sciencedirect.com/science/article/abs/pii/S2212095513000552?via%3Dihub. Accessed: 13 Aug.2025.

MAROUELLI, W. A.; DA SILVA, H. R.; MADEIRA, N. R. Uso de água e produção de tomateiro para processamento em sistema de plantio direto com palhada. *Pesquisa Agropecuária Brasileira*, Brasília, v. 41, n. 9, p. 1399-404, 2006. Available at: https://www.scielo.br/j/pab/a/sJ4QCQwckpbvVNDx37gyTzv/?lang=pt. Accessed: 13 Aug.2025.

MASSON-DELMOTTE, V. *et al*. (eds.). *Climate Change and Land:* an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. Genebra: IPCC, 2019. Available at: https://www.ipcc.ch/site/assets/uploads/2019/11/SRCCL-Full-Report-Compiled-191128.pdf. Accessed: 13 Aug.2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS (ONU). World population projected to reach 9.8 billion in 2050, and 11.2 billion in 2100. *United Nations Department of Economic and Social Affairs*, [201-]. Available at: https://www.un.org/en/desa/world-population-projected-reach-98-billion-2050-and-112-billion-2100. Accessed: 13 Aug. 2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS (ONU). *World Population Prospects 2019:* Highlights. Nova York: ONU, 2019. Available at: https://population.un.org/wpp/assets/Files/WPP2019_Highlights.pdf. Accessed: 13 Aug.2025.

ORGANIZAÇÃO DAS NAÇÕES UNIDAS PARA ALIMENTAÇÃO E AGRICULTURA (FAO). *Strengthening urban and peri-urban food systems to achieve food security and nutrition, in the context of urbanization and rural transformation.* Roma: FAO, 2024.

PINHEIRO, M. C.; FERRARETO, L. C. Política Nacional de Agricultura Urbana: estratégia para o combate à fome e promoção da segurança alimentar. *Segurança Alimentar e Nutricional*, Brasília, v. 13, p. 253-264, 2010.

RIBEIRO, S. M.; BÓGUS, C. M.; WATANABE, H. A. W. Agricultura urbana agroecológica na perspectiva da promoção da saúde. *Saúde e Sociedade,* v. 24, n. 2, p. 730-743, 2015. Available at: https://www.scielo.br/j/sausoc/a/H8sp5CgPgsJ6gf6nqtMwv9G/?lang=pt. Accessed: 13 Aug.2025.

RIO DE JANEIRO (MUNICÍPIO). *Lei Complementar n. 270, de 16 de janeiro de 2024.* Dispõe sobre a Política Urbana e Ambiental do Município, institui a revisão do Plano Diretor de Desenvolvimento Urbano Sustentável do município do Rio de Janeiro e dá outras providências. Rio de Janeiro, 2024. Available at: https://leismunicipais.com.br/a1/rj/r/rio-de-janeiro/lei-complementar/2024/27/270/lei-complementar-n-270-2024-dispoe-sobre-a-politica-urbana-e-ambiental-do-municipio-institui-a-revisao-do-plano-diretor-de-desenvolvimento-urbano-sustentavel-do-municipio-do-rio-de-janeiro-e-da-outras-providencias?q=270. Accessed: 13 Aug.2025.

SHUKLA, P. R. *et al*. (eds.). *Mudança do Clima 2022*: mitigação da mudança do clima. Contribuição do Grupo de Trabalho III ao Sexto Relatório de Avaliação do Painel Intergovernamental sobre Mudança do Clima. Cambridge; Nova Iorque: Cambridge University Press, 2022.

SOARES, L. P.; BÚRIGO, A. C.; SOUZA, N. A. (orgs.). *Tecendo redes de experiências em saúde e agroecologia*: resultados e reflexões a partir da sistematização de iniciativas construídas pela Fundação Oswaldo Cruz (Fiocruz). Rio de Janeiro: Fiocruz, 2022. Available at: https://fiocruz.br/sites/fiocruz.br/files/documentos_2/relatoriodigital_07022023.pdf. Accessed: 13 Aug.2025.

TEÓFILO, T. M. S. *et al*. Eficiência no uso da água e interferência de plantas daninhas no meloeiro cultivado nos sistemas de plantio direto e convencional. *Sociedade Brasileira da Ciência das Plantas Daninhas*, Viçosa, v. 30, n. 3, p. 547-56, 2012. Available at: https://www.periodicos.capes.gov.br/index.php/acervo/buscador.html?task=detalhes&id=W2012483835. Accessed: 13 Aug.2025.

TÜRKER, H. B. *et al*. The role of urban agriculture in adapting to climate change for sustainable cities. *Environmental Science and Pollution Research,* v. 29, p. 1-13, Jan. 2022. Available at: https://www.researchgate.net/publication/357688782_The_role_of_urban_agriculture_in_adapting_to_climate_change_for_sustainable_cities. Accessed: 13 Aug. 2025.

UNITED NATIONS ENVIRONMENT PROGRAMME (UNEP). *Driving Policy Change towards Sustainable Urban Food Systems:* Upscaling Urban and Peri-urban Agriculture in Brazil. Nairobi: UNEP, 2024a. Available at: https://www.greenpolicyplatform.org/sites/default/files/downloads/resource/policy_food_systems_Brazil.pdf. Accessed: 13 Aug. 2025.

UNITED NATIONS ENVIRONMENT PROGRAMME (UNEP). *Food Waste Index Report 2024:* Think Eat Save – Tracking Progress to Halve Global Food Waste. Nairobi: Unep, 2024b. Available at: https://wedocs.unep.org/20.500.11822/45230. Accessed: 13 Aug. 2025.

WINKLERPRINS, A.; OLIVEIRA, P. S. de S. Urban agriculture in Santarém, Pará, Brazil: Diversity and circulation of cultivated plants in urban homegardens. *Boletim do Museu Paraense Emílio Goeldi* – Ciências Humanas, v. 5, n. 3, p. 571-585, 2010. Available at: https://www.scielo.br/j/bgoeldi/a/8TSbsShPcgkLWnLmp8P79rg/?lang=en. Accessed: 13 Aug.2025.

ZHAO, C.; SANDER, H. A.; HENDRIX, S. D. Wild bees and urban agriculture: assessing pollinator supply and demand across urban landscapes. *Urban Ecosystems*, v. 22, n. 3, p. 455-470, 2019. Available at: https://link.springer.com/article/10.1007/s11252-019-0826-6. Accessed: 13 Aug.2025.

The Role of Social Technologies for Access to Water in the Context of Climate Change

Vitor Leal Santana
Camile Marques Sahb
Patricia Mollo

Introduction

Shifts in climate have triggered more severe droughts, desertification, and biodiversity loss, with direct consequences for food security and an increase in poverty. The world is moving rapidly toward an intense degradation of natural resources, which directly affects access to water. Recent data indicate that Brazil has been getting drier, having lost more than 3% of its surface water over the past 40 years (MapBiomas, [2025]), while global groundwater reserves are also in decline (Jasechko *et al.*, 2024)[1].

In this context, since 2003, the Brazilian government has promoted access to water for rural populations living in poverty through simple, low-cost social technologies under the Cisterns Program. At the heart of these technologies is the harvesting and storage of rainwater, which has enabled a broad process of decentralizing and democratizing water access in response to the challenges of implementing conventional urban-style supply systems.

Brazil embodies a paradoxical scenario: the populations most vulnerable in terms of income and access to basic services live in rural communities situated in regions with both the greatest and the scarcest water availability—the North, largely covered by the Amazon biome, and the Northeast, home to most of the country's semi-arid zone. It is in these two regions that the Cisterns Program has established its strongest presence, tailored to the specific conditions and needs of each area. Nevertheless, the demand for water-access technologies continues to grow. In the far south of Rio Grande do Sul and in Mato Grosso do Sul, rainwater harvesting technologies are also being implemented under the scope of the Cisterns Program.

Accordingly, this chapter aims to demonstrate how the Cisterns Program has contributed to improving the quality of life of its beneficiaries by providing tangible means to reduce waterborne diseases, enhance food and nutritional security, generate income, and strengthen the resilience and climate adaptation capacity of the rural communities it serves.

The Cisterns Program as a public policy for climate adaptation

The Cisterns Program was launched in 2003 in response to demands from civil society in Brazil's semi-arid region, at a time when traditional water access solutions implemented by the Brazilian government were exclusionary

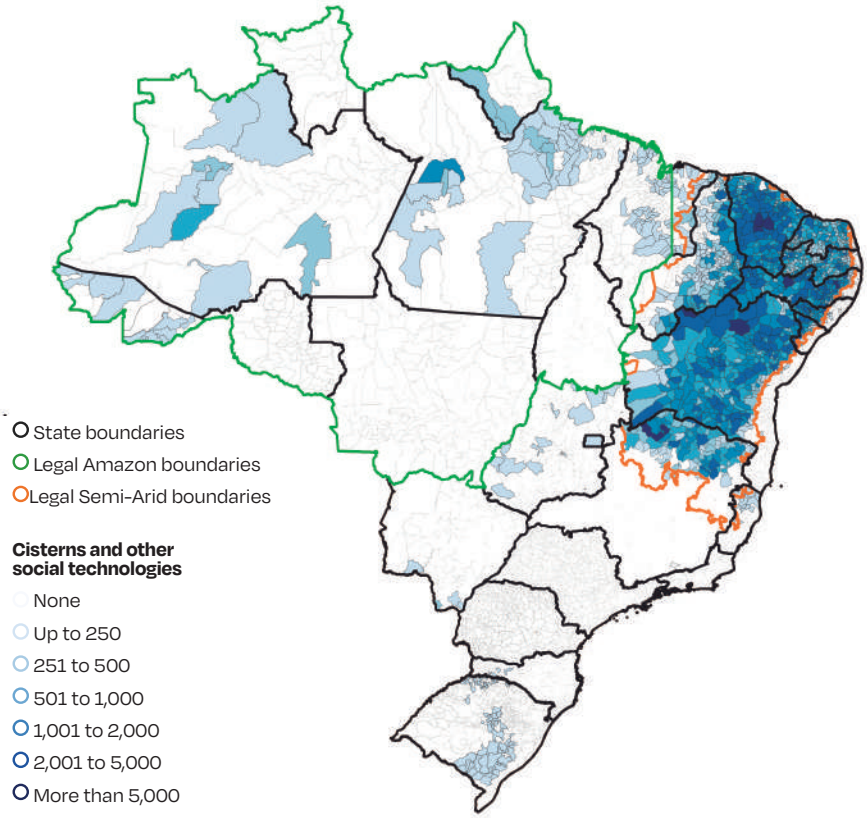
1 The study's authors reported that groundwater levels declined by 71% across nearly 1,700 aquifer systems included in the research, conducted between 2000 and 2022

and unable to adequately meet the needs of the most vulnerable populations, primarily located in the rural areas of the region.

Since then, more than 1.3 million families and over 8,000 schools have been reached, spread across more than 1,500 municipalities in 20 Brazilian states, as illustrated below. The program has become the largest public initiative known to implement rainwater harvesting technologies to democratize access to water in rural areas.

The Cisterns Program is an initiative that does not stand out for the scale of its infrastructure or for large financial investments. On the contrary, it represents a broad process of decentralizing and democratizing water access through alternative solutions at the household or community level. In some municipalities, the investment made over recent years exceeds five ti-

FIGURE 1 Cisterns program and other social technologies implemented in Brazil (2003–2025)



Source: Adapted from SESAN/MDS (2025).

Program beneficiary Diana da Silva with her children in Morada Nova, Ceará. Beneficiaries of the Cisterns Program are involved throughout the entire process, participating in training activities on water use and management. Photo: Marcelo Curia.

mes the average monthly per capita income for a single year, illustrating the potential multiplier effect of the program's resources on the local economy (Santana; Rahal, 2020).

This is a public policy with significant territorial coverage, capable of reaching the poorest and most hard-to-reach regions and municipalities, often characterized by considerable logistical complexity.

The scale of service achieved is made possible by a broadly decentralized implementation arrangement, involving partnerships with public entities and, above all, with civil society organizations.

In this context, the various types of cisterns, along with the set of other social technologies - derived from them and included in the Cisterns Program portfolio - constitute a framework of sustainable solutions aimed at addressing the problem of water access in rural areas by optimizing water use, primarily harnessing a resource that falls from the sky: rain. These technologies combine local and traditional knowledge with technical expertise, emerging as social innovations.

The following figures show the main technologies supported by the Cisterns Program, along with a brief description of each.

Photo: MDS/Senan

16,000-liter plate cistern

Masonry plate reservoir consisting of a rainwater harvesting system from the household roof, with a storage capacity of up to 16,000 liters of water for family consumption.

