Unlocking Public Finance for Agroecology

Catalysing the potential of agriculture in achieving the Sustainable Development Goals

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Cover: Ms. Ngoki from Meru, Kenya showing her farm harvest. (Photo credit: Institute for Culture and Ecology)

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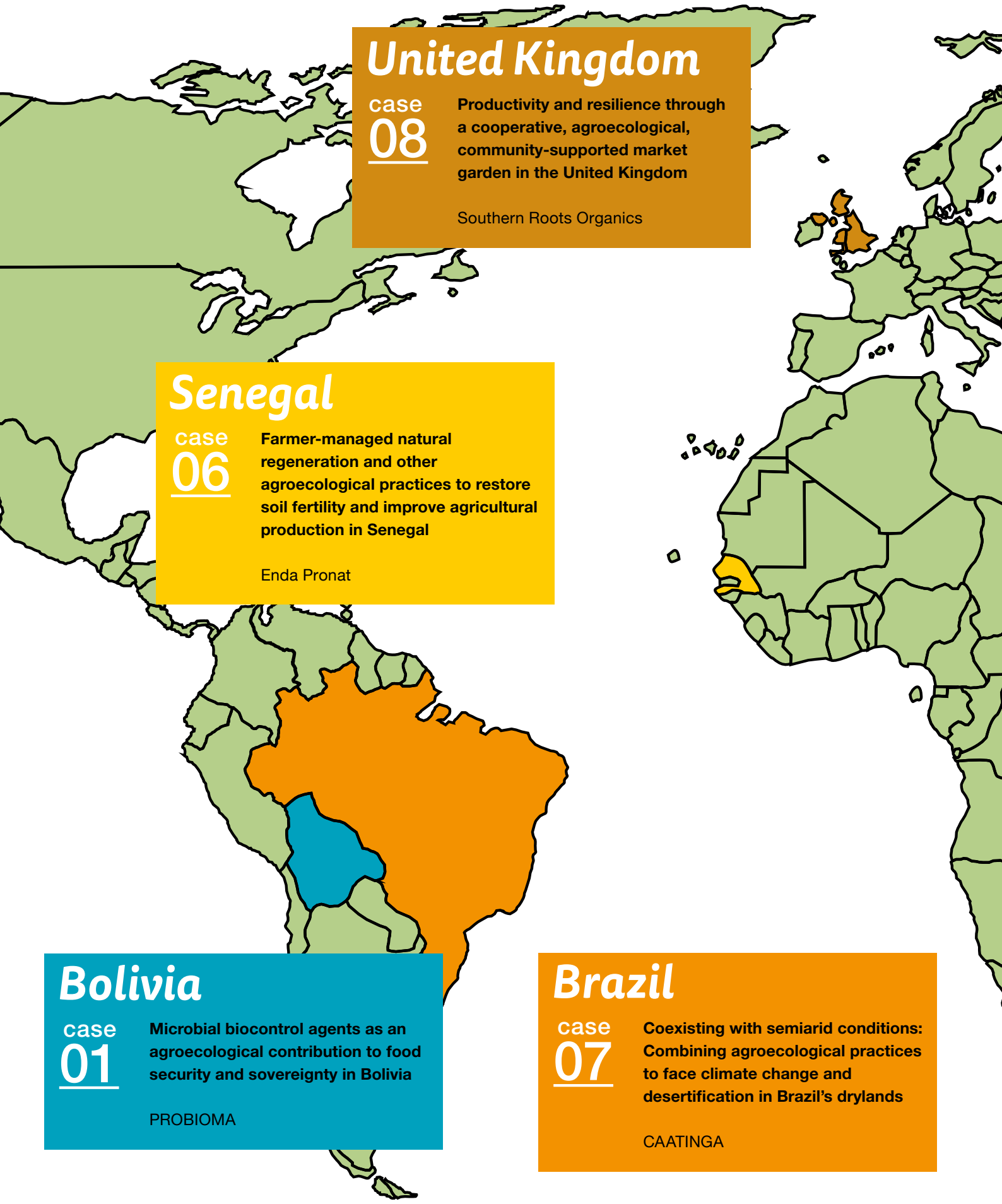

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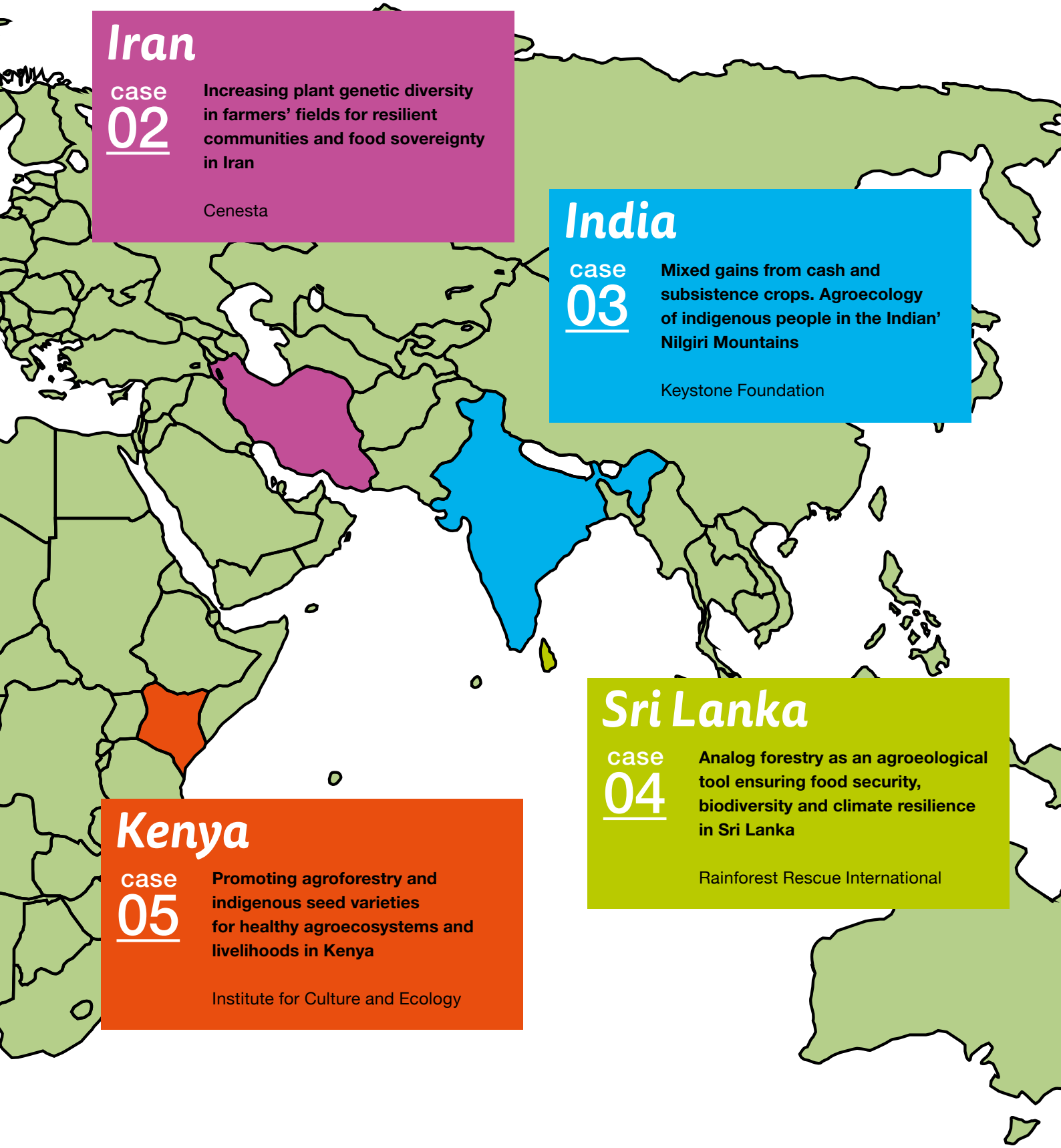

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EXECUTIVE SUMMARY

AGRICULTURE AND THE SUSTAINABLE DEVELOPMENT GOALS

Food and agricultural systems around the world are currently stuck at a crossroads. On the one hand, they are continuing to contribute a lion's share to climate change, land degradation and the loss of biodiversity – on the other hand, the movement of people calling for a radical transformation of the way we relate to food and our environment is stronger than ever.

An approach that is gaining attention worldwide among a wide range of actors as an answer to this call is agroecology, a conceptual framework that provides the basic principles of how to study, design and manage food and agricultural systems that are geared towards greater ecological sustainability, social justice, and resilience. Considered jointly a scientific field of study, an agricultural practice, and a social movement, agroecology can constitute a pathway for agriculture to take up its role as a catalyst for sustainable development. In particular, agroecology can help in achieving multiple landmark accords like the Sustainable Development Goals (SDGs) and the Paris Agreement. Although similar claims are also made by other agricultural approaches – some of which promote a fundamentally different vision of agricultural development – agroecology has shown to be unique in having a transformative vision, one that stresses the importance of inclusivity, equality and sovereignty on all levels. Unlike climate-smart agriculture for example, agroecology has clearly stated what it does and does not stand for while challenging the power imbalances that currently exist within our food systems. Hence, it is an approach that aims to tackle the structural causes that hamper transformative change.

Despite the surge of interest in supporting agricultural development after the 2007–08 world food price crisis, the funding for community-led initiatives or civil society organisations implementing agroecology at the grassroots level still remains insufficient. Neither domestically, nor internationally through (inter-)national development agencies and global financial mechanisms like the Green Climate Fund is support for small-scale farmers adequately represented in funding portfolios. Given the potential of agroecology in achieving progress on several development objectives, this report is providing further evidence on the multiple benefits that agroecology comprises before presenting a set of recommendations for governments, (inter-)national development agencies and global financial mechanisms of how to actively support agroecology.

THE TRANSFORMATIVE POTENTIAL OF AGROECOLOGY

The eight case studies presented in this report show the successes behind a diverse range of agroecological practices in spatially and culturally diverse settings. By relating their grassroots work to the rather abstract SDGs, different civil society actors and community-led initiatives show how agroecology can constitute a pathway towards achieving sustainable development:

• **Case 1:** In Bolivia, the introduction of biocontrol agents

has significantly reduced the use of agrochemicals, which has helped in tackling the contamination of waters and soils.

- **Case 2:** In Iran, the use of an approach called evolutionary participatory plant breeding is rapidly increasing on-farm biodiversity by utilising plant genetic diversity as a means to increase income and resilience.
- **Case 3:** In India, agroecology is helping indigenous people in the Nilgiri Mountains to gain from both cash and subsistence crops, tapping into traditional and modern knowledge as a means to enhance the production and resilience of local farming systems.
- **Case 4:** In Sri Lanka, the use of analog forestry is helping war widows to improve their livelihoods, mimicking the natural forest structure to ensure improved food production, biodiversity and climate resilience.
- **Case 5:** In Kenya, the use of agroforestry and indigenous seed varieties of traditional food crops is helping small-scale farmers respond to climate change while preserving agrobiodiversity and improving diets.
- **Case 6:** In Senegal, the use of farmer-managed natural regeneration coupled with other agroecological practices is improving soil quality, resulting in improved yields and adaptation to climate change.
- **Case 7:** In Brazil, a combination of agroecological practices is helping people in the drylands of the Caatinga to co-exist with semi-arid conditions while preserving and restoring the local ecosystem.
- **Case 8:** In the United Kingdom, a cooperative, agroecological and community-supported market garden is creating decent and meaningful work for young people entering the labour market, providing fresh, healthy and organic produce for the community.

Those eight cases provide in-depth examples of how agroecology at the grassroots level can contribute considerably towards achieving several of the SDGs. In particular, all case studies have shown the positive contribution of agroecology to ending hunger and achieving food security (SDG 2), to taking urgent action against climate change (SDG 13) and to protecting and restoring ecosystems (SDG 15). Additionally, contributions were also reported on ending poverty (SDG 1), on ensuring healthy lives and promoting well-being (SDG 3), on achieving gender equality (SDG 5), on ensuring availability and sustainable management of water (SDG 6) and on promoting decent work (SDG 8).

RECOMMENDATIONS ON PUBLIC FINANCE FOR AGROECOLOGY

Given the potential of agroecology for sustainable development highlighted in the case studies, this report suggests the following to governments, (inter-)national development agencies and global financial mechanisms:

GOVERNMENTS

- Think out of the box and show openness towards transformative approaches like agroecology.
- Recognise the potential of agroecology in reducing negative externalities throughout the entire food system.
- Put new and innovative governance structures in place that incentivise production based on agroecological principles as a means to improve the sustainability of current agricultural production and distribution.
- Increase focus on agroecology in (agricultural) research and development, extension services and education.
- Support agroecology as the central approach to agricultural development in multilateral and intergovernmental institutions and policy processes.

INTERNATIONAL COOPERATION

- Value the systems approach that agroecology incorporates, tackling multiple issues within malfunctioning food and agricultural systems in order to make progress on various development objectives.
- Increase support for community-led initiatives, farmer's organisations and different civil society actors implementing agroecology at the local level.
- Express long-term commitment to agricultural support in general and innovative approaches like agroecology in particular.
- Look at positive examples among donor agencies that have endorsed and financially supported agroecology successfully over a longer period of time.

GLOBAL FINANCIAL MECHANISMS

- Recognise and actively support agroecology as an effective approach to climate change adaptation and mitigation.
- Build on the few existing projects that do incorporate some aspects of agroecology.
- Enhance access for community-led initiatives, farmer's organisations and CSOs implementing agroecology on the ground.
- Move from decisions to decisive action on tackling the vulnerabilities of agriculture to climate change.

INTRODUCTION

AGRICULTURE AT A CROSSROADS

TEN YEARS AGO, THE INTERNATIONAL ASSESSMENT OF AGRICULTURAL KNOWLEDGE, SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (IAASTD) PUBLISHED ITS REPORT 'AGRICULTURE AT A CROSSROADS'. AS A THREE-YEAR LONG INTERNATIONAL SCIENTIFIC PROCESS, IT INVOLVED 400 SCIENTISTS FROM ALL CONTINENTS AND A BROAD SPECTRUM OF DISCIPLINES.[1] THE TITLE REFLECTED THE CONCLUSION OF THE REPORT, WHICH INDICATED THE NEED FOR AGRICULTURE TO TAKE A FUNDAMENTALLY DIFFERENT PATH IN ORDER TO MEET THE CHALLENGES OF THE 21ST CENTURY. ENVIRONMENTAL DEGRADATION OF FORESTS, SOILS AND WATER BODIES, STRIKING LOSSES OF BIODIVERSITY, ALARMING CONTRIBUTIONS TO CLIMATE CHANGE AND SOCIO-ECONOMIC INEQUITIES WERE ALL NEGATIVE CONSEQUENCES ATTRIBUTED TO AGRICULTURE IN GENERAL AND THE INPUT-INTENSIVE INDUSTRIAL APPROACH TO IT IN PARTICULAR. AT THE SAME TIME, THE REPORT INDICATED THAT SOLUTIONS WERE ALREADY IN PLACE, WITH AGROECOLOGY BEING THE MOST PROMISING ONE.

Ten years later, it is not entirely clear which direction we have taken. On the one hand, the sector continues to contribute around 13 per cent of all global greenhouse gas emissions.[2] It remains responsible for more than 20 per cent of vegetated land degrading[3] and is still the main cause of global biodiversity loss.[4] On the other hand, the movement advocating for radical transformation of global food and agricultural systems is stronger than ever. Farmers, pastoralists, forest-based communities, civil society organisations, consumers, scientists and, more recently, key multilateral bodies like the Food and Agriculture Organisation (FAO) of the United Nations (UN) have called for institutional support of agroecology.[5] As a sustainable approach to food and agriculture, agroecology centres on the knowledge and capacities of male and female farmers, pastoralists, and forest dwellers in managing forests and agroecosystems in an environmentally sound and socially just way.

By further building evidence of the multiple ecological, economic and social benefits of agroecology, especially in relation to the Sustainable Development Goals (SDGs), this report calls upon governments, (inter-)national development agencies, and global financial mechanisms to redirect financial assistance to actors implementing and supporting agroecology all over the world. It starts with an introduction to agroecology and the multiple benefits that the approach comprises, before highlighting its uniqueness in relation to other contemporary ideas of agricultural development. The report then moves on to an overview of the current financial support for agriculture in general

and agroecology in particular. Afterwards, it presents eight case studies from civil society actors around the world that show how their grassroots work with agroecological practices contributes to multiple SDGs in culturally and spatially diverse settings. Finally, the report concludes with a series of recommendations for increasing financial and institutional support for agroecology.

WHAT IS AGROECOLOGY?

Agroecology has historically been defined as the inclusion of ecology into agricultural farming systems, especially as a response to the external environmental effects of industrial agriculture, by redesigning and managing agricultural systems based on traditional knowledge and ecological principles.[9] More recently, the definition of agroecology has been broadened to represent a transdisciplinary scientific field of study, an agricultural practice, and a social movement that aims to understand and transform food and agricultural systems towards greater ecological sustainability, social justice, and resilience.[10]

BUSINESS-AS-USUAL VS. AN ALTERNATIVE VISION

Agroecological farming systems have the potential to address many of the core sustainability issues that the agricultural sector is currently facing. Not only are such systems able to meet the need for increased productivity through deliberate use of beneficial ecological processes, they are also more resilient towards external threats like climate change and price volatility.[6] By making use of a knowledge-intensive approach that stresses the value of both traditional and scientific knowledge (and the synergies between the two), agroecology offers a great opportunity to improve the livelihoods of farmers and forest communities while simultaneously respecting our planetary boundaries. Through mutual learning, knowledge sharing, social cohesion, and creation of economic opportunities, agroecology has shown to be effective in empowering women, addressing gender inequalities and instigating social change.[7] It can therefore be stated that agroecology has the potential to meet the triple challenge of eradicating poverty, increasing productivity and achieving sustainability – which is at the heart of the SDGs through the pledge of leaving no one behind.[8]

The SDGs constitute an important framework for tackling today's most important global challenges. Developed by the UN in 2015 as a follow-up to the Millennium Development Goals (2000-2015), they show the interconnectedness and interdependence of different environmental, social, and economic development issues and, unlike their predecessor, perceive those issues globally.[11] By applying a holistic approach to food and agricultural systems – which highlights not only economic, but also ecological and social implications – agroecology can change agriculture into a catalyst for achieving the SDGs, rather than a key contributor to climate change and environmental degradation. Increasing carbon sequestration, reversing land degradation, halting biodiversity loss, securing (women's) land rights, strengthening local food systems, and promoting inclusive economic growth are all examples of positive contributions that agroecological practices can make to the SDGs. According to the 'Scaling up Agroecology Initiative of the FAO', agroecology contributes directly to the following SDGs: The eradication of poverty (1) and hunger (2), ensuring quality education (4), achieving gender equality (5), increasing water-use efficiency (6), promoting decent jobs (8), ensuring sustainable consumption and production (12), building climate resilience (13), securing sustainable use of marine resources (14), and halting the loss of biodiversity (15).[12]

While this sounds promising at a first glance, it is important to mention that agroecology doesn't stand in isolation. Claims about the contribution to the SDGs have also been made by proponents of other agricultural approaches, some of which promote a fundamentally different vision of agricultural development. While there is widespread consensus about the need to make agricultural systems more sustainable, there are very different ideas about how this is supposed to be achieved.