Photo: MDS/Senan

School cisterns

Masonry plate reservoir with a capacity to store up to 52,000 liters of water collected from the school roof. A version adapted to the Amazon context consists of two 5,000-liter reservoirs connected to the school roof, with pre-treatment through a slow sand filter.

Photo: Marcelo Curia

Sidewalk cistern (*cisterna calçadão*)

A 52,000-liter reservoir connected to a 200 m² concreted area designed to collect rainwater.

Photo: Marcelo Curia

Runoff cistern (*cisterna enxurrada*)

A 52,000-liter reservoir connected to a sedimentation tank, designed to collect runoff water and retain impurities.

Photo: MDS/Sesan

Multipurpose large roof cistern (*cisterna telhadão*)

Reservoirs with capacities of 16,000 and 25,000 liters, connected to a shed (a structure built along with the cistern) measuring between 40 and 80 m².

Photo: MDS/Sesan

Subsurface dam

A transverse barrier built across the bed of runoff channels, streams, or temporary creeks, created by placing a flexible plastic liner in a trench excavated down to crystalline or impermeable soil.


Photo: Rodolfo Rodrigo/ASA

Trench-berm reservoir (*barreiro-trincheira*)

An excavated reservoir dug into the soil down to the impermeable layer, with narrow and deep vertical walls, capable of storing at least 500,000 liters of water.

Photo: SDR/RS

Micro-reservoir (*microaçude*)

An excavated reservoir with the capacity to store about 1,000 cubic meters of water.

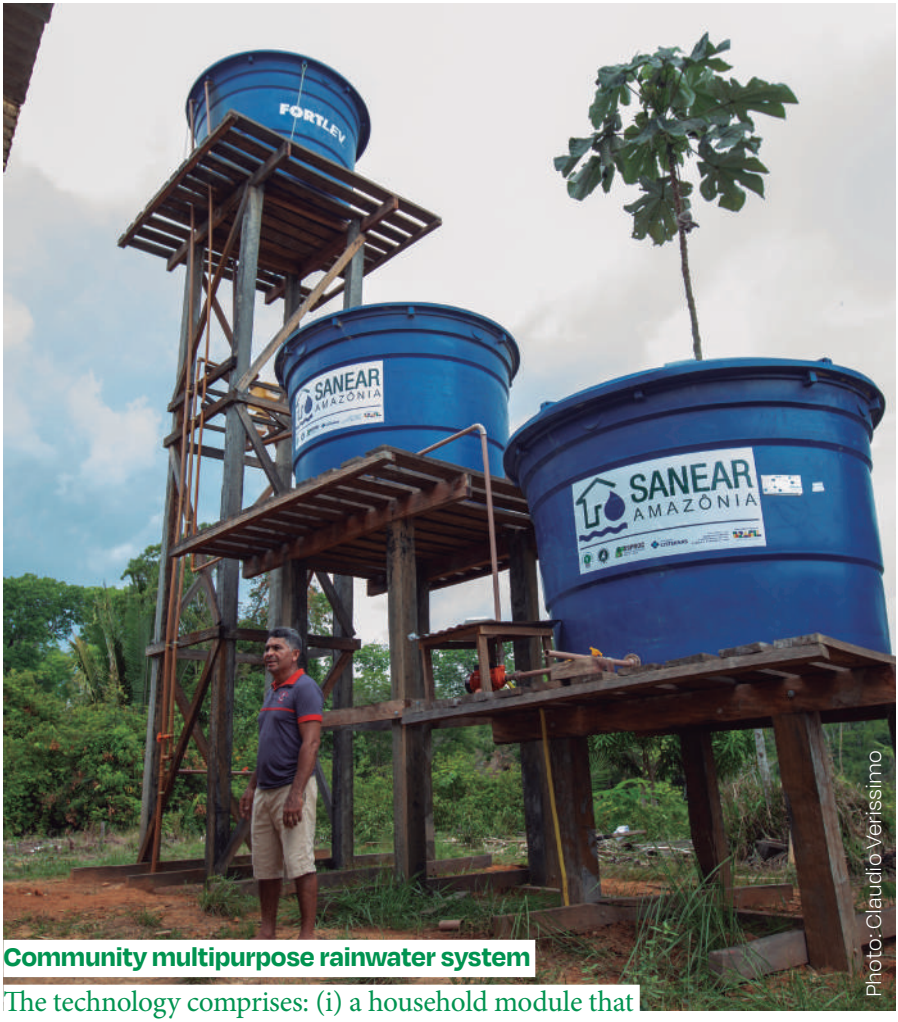


Photo: Claudio Verissimo

Community multipurpose rainwater system

The technology comprises: (i) a household module that includes a rainwater harvesting component, a treatment device, a 1,000-liter reservoir, a household sanitation unit with bathroom facilities (toilet, shower, and sink), and a simplified septic tank; and (ii) a community module that includes water capture from a complementary source (surface or groundwater) and three 5,000-liter reservoirs—one for treatment, another for storage, and a third for distributing water to households through an interconnected distribution network. The technology has variations adapted for floodplain and upland areas.

Photo: Claudio Verissimo

Autonomous multipurpose rainwater system

This system combines a rainwater harvesting component, a treatment device, two reservoirs—one of 1,000 liters and another of 5,000 liters—a household sanitation unit with bathroom facilities (toilet, shower, and sink), and a simplified septic tank. The technology has variations adapted for floodplain and upland areas.

Photo: MDS/Sesan

Household gray water treatment and reuse system

A hydraulic system that channels household water through a junction box, a biological filter, a septic reuse tank, and an elevated water tank to which the water is pumped by an electric pump, with the option of including an ecological septic tank.

Photo: Stanny Saraiva

Micro water supply system with collective use points

A system for collecting surface water, featuring a simplified treatment unit with a slow sand filter, storage tanks for treated water, and a distribution network supplying filtered water to communal access points.

Community cistern for agrobiodiversity management

A system comprising: (i) a masonry plate reservoir with a capacity of up to 30,000 liters, connected to a 100 m^2 catchment area also made of masonry plates; (ii) a community seed multiplication field with a simplified irrigation system; and (iii) a community seed bank equipped with facilities for the management and conservation of adapted genetic material.

Technics for harvesting rainwater, as a nature-based solution, help reduce water vulnerability by securing a strategic reserve of water during times of scarcity. As rainfall becomes increasingly erratic and extreme, families relying on wells or public supply networks often face frequent shortages. By storing rainwater in cisterns, households gain reliable access to water for essential needs—from drinking and hygiene to small-scale vegetable gardens. Beyond meeting daily needs, this approach strengthens resilience, enabling communities to face droughts or extreme events proactively, without disrupting livelihoods or well-being.

In Brazil's semi-arid region, the scarcity of both surface and groundwater has long hindered social development and constrained productive capacity, perpetuating the cycle of hunger and poverty that has historically characterized the area. In that biome, rivers are typically seasonal, and the shallow crystalline bedrock makes it difficult to sustain perennial water sources, while also leaving groundwater supplies often saline and unfit for drinking. In this context, even though rainfall is scarce, irregular, and unevenly distributed, capturing what little water is available—and gradually expanding its use—is essential to ensure drinking water and to create the minimum conditions needed for food production and diversification, whether for family consumption or small-scale trade.

In the Amazon region, rural access to water is closely tied to its quality. In many riverside communities, the same water used for drinking, cooking, and small-scale farming also receives untreated human waste, without proper treatment or disposal. As a result, poor water quality not only undermines people's health but also constrains the potential for sustainable, productive livelihoods. For this reason, the technologies introduced in the region place a slow sand filter at their core—an efficient, low-cost, and easy-to-maintain device for treating water drawn from surface or underground sources.

In this context, providing communities with technologies and technical guidance tailored to their environment has enormous potential to transform local realities, even serving as a driver for reducing deforestation and illegal mining in the region. By improving the living conditions of people who coexist with the forest, new opportunities emerge: communities can embrace the bioeconomy and biodiversity conservation over short-term economic gains. For example, value chains such as açaí and fisheries carry high added value, but access to safe water is essential for their development, strengthening, and long-term sustainability.

The water stored through the program's social technologies sustains small-scale farming and animal husbandry, ensuring subsistence even un-

der adverse climatic conditions. This not only safeguards household income but also reduces dependence on external markets, creating a stronger foundation for coping with prolonged crises. In the North, for instance, communities that had already adopted these technologies endured the historic 2024 drought without running out of water, significantly reducing their vulnerability.

Supporting rainwater harvesting and storage also helps to reduce pressure on natural resources, as both surface and groundwater sources have been drying at a pace far beyond expectations. To put this into perspective, the social technologies promoted by the Cisterns Program can capture and store around 30 billion liters of water in each rainy season—the equivalent of three million water trucks in a single year.

Rainwater harvesting also helps mitigate both individual and collective risks. Poorer families often spend a significant portion of their income on water or on treating illnesses caused by contaminated sources. By storing higher-quality water—which undergoes a simple treatment—exposure to diseases such as diarrhea is reduced, while resources are freed for education, recreation, or other priorities. This dual benefit, encompassing both health and economic dimensions, strengthens adaptive capacity, making water management a cornerstone of social well-being.

Among solutions addressing water scarcity, the Cisterns Program stands out for its wide-ranging and transformative impact on beneficiaries' lives. Recent evidence shows its effectiveness across nearly every aspect of an individual's life, positively influencing health and income generation, while also serving as a key strategy for adapting to adverse climatic conditions (Britto; Carrilho; Sampaio, 2021a; Britto; Carrilho; Sampaio, 2021b; Casagrande *et al.*, 2021; Da Mata *et al.*, 2023; Gonçalves, 2024; Luna *et al.*, 2011; Silva, 2015).

These impacts demonstrate the great potential of social technologies to enhance the adaptive capacity of communities and individuals living in areas most vulnerable to climate change.

A study by Gonçalves (2024) indicates that cisterns help equalize the capacity to cope with drought between municipalities within the Semi-arid region and those outside it, significantly altering the relationship between waterborne diseases and precipitation. As a result, the Cisterns Program "emerges as a key factor in mitigating—or even neutralizing—climatic shocks that could cause serious harm to the health of populations in the Semi-arid region" (Gonçalves, 2024, p. 195).

However, what distinguishes the Cisterns Program from other water access initiatives is not just its rainwater harvesting component. Recogni-

zing local knowledge and actively involving the community strengthens social bonds and fosters active citizenship. By framing the cistern as a social technology rather than merely an engineering project, participatory processes and social actors are placed at the forefront. Beneficiaries are engaged throughout and participate in training activities on water use and management. At the same time, continuous exchanges of experiences occur, with discussions on shared challenges, nurturing a form of citizenship grounded in the unique characteristics of each territory.

The process of community mobilization and training encourages local organization and knowledge exchange. When addressed collectively, communities become better equipped to respond to climate crises, while access to technologies and knowledge fosters participatory water governance. This resilience is further strengthened through the learning of efficient water-use techniques, enabling the optimization of available resources and the creation of more productive, diverse, and climate-adapted ecosystems.

To illustrate the processes involved, even before climate change became a prominent public concern, the concept of 'living with the climate' as a social claim over one's territory was already widely embraced by low-income farmers in Brazil's Semi-arid region.

Viewed as a kind of prosthesis acting upon the territory, social water-access technologies are interventions with minimal impact on the social landscape. This feature is particularly relevant in Conservation Units, which are among the areas most frequently targeted by the program in the Amazon. Multi-use rainwater systems capture, store, treat, and distribute water to four points within households (two taps, a toilet, and a shower). These technologies differ from the model most widely used by the Cisterns Program in the Semi-arid region—the 16,000-liter plate cistern—as they incorporate additional components that enable broader access to sanitation, including a bathroom and a simplified septic system. To date, more than 7,000 of these systems have been implemented, mostly within federally managed territories such as Conservation Units.

These systems include a greater number of components, yet their installation preserves the socio-environmental characteristics of the territory, as illustrated below. From this perspective, traditional peoples and communities adopt the social technology in a way that is more closely integrated with their environment.

Social technologies are also sensitive to the community organization of the territories they serve. A clear example of this is the program's work in the Yanomami Indigenous Territory, which required extensive dialogue with local actors and the development of a model suited to the unique social dynamics of

this group. The approach is based on other social technologies implemented in the Amazon but adapted for the *xapono*—a circular or polygonal structure with a thatched roof in which multiple families share a common space while each family has its own designated area within the main structure. Given this form of communal organization, it was not feasible to implement individual or family-based components or systems relying on rooftop rainwater collection.