One prominent example is 'climate-smart agriculture', which has recently gained ground in international fora'. First coined in 2009 and brought forward by the FAO a year later, climate-smart agriculture is meant to address the interlinked challenges of food security and climate change. More specifically, it is defined as 'agriculture that sustainably increases productivity, resilience

(adaptation), reduces/removes GHGs (mitigation), and enhances achievement of national food security and development goals'.[13]

At first glance, the concept sounds promising and certainly similar to agroecology. Yet, it clearly fails to describe the agricultural practices and models with which the stated goals are supposed to be achieved and which role small-scale farmers are to play.[14] Advocacy groups like the Global Alliance for Climate-Smart Agriculture (GACSA) are dominated by agribusiness giants such as Yara International and Syngenta and their respective lobby organisations.[15] Likewise, the World Business Council on Sustainable Development's Low Carbon Technology Partnerships initiative runs a Climate Smart Agriculture Working Group headed by the world's leading food and agribusinesses, including Bayer, Olam International, Unilever, PepsiCo and Kelloggs, amongst others.[16] Climate-smart agriculture thus does not seem to question the structural causes of the problems it claims to address. Rather, it continues with a supposedly climate-friendly version of a 'business as usual approach' that encompasses virtually any agricultural practice and maintains a corporate-controlled vision of agricultural development.[17] Advocates of this approach have yet to define what exactly they understand as 'climate-smart' and yet to say whether the voices of small-scale farmers are included when climate-smart projects are executed by multinational and often export-oriented corporations.

Supporters of agroecology on the other hand have persistently stressed the relevance of what agroecology does and equally does not stand for. In contrast to climate-smart agriculture, agroecology has a far more transformative vision – one that stresses the importance of inclusivity, equality and sovereignty on all levels. It focuses on circular, localised, and resilient food systems that aim not only to achieve food security, but also food sovereignty. Thereby, it tries to challenge the power imbalances in the food system that climate-smart agriculture seems to adhere to. It is no surprise then that the IAASTD, which found that a radical change in current food and agricultural systems was needed, highlighted agroecology as the most promising alternative available. Similarly, Olivier De Schutter, the current co-chair of the International Panel of Experts on Sustainable Food Systems (IPES-Food) and former UN Special Rapporteur on the Right to Food, has also advocated for a paradigm shift towards diversified agroecological farming systems in his much-discussed report 'Agroecology and the Right to Food'.[18]

FINANCING AN AGROECOLOGICAL TRANSFORMATION

After nearly two decades of low prioritisation by foreign aid programmes, agriculture is again high on the agenda of governments, (inter-)national development agencies and global financial mechanisms.[19] The increase in world food prices in 2007-2008 and the resulting socio-economic crisis revealed the vulnerability of the global food system. This became apparent through the fact that people living in extreme poverty, about two-thirds of whom are resource-poor small-scale farmers and forest dwellers in rural areas of especially Sub-Saharan Africa and South Asia, were among those worst affected by increasing food prices.[20]

Since then, agriculture has been identified as a crucial catalyst for the achievement of several landmark international agreements, including the SDGs as well as the mitigation and adaptation targets on climate change set by the UN Framework Convention on Climate Change (UNFCCC) in the Paris Agreement in 2015.[21] The latter was further emphasised by the Koronivia joint work on agriculture (KJWA), a decision reached at the UNFCCC's 23rd conference in November 2017, which officially acknowledged the significance of the agriculture sector in adapting to and mitigating climate change. The Green Climate Fund (GCF), set up as a financial mechanism in 2010 by UNFCCC to assist 'developing countries' in adaptation and mitigation practices to counter climate change, has also taken up agriculture as one of its key potential investment priorities.[22] Likewise, official development assistance (ODA) for agriculture through (inter-) national development agencies has increased, with the aim of linking the agricultural sector with climate adaption and mitigation targets.[23] The sector is equally important in advanced economies like the European Union (EU) given its potential for climate change mitigation and adaptation, as well as for reduction of soil degradation and overall environmental pollution.[24] The EU's Common Agricultural Policy (CAP) has thus set-up cross-compliance mechanisms and Green Direct Payment schemes intended to

stimulate environmentally and climate-friendly farming.[25]

While one might assume that this increased attention to agriculture has translated into increased support for climate-resilient and/or climate-friendly small-scale farming systems, unfortunately this is not the case. According to recent research by the FAO, only twelve per cent of total GCF funding is going to projects considered primarily agricultural and linked to one or more KJWA topics (Figure 1).[26] Given the enormous potential that the support of climate-resilient agriculture can offer in terms of climate change adaptation in the Global South, this number is strikingly low. Instead, the GCF has mainly focused on energy and industry improvement projects, which has resulted in mitigation funding outnumbering adaptation funding considerably.[27] Even of those projects that do focus on agriculture and climate change adaptation, only a third is found in Sub-Saharan Africa and South Asia, where the majority of marginalised small-scale farmers and forest dwellers are located. The volume of funding also often exceeds $50 million, a figure far beyond the reach of local civil society organisations that are best placed to ensure that funding meets the needs of local communities. However, if the focus is adjusted accordingly, the GCF can be a transformative tool in shaping the role of agriculture in climate mitigation and adaptation.

Looking at the EU's ODA on agriculture, a 2017 study by Oxfam of more than 7,500 EU-funded projects showed that little more than one-fifth is actually targeting small-scale farmers.[28] Zooming in on the UK as the EU's second largest provider of ODA (after Germany), a recent study revealed that aid for agroecological projects – even when using the most generous interpretation of what this includes – counted for less than five per cent of agricultural aid and less than 0.5 per cent of the total UK aid budget since 2010.[29] Instead, there has been a recent surge in interest in the EU and its member countries to look into ways of how to support agricultural development abroad through public–private partnerships (PPPs).[30] which often focus on leveraging private finance for the commercialisation and export-orientation of well-off and medium-scale farmers, rather than supporting marginalised and climate-change prone households to enhance the resilience of their farming systems. PPPs thus risk reinforcing pre-existing inequalities and obstructing food sovereignty, one of agroecology's key goals.[31]

Within Europe, the situation is not much different. The current CAP still provides most of its subsidies through land-based payment schemes that promote scale, further marginalise small-scale farmers, and discourage environmentally friendly agroecological production.[32] This is also the conclusion of a comprehensive report recently published by IPES-Food. The report found that 'the current responses – whether from public policies or from the private sector – are failing to adequately address the deep and interconnected challenges in food systems' and that 'the prevailing solutions have only reinforced our reliance on a highly specialised, industrialised,

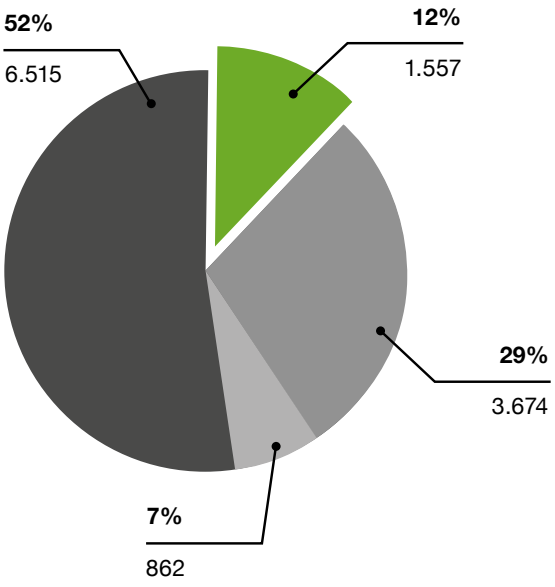


Figure 1: Agriculture-related Activities in the Green Climate Fund Portfolio[26]

FUNDING OF GCF PROJECTS (USD MIL)

- **Primarily argiculture project**
- **Non primarily argiculture, but some argiculture component**
- **Non primarily argiculture, but with some argiculture co-benefits**
- **Non argiculture project**

financialised, standardised and export-oriented model of agriculture and food production'.[33]

These findings confirm that although global investment in agriculture has been increasing in recent years, overall financial support for small-scale farmers using agroecological practices remains strikingly low through both domestic as well as international funding streams.

In contrast to the limited financial support, the popularity of agroecology over the last decade has increased rapidly, moving the approach from the margins to the centre of discussions on agriculture, food, and development. A prominent example for this is the FAO, which is now considering agroecology integral to its own vision for sustainable food and agriculture and a key approach to tackling climate change and the interconnected challenges of food security and nutrition. Likewise, the popularity is also seen among governments and (inter-) national development agencies. The French Development Agency (AFD), for example, recently launched the four-year-long initiative 'Agro-Ecological Transition Support Project' in West Africa.[34] Likewise, the Swiss Development Cooperation (SDC) and Canadian International Development Agency (CIDA), amongst others, have been actively supporting agroecological projects over a number of years.[35] On national level, Senegalese president Macky Sall recently announced that Senegal will start preparing the country for an agroecological transition by anchoring the approach in the country's socio-economic development programme, Plan Sénégal Emergent (PSE).[36] In India, whole states (e.g. Sikkim[37] and Andhra Pradesh[38]) are switching to agroecological and organic farming methods to increase farmer's resilience, improve livelihoods, and foster environmentally and climate-friendly food production. Seeing that agroecology is gaining ground on multiple levels, the following eight case studies are going to provide further evidence on the contributions of grassroots agroecological projects towards major international agreements like the SDGs and the Paris agreement.

NOTES

1 International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD). (2009). *Synthesis report: a synthesis of the global and sub-global IAASTD reports, Agriculture at a crossroads*. Island Press, Washington, DC. Retrieved from: https://www.globalagriculture.org/fileadmin/files/weltagrarbericht/IAASTDBerichte/GlobalReport.pdf

2 Intergovernmental Panel on Climate Change (IPCC). (2014). *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Retrieved from: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_full.pdf

3 United Nations Convention to Combat Desertification (UNCCD). (2017). *The Global Land Outlook, first edition.* Bonn, Germany. Retrieved from: https://knowledge.unccd.int/sites/default/files/2018-06/GLO%20English_Full_Report_rev1.pdf

4 Dudley, N. & Alexander, S. (2017). Agriculture and biodiversity: a review. *Biodiversity 18* (2-3), 45-49. DOI: 10.1080/14888386.2017.1351892

5 Food and Agriculture Organisation of the United Nations (FAO). (2018). *Scaling-up Agroecology Initiative - Transforming food and agriculture to achieve the SDGs.* Retrieved from: http://www.fao.org/3/I9049EN/i9049en.pdf

6 FAO. (2018). *The 10 elements of agroecology - Guiding the transition to sustainable food and agricultural systems.* Agroecology Knowledge Hub. Retrieved from: http://www.fao.org/3/i9037en/I9037EN.pdf

7 Khadse, A. (2017). *Women, Agroecology & Gender Equality.* Focus on the Global South. Retrieved from: https://focusweb.org/wp-content/uploads/2017/09/women_agroecology_gender_equality.pdf

8 Casey, J. (2016). Editorial: Agroecology and the Sustainable Development Goals. *Food Chain*, *6* (2). DOI: 10.3362/2046-1887.2017.004

9 Altieri, M. A. (1995). *Agroecology: The Science of Sustainable Agriculture* (2nd Edition ed.). Boulder, CO, USA: Westview Press.

10 Wezel, A. et al. (2009). Agroecology as a science, a movement and a practice. A review. *Agronomy for Sustainable Development, 29* (4), 503-515. DOI: 10.1051/agro/2009004

11 Sustainable Development Goals Fund. (n.d.). *From MDGs to SDGs*. Initiative on behalf of the United Development Programme. Retrieved from: http://www.sdgfund.org/mdgs-sdgs

12 See 5

13 FAO. (2010). *"Climate-Smart" Agriculture - Policies, Practices and Financing for Food Security, Adaptation and Mitigation.* Retrieved from: http://www.fao.org/docrep/013/i1881e/i1881e00.pdf

14 Pimbert, M. (2017). Agroecology as an Alternative Vision to Conventional Development and Climate Smart Agriculture. *Development, 58,* (2-3), 286-298. DOI:10.1057/s41301-016-0013-5

15 FAO. (2019). *Global Alliance for Climate-Smart Agriculture (GACSA) Member List.* GACSA. Retrieved from: http://www.fao.org/gacsa/members/members-list/en/

16 World Business Council for Sustainable Development (WBCSD). (2018). *Low Carbon Technology Partnerships initiative '18 – Going further, faster.* Low Carbon Technology Partnerships initiative (LCTPi). Retrieved from: https://docs.wbcsd.org/2018/12/LCTPi_progress_report_2018.pdf

17 Coopération Internationale pour le Développement et la Solidarité (CISDE). (2015). *'Climate-Smart Agriculture': the Emperor's new clothes?*. CIDSE Discussion paper. Retrieved from: https://www.cidse.org/publications/just-food/food-and-climate/csa-the-emperor-s-new-clothes.html

18 De Schutter, O. (2010). *Agroecology and the Right to Food*. UN Report A/HRC/16/49 to the 16th Session of the Human Rights Council. Retrieved from: http://www.srfood.org/images/stories/pdf/officialreports/20110308_a-hrc-16-49_agroecology_en.pdf

19 Islam, N. (2011). *Foreign Aid to Agriculture - Review of Facts and Analysis*. International Food Policy Research Institute (IFPRI) Discussion Paper 01053. Retrieved from: http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/124880/filename/124881.pdf

20 Compton, J., Wiggins, S. & Keats, S. (2010). *Impact of the global food crisis on the poor: what is the evidence?*. Overseas Development Institute. Retrieved from https://www.odi.org/publications/5187-impact-global-food-crisis-poor-evidence

21 For more information on the Paris Agreement, visit: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

22 Green Climate Fund. (2015). *Analysis of the Expected Role and Impact of the Green Climate Fund*. Meeting of the Board GCF/B.09/06. Retrieved from: https://www.greenclimate.fund/documents/20182/24949/GCF_B.09_06_-_Analysis_of_the_Expected_Role_and_Impact_of_the_Green_Climate_Fund.pdf/d0dec00c-1424-4670-8cff-0465b5dd8ee5

23 Seek Development. (2018). *Are we making progress? Understanding trends in donor support for agriculture, education, global health, global health R&D, and nutrition.* Donor Tracker. Retrieved from: https://donortracker.org/sites/default/files/highlightstories/pdf/DT_HighlightStory_AreWeMakingProgress_March2018_1.pdf

24 Heinrich Böll Foundation, Friends of the Earth Europe and BirdLife Europe & Central Asia. (2019). Agriculture Atlas 2019 – Agriculture Atlas 2019 – *Facts and Figures on EU Farming Policy*. Retrieved from: https://www.boell.de/en/2019/05/02/agriculture-atlas-facts-and-figures-eu-farming-policy

25 European Commission. (2015). *EU Agriculture and Climate Change*. Factsheet. Retrieved from: https://ec.europa.eu/agriculture/sites/agriculture/files/climate-change/factsheet_en.pdf

26 FAO. (2018). *A Preliminary Review of Agriculture-Related Activities in the Green Climate Fund Portfolio*. Retrieved from: http://www.fao.org/3/CA2698EN/ca2698en.pdf

27 Green Climate Fund. (2019). *Consideration of funding proposals.* Meeting of the Board GCF/B.22/10/Rev.01. Retrieved from: https://www.greenclimate.fund/documents/20182/1424894/GCF_B.22_10__Consideration_of_funding_proposals.pdf/522c5e26-e0c6-511f-06c3-377914489751

28 Mayrhofer, J. & Saarinen, H. (2017). *Missing out on Small is Beautiful.* Oxfam Briefing Paper. Retrieved from: https://www.oxfam.org/en/research/missing-out-small-beautiful

29 Pimbert, M. & Moeller, N.I. (2018). Absent Agroecology Aid: On UK Agricultural Development Assistance Since 2010. *Sustainability 10* (2), 1-10. DOI: 10.3390/su10020505

30 FAO. (2016). *Public–private partnerships for agribusiness development - A review of international experiences.* Retrieved from: http://www.fao.org/3/a-i5699e.pdf

31 See 30

32 Pe'er, G. et al. (2017). *Is the CAP Fit for purpose? An evidence-based fitness-check assessment.* German Centre for Integrative Biodiversity Research (iDiv), Halle-Jena-Leipzig. Retrieved from: http://extranet.greens-efa-service.eu/public/media/file/1/5401

33 IPES-Food. (2018). *Towards a Common Food Policy for the European Union.* Report. Retrieved from: http://www.ipes-food.org/_img/upload/files/CFP_FullReport.pdf

34 Fore more information, see: https://www.ecowas.int/agro-ecological-transition-support-project-in-west-africa-is-now-a-reality/

35 Wijeratna, A. (2018). *Agroecology: Scaling-up, scaling-out.* Action Aid. Retrieved from: https://actionaid.org/publications/2018/agroecology-scaling-scaling-out