In summary, rainwater harvesting and storage go far beyond a mere technical solution; they represent a multifaceted strategy that combines resilience and adaptation. This system ensures access to a vital resource in times of crisis, empowers communities with greater autonomy, reduces financial and health vulnerabilities, and promotes sustainable consumption and production practices. For vulnerable families, this approach is an important step toward climate justice, ensuring that those most affected by climate change have the tools not only to survive but to build more dignified and resilient futures.

Integration of technologies with the landscape. Photo: João Albuquerque.

Social technologies for water access have a low impact on community dynamics and preserve the socio-environmental characteristics of the territory, which is especially relevant in Conservation Units. Photo: Stanny Saraiva.

The social and economic outcomes achieved reflect the cumulative efforts of over twenty years of the Cisterns Program. During this time, technological and institutional innovations have enabled the establishment of a public policy capable of withstanding—though not without strain—a period of intense disruption. Simultaneously, the program has demonstrated the ability to reinvent itself and innovate in multiple areas, offering mechanisms to reach populations and territories that few other public policies have effectively reached.

Even so, the challenges ahead demand new responses and institutional approaches, given a more difficult political, economic, and social context, a still vast contingent of rural poor families without safe access to water, and increasingly complex needs. In this scenario, the coordination of public policies, implementation of social innovations, and dissemination of sustainable practices and technologies are essential to continue providing effective solutions in the face of increasingly frequent extreme climate events.

Cistern Program in the Yanomami Indigenous Territory. Implementing the program in this territory required dialogue with the local actors working there and the development of a model suited to the specific dynamics of the Yanomami people. Photo: Stanny Saraiva.

Considerations

The Cisterns Program began with the deployment of simple rainwater harvesting and storage systems, initiated in response to civil society demands in the Semi-arid region, as a counterpoint to historically centralized and largely ineffective policies. Over the years, these social technologies have been adapted to diverse social and territorial contexts—including the Amazon biome, Indigenous lands, and Quilombola communities—while retaining the simplicity that defines the concept of social technology.

Implementing rainwater harvesting and storage structures has emerged as a key strategy for strengthening the resilience and adaptive capacity of vulnerable families facing climate-related challenges. In regions where water availability is threatened by prolonged droughts or environmental degradation, this practice not only mitigates immediate risks but also enhances community autonomy, creating a virtuous cycle of sustainability. The set of social technologies implemented currently provides a comprehensive response to a critical social issue and serves as a driver of social and economic development for rural communities in the country's most vulnerable territories.

Nonetheless, the program still faces significant hurdles: the large number of poor families lacking reliable water access, the need to scale implementation beyond the North and Northeast regions, and the necessity of identifying or adapting technologies suitable for a broader range of populations and territories.

REFERENCES

BRITTO, D.; CARRILHO, B.; SAMPAIO, B. *Análise de impacto do Programa Cisternas 1ª Água sobre indicadores de saúde.* [s. l.]: GAPPE; UFPE; SUDENE; MDR, 2021a. Available at: https://www.gov.br/sudene/pt-br/centrais-de-conteudo/ted0172020-produto4.pdf. Accessed: 8 Aug. 2025.

BRITTO, D.; CARRILHO, B.; SAMPAIO, B. *Análise de impacto do Programa Cisternas 1ª Água sobre indicadores de mercado de trabalho.* [s. l.]: GAPPE; UFPE; SUDENE; MDR, 2021b. Available at: https://www.gov.br/sudene/pt-br/centrais-de-conteudo/ted0172020-produto2.pdf. Accessed: 8 Aug. 2025.

CASAGRANDE, D. *et al*. *Tecnologias sociais e renda*: evidências do Programa Cisternas Segunda Água no Brasil. [s. l.]: ANPEC, 2021. Available at: https://www.anpec.org.br/encontro/2022/submissao/files_I/i12-ac57d2d948a7eddeb19455c94b7f857b.pdf. Accessed: 8 Aug. 2025.

DA MATA, D. *et al*. Climate adaptation policies and infant health: Evidence from a water policy in Brazil. *Journal of Public Economics,* v. 220, abr. 2023. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0047272723000178. Accessed: 8 Aug. 2025.

GONÇALVES, M. O Programa Cisternas como estratégia de adaptação climática. In: SAHB, C. M.; SANTANA, V. L.; MUCHAGATA, M. (orgs.). *Água para colher futuro*: 20 anos do Programa Cisternas. Brasília: Ministério do Desenvolvimento, Assistência Social, Família e Combate à Fome; Fiocruz; Zabelê Comunicação, 2024.

JASECHKO, S. *et al*. Rapid groundwater decline and some cases of recovery in aquifers globally. *Nature*, v. 625, p. 715-721, 2024. Available at: https://rdcu.be/dWfL4. Accessed: 8 Aug. 2025.

LUNA, C. *et al*. Impacto do uso da água de cisternas na ocorrência de episódios diarreicos na população rural do agreste central de Pernambuco, Brasil. *Revista Brasileira Saúde Materno-Infantil*, v. 11, n. 3, set. 2011. Available at: https://www.scielo.br/j/rbsmi/a/NSzHWyjCZGj3WH6pnf5kgGS/. Accessed: 8 Aug. 2025.

MAPBIOMAS. Mapeamento da superfície de água no Brasil. [s. l.]: *MapBiomas*, [2025]. (Coleção 3.) Available at: https://brasil.mapbiomas.org/wp-content/uploads/sites/4/2024/06/Fact_MapBiomas_Agua_2023_25.06.24.pdf. Accessed: 8 Aug. 2025.

SANTANA, V.; RAHAL, L. Tecnologias sociais como impulso para o acesso à água e o desenvolvimento sustentável no meio rural brasileiro: a experiência do Programa Cisternas. In: GRAMKOW, C. (org.). *Investimentos transformadores para um estilo de desenvolvimento sustentável:* estudos de casos de grande impulso (Big Push) para a sustentabilidade no Brasil. Santiago: Comissão Econômica para a América Latina e o Caribe (CEPAL), 2020.

SILVA, L. *O impacto de cisternas rurais sobre a saúde infantil: uma avaliação do Programa 1 Milhão de Cisternas, 2000-2010.* Dissertação (Mestrado em Economia) – Centro de Ciências Sociais Aplicadas, Universidade Federal de Pernambuco, Recife, 2015.

The Food Acquisition Program and the Response to Climate Change: PAA Indigenous and PAA Quilombola Modalities

Luiz Antônio de Oliveira
Elisângela Sanches Januário
Mariana Ferreira Madruga
Camila Batista Marins Carneiro

Introduction

Brazil is a country of continental dimensions, with much of its territory still covered by native vegetation. This includes vast tropical forests such as the Amazon and the Atlantic Forest, as well as other important biomes like the Cerrado, Pantanal, Caatinga, Pampa, and the Coastal-Marine Zone—placing the country among the world's megadiverse nations. Brazil also stands out for the sociocultural diversity of its population, which includes more than 300 Indigenous peoples, according to the 2010 Census of the Brazilian Institute of Geography and Statistics (IBGE), along with numerous other traditional peoples and communities (PCTs). These groups are guardians of traditional knowledge related to (agro)food systems and biodiversity management, with their own unique, community-based ways of living[1].

The increasing frequency of extreme climate events, compounded by environmental racism and climate injustices, has significantly impacted the food and nutritional security of the most vulnerable populations. Among these are rural communities, particularly traditional peoples and communities (PCTs), whose ways of life are closely tied to the management of local biodiversity. This situation has required Food Security policies to develop responses that integrate multiple strategies, going beyond emergency humanitarian assistance.

Thus, it is important to recognize that the impacts of climate change do not affect all segments of the population equally. For traditional peoples and communities, adapting to and coping with this new reality requires ensuring the protection of their territories, maintaining decision-making authority over the use of natural resources within them, and valuing and recognizing the importance of traditional agricultural practices as key contributors to food and nutritional security.

Ensuring food sovereignty and security for these peoples and communities requires tailoring policies to the particularities of their territories, food systems, and "world management practices" (Luciano, 2019). This approach calls for integrating sociocultural and environmental consi-

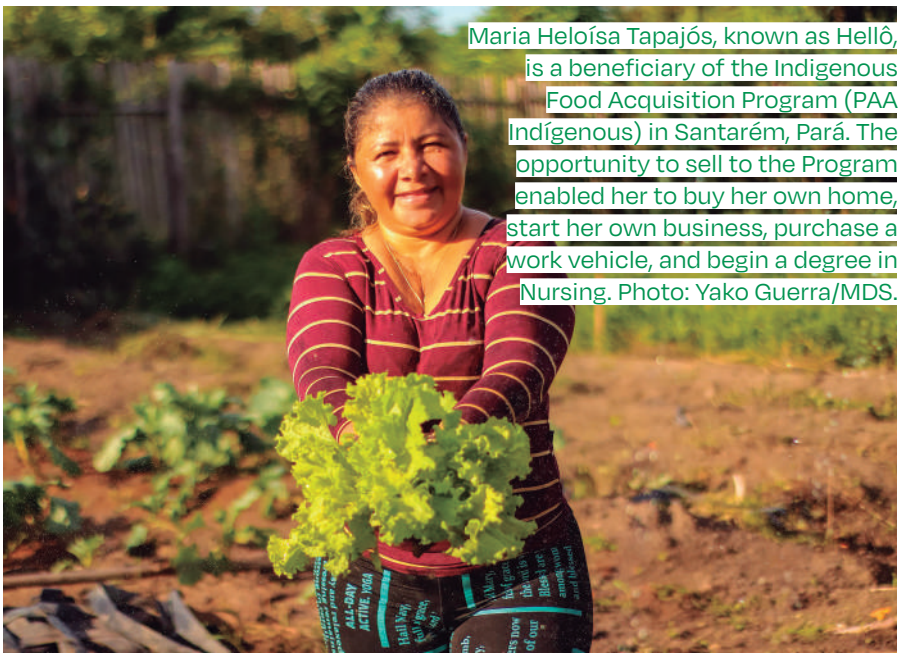
---

1 Traditional peoples and communities (PCTs) are officially recognized by the Brazilian government through Decree No. 6,040 of February 7, 2007 (Brazil, 2007), which established the National Policy for the Sustainable Development of Traditional Peoples and Communities. Defined as culturally distinct groups that identify themselves as such, PCTs have their own forms of social organization, as well as unique ways of using and occupying territories and managing natural resources to sustain their cultural, social, religious, ancestral, and economic practices. The 28 PCT segments officially recognized are listed in Decree No. 8,750 of May 9, 2016 (Brazil, 2016), which established the National Council of Traditional Peoples and Communities. For further information, see *Povos*... ([201-]).

derations into the design and implementation of public policies, recognizing that one-size-fits-all measures are insufficient.

To strengthen the participation of Indigenous peoples and Quilombola (Afro-Brazilian) communities in the Food Acquisition Program (PAA), the National Secretariat for Food and Nutritional Security (SESAN) of the Ministry of Social Development, Family, and Fight against Hunger (MDS) launched targeted initiatives in 2023, known as PAA-Indigenous and PAA-Quilombola.

Through this initiative, Indigenous and Quilombola communities have been effectively prioritized in the purchase of the foods they produce, which are then distributed through public or community facilities—such as schools or social assistance and food security centers—located within their territories or nearby areas. The main goal is to reduce reliance on food baskets, whose contents often fail to meet the nutritional and cultural needs of these diverse communities. The program seeks to encourage the revival of traditional food systems, strengthen community solidarity, and support social reproduction processes that have been undermined by years of public neglect and both local and institutionalized racism. Additionally, it seeks to enhance the resilience of Indigenous and Quilombola communities in the face of climate-related emergencies.



Maria Heloísa Tapajós, known as Hellô, is a beneficiary of the Indigenous Food Acquisition Program (PAA Indígenous) in Santarém, Pará. The opportunity to sell to the Program enabled her to buy her own home, start her own business, purchase a work vehicle, and begin a degree in Nursing. Photo: Yako Guerra/MDS.

The Food Acquisition Program (PAA), carried out in partnership with Indigenous and Quilombola communities, has reached thousands of people across several states. It illustrates how Food Security policies can be more effectively adapted to their specific needs, serving as a strong example of public policy that advances the human right to adequate and healthy food. Recent regulatory changes and the allocation of resources have further increased the participation of Indigenous and Quilombola peoples in the program, while also raising their visibility to local public authorities, who often had not recognized them or had overlooked them as priority beneficiaries.