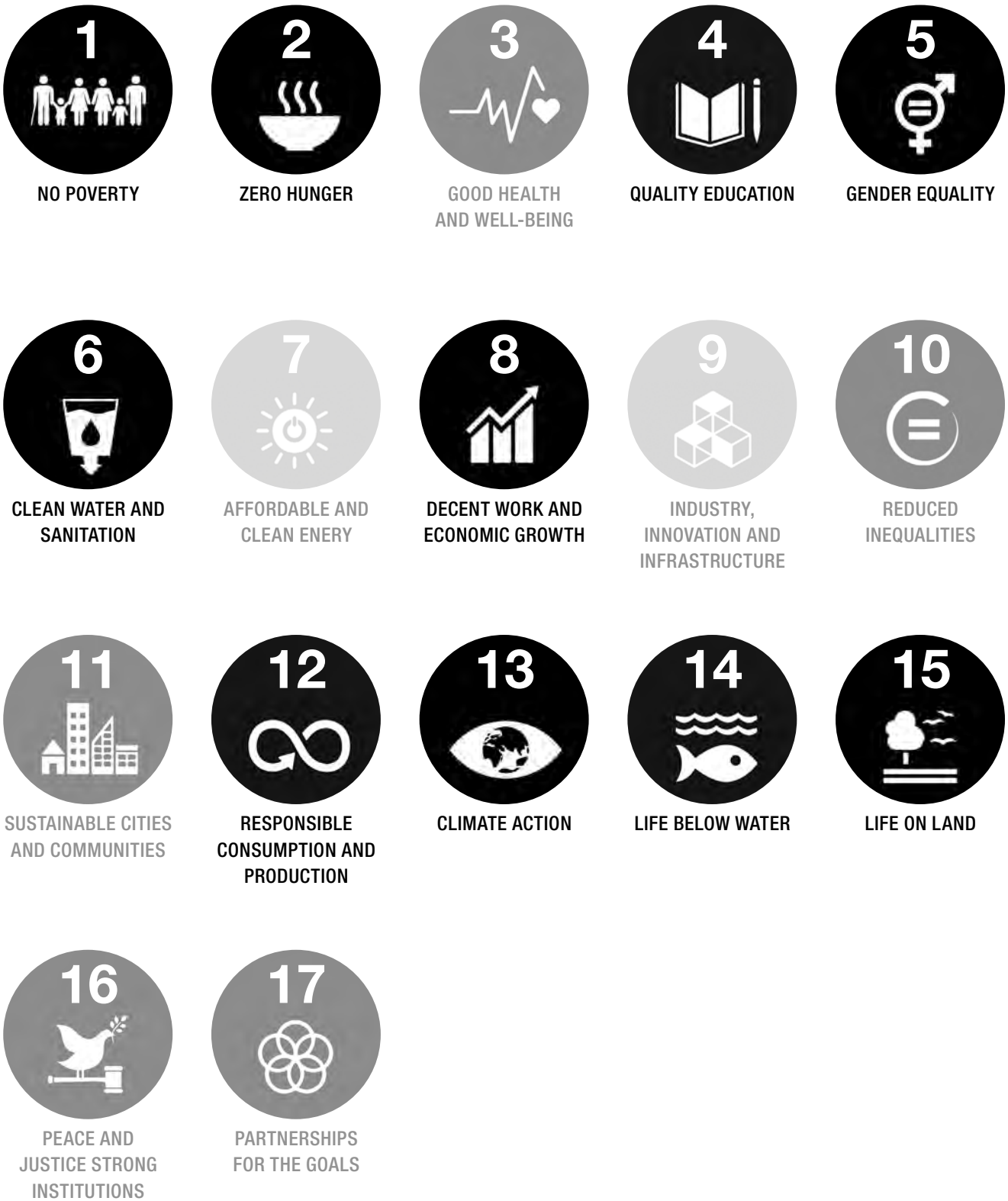
36 Sall, M.C. (2018). *Message à la Nation de son Excellence Monsieur le Président de la République à l'occasion du Nouvel An*. Retrieved from: http://www.presidence.sn/actualites/message-a-la-nation-de-son-excellence-monsieur-le-president-de-la-republique-a-loccasion-du-nouvel-an_1536

37 Masucci, M. (2018). *A 100% organic world is possible. The Indian state of Sikkim shows us how.* Lifegate. Retrieved from: https://www.lifegate.com/people/lifestyle/sikkim-organic-agriculture-model

38 UN Environment. (2018). *Andhra Pradesh to become India's first Zero Budget Natural Farming state.* Press Release. Retrieved from: https://www.unenvironment.org/news-and-stories/press-release/andhra-pradesh-become-indias-first-zero-budget-natural-farming-state

Sustainable Development Goals

According to FAO, agroecology is contributing directly to 10 (black) and indirectly to 5 (dark grey) of the 17 SDGs



Case Studies

Ms. Isabella Kaguna showing the harvest of her indigenous sorghum and millet varieties.
(Photo credit Institute for Culture and Ecology)

case 01

Microbial biocontrol agents as an agroecological contribution to food security and sovereignty in Bolivia

MIGUEL ANGEL CRESPO, PRODUCTIVIDAD BIOSFERA MEDIO AMBIENTE (PROBIOMA) – BOLIVIA

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Sustainable Devopment Goals:

OVER THE LAST 25 YEARS, PROBIOMA (PRODUCTIVIDAD BIOSFERA MEDIO AMBIENTE), BASED IN BOLIVIA, HAS BEEN CONTRIBUTING TO THE VALUATION AND SUSTAINABLE USE OF NATURAL RESOURCES AND BIODIVERSITY AS A BASIS FOR SUSTAINABLE DEVELOPMENT. THE ORGANISATION CONDUCTS RESEARCH AND ENVIRONMENTAL REMEDIATION WHILST FOCUSSING ON THE PROMOTION OF AGROECOLOGY AND FOOD SOVEREIGNTY IN BOLIVIA AND ABROAD. AMONG OTHER THINGS, PROBIOMA HAS DEVELOPED A SUCCESSFUL METHOD OF BIOLOGICAL PEST CONTROL THAT CAN BE APPLIED TO BOTH INTENSIVE AND EXTENSIVE CROP PRODUCTION SYSTEMS.

Small green bug (Piezodorus guilldinii) controlled with the Beauveria bassiana fungus in a field of soya bean. (Photo credit PROBIOMA)

THE DESTRUCTIVE IMPACT OF AGRIBUSINESS IN BOLIVIA

Bolivia is among the world's richest countries in biodiversity.[1] But the agro-industrial business model, which relies heavily on the use of agrochemicals (pesticides and synthetic fertilizers) and transgenic seeds, is having serious social, environmental and productive impacts on the country. Export crops such as soybean, sorghum and sugar cane (produced for agrofuel) are increasingly replacing food crops. The production of cereals, vegetables, fruits, tubers and fodder has therefore declined by more than 27 per cent over the last ten years, generating dependency on food imports and hampering food security and sovereignty.[2] The area under soybean cultivation on the other hand has more than doubled since the early 2000s, increasing disproportionately to the increase in total cultivated area (Figure 4). As a consequence, soybean accounted for 36 per cent of the country's total area under cultivation in the 2016-2017 agricultural season.[3]

Bolivia's shift to export crops has also been responsible for significant deforestation, with approximately 3.5 million additional hectares cut down since the turn of the century.[4] It has also contributed to the degradation of soils on 40 per cent of the land, and to climate change, resulting in an increase in droughts and torrential rains. From 2000 to 2017, the import of agrochemicals has increased fivefold in Bolivia – from around 30 to more than 150 million kilograms per year[5] – while at the same time, the area cultivated only went up for around 80 per cent (Figure 4). Taking into consideration that no considerable improvements in yield levels have been achieved for major cash crops during that period – soya yields for example fluctuated between 1.9 and 2.4 tons per hectare, this means that agrochemicals have been excessively used without any justifiable benefit.[6] On the contrary, it has had serious social, health and environmental impacts. The use of the herbicide glyphosate on transgenic soybean has also been linked to serious human health impacts.[7]

HARNESSING THE POWER OF NATURE

PROBIOMA supports the development and transfer of knowledge about biological pest and disease control. In laboratories specially designed by the PROBIOMA team, the organisation has developed a system based on the use of beneficial microorganisms which are present in nature. These microorganisms are natural regulators of insects that are considered pests, as well as of diseases. To be able to manufacture and commercialise such biological pest and disease control, PROBIOMA as a non-profit organisation has created an independent entity called PROBIOTEC SRL.[8] Through working together over the past 15 years, the application of bioregulators based on entomopathogenic and mycoparasitic fungi has reached more than 500,000 hectares in over 60 agricultural crops and a number of livestock throughout Bolivia.[9] Additionally, PROBIOMA has promoted other agroecological practices accompanying biological pest control. The organisation has for example developed different organic foliar fertilizers and engaged in the conservation and recovery of native seeds. Additionally, PROBIOMA has worked on bioremediation of soils to counter soil degradation and helped restoring degraded forest systems through analog forestry. Apart from those practices, PROBIOMA has also introduced an official agroecology label *(Sello de Identidad Agroecológica)* as an alternative to conventional certification, has reached out to media on alternatives to large-scale agribusiness and has given trainings for organisational capacity development.

TACKLING HUNGER AND CLIMATE CHANGE WHILE REDUCING NEGATIVE IMPACTS ON LAND

PROBIOMA's agroecological practices have shown to contribute to several SDGs. On SDG 2 for example, the use of biological control activities has shown to improve yields considerably[10] – a significant contribution towards SDG Target 2.3 of increasing agricultural productivity. Next to increased yields, also the access to safe and nutritious food for people in vulnerable situations (SDG Target 2.1) is addressed, as the organisation arranges weekly agroecological fairs where more than 250 different organic foods are being sold. The agroecological label, which guarantees that agroecological production methods have been used, is popular among consumers and gives farmers the opportunity of value addition (part of SDG Target 2.3). PROBIOMA has also helped to accelerate the implementation of agroecology on a broader scale, as several municipalities of the Chiquitania are incorporating the use of agroecological practices in their policies as a fundamental basis for the sustainable management of their natural resources. Equally, on national level, Bolivia has adopted a law based on agroecological principles, Law 3525 on Ecological Agriculture (SDG 2.4).[11]

Currently, the Bolivian state continues to import agrochemicals in a volume of 150 million kilogram per year, mainly for the production of export crops.

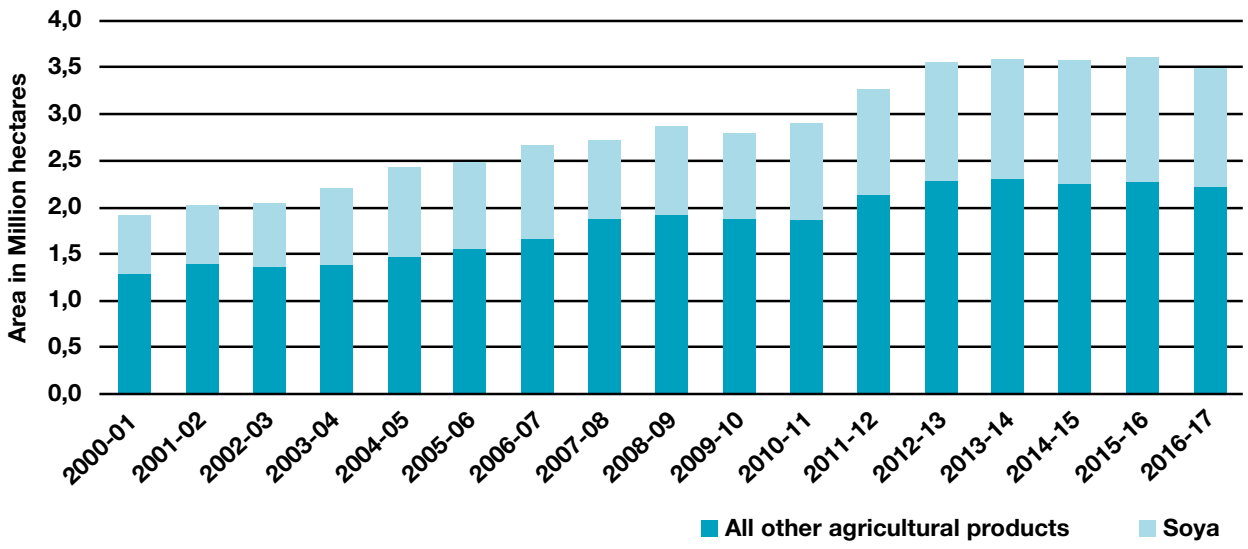
Taking into consideration that through the use of biological pest control, PROBIOMA has contributed to the replacement of more than 420,000 kilogram of pesticides that have not been applied in the fields, the organisation actively works on SDG 3 Target 3.9 of *"substantially reducing the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination"* and SDG Target 6.3 of *"improving water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, thereby avoiding the contamination of waters of rivers and underground aquifers"*. This is especially relevant in Bolivia given that during a recent agricultural census, almost 40 per cent of communities in the country had the perception that their waters are contaminated with agrochemicals.[12]

"PROBIOMA has contributed to the replacement of more than 420,000 kilogram of pesticides that have not been applied in the fields."

By promoting biological pest control and other agroecological practices like analog forestry, PROBIOMA actively resists the expansion of industrial and agriculture in Bolivia. Taking into consideration the enormous environmental and climatic consequences that are associated with such practices – especially considering the deforestation that precedes the creation of large-scale monocultures – the organisation therefore takes action to combat climate change (SDG 13) and help reaching the Paris Agreement. Likewise, PROBIOMA has set up an internationally accredited institute, the Institute of Biodiversity and Biotechnology (INBIOTEC), which, in 18 years, has trained more than 2,000 people from different groups of social, governmental, non-governmental organisations, producer associations and journalists, with the purpose of preventing environmental and climatic disasters.

Finally, Probioma strongly focuses on SDG 15 of preserving life on land. In 2017, Bolivia imported food (especially tubers, cereals, fruits and vegetables) destined for the domestic in a volume of 980 million kilograms, which reflects the current situation of public policies prioritizing the production of export crops at the expense of local and diversified production.[13] As a consequence, the countries cultivated area is covered by a handful of crops (with transgenic soybean being the majority on more than one third of the land), considerably harming Bolivia's (agro)biodiversity. PROBIOMA has therefore decided to contributie to the conservation of native genetic resources by having a stock of 420 types of microorganisms beneficial for agriculture, livestock, soil bioremediation and for the control of vectors of human diseases. It also has a germplasm bank with 82 seed

Figure 4: Proportion of total cultivated area in Bolivia used for soybean production.[2]



varieties of different crops, among which are more than 16 varieties of native corn and four varieties of non-transgenic soybeans, thereby focussing on SDG 15 Target 15.6 of *"promoting the fair and equitable sharing of the benefits arising from the utilisation of genetic resources and promoting appropriate access to such resources"*.

In partnership with other organisations, PROBIOMA also contributes to the consolidation of Forest Management Plans in indigenous territories of the Chiquitania (Lomerio) through the implementation of more than 80 ecological gardens that are in harmony with the forest (SDG 15 Target 15.2). Where areas have been degraded, the organisation conducts bioremediation of soils. This is especially the case in highland arid zones that produce quinoa and in lowland areas of extensive crop and livestock production. Encompassing 50,000 hectares, this work helps combat the process of soil degradation, effectively targeting SDG Target 15.3 of combat desertification and restoring degraded land and soil.

More research and dissemination of knowledge

The use of biological pest and disease control in combination with other practices is key to the growth of agroecology in Bolivia. With its wealth of experience using those control techniques, PROBIOMA serves as a key reference in the country. PROBIOMA promotes biological control via the Agroecological Platform, the Urban Ecological Orchards Network, the Santa Cruz Beekeepers Association, the International Analog Forestry Network (IAFN), the International Seeds of Life Network, the Pantanal Without Limits network and several universities. PROBIOMA believes that further support is needed to deepen and consolidate research, such as field tests of biological pest control agents for new pests that affect crops. Resources are also needed to disseminate such knowledge and to train more producers and their organisations about biological pest control.

NOTES

1 Convention on Biological Diversity (CBD). (n.d.) *Bolivia (Plurinational State of) Biodiversity Facts.* Country Profile. Retrieved from: https://www.cbd.int/countries/profile/default.shtml?country=bo#facts

2 Instituto National de Estadística (INE). (2017). *Estadísticas por Actividad Económica – Agricultura.* Databank. Retrieved from: https://www.ine.gob.bo/index.php/estadisticas-por-actividad-economica/industria-manufacturera-y-comercio-4

3 See 2

4 Ministerio de Medio Ambiente y Agua & Autoridad de Fiscalización y Control Social de Bosques y Tierra. (2018). *Deforestación en el Estado Plurinacional de Bolivia. Periodo 2016-2017.* Informes Anuales. Retrieved from: http://www.abt.gob.bo/images/stories/Transparencia/InformesAnuales/memorias-2016-2017/Memoria_Deforestacion_2016_2017_opt.pdf

5 Salinas, J.C. (2018). *Quintuplican el uso de agroquímicos para evitar nuevas áreas de siembra.* El Deber. Retrieved from: https://www.eldeber.com.bo/economia/Quintuplican-el-uso-de-agroquimicos-para-evitar-nuevas-superficies-20180717-0011.html

6 See 2

7 Dixon, E. (2019). *Common weed killer glyphosate increases cancer risk by 41%, study says.* CNN. Retrieved from: https://edition.cnn.com/2019/02/14/health/us-glyphosate-cancer-study-scli-intl/index.html

8 For more information, visit: http://www.probiotec.org

9 El Mundo. (2018). *Probioma apoya control biológico en 500.000 ha.* Newspaper article. Retrieved from: http://elmundo.com.bo/web2/index.php/noticias/index?id=probioma-apoya-control-biologico-en-500-000-ha

10 Van Lenteren, J.C. et al. (2018). Biological control using invertebrates and microorganisms: plenty of new opportunities. *BioControl 63* (1), 39-59. DOI: 10.1007/s10526-017-9801-4

11 Presidencia de la Repùplica Bolivia. (2006). *Regulación y Promoción de la Producción Agropecuaria y Forestal No Maderable Ecológica.* Bill. Retrieved from: https://www.ciaorganico.net/legislacion/385_Ley_3525.pdf

12 INE. (2014). *Un pincelazo a las estadísticas con base a datos de censos*. Report. Retrieved from: http://www.fao.org/family-farming/detail/fr/c/317135/

13 INE. (2017). *Estadísticas de Comercio Exterior - Importaciones*. Databank. Retrieved from: https://www.ine.gob.bo/index.php/comercio-exterior/introduccion-3

case 02

Increasing plant genetic diversity in farmers' fields for resilient communities and food sovereignty in Iran

NAHID NAGHIZADEH, CENESTA – IRAN

www.cenesta.org

Sustainable Devopment Goals:

CENESTA IS WORKING TO IMPROVE THE AGROECOLOGICAL SYSTEMS OF SMALL-SCALE FARMERS IN IRAN. SINCE 2008, THE ORGANISATION HAS IMPLEMENTED AN EVOLUTIONARY PARTICIPATORY PLANT BREEDING PROGRAMME TO RAPIDLY INCREASE BIODIVERSITY IN FARMERS' FIELDS, ENHANCE RESILIENCE TO CLIMATE CHANGE AND RECORD TRADITIONAL KNOWLEDGE. BY DOING SO, CENESTA IS CONTRIBUTING TO A SYSTEM OF HEALTHY FOOD PRODUCTION AND SUSTAINABLE ECOSYSTEMS.

Farmer's examining the quality of a evolutionary wheat population in the field. (Photo credit CENESTA)

LACK OF ACCESS TO GENETIC RESOURCES

Most of Iran's climate is considered hot and dry – 85 per cent of its land area is classified as either arid or semi-arid.[1] At the same time, the agriculture sector continues to play a key role in the countries' economy. The majority of farmers are smallholders as 75 per cent of them work on less than 5 hectares.[2] Most of them live in drylands with low soil fertility and high exposure to climate change, including severe droughts, low precipitation and water scarcity.[3] They lack access to plant genetic resources, including varieties that are adapted or resilient to climate change. As most small-scale farmers have been excluded from participation in formal agricultural research, their engagement with agricultural research stations is very low.