The Food Acquisition Program

The Food Acquisition Program (PAA) was established in July 2003 under the Zero Hunger Program, through Law No. 10,696 (Brazil, 2003). Twenty years later, it was re-established by Law No. 14,628 (Brazil, 2023a), which also created the Solidarity Kitchen Program[2]. The PAA's core mission is to bridge the two sides of Food Security: small-scale producers and people in need of food. The PAA's core mission is to bridge the two sides of Food Security: small-scale producers and people in need of food. By strengthening family farming and local production chains, the program generates income, stimulates regional economies, and expands access to healthier products that are culturally appropriate to the dietary practices and food systems of communities facing food insecurity.

The relaunch of the PAA comes at a time when agendas to support family farming and combat hunger are being rebuilt. It promotes both the productive inclusion of traditional peoples and communities (PCTs) in public procurement markets and encourages healthier eating practices. An example is Decree No. 11,936 of March 5, 2024 (Brazil, 2024a), which establishes the composition of the national food basket under the National Food and Nutrition Security Policy and the National Food Supply Policy.

It is worth noting that family farming and the practices of traditional peoples and communities play a strategic role in both biodiversity conser-

---

2 Regulated by Decree No. 11,937 of March 5, 2024 (Brazil, 2024b), the Solidarity Kitchen Program supports civil society initiatives that produce and offer free, quality meals to people in situations of vulnerability and social risk, including the homeless population. The program operates through three types of support: i) financial support to management units to cover operating, personnel, and maintenance expenses; ii) supply of fresh and minimally processed foods through the PAA; and iii) support for employee training and the implementation of projects that address training processes. For more information, see Program... ([202-]).

vation and the production of genuinely healthy, sustainable, and culturally appropriate food. Territories traditionally occupied by Indigenous peoples, Quilombolas, and other traditional communities have proven particularly effective in safeguarding native vegetation, serving as vital barriers to deforestation. As Doblas and Oviedo (2021) highlight, these territories are critical for maintaining forest cover and preventing environmental degradation. Their effectiveness, as the authors argue, underscores the urgent need for public policies that not only ensure their protection but also recognize traditional ways of life as central to addressing environmental, food, and climate crises.

When the PAA was relaunched in 2023, its Management Group (GGPAA) was also reinstated and introduced important updates to the program's regulations. Notably, traditional peoples and communities (PCTs) can now sell plant- or animal-based products without formal registration, inspection, or oversight, as long as the food is consumed within local nutrition and feeding facilities—Art. 6, §2, GGPAA Resolution No. 2, June 15, 2023 (Brazil, 2023b). This adjustment reflects the principles outlined in Technical Note No. 03/2020/6ªCCR/MPF (Brazil, 2020), which emphasizes respecting traditional production and consumption practices while maintaining minimum safety standards, and recognizing the cultural, social, and nutritional value of these foods.

Another important development is that traditional peoples and communities (PCTs) can now register as food suppliers using the Social Identification Number (NIS) from the federal government's Single Registry (CadÚnico), as an alternative to presenting the Declaration of Aptitude for PRONAF (DAP) or the National Family Farming Registry (CAF), in accordance with Art. 5 of GGPAA Resolution No. 3, September 5, 2023 (Brazil, 2023c). This change was prompted by the difficulty PCTs often face in obtaining these documents, largely due to the diversity of land tenure situations in their territories, many of which are still not regularized or are located in areas of repossession.

PAA Indigenous and PAA Quilombola

By the first half of 2025, the PAA-Indigenous and PAA-Quilombola programs were being implemented in 20 states across all regions of the country through agreements signed with the Ministry of Social Development and Fight against Hunger (MDS). Over this period, more than BRL 83 million were allocated to these initiatives. This funding was crucial in ensuring that Indigenous and Quilombola communities had effective access to the PAA, promoting, as noted earlier, productive inclusion as well as food sovereignty and security in traditional territories that have historically been more vulnerable to climate-

-related events. It is also important to note that, beyond these dedicated funds, regulatory adjustments have enabled greater Indigenous and Quilombola participation in PAA programs administered by various municipalities, with additional attention warranted for projects contracted by the National Supply Company (CONAB).

This approach plays a key role in addressing climate change by recognizing and valuing the sociocultural diversity and traditional ways of life of these communities. Equally important, by being developed in collaboration with the states—which implement the program in a decentralized way—the PAA initiatives for specific groups have increased their visibility to local policy actors. Implementing these resources required proactive efforts to include communities that had previously been excluded, such as properly registering their identities in CadÚnico and enabling access to state systems for issuing sales invoices. These steps have also opened doors to other programs, including selling food to the National School Feeding Program (PNAE) and accessing technical assistance and rural extension services (ATER), among others.

The significance of this affirmative action within the program is reflected not only in the economic impact of the resources allocated between 2023 and 2025 but also in its social and environmental effects on the communities. The initiative has strengthened family farming and its sustainable production practices; supported traditional management of natural resources and socio-biodiversity products; promoted food sovereignty and nutritional security; fostered the recognition and value of diverse traditional foods and knowledge; and contributed to the sustainable development of Indigenous and Quilombola communities across multiple states in the country.

FIGURE 1 Percentage of participation of farmers belonging to non-traditional peoples and communities in the PAA

Source: MDS ([2025]).

The agriculture practiced by traditional peoples and communities plays a strategic role in conserving biodiversity and producing healthy, sustainable, and culturally appropriate food. Photo: Mateus Fernando/ASCOM SEADES/Government of Bahia.

The following graph shows the share of family farmers belonging to Indigenous peoples, Quilombola communities, and traditional populations (PCT) as food suppliers to the PAA from 2022 to 2024. It is also noteworthy that in the first half of 2025, this share had already reached 20.7%.

The PAA features an enormous diversity of foods produced by traditional peoples and communities, as well as other family farming suppliers. While conventional food baskets typically include six to seven types of items, it is estimated that the PAA nationally included more than 200 distinct food items in the first half of 2025[3]. These covered fruits, vegetables, roots, meats, eggs, and traditional processed products—such as native fruit pulps, manioc flour, *beiju* (traditional manioc-based pancake), and homemade biscuits. This diversity not only supports local production and healthy dietary patterns but also helps combat chronic non-communicable diseases (NCDs) by encouraging the consumption of fresh, minimally processed foods over ultra-processed products.

In this way, implementing the PAA in Indigenous and Quilombola territories serves as a strategy to address food insecurity while empowering communities. The program strengthens local productive capacity, generates income, and reinforces food sovereignty and autonomy over their lands. In doing so, it supports the protection of their rights and the pursuit of well-being and self-determined development.

3 Internal Data API-DONATION Terms of Agreement, extracted July 2025. Data are subject to change.

Considerations

Traditional peoples and communities (PCTs) play a central role in creating and sustaining resilient territories, making them key actors in climate change adaptation and mitigation. Their ways of life, based on balanced relationships with nature, carry generations of knowledge about sustainable resource management, biodiversity conservation, and adapting to climate cycles. Supporting these practices not only enhances local livelihoods and food security but also reinforces climate strategies that have long existed within these territories. Recognizing this knowledge means understanding that effective responses to the climate crisis require listening to and empowering the communities that have been caretakers of the land, water, and food for centuries.

Therefore, the PAA has proven to be a vital public policy for addressing climate change by fostering sustainable food systems, supporting agroecological practices, and recognizing the traditional knowledge of Indigenous peoples, Quilombola communities, and other traditional communities. By ensuring access to healthy, diverse food and encouraging the preservation of socio-biodiversity, the program not only tackles food insecurity but also strengthens the resilience of territories facing extreme climate events. Expanding and enhancing this policy is, consequently, an investment in social justice, food security, and the creation of a future where environmental balance and cultural diversity are safeguarded.

Expanding access to the PAA for Indigenous peoples and Quilombola communities represents a major step forward in public policy, recognizing the need for structural measures that improve living conditions and ensure food and nutritional security for these groups. Rather than relying solely on short-term emergency measures, the PAA-Indigenous and PAA--Quilombola programs provide a continuous and sustainable response, especially important given the climate impacts that heighten the vulnerability of traditional territories. By gradually replacing the welfare-based model of centralized food basket distribution with a public procurement system that values traditional knowledge, local foods, and food cultures, these innovative initiatives strengthen community autonomy, support local production, and help build more resilient and equitable food systems.

REFERENCES

BRASIL. *Decreto n. 11.936, de 5 de março de 2024.* Dispõe sobre a composição da cesta básica de alimentos no âmbito daPolítica Nacional de Abastecimento Alimentar. Brasília, 2024a. Available at: Política Nacional de Segurança Alimentar e Nutricional e da : https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2024/decreto/d11936.htm. Accessed: 15 Aug. 2025.

BRASIL. *Decreto n. 11.937, de 5 de março de 2024.* Regulamenta o Programa Cozinha Solidária. Brasília, 2024b. Available at: https://bibliotecadigital.mdh.gov.br/jspui/handle/192/12198. Accessed: 15 Aug. 2025.

BRASIL. *Decreto n. 6.040, 7 de fevereiro de 2007.* Institui a Política Nacional de Desenvolvimento Sustentável dos Povos e Comunidades Tradicionais. Brasília, 2007. Disponível em: https://www.planalto.gov.br/ccivil_03/_ato2007-2010/2007/decreto/d6040.htm. Accessed: 15 Aug. 2025.

BRASIL. *Decreto n. 8.750, de 9 de maio de 2016*. Institui o Conselho Nacional dos Povos e Comunidades Tradicionais. Brasília, 2016. Available at: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2016/decreto/d8750.htm. Accessed: 15 Aug. 2025.

BRASIL. *Lei n. 10.696, de 2 de julho de 2003.* Dispõe sobre a repactuação e o alongamento de dívidas oriundas de operações de crédito rural, e dá outras providências. Brasília, 2003. Available at: https://www.planalto.gov.br/ccivil_03/leis/2003/l10.696.htm. Accessed: 15 Aug. 2025.

BRASIL. *Lei n. 14.628, de 20 de julho de 2023.* Institui o Programa de Aquisição de Alimentos (PAA) e o Programa Cozinha Solidária; altera as Leis n. 12.512, de 14 de outubro de 2011, e 14.133, de 1º de abril de 2021 (Lei de Licitações e Contratos Administrativos); e revoga dispositivos das Leis n. 11.718, de 20 de junho de 2008, 11.775, de 17 de setembro de 2008, 12.512, de 14 de outubro de 2011, e 14.284, de 29 de dezembro de 2021. Brasília, 2023a. Available at: https://www.planalto.gov.br/ccivil_03/_Ato2023-2026/2023/Lei/L14628.htm. Accessed: 15 Aug. 2025.

BRASIL. Ministério Público Federal. *Nota Técnica n. 03/2020/6ªCCR/MPF.* Brasília, 2020. Available at: https://www.mpf.mp.br/atuacao-tematica/ccr6/catrapovosbrasil/documentos-e-publicacoes/nota_tecnica_geral_-_3-2020_6ccr_-_alimentos_tradicionais.pdf. Accessed: 15 Aug. 2025.

BRASIL. *Resolução GGPAA n. 2, de 15 de junho de 2023*. Dispõe acerca da destinação dos alimentos adquiridos com recursos do Programa de Aquisição de Alimentos (PAA). Brasília, 2023b. Available at: https://www.in.gov.br/en/web/dou/-/resolucao-n-2-de-15-de-junho-de-2023-490427463. Accessed: 15 Aug. 2025.

BRASIL. *Resolução GGPAA n. 3, de 5 de setembro de 2023*. Estabelece as normas que regem a modalidade Compra com Doação Simultânea – CDS, no âmbito do Programa de Aquisição de Alimentos – PAA. Brasília, 2023c. Available at: https://www.in.gov.br/en/web/dou/-/resolucao-ggpaa-n-3-de-5-de-setembro-de-2023-508083635. Accessed: 15 Aug. 2025.

DOBLAS, J.; OVIEDO, A. Efetividade dos territórios tradicionalmente ocupados na manutenção da cobertura vegetal natural no Brasil. *In*: CUNHA, M. C. da; MAGALHÃES, S. B.; ADAMS, C. (orgs.). *Os territórios indígenas e tradicionais protegem a biodiversidade?* São Paulo: SBPC, 2021, p. 14-58.

IBGE. Instituto Brasileiro de Geografia e Estatística. *Características gerais dos indígenas no Censo Demográfico 2010*. Resultados do Universo. Rio de Janeiro: IBGE, 2012.

LUCIANO, G. J. dos S. Educação para manejo do mundo. *Articulando e Construindo Saberes,* Goiânia, v. 4, 2019. Available at: https://revistas.ufg.br/racs/article/view/59074. Accessed: 15 Aug. 2025.

MINISTÉRIO DO DESENVOLVIMENTO E ASSISTÊNCIA SOCIAL, FAMÍLIA E COMBATE À FOME (MDS). Monitora MDS. *Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome*, [2025]. Available at: https://mds.gov.br/monitora/. Accessed: 15 Aug. 2025.