EVOLUTIONARY PARTICIPATORY PLANT BREEDING

The Evolutionary Participatory Plant Breeding (EPPB) approach is a combination of two specific breeding methods: evolutionary breeding and participatory plant breeding. Evolutionary breeding is based on a mass selection technique used by farmers for over 10,000 years of crop improvement and represents a dynamic and inexpensive strategy to enhance the adaptation of crops to climate change. It has been shown to increase yields, disease resistance, genetic diversity, nutrient food and adaptability of a crop population over time.[4] Participatory plant breeding on the other hand originated in developing countries and is designed to meet the needs of low-input, small-scale farmers in marginal environments – those who were often overlooked by conventional crop breeders.[5]

EPPB can be considered a living gene bank in farmers' fields which rapidly increases on-farm biodiversity as one of the fundamental elements of small-scale agroecological systems.[6] EPPB emphasises the utilisation of natural selection in combination with site-specific farmer selection in early segregating generations of a heterogeneous crop population. It represents a dynamic and inexpensive strategy to quickly enhance the adaptation of crops to climate change and promote in situ conservation of agro-biodiversity. EPPB enables production of varieties specifically adapted to an agroecological agricultural model and puts control of seed production back in the hands of farmers.[7]

Iran was among the first group of countries – together with Syria, Jordan, Algeria and Eritrea – where the idea of EPPB was first discussed with farmers and implemented with an evolutionary population of wheat and barley. Activities were started by one farmer in Kermanshah (rain-fed condition) and another in Garmsar (irrigated condition). The farmer in Kermanshah then served as a multiplier of the evolutionary population to several other farmers in Kermanshah and beyond. Today, populations cover several hundred hectares and are planted in 17 Iranian provinces. Although it was an innovative methodology, both farmers and the government have reacted positively to the programme.[8]

RESILIENT COMMUNITIES AND LOCAL FOOD SOVEREIGNTY

Evolutionary Participatory Plant Breeding helps building resilient communities and local food sovereignty, thereby contributing to several Sustainable Development Goals (SDGs), especially SDG 1, 2, 13 and 15. By supporting local food producers in reducing production costs and increasing both income and resilience, EPPB contributes to more reliable and sustainable agricultural productivity – thereby contributing to SDG 1 Target 1.5 of *building the resilience of the poor and reduce their exposure and vulnerability.* Recent molecular studies on evolutionary populations of barley in Italy confirmed their yield stability over time and under different agro-ecological conditions.[9] Evolutionary populations are able to control weeds, diseases and insects, and therefore can reduce production costs considerably towards a low/no input agroecological system. This protects farmers from dependence on subsidies and/or input price fluctuations, which in the past have considerably affected farmers' incomes. Equally, it returns control of genetic resources and agrobiodiversity to small-scale farmers and gives them crucial independence in both seed supply and genetic diversity.

Coupled with the fact that fields of evolutionary plant populations have shown increased yields[10], EPPB directly contributes to most SDG 2 Targets, in particular Target 2.3 of *doubling the agricultural productivity and incomes of small-scale food producers* and Target 2.5 of *maintaining the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species.* The evolutionary plant populations are a permanent asset in the hands of the farmers. They provided a valuable opportunity for small-scale farmers to engage in a 'learning by doing process' that can enhance their knowledge for reliable and sustainable productivity patterns based on natural selection and different types of agronomic management. Indications from the field (Italy, France, Iran, and Ethiopia) also suggest that the

evolutionary populations exhibited superior quality characteristics (protein content, cooking quality, taste, reduced gluten intolerance), require fewer chemical inputs and are well adapted to organic farming. For example, one of the important issues of rain-fed bread wheat in Iran is its low quality for making bread.[11] Following the EPPB programme, a number of women in Garmsar started using the evolutionary population of bread wheat in their bakeries. Both the farmers and bakers have been pleased with the results. They confirmed that creating mixtures not only brings greater yield stability, but also greater aroma and quality to the bread.[12]

"EPPB can be considered a living gene bank in farmers' fields which rapidly increases on-farm biodiversity as one of the fundamental elements of small-scale agroecological systems."

EPPB is also strengthening resilience and adaptive capacity to climate-related hazards (SDG 13 Target 13.1). By increasing genetic diversity, the approach offers a flexible and efficient strategy to enhance the adaptation of crops to climate change.[13] The genetic diversity serves as a way for populations to adapt to changing environments: EPPB mixtures of wheat and barley therefore have the opportunity to adapt to climate change, which in turn increases the resilience of the small-scale farmers who plant them. It is a highly suitable approach to in-situ conservation of plants and genetic material that incorporates traditional and indigenous knowledge.

The EPPB approach is strongly contribution to SDG 15 Target 15.6 of *promoting the fair and equitable sharing of the benefits arising from the utilisation of genetic resources and promote appropriate access to such resources, as internationally agreed.*[14] The programme in Iran offers a model for giving a large number of farmers access to a great amount of biodiversity in a relatively short time . Contributing to agricultural biodiversity, including conservation and use of landraces (domesticated, locally adapted, traditional varieties) and crop wild relatives, is widely recognised to be essential for adapting successfully to climate change.[15] Moreover, EPPB promotes the fair and equitable sharing of genetic resources with all stakeholders through customary systems of farmer-saved seed and seed exchange that enable small-scale farmers to access and benefit from gene diversity. The EPPB programme provides a valuable opportunity for small-scale farmers to 'learn by doing' and enhance their knowledge of reliable and sustainable productivity patterns based on natural selection and in different types of agronomic management.

BROADENING THE EPPB APPROACH

The evolutionary populations of wheat and barley continue to be spread throughout Iran, both through farmer-to-farmer exchanges and through exchanges organised by the *Dryland Agricultural Research Institute (DARSI),* the Department of Agriculture of Fars Province, and CENESTA. In addition, DARSI established a similar programme for bread wheat. Evolutionary populations of a variety of crops are now also grown in several other countries.

The EPPB programme will continue in Iran and beyond (Jordan, Bhutan, Nepal, Ethiopia and Uganda) with the aim of sustainably increasing crop productivity and enhancing resilience to climate change of farming communities under low-input, rain-fed and less favoured production conditions.[16] The continuing programme specifically aims to enhance resilience of farmers in partner countries through higher and stable yields under the agronomic and stress conditions of local farms, including drought, salinity, pest and diseases.

CENESTA believes that the establishment and recognition of organisations of small-scale farmers at local, regional, national and international levels is critical. More focus is also needed on women's role in the process of local agroecological systems. Policies to support, disseminate, up- and out-scale EPPB achievements and best practices are also needed, as is capacity building to enhance participation among small-scale farmers and agricultural research institutions. Finally, promotion of EPPB and evolutionary crop populations in general will contribute to more resilient communities and ecosystems.

NOTES

1 Naghizadeh, N., Didari, A. & Farvar, M.T. (2012). *Recognition and Support of Territories and Areas Conserved by Indigenous, Peoples and Local Communities in Iran, A National Case Study.* ICCA Consortium, IUCN/TILCEPA, Kalpavriksh, and Natural Justice. Retrieved from: http://www.cenesta.org/wp-content/uploads/2012/12/publication-cbd-technical-series-no64-iran-en.pdf

2 CENESTA. (2010). *Implementation of Farmers' Rights in the Islamic Republic of Iran.* Report for the 3rd Session of the Secretariat of the International Treaty on Plant Genetic Resources for Food and Agriculture. Retrieved from: http://www.cenesta.org/wp-content/uploads/2015/10/farmers-rights-in-iran-2010-en.pdf

3 Jamshidi, O. et al. (2018). Vulnerability to climate change of smallholder farmers in the Hamadan province, Iran. *Climate Risk Management, 23,* 146-159. DOI: 10.1016/j.crm.2018.06.002

4 Raggi, L. et al. (2017). Evolutionary breeding for sustainable agriculture: Selection and multi-environmental evaluation of barley populations and lines. *Field Crops Research 204,* 76-88. DOI: 10.1017.01.011

5 Murphy, K. et al. (2007). Breeding for organic and low-input farming systems: An evolutionary–participatory breeding method for inbred cereal grains. *Renewable Agriculture and Food Systems 20* (1), 48-55. DOI: 10.1079/RAF200486

6 Rahmanian, M., et al. (March 2014). *Evolutionary Populations: Living Gene Banks in Farmer's Fields.* Farming Matters 30.1. Cultivating Diversity. Retrieved from: https://www.ileia.org/wp-content/uploads/2017/02/30_1_Agrobiodiversity.pdf

7 See 6

8 CENESTA. (2014). *Using Agricultural Biodiversity and Farmers' Knowledge to Adapt Crops to Climate Change.* Grant completion report, Grant #1214

9 See 4

10 See 4

11 Haghparast, R. et al. (2009). Review on Participatory Bread Wheat Breeding Program in Kermanshah, Iran under Rainfed Condition: Importance, Opportunities and Challenges. *Middle Eastern and Russian Journal of Plant Science and Biotechnology, 3* (1), 1-4

12 See 8

13 Ceccarelli, S., Galie, A. & Grando, S. (2013). Participatory Breeding for Climate Change-Related Traits. C. Kole (ed.), *Genomics and Breeding for Climate-Resilient Crops, 1*, 331-376. DOI 10.1007/978-3-642-37045-8_8

14 See 6

15 FAO. (2019). *The State of the World's Biodiversity for Food and Agriculture,* J. Bélanger & D. Pilling (eds.). FAO Commission on Genetic Resources for Food and Agriculture Assessments. Retrieved from: http://www.fao.org/3/CA3129EN/CA3129EN.pdf

16 For more information, visit: http://www.libird.org/app/projects/view.aspx?record_id=82

Diversity of different barley populations grown in the same field. (Photo credit CENESTA)

case 03

Mixed gains from cash and subsistence crops. Agroecology of indigenous people in the Indian' Nilgiri Mountains

SNEHLATA NATH,
KEYSTONE FOUNDATION – INDIA

www.keystone-foundation.org

Sustainable Devopment Goals:

ZERO HUNGER

CLIMATE ACTION

LIFE ON LAND

KEYSTONE FOUNDATION WORKS WITH INDIGENOUS PEOPLE IN THE NILGIRI BIOSPHERE RESERVE OF THE WESTERN GHATS TO ESTABLISH SUSTAINABLE AGROECOLOGICAL MODELS IN MARGINAL LAND HOLDINGS. SUCH MODELS USE BOTH TRADITIONAL KNOWLEDGE AND MODERN METHODS. THEY INCLUDE EFFORTS TOWARD CROP DIVERSITY, SOIL IMPROVEMENT, ORGANIC AGRICULTURE, INCREASING THE NUMBERS OF POLLINATORS AND OVERALL BIODIVERSITY. THESE INTERVENTIONS HELP TO IMPROVE HEALTH AND NUTRITION OF FARMING FAMILIES AND PROVIDE HIGHER RETURNS FOR CASH CROPS. KEYSTONE ADDRESSES THE WHOLE VALUE CHAIN, FROM THE FARM AND FOREST TO THE MARKET, WHERE EFFORTS ARE MADE TO ENSURE SUSTAINABLE CONSUMPTION.

Traditional millet variety grown among various fruit trees.
(Photo credit Keystone Foundation)

THE LOSS OF TRADITIONAL FOOD GROWING PRACTICES

The Western Ghats in India are categorised as a world biodiversity hotspot.[1] Located within that range, at the junction of the three states of Tamil Nadu, Kerala and Karnataka, is the Nilgiri Biosphere Reserve (NBR). The region's plantation economy – which features tea, coffee, rubber, areca and timber species of Eucalyptus, Acacia and Teak – has drastically changed land use in the region. Over the years, many Indigenous people abandoned traditional food growing practices. Millets, maize, amaranths and vegetables were either replaced by cash crops or land was left fallow while people took up other work or migrated.[2] Attacks by wildlife (elephants), the lack of economic viability of millets and the increasing threats of climate change are among the causes behind these shifts.[3] While some people turned to paid employment to buy food, most relied on the Public Distribution System.[4] The latter provides rice, not millets, and resulted in changing diet patterns. The incidence of anaemia is high among women in the region and symptoms of malnutrition are common among children. The health and well-being of the forest-dwelling Indigenous communities also worsened due to the loss of access to forests for wild food, medicine and small game. Livelihood options like marginal agriculture and non-timber forest product (NTFP) collection provide only minimal income due to the exploitative practices of traders and middlemen.[5]

BUILDING SUSTAINABLE FARMING SYSTEMS AND PROMOTING NTFPS

Keystone Foundation has supported eco-development in the NBR since 1994 and has been working since 2001 to promote agroecology among Indigenous farmers. Keystone has worked with more than 2000 families in over 89 Indigenous hamlets at different elevations, covering over 2000 acres of indigenous land in the NBR. Keystone promotes both traditional practices of Indigenous communities (used for generations and passed down to younger community members) and modern agroecological methods. Methods include crop diversification, organic and ecological practices, soil and moisture conservation, and use of appropriate technologies. The group also works to ensure people's land tenure and improved employment opportunities through value added products, collective production and marketing. Keystone has helped develop land-use plans for marginal farm holdings (average of two acres) within a framework of food sovereignty and cash income. The plans involve cultivation of millets, vegetables and mixed coffee, as well as agroecological techniques that address social, economic and ecological issues. Traditional seeds of millets and vegetables, which perform better given their resilience to climate variabilities, are used and Keystone has helped to create local seed banks. In millet fields, small patches are dedicated for vegetables, local medicinal plants, and wild foods (e.g. tubers and greens). Similarly, coffee and mixed crops are intermixed with shade trees like silk cotton, jackfruit and spices like clove, pepper vines, nutmeg and cinnamon to increase both food and income. Beekeeping is also integrated into the mix. Bio-fencing using tall tree species helps protect farms from wildlife. Soil improvement practices include mulching and organic manure application, and increasing dried biomass and leaves to retain moisture in the soil and add organic nutrition. Among other things, these practices have helped improve soil health, increase the number of pollinators, and attract other insect species.

Forest protection and sustainable use of its services is integrated into Keystone's interventions. Working with NTFPs as a livelihood means, the group has built awareness and conducted research on sustainable use practices directly with communities. 'Barefoot ecologists' from the community monitor and protect the forests. Keystone also works on community forest rights under the Forest Rights Act; claims have been made by indigenous community members for sustainable management of forest resources.

DIRECT BENEFITS OF LOCAL FOOD IN A LOCAL MARKET

A key element of Keystone's agroecological model is the promotion of local food in a local market, bringing producers and consumers closer together, shortening the value chain, and thereby reducing food miles. This is significantly contributing to contributing to the Sustainable Development Goals (SDGs), especially efforts to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture (SDG 2). More specifically, Target 2.2 to end all forms of malnutrition is addressed by increased diversity, as the mix of millets, vegetables, medicines, wild foods, and bee products greatly improves the food basket of families. Keystone also facilitates 'nutritional fests' organised by the community, aimed at reviving traditional practices pertaining to nutrition by sharing experiences and knowledge linked to traditional food and recipes. These interventions are spread across six regions and involve at least 600 vulnerable indigenous families.

Furthermore, Target 2.3 of *doubling the agricultural productivity and incomes of small-scale food producers, in particular women and indigenous peoples*, is tackled in multiple ways through Keystone's interventions. Farmers have, for example, organised into an Indigenous farmer-producer company, Aadhimalai Pazhangudinyar Producer Company Ltd (APPCL), which ensures better agricultural returns and local employment. Many of the crops grown are value added locally and sold at a premium through the company. The company functions with five local village collection and value addition centres and three local shops which employ 35 Indigenous women. Its operations involve ten members, as well as four trainers and field coordinators, all of whom are selected from the local regions and receive training. This model has proven to be successful and has encouraged government agencies to take up similar work through their livelihood promotion projects. The centre was recognised by the state government and awarded a building and machinery for improved work and expansion. Marketing of products is supported by Last Forest Enterprises, a consumer and market-focused institution, which works to promote the values of slow food, organic, and fair trade among consumers. Last but not least, the group has established a slow food restaurant that promotes locally and sustainably produced food and creates recipes that infuse international flavours with local ingredients and recipes. Provision of local, organic, nutritious food and promotion of local recipes builds the economy as well as promotes a resilience within the community.

"A key element of Keystone's agroecological model is the promotion of local food in a local market, bringing producers and consumers closer together, shortening the value chain, and thereby reducing food miles."

Next to SDG 2, Keystone's interventions and the promotion of agroecological practices also help Indigenous peoples adapt to and mitigate climate risks (SDG 13), which is crucial given the risk that the NBR is currently facing.[6]

Finally, the interventions aim to tackle SDG 15, given the high amount of biodiversity that can be found in the region. Looking at Target 15.1 – *ensuring the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands,* – Keystone carries out forest conservation efforts such as the removal of exotics and restoration with indigenous species, and water conservation projects. Spring sheds and spring protection boxes are being made with community participation. Efforts also include hill wetland protection and stopping encroachments from dumping and intensive agriculture. District and state level advocacy on water conservation is an important part of its work: Keystone has the only nursery in the region with wetland and spring shed plants. By promoting the use of NTFPs as a sustainable way of managing forests, Keystone is directly contributing to SDG 15 Target 15.2. Finally, being a key member of the Save Western Ghats Campaign aimed at working on ecologically sensitive area demarcation and sustainable planning for the mountains, Keystone is helping to obtain Target 15.4 – ensuring the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity

Bee keeping integrated into a mixed cropping system of fruit trees, coffee and various vegetables. (Photo credit Keystone Foundation)

to provide benefits that are essential for sustainable development of all types of forests.

THE BROADER IMPACT ON POLICY AND THE QUEST FOR MORE INVESTMENT

Beyond direct work with Indigenous communities, Keystone staff are part of the national level authority on biodiversity. Keystone is also a member of agriculture forums in the state and advisor to the national rural livelihood scheme. The group holds a position on the regional council for the Participatory Guarantee System in India, which certifies small and marginal farmers for sustainable organic practices. Moreover, being part of the Save Western Ghats, Keystone lobbies the Ministry of Environment and Forests for conservation policies and a sustainable development agenda for the Nilgiri mountain ecosystem.

Keystone also with networks and civil society organisations to spread agroecological approaches to different regions in the country. To expand such efforts to similar Indigenous, forest ecosystems, more documentation, research, and outreach is needed. Other regions and state institutions can learn from small successes and take them into account in policies and schemes for forestry, horticulture and agriculture. Keystone believes that investment in sustainable land-use planning involving small and marginal growers is critical for ensuring a positive impact on both income and quality of life, as well as ecological security. Subsidies for nurseries, soil improvement and large-scale promotion of organic production and marketing are also critical.

NOTES

1 United Nations Educational, Scientific and Cultural Organization (UNESCO). (2012). *Western Ghats.* Website Entry. Retrieved from: https://whc.unesco.org/en/list/1342

2 Nath, S. & Sharma, K. (2007). *Honey Trails in the Blue Mountains.* Published by Keystone Foundation, Kotagiri, Tamil Nadu

3 Arasu, S. (2018). *Nilgiris threatened by climate change.* India Climate Dialogue. Retrieved from: https://indiaclimatedialogue.net/2018/02/05/nilgiris-ecosystem-threatened-climate-change/

4 Government of India. (2016). *Evaluation Study on Role of Public Distribution System in Shaping Household and Nutritional Security India.* NITI Aayog Development, Monitoring and Evaluation Office. Retrieved from: http://www.indiaenvironmentportal.org.in/files/file/Final%20PDS%20Report-new.pdf

5 See 2

6 See 3

case 04

Analog forestry as an agroeological tool ensuring food security, biodiversity and climate resilience in Sri Lanka

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Sustainable Devopment Goals:

RAINFOREST RESCUE INTERNATIONAL (RRI) HAS BEEN IMPLEMENTING PROJECTS BASED ON NATURE CONSERVATION, ECOSYSTEM RESTORATION AND ORGANIC