POVOS e comunidades tradicionais. *Ministério do Meio Ambiente e Mudança do Clima,* [201-]. Available at: https://www.gov.br/mma/pt-br/assuntos/povos-e-comunidades-tradicionais. Accessed: 15 Aug. 2025.

PROGRAMA Cozinha Solidária: o governo federal abraça esta iniciativa. *Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome,* [202-]. Available at: https://www.gov.br/mds/pt-br/acoes-e-programas/acesso-a-alimentos-e-a-agua/programa-cozinha-solidaria. Accessed: 15 Aug. 2025.

Rural Productive Activities Promotion Program and Productive Inclusion in a Changing Climate

Ana Amélia da Silva
Camile Marques Sahb

Introduction

When discussing the impacts of climate change, one point of consensus among scientists and environmentalists is that its effects will not be felt equally: outcomes vary depending on geography, levels of development, and income. The most vulnerable populations are expected to experience the harshest consequences, while socially privileged groups will be better shielded. In this context, both governments and society at large must forge an ethical and humanitarian pact to design actions that strengthen the adaptive capacity and resilience of those most at risk. Such actions must be multidimensional, offering not only adaptive responses but also measures that contribute to mitigation.

Productive inclusion policies are among the essential tools governments must deploy to address social vulnerabilities in the context of climate change. Because they require intersectoral and intergovernmental coordination, these policies are inherently complex to implement. Experience shows that programs are far more effective when they arrive in a coordinated and timely manner in the communities they are meant to serve. At one stage, implementers placed strong expectations on Brazil's Unified Registry for Social Programs (CadÚnico) as the mechanism that could align different policies, since it targets the same population. Y*et al*igning on beneficiaries alone is not enough: public policies must also converge on the ground, reaching territories simultaneously to generate real synergies and multiplier effects.

In the field of productive inclusion, transferring sustainable techniques and practices is essential for developing livelihoods that take into account the realities of climate change. Shifting production toward an agroecological model—while recovering and enhancing traditional knowledge—is a key strategy for meeting the challenges posed by new environmental conditions. Yet this transition is far from straightforward. For decades, the principles of the Green Revolution were promoted as a magic formula for prosperity and food surplus, a model embraced even by smallholder farmers.

This article aims to present the experience of rural productive inclusion through the Rural Productive Activities Promotion Program (*Programa Fomento Rural*), starting from the recognition that poverty in rural Brazil is proportionally higher than in urban areas. Within this population, there is also a segment that does not necessarily identify with agriculture: they live in rural areas but are not engaged in farming or food production. After briefly contextualizing the relationship between climate change and poverty, the article offers a short description of the program, an overview of its current state, and a discussion of the challenges and opportunities it presents for addressing rural poverty in Brazil.

Climate change, poverty, and productive inclusion

Research shows that the social impacts of climate change include rising poverty and food insecurity, as well as the loss of assets and livelihoods. This reality highlights the urgent need to integrate social protection with the climate agenda. At the same time, poor families are the most vulnerable to natural disasters and have the least capacity to recover, making them disproportionately affected by their consequences (Bagolle, Costella & Goyeneche, 2023).

Climate change has also been shown to directly affect agricultural production, with disproportionate impacts on smallholder farming families, who are already among the most vulnerable. Environmental degradation exacerbates these challenges, particularly for poor rural populations whose livelihoods heavily depend on the ecosystems within their local biomes. This means that socioeconomic factors can significantly erode the resilience and adaptive capacity of these communities, leaving them highly exposed to climate risks (Padovezi, Oliveira & Jacob, 2018).

Reducing the vulnerability of these populations to climate risks necessarily requires addressing their underlying social vulnerabilities. This raises a key question: to what extent can social policies support the most vulnerable households in building resilience to increasingly frequent climate shocks? As Tafner *et al*. (2025, p. 2) observe, "states that integrating climate risk into social protection helps shield households from immediate climate shocks and also contributes to longer-term development goals by building resilience and adaptive capacity".

In a comparative assessment across Latin American countries, Brazil is classified as having a medium level of vulnerability to climate change (Bagolle, Costella & Goyeneche, 2023). Within this context, the challenge lies in innovating current productive models so that they simultaneously contribute to mitigating global warming while also fostering strategies for resilience and adaptation to ongoing climate change (Padovezi, Oliveira & Jacob, 2018).

An investment made in a rural property can be lost due to a climate emergency, as occurred in several municipalities of Rio Grande do Sul during the severe droughts of 2023 and the major floods of 2024. In the case of the Rural Productive Activities Promotion Program, families whose productive activities were disrupted in the state were identified by the public Technical Assistance and Rural Extension (ATER) services and re-enrolled in the program following a resolution of its federal-level management committee. To date, 2,403 families in Rio Grande do Sul have been reintroduced into the Program after these adverse climate events.

Within family farming, agroecology has emerged as a widely discussed strategy, linking productive practices to sustainability and drawing on traditional knowledge. This approach fosters more integrated farming systems and strengthens community ties (Caporal, Costabeber, 2000). For low-income families, ensuring participation in the selection of productive projects they consider most suitable for their rural properties has been recognized as a key factor in promoting greater income sustainability over time.

Another critical factor in addressing the vulnerabilities of rural families affected by climate change is the significant presence of women as heads of households within the income group targeted by the program. Evidence shows that women and children are disproportionately affected by climate-related risks (Bagolle, Costella & Goyeneche, 2023), as they typically constitute the majority within the most vulnerable populations.

Farmer Lourença Moraes, from the Mamuna Quilombo in Alcântara, Maranhão. Climate change affects agricultural production, especially that of the most vulnerable smallholder families. Photo: Claudio Verissimo.

The Rural Promotion Program: origins and objectives

The Rural Productive Activities Promotion Program was launched in 2011 to contribute to the reduction of rural poverty, as part of the Brazil Without Extreme Poverty Plan, established by Law No. 12,512 of October 14, 2011 (Brazil, 2011b) and regulated by Decree No. 9,221 of December 6, 2011, with subsequent amendments (Brazil, 2011a). The program's main objectives are to promote food security through rural productive inclusion and to generate income through the commercialization of production surpluses. To achieve these goals, it combines two core components: household support provided through technical assistance services, and a non-reimbursable cash transfer to participating families.

The technical assistance service is responsible for assessing the socioeconomic conditions of families and identifying their skills and prior knowledge. Based on this diagnosis, a productive project is designed to be implemented through both individual and collective activities. Household follow-up is essential to the program's success, as it involves technical visits and guidance that support effective implementation and help mitigate potential challenges. The financial transfer, in turn, strengthens this process by enabling beneficiaries to invest in their properties, thereby making the productive project feasible.

The Ministry of Social Development and Assistance, Family, and the Fight against Hunger (MDS) is the federal agency responsible for implementing the program. To this end, it may establish partnerships to deliver household follow-up services for social and productive inclusion. These partnerships can involve states and, in some cases, municipalities, as well as autonomous social service organizations, agencies overseeing water-access programs for production, rural technical assistance and extension institutions, federal universities, and federal institutes of education, science, and technology.

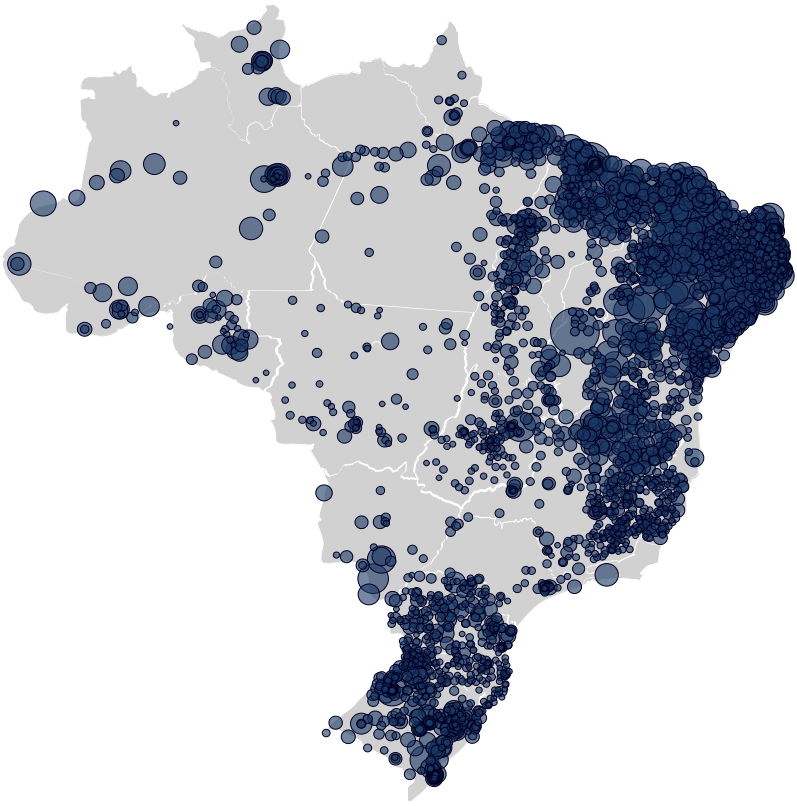
The program also seeks integration with other public policies, such as supporting and guiding families in accessing supervised microcredit through the PRONAF-B modality, as well as in developing strategies for marketing production surpluses, including through the Food Acquisition Program (PAA). In line with MDS guidelines, which prioritize identifying women as the heads of households registered in CadÚnico, most of the program's beneficiary families are women-led. This focus has recently enabled a partnership with the Productive Backyards Program for Rural Women, coordinated by the Ministry of Agrarian Development and Family Farming (MDA).

Current status of the Rural Promotion Program

According to the CadÚnico, 4,536,577 rural families are living in poverty (CECAD 2.0, August 2025), who need access to programs such as the Rural Production Activities Promotion Program to expand and diversify food production and income-generating activities. Such support contributes to improved Food Security while helping families overcome poverty.

Between 2012 and mid-2025, approximately 350,000 families were reached by the program—a relatively small proportion compared to the total population in need. This limited coverage reflects both the technical capacity constraints of rural technical assistance teams (ATER) in the territories and the budgetary restrictions the program has faced in recent years. Many of the most vulnerable families also reside in remote and hard-to-reach areas, which often hinders the effective provision of technical support.

FIGURE 1 Coverage of the Rural Productive Activities Promotion Program (2012–2025)



Source: Rural Promotion Program database (CGFOM/DFA/SESAN/MDS), reference July 2025.

Among the objectives of the Rural Development Program are promoting food security through rural productive inclusion and generating income through the commercialization of production surpluses.

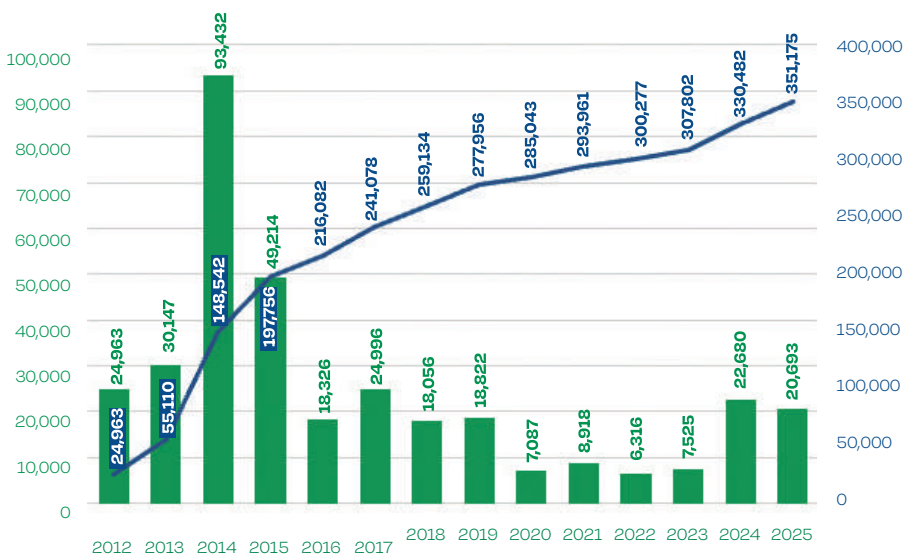
Photo: Marcelo Curia

Significant institutional changes took place between 2016 and 2022, including the dissolution of the Ministry of Agrarian Development (MDA). This shift forced the Ministry of Social Development (MDS) to seek alternative partners to deliver technical assistance and rural extension (ATER) to program participants. Public state-level ATER agencies (EMATER) emerged as the main partners, becoming the primary providers of technical assistance in recent years. Nonetheless, private entities also played a role, either through service contracts issued by the National Agency for Technical Assistance and Rural Extension (ANATER) or through integrated implementation with the Cisterns Program, where executing organizations combined the Household Monitoring Service for Social and Productive Inclusion (SAFISP) with the construction of water cisterns for production, particularly in the Semi-Arid region.

Coordination with state governments was crucial to keeping the program alive during a period highly unfavorable to social policies. However, it was only from 2023 onward that state participation was formally incorporated into the program's design through an official adhesion process. Currently, state governments are responsible for more than 70% of the program's technical assistance delivery.

As of mid-2025, the Rural Promotion Program has reached a total of 351,175 families since its inception in January 2012. Of this total, 50,898 families were included between January 2023 and June 2025, as shown in the graph below.

FIGURE 2 Families assisted by the Rural Productive Activities Promotion Program (2012-2025)



Source: Rural Productive Activities Promotion Program database (CGFOM/DFA/SESAN/MDS), reference July 2025.

Agroecology combines productive practices with sustainability and seeks a closer connection with traditional knowledge, fostering a stronger sense of community
Photo: André Oliveira/MDS.

Indeed, state-level rural extension agencies vary considerably in their structures and capacities. Yet, even within this heterogeneous landscape, the program has delivered positive outcomes. Many of these agencies had not previously engaged with the poorest rural households—whether due to distance, lack of knowledge, or limited interest—even though these families face greater barriers to entering more structured, long-term activities. Bringing this population into the scope of public rural extension policy already represents a significant achievement of the Program.

The Rural Productive Activities Promotion Program was conceived on the premise that poverty is multidimensional and that effective responses require intersectoral approaches. This rationale underpins the program's design, which combines two complementary dimensions. At the same time, coordinating a single policy across different government sectors has never been a straightforward task, given the high degree of specialization that typically characterizes public administration. For this reason, the program is best understood as one component within a broader policy framework, whose effectiveness depends on its articulation with other initiatives capable of addressing the complex and persistent challenge of rural poverty.

A promising initiative has been the joint implementation of the Program and production-oriented cisterns in the Semi-arid region. This approach links access to water with support for productive inclusion, targeting populations living in areas of chronic water scarcity, where both crop cultivation and livestock raising are severely constrained. According to Padovezi, Oliveira, and Jacob (2018), the semi-arid biome has already been identified as the one most likely to suffer the impacts of climate change in Brazil.

Launched as a pilot project in 2018—financed through a public call by the Brazilian Development Bank (BNDES) and implemented by the One Million Cisterns Program Association (AP1MC)—this initiative was later adopted, in 2023, as an executive guideline within the National Secretariat for Food and Nutrition Security (SESAN). Since then, all production-oriented cisterns contracted under the program have been designed to integrate with the Rural Promotion Program. Within this framework, the investment allocated to each productive backyard amounts to roughly BRL 32,000.00, covering water-access technology, technical assistance, and direct financial transfers to participating families.

Lastly, evaluations of the Program indicate that beneficiary households experience long-term income growth. Preliminary findings from the program's impact evaluation, conducted by researchers at the Federal University of Pernambuco, indicated an income increase of more than 23% among participating families between 2018 and 2024. In addition, food security among these households improved by 21%.

Another evaluation—this time focused on the program's implementation—is being conducted by researchers at the University of Brasília. The study has shown that, despite variations in how public and private rural technical assistance (ATER) providers implement their activities, the program delivers visible, immediate benefits for participating families. Testimonies collected during the research highlight cases in which beneficiary households were able to resume small-scale production and invest in projects that expanded their opportunities for income generation.

Challenges and Future Directions

In the practical implementation of public policies, the prospects for any initiative are always tied to the availability of financial resources. The Rural Productive Activities Promotion Program is no exception. Although funding has been partially restored since 2023, with R$113 million allocated in 2025, this amount remains insufficient to generate more consistent results at the territorial level. Compounding this limitation is the way technical assistance providers have chosen to territorialize program delivery: in an effort to reach the largest possible number of municipalities, they end up serving only a small number of families in each locality. This approach reduces opportunities for collective organization and limits the potential for more effective use of the resources invested in each territory.

Technical assistance itself represents a major challenge. The need to expand coverage and modernize communication channels between technicians and beneficiary families is hampered by chronic underfunding, as the service currently lacks any systematic financial support from the federal government. Beyond structural limitations that restrict both the quantity and quality of service, there is no continuous policy for capacity building addressing technical skills, gender perspectives, or deeper knowledge of the target population, their organizational capacities, and potential integration with other local policies. Despite these gaps, these technicians often serve as one of the few links between rural families and the state, with the Ater service acting as a gateway to other public policies, including registration in the CadÚnico. The Ministry of Agrarian Development (MDA), as coordinator of the National Policy for Technical Assistance and Rural Extension for Family Farming and Agrarian Reform (PNATER), has sought to establish a unified system of technical assistance and rural extension. Still, progress depends on legislative approval and sufficient funding. The reality is that, while this service is crucial for the social development of the poorest rural populations, it remains insufficient and requires comprehensive investment.

Another key challenge lies in integrating the Rural Promotion Program with other public policies. Participation in the program represents a targeted intervention, but complementary actions must be accessible to ensure the sustainable development of participating families. Technical assistance, in particular, must maintain ongoing engagement with beneficiaries, providing support for subsequent stages such as access to bank credit, market opportunities, and participation in public procurement programs.

Additionally, the Program itself needs to further develop its management tools to strengthen collaboration with states and other partners. The creation of a new management system would allow for more detailed tracking of family-based productive projects, supporting a better assessment of the Program outcomes. Operational frameworks also need to be enhanced to ensure that procedures are clear and transparent for both beneficiaries and partners. Finally, the training of field technicians must be reinforced, with a focus on the specific needs and realities of the Program's priority population.

The challenges are undeniably significant, and much work lies ahead, but persistence is a fundamental quality for those implementing and managing public policies. What matters most is having a well-designed program that delivers tangible results, fostering inclusion and empowering the most vulnerable rural families.

REFERENCES

AQUINO, J. R. *et al*. Articulação de políticas para a superação da pobreza rural: um estudo das interfaces entre o Programa Bolsa Família e as políticas de inclusão produtiva no Nordeste e no Sul do país. *Revista de Economia do Nordeste*, Fortaleza, v. 48, n. 4, p. 155-173, 2017.

BAUGLLE, A.; COSTELLA, C.; GOYENECHE, L. Proteção social e mudanças climáticas: como proteger as famílias mais vulneráveis de novas ameaças climáticas? *Banco Interamericano de Desenvolvimento,* boletim n. 375, maio 2023. Available at: https://publications.iadb.org/en/publications/portuguese/viewer/Protecao-social-e-mudancas-climaticas-como-proteger-as-familias-mais-vulneraveis-de-novas-ameacas-climaticas.pdf. Accessed: 22 Aug. 2025.

BRASIL. *Decreto n. 9.221, de 6 de dezembro de 2011*. Regulamenta a Lei n. 12.512, de 14 de outubro de 2011, que institui o Programa de Fomento às Atividades Produtivas Rurais. Brasília, 2011a. Available at: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2017/decreto/d9221.htm. Accessed: 22 Aug. 2025.

BRASIL. *Lei n. 12.512, de 14 de outubro de 2011*. Institui o Programa de Apoio à Conservação Ambiental e o Programa de Fomento às Atividades Produtivas Rurais; altera as Leis n. 10.696, de 2 de julho de 2003, 10.836, de 9 de janeiro de 2004, e 11.326, de 24 de julho de 2006. Brasília, 2011b. Available at: https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2011/lei/l12512.htm. Accessed: 22 Aug. 2025.

CAPORAL, F.; COSTABEBER, J. Agroecologia e desenvolvimento rural sustentável: perspectivas para uma nova extensão rural. *Agroecologia e Desenvolvimento Rural Sustentável,* Porto Alegre, v.1, n. 1, jan.-mar. 2000.

DELGROSSI, M. E. *et al*. O impacto da assistência técnica e extensão rural para os agricultores familiares pobres: o caso do Programa Dom Hélder Câmara II. *Revista de Economia e Sociologia Rural*, v. 62, n. 2, 2024. Available at: https://www.scielo.br/j/resr/a/mGvx7gCXLSSLSSVsS3mvN6F/?lang=pt. Accessed: 22 Aug. 2025.

FLECK, L. F. *et al. Programa de Fomento às Atividades Produtivas Rurais e o combate à pobreza rural no Rio Grande do Sul*. Porto Alegre: UFRGS, 2019.

OLIVEIRA, T. *et al*. Agroecologia: uma estratégia para inclusão socioprodutiva de famílias agricultoras no território do alto sertão de Sergipe. *In*: CONGRESSO DA SOCIEDADE BRASILEIRA DE SISTEMAS DE PRODUÇÃO, 10., 2014, Foz do Iguaçu. *Anais* [...]. Foz do Iguaçu: SBSP, 2014. Available at: https://www.alice.cnptia.embrapa.br/alice/bitstream/doc/1043594/1/ArtigoSBSP2014estrategiainclusaoPBSM2014.pdf. Accessed: 22 Aug. 2025.

PADOVEZI, A.; OLIVEIRA, M.; JACOB, L. Conhecimento agroecológico local: caminhos para a adaptação às mudanças climáticas e restauração da Caatinga. *Working Paper*, mar. 2018. Available at: https://www.wribrasil.org.br/sites/default/files/AF_WRI_Working%20Paper_Caatinga_web.pdf. Accessed: 22 Aug. 2025.

PROGRAMA Fomento Rural. *Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome*, [20--]. Available at: https://www.gov.br/mds/pt-br/acoes-e-programas/acesso-a-alimentos-e-a-agua/programa-fomento-rural. Accessed: 22 Aug. 2025.

RODY, T.; TELLES, L. (orgs.). *Caderneta agroecológica*: o saber e o fazer das mulheres do campo, das florestas e das águas. Viçosa: Editora Asa Pequena, 2021.

TAFNER, P. *et al*. Política social e resiliência: uma análise geoespacial do impacto das mudanças climáticas nas decisões de migração entre produtores agropecuários vulneráveis. *Instituto Mobilidade e Desenvolvimento Social*, Rio de Janeiro, n. 9, jul. 2025. Available at: https://imdsbrasil.org/wp-content/uploads/2025/03/ImdsA009_2025_PoliticaSocialeResiliencia-1.pdf. Accessed: 22 Aug. 2025.

VAHDAT, V. S.; FAVARETO, A.; FAVARÃO, C. Uso de evidências em iniciativas de inclusão produtiva rural. *Revista Brasileira de Avaliação*, v. 12, n. esp. 2, 2023. Available at: https://doi.org/10.4322/rbaval202312032. Accessed: 22 Aug. 2025.

TIMELINE

The Agri-food System in Multilateral Governance Arenas and the Key Measures in Brazil's Food Security Agenda (1972–2025)

This timeline was developed drawing on the publications "Policy Brief COP30 in Brazil – For a Just and Sustainable Transition of the Agri-Food System" (Josué de Castro Chair, School of Public Health, University of São Paulo, 2025) and "From Hunger to Hunger: Dialogues with Josué de Castro" (Josué de Castro Chair, School of Public Health, University of São Paulo, and Elefante Press, 2022). The original content was edited and expanded with additions and updates by the team responsible for this edition.

1972 **United Nations Conference on the Environment**

Stockholm, Sweden

First international meeting to focus on environmental concerns on a global scale

- **Creation of the National Institute of Food and Nutrition (INAN)**
- **Regulation of the National Supply Centers System**
- **Establishment of the Brazilian Agricultural Research Corporation (Embrapa)**

1976 **Establishment of the Worker Food Program (PAT)**

1979 **Creation of the National School Feeding Program (PNAE)**

1986 **First National Conference on Food and Nutrition**

1988 **Approval of the Federal Constitution, which establishes, in the Social Security chapter, rights and a solid foundation for the social sector**

1989 **Law 7,802 regulates the use of pesticides, establishing rules from research to inspection**

1990 **Creation of the National Supply Company (Conab)**

1992 **Rio-92**

Rio de Janeiro, Brazil

The Earth Summit introduced the concept of sustainable development to a global audience

1993 **Creation of the National Council for Food and Nutrition Security (CONSEA)**

1994 **First National Conference on Food Security, under the theme "Hunger, a National Issue"**

1995 **Dissolution of the National Council for Food and Nutrition Security (Consea)**

Launch of the *Comunidade Solidária* (Solidarity Community) strategy

1996 **Launch of the National Program for Strengthening Family Farming (Pronaf)**

1999 **Approval of the National Food and Nutrition Policy (PNAN)**

Law 9,782 defines the National Health Surveillance System and establishes the National Health Surveillance Agency (Anvisa)

2000 **Law 9,985 regulates Article 225 of the 1988 Constitution and establishes the National System of Conservation Units (SNUC)**

2001 **Launch of the National Minimum Income Program – *Bolsa Alimentação* (Food Allowance Program)**

2002

World Summit on Sustainable Development

Johannesburg, South Africa

Rio+10 assessed progress on the agreements established at Rio-92

2003

Reestablishment of the National Council for Food and Nutrition Security (Consea)

- **Launch of the *Fome Zero* (Zero Hunger) Program**
- **Launch of the Food Acquisition Program (PAA)**
- **Creation of the Guaranteed Harvest Fund and establishment of the Guaranteed Harvest Benefit**
- **Law 10,831 regulates organic and agroecological agriculture in Brazil**
- **Launch of the Cisterns Program**

2004

Second National Conference on Food and Nutrition Security

- **Launch of the Bolsa Família Program**

2005

COP11 on Climate Change

Montreal, Canada

First meeting since the Kyoto Protocol came into force; deforestation and land use were included in the discussions for the first time

- **Law 11,105 establishes the National Biosafety Policy and creates the Biosafety Council and Commission**

2006 Launch of the Price Guarantee Program for Family Farming (PGPAF)

- Law 11,428 regulates the use and protection of native vegetation in the Atlantic Forest biome
- Approval of the Organic Law on Food and Nutrition Security (Losan), which creates the National Food and Nutrition Security System (Sisan) and institutionalizes the National Food and Nutrition Security Policy
- Law 11,236 establishes guidelines for the formulation of the National Policy for Family Farming and Rural Family Enterprises

2007 Creation of the Interministerial Chamber for Food and Nutrition Security (Caisan)

- Decree 6,323 regulates organic and agroecological production and establishes the Brazilian Organic Conformity Assessment System
- Establishment of the National Policy for the Sustainable Development of Traditional Peoples and Communities
- Third National Conference on Food and Nutrition Security

2008 Launch of the Programa Mais Alimentos (More Food Program)

2009 Establishment of the National Policy on Climate Change (PNMC)

- Launch of the National Plan for Promoting Sociobiodiversity Product Chains
- Launch of the Minimum Price Guarantee Policy for Sociobiodiversity Products (PGPM-Bio)

2010

COP10 on Biodiversity

Nagoya, Japan

Development of the Strategic Plan for Biodiversity 2011–2020 and the 20 Aichi Biodiversity Targets. 193 countries, including Brazil, committed to working together to achieve the targets by 2020

- **Inclusion of food as a social right in Article 6 of the Federal Constitution**
- **Establishment of the National Food and Nutrition Security Policy**
- **Establishment of the National Policy for Technical Assistance and Rural Extension for Family Farming and Agrarian Reform**

2011

- **Fourth National Conference on Food and Nutrition Security**
- **Launch of the First National Food and Nutrition Security Plan 2012–2015**
- **Launch of *Plano Brasil Sem Miséria* (Brazil Without Extreme Poverty Plan)**
- **Creation of the *Bolsa Verde Program* (Environmental Conservation Support Program)**

2012

Rio+20

Rio de Janeiro, Brazil

The United Nations Conference on Sustainable Development renewed political commitments to sustainable development

- **Establishment of the National Policy on Agroecology and Organic Production**
- **Creation of the Program to Promote Rural Productive Activities**

Decree 7,775 regulates the Food Acquisition Program (PAA) and establishes the modality of institutional purchases from family farming

Law 12,651 provides for the protection of native vegetation

2013

Establishment of the Cisterns Program - Program to Support Rainwater Harvesting and Other Social Technologies for Access to Water

Launch of the First National Plan for Agroecology and Organic Production

2014

Brazil was removed from the FAO/UN Hunger Map

2015

COP21 on Climate Change

Paris, France

The Paris Agreement was adopted as a global framework tackling climate change, setting a target to limit global warming to between 1.5°C and 2°C. The 2030 Agenda and the Sustainable Development Goals were also launched

Inclusion of the right to food in Article 6 of the Brazilian Constitution

Fifth National Conference on Food and Nutrition Security

Establishment of the National Pact for Healthy Eating

Law 13,123 regulates access to, use of, and benefit-sharing from biodiversity genetic resources and associated traditional knowledge

2016

The Ministry of the Environment Ordinance 150 establishes the National Climate Change Adaptation Plan, which includes a sectoral strategy for Food Security

2017

COP23 on Climate Change

Bonn, Germany

Formation of the Koronivia Joint Work Group on Agriculture

Decree 7,830 regulates the Rural Environmental Registry System and the Rural Environmental Registry

Launch of the Second National Food and Nutrition Security Plan 2016–2019

2018

COP14 on Biodiversity

Sharm El-Sheikh, Egypt

Adoption of Decision 14/3, which sets guidelines for integrating biodiversity into productive sectors such as agriculture, forestry, fisheries, and aquaculture

2019

Dissolution of the National Council for Food and Nutrition Security (Consea)

Brazil returns to the FAO/UN Hunger Map

2020

Creation of the Emergency Aid Program

2021

United Nations Food Systems Summit (UNFSS)

New York, USA

COP26 on Climate Change

Glasgow, Scotland

Agriculture Innovation Mission for Climate Initiative

Provisional Measure 1,061 terminated the *Bolsa Família Program* after 18 years and established its replacement, the *Auxílio Brasil Program*. The same measure also terminated the Food Acquisition Program (PAA) and replaced it with the Alimenta Brasil Program (Feed Brazil Program)

2022

COP15 on Biodiversity

Montreal, Canada

Adoption of the Kunming-Montreal Global Biodiversity Framework

COP27 on Climate Change

Sharm El-Sheikh, Egypt

The COP27 Final Declaration incorporated the Sharm El-Sheikh Joint Work on the Implementation of Climate Action in Agriculture and Food Security

2023

Launch of the *Plano Brasil Sem Fome* (Brazil Without Hunger Plan)

Reestablishment of Consea

Resumption of the Cisterns Program

Signing of a decree restoring and expanding the governance bodies of the National Policy on Agroecology and Organic Production

United Nations Food Systems Summit +2 (UNFSS+2)

Rome, Italy

Launch of the Convergence Initiative on Food Systems and Climate Action

COP28 on Climate Change

Dubai, United Arab Emirates

United Arab Emirates Declaration on Sustainable Agriculture, Resilient Food Systems, and Climate Action

Launch of the Alliance of Champions for Food Systems Transformation (ACF)

Dubai, United Arab Emirates

A coalition composed of Brazil, Cambodia, Norway, Rwanda, and Sierra Leone

2024

COP29 on Climate Change

Baku, Azerbaijan

Launch of Brazil's Nationally Determined Contribution (NDC)

COP16 on Biodiversity

Cali, Colombia

Nineteen countries submitted their national biodiversity targets, but only 44 delivered complete National Biodiversity Strategies and Action Plans

COP16 on Combating Desertification

Riyadh, Saudi Arabia

For the first time, a specific day was designated for discussions on agri-food systems (Agri-food Systems Day)

G20 Leaders' Summit

Rio de Janeiro, Brazil

Creation of the Global Alliance Against Hunger and Poverty

2025

United Nations Food Systems Summit +4 – Review (UNFSS+4)

Addis Ababa, Ethiopia

Announcement of Brazil's new exit from the FAO/UN Hunger Map

Brazil again removed from the FAO/UN Hunger Map

COP30 on Climate Change

Belém, Brazil

Agriculture and Food Systems are priority topics on the Action Agenda

Authors

Organized by **Márcia Muchagata**
Project Manager at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS). She holds a PhD in Development Studies and a master's in Agriculture, Environment, and Development from the University of East Anglia and is an Agricultural Engineer from the Luiz de Queiroz College of Agriculture at the University of São Paulo (Esalq/USP). She is currently a federal public servant in the Public Policy and Government Management Specialist (EPPGG) career.

Aloísio Lopes Pereira de Melo
National Secretary for Climate Change at the Ministry of the Environment and Climate Change (MMA). Agricultural Engineer, graduated from the Luiz de Queiroz College of Agriculture at the University of São Paulo (Esalq/USP), with a specialization in Climate Change Economics from the University of Cambridge and a master's degree in Development and Agriculture from the Federal Rural University of Rio de Janeiro (UFRRJ). Member of the Public Policy and Government Management Specialist career (EPPGG).

Ana Amélia da Silva
A Public Policy and Government Management Specialist (EPPGG) since 2004, and a PhD in Sociology from the Federal University of Rio de Janeiro (UFRJ). She has professional experience in social public policy, particularly in poverty reduction initiatives. She worked on the *Bolsa Família* and *Minha Casa Minha Vida* programs and currently coordinates the Rural Development Program at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development, Family, and Fight Against Hunger (Sesan/MDS)

Ana Carolina Silva e Souza
Anthropologist and international relations specialist, with a master's degree in Anthropology of Education and Globalization from Aarhus University. She has contributed to the management of education policies, and currently works in the General Coordination office, responsible for the Solidarity Kitchen Program (Cozinha Solidária), at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development, Family, and Fight Against Hunger (Sesan/MDS).

Ana Moraes Coelho
Social scientist with a master's degree in Sustainable Development. She has worked at the Center for Sustainability Studies of the Getulio Vargas Foundation (FGVces) for over 13 years and leads the Sustainability in Value Chains program, which brings together projects promoting equitable practices and more sustainable processes across production chains.

Arilson Favareto
Sociologist and full professor of the Josué de Castro Chair in Healthy and Sustainable Food Systems at the School of Public Health of the University of São Paulo (FSP/USP). He is also a professor in the field of Territorial Planning at the Federal University of ABC (UFABC), as well as a researcher and scientific director at the Brazilian Center for Analysis and Planning (Cebrap).

Bruna Pitasi Arguelhes
Nutritionist and public health specialist with a master's degree in Public Health. A federal civil servant in the Social Policy Analyst (ATPS) career since 2013, she currently serves as Support Coordinator for the General Coordination of Healthy Eating Promotion at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development, Family, and Fight Against Hunger (Sesan/MDS).

Camila Batista Marins Carneiro
Graduated in Social Sciences from the Federal University of Rio de Janeiro (UFRJ), with an interdisciplinary master's in Social Sciences focused on Rural Sociology from the Federal Rural University of Rio de Janeiro (UFRRJ), and a postgraduate specialization in African matrix studies. She is a public servant in the Social Policy Analyst (ATPS) career, advising on policies concerning traditional peoples and communities since 2013 at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development, Family and Fight Against Hunger (Sesan/MDS).

Camile Marques Sahb
Federal public servant and member of the Public Policy and Government Management Specialist (EPPGG) career since 2001. She holds a master's degree in Social Policy from the University of Brasília (UnB). She is currently the Director of Promotion of Rural Productive Inclusion and Access to Water at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development, Family and Fight Against Hunger (Sesan/MDS).

Carlos Roberto Sanquetta
Forest engineer with a master's degree in Forest Management from the Federal University of Paraná (UFPR) and in Silviculture and Ecology from Ehime University. He holds a PhD in Ecology and Forest Resource Management from the United Graduate School of Agricultural Sciences and completed a postdoctoral fellowship with the Japan Society for the Promotion of Science. Member of the Intergovernmental Panel on Climate Change (IPCC) and expert for the United Nations Framework Convention on Climate Change (UNFCCC). He is currently a professor at the Federal University of Paraná (UFPR).

Carmem Priscila Bocchi
Federal public servant in the Public Policy and Government Management Specialist (EPPGG) career. She is the General Coordinator of Food and Nutrition Security Facilities at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development, Family, and Fight Against Hunger (Sesan/MDS).

Catia Grisa
Professor in the Graduate Programs in Rural Development (PGDR) and Regional Dynamics and Development (PGDREDES), both at the Federal University of Rio Grande do Sul (UFRGS). She is also the Coordinator of the Study and Research Group on Agriculture, Food, and Development (GEPAD).

Cláudia Bocca
Nutritionist working in the General Coordination for the Promotion of Healthy Eating (CGSAU) at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS).

Elisa Carvalho Lauer
Agricultural engineer graduated from the Federal Rural University of Rio de Janeiro (UFRRJ), with specializations in Agroecology and Rural Education through the National Program of Education in Agrarian Reform (PRONERA/Unicamp) and in Solidarity Economy and Social Technology from Unicamp. She has over 15 years of experience in agroecology, rural extension, and solidarity-based marketing, working with urban agriculture, agrarian reform settlements, and popular cooperatives.

Elisabetta Recine
Faculty member with a PhD in Public Health. She is part of the Food and Nutrition Security Policy Observatory at the University of Brasília (UnB) and a member of the High-Level Panel of Experts of the United Nations Committee on World Food Security, as well as the Panel of Experts on Sustainable Food Systems (2023–25) – IPES-Food. She is also a member of the Alliance for Adequate and Healthy Food.

Elisângela Sanches Januário
Economist and Public Policy and Government Management Specialist (EPPGG). She works on the formulation and implementation of public policies for family farming and traditional peoples and communities. She currently serves as Executive Secretary of the management team of the Food Acquisition Program (PAA) and coordinates the response to climate emergencies at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS).

Estela Catunda Sanseverino
Bachelor's degree in Environmental Management from the School of Arts, Sciences, and Humanities at the University of São Paulo (USP), and is a master's degree candidate in Environmental Science at the Institute of Energy and Environment, USP. She works as a researcher at the Josué de Castro Chair in Healthy and Sustainable Food Systems at the School of Public Health, USP.

Erick Brigante Del Porto
Graduated in Economics and holds a master's degree in Economic Development from the State University of Campinas (Unicamp). He has been a federal public servant in the Public Policy and Government Management Specialist (EPPGG) career since 2000 and has worked on several programs, including *Comunidade Solidária*, *Fome Zero*, *Brasil Sem Miséria*, and *Brasil Sem Fome*. He is currently serving at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger(Sesan/MDS).

Fernanda Castilhos França de Vasconcellos
Economist, PhD in Rural Development, and postdoctoral researcher at the Federal University of Rio Grande do Sul (UFRGS). Her research focuses on Food Security, family farming, and climate change, connecting science, public policy, and local practices.

Fernanda Helena Marrocos-Leite
Nutritionist with a master's degree in Health Sciences from the Federal University of São Paulo (UNIFESP) and a PhD in Global Health and Sustainability from the School of Public Health at the University of São Paulo (FSP/USP). She works as a researcher at the Epidemiological Research Center in Nutrition and Health (Nupens/USP) and at the Josué de Castro Chair in Healthy and Sustainable Food Systems at FSP/USP.

Fernanda Romero
Waste Consultant at the United Nations Environment Program (UNEP) Office in Brazil, working on circular economy and sustainable food systems. She has experience in government coordination, international cooperation, and public policy development. She holds a bachelor's degree in Environmental Sciences and a master's degree in Science from the Federal University of São Paulo (UNIFESP).

Gisele Bortolini
Holds a PhD in Nutrition from the University of Brasília (UnB) and completed postdoctoral research in Nutrition and Public Health at the University of São Paulo (USP). She is a federal public servant in the Social Policy Analyst (ATPS) career, with 18 years of experience in public policy, and currently works at the Ministry of Social Development and Fight Against Hunger (MDS).

Gustavo Porpino
Holds a PhD in Administration from the São Paulo School of Business Administration at the Getulio Vargas Foundation (FGV-EAESP) and has worked at Embrapa for 20 years. He is currently a member of the RD&I team at Embrapa Food and Territories, in Alagoas. He has led three projects in the EU-Brazil Dialogues on Food Waste and collaborates with initiatives of the Food and Agriculture Organization (FAO) and the United Nations Environment Program (UNEP) in the areas of food security and circular economy.

Janine Giuberti Coutinho
Public health nutritionist with a master's and PhD in Nutrition from the University of Brasília (UnB). She is a federal public servant with over 20 years of experience in Food Security policies. She has worked at the Ministry of Health, the Pan American Health Organization/World Health Organization (PAHO/WHO), the Institute for Consumer Defense (Idec), and the University of Brasília (UnB). Currently, she serves as an advisor at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS), focusing on international affairs and climate issues.

Jaqueline Lima Liskoski
Master's degree in Social Policy from the University of Brasília (UnB) and a postgraduate specialization in Management of Public Policy and Management of the Unified Social Assistance System (SUAS). She is a social worker trained at the Federal University of Rio Grande do Sul (UFRGS), with experience in research, teaching, and the management of intergovernmental public and social policies, particularly in social assistance and food security. She currently works with the team at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS).

Jay M. N. van Amstel
PhD in Social Sciences in Agriculture, Development, and Society from the Federal Rural University of Rio de Janeiro (UFRRJ). He has experience in research and projects on sustainable agriculture in Brazil, Africa, and Asia. Since 2020, he has been a consultant for the United Nations Environment Program (UNEP), coordinating projects on urban and peri-urban agriculture, circularity, and bioeconomy.

Jessica Chryssafidis
Project manager and researcher in sustainable food systems, governance, and urban and peri-urban agriculture. With extensive experience in public policy and multi-sectoral coordination, she leads initiatives at the Center for Sustainability Studies of the Getulio Vargas Foundation (FGVces) that strengthen municipalities and promote food security and climate resilience.

Juliano Ferreira de Sá
PhD candidate in Public Policy at the Federal University of Rio Grande do Sul (UFRGS), with a bachelor's degree in Environmental Management (UNOPAR) and a master's in Rural Development (UFRGS). He is part of the coordination team of the Brazilian Research Network on Food and Nutrition Sovereignty and Security (Rede PENSSAN). Former president of the State Council for Food and Nutrition Security of Rio Grande do Sul (CONSEA-RS) and an activist for the human right to adequate food.

Kelliane da Consolação Fuscaldi
Analyst at the Brazilian Agricultural Research Corporation (Embrapa), she serves as the General Coordinator of Urban and Peri-Urban Agriculture at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS).

Lilian dos Santos Rahal
National Secretary for Food and Nutrition Security at the Ministry of Social Development and Fight Against Hunger (MDS). She holds a bachelor's degree in Social Sciences and a master's degree in Sociology from the State University of Campinas (Unicamp) and is a federal public servant in the Public Policy and Government Management Specialist (EPPGG) career.

Lorrana Nascimento Grimes
Educator and nutritionist, with specializations in Public Health from the University of São Paulo (USP), Family and Community Health (ESPDF/FEPECS), and Political Science from the University of São Caetano do Sul (USCS). She is a master's degree candidate in Social and Cultural Psychology at the University of Brasília (UnB), and serves as a tutor at MultiplicaSSAN/UnB and as a technical consultant at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS).

Luiz Antônio de Oliveira
PhD in Anthropology, and a university professor and researcher at Brazilian universities and the Latin American Faculty of Social Sciences (FLACSO). He has worked on technical collaboration projects at the Ministry of Education (MEC) and currently serves as an advisor at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS), focusing on the training of indigenous teachers, food anthropology, and cultural policies.

Marcos Dal Fabbro
Agricultural engineer with a professional background in public policy formulation and management, as well as applied research, focusing on the sustainable development of communities and rural territories. He currently supports the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS) on climate change issues, in collaboration with the Oswaldo Cruz Foundation (Fiocruz).

Mariana Ferreira Madruga
Nutritionist with a master's degree in Public Health from the University of São Paulo (USP). She has worked in nutritional epidemiology at the Epidemiological Research Center in Nutrition and Health (Nupens/USP) and at the Indigenous Health Secretariat of the Ministry of Health. She currently works at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS), developing public policies on Food Security, with a focus on the Food Acquisition Program (PAA) for traditional peoples and communities.

Nadine Marques Nunes-Galbes
Nutritionist with a master's degree in Public Health Nutrition and a PhD in Public Health from the School of Public Health at the University of São Paulo (FSP/USP), and a specialization in Psychobiology and Exercise from the Federal University of São Paulo (UNIFESP). She is an assistant researcher at the Josué de Castro Chair in Healthy and Sustainable Food Systems at FSP/USP.

Naila de Freitas Takahashi
A geographer from the State University of Campinas (Unicamp) who holds a master's degree in Public Policy from the Federal University of Rio de Janeiro (UFRJ). She is a researcher at the Public Policy Group of the Luiz de Queiroz College of Agriculture (GPP/Esalq) and at LabMaréss, Federal University of Rio Grande (FURG). She has over 15 years of experience conducting assessments, studies, and policy analysis focused on family farming, artisanal fishing, and food security, with recent contributions to mapping food deserts and swamps in Brazil.

Olívia Dórea
Public Administrator from the São Paulo School of Business Administration at the Getúlio Vargas Foundation (FGV-EAESP). She is a researcher at the Josué de Castro Chair in Healthy and Sustainable Food Systems at the School of Public Health, University of São Paulo (FSP/USP).

Patricia Chaves Gentil
Director of Healthy Eating Promotion at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS). She is a nutritionist with specialist training, a master's degree, and currently a PhD candidate in Human Nutrition at the University of Brasília (UnB). She has 25 years of experience in food and nutrition policies management, food security, and the human right to adequate food.

Patricia Mollo
Federal public servant in the Public Policy and Government Management Specialist (EPPGG) career. She holds a degree in Psychology from the University of Brasília (UnB) with a master's degree in Geography from the Graduate Program in Geography at the University of Brasília (UnB), and a PhD from the Graduate Program in Communication and Semiotics at the Pontifical Catholic University of São Paulo (PUC-SP).

Potira Preiss
Biologist with a master's and PhD in Rural Development. She is currently a visiting professor in Agroecology at the Federal Institute of Rio Grande do Sul (IFRS), Restinga Campus. She is also a member of the Study and Research Group on Agriculture, Food, and Development (GEPAD) and of the Brazilian Research Network on Food and Nutrition Sovereignty and Security (Rede PENSSAN).

Rafael Rioja Arantes
Holds a master's degree in Public Health Nutrition from the University of São Paulo (USP) and has over nine years of experience working in civil society and federal government organizations. She has led delegations at UN forums, including COP27 and INC-2 on plastics. She is a member of the Food and Climate Working Group of the Federal Council of Nutrition (CFN) and a Youth Representative at the World Food Forum (WFF). She is also a senior researcher at the Alliance for Adequate and Healthy Food and a project coordinator at the Observatory of Food and Nutrition Security Policies at the University of Brasília (OPSAN/UnB).

Sergio Paganini Martins
Agricultural engineer and specialist in public policies for food security and family farming. He worked at the Ministry of Social Development and Fight Against Hunger (MDS), the National Institute for Colonization and Agrarian Reform (Incra), and in the implementation of the *Fome Zero* program. He also served as a consultant for the FAO, UNDP, and UNESCO. He is currently a visiting researcher at the University of São Paulo (USP), affiliated with the Public Policy Group at the Luiz de Queiroz College of Agriculture (GPP/Esalq).

Sergio Schneider
Full Professor of Rural Development Sociology and Food Studies at the Federal University of Rio Grande do Sul (UFRGS), and a CNPq Research Productivity Fellow, PQ1A.

Tatiane Nunes Pereira
Holds a degree in Nutrition from the University of São Paulo (USP), a master's in Public Health from the University of Brasília (UnB), and a PhD in Global Health and Sustainability from USP. She is a federal public servant in the Social Policy Analyst (ATPS) career, working in the General Coordination of Healthy Eating Promotion (CGSAU) at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS).

Thaís Fonseca Veloso de Oliveira
Federal public servant in the Social Policy Analyst (ATPS) career, working at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS). She holds a master's degree in Public Health from the Institute of Social Medicine at the State University of Rio de Janeiro (UERJ), a specialization in Health Promotion and Social Development from the Oswaldo Cruz Foundation (Fiocruz), and a degree in Nursing from the Federal University of Rio de Janeiro (UFRJ).

Vitor Leal Santana
Federal public servant in the Public Policy and Government Management Specialist (EPPGG) career. He holds a master's degree in Political Science from the University of Brasília (UnB) and currently serves as General Coordinator for Water Access at the National Secretariat for Food and Nutrition Security of the Ministry of Social Development and Fight Against Hunger (Sesan/MDS).

Photo: Marcelo Curia

What draws people to gather around a table, if not the very thread that binds us as human beings?

The shape of the table is irrelevant — it may not even need to exist at all. The table is, in truth, a world in miniature, a small universe where people come together in an almost sacred moment. In that shared space and time, the act of sharing nourishes the spirit, just as food nourishes the body.

To imagine the future at the table is to invite all beings to a banquet of reflection on our planet — our shared home — where the table is set each day so that, together, we may choose the paths that lead to a fairer world. What we eat — and even what we refrain from eating — holds the power to change the world.

This book is an invitation to reflect on the public actions and strategies that can transform the ways we produce, access, and consume food, guiding us toward both social and climate justice. It charts pathways to ensure that Brazil's recent achievement — its removal from the Hunger Map — endures, and that food may truly become real food: food that respects the planet and the cultures that give it meaning, even in a time of profound climate change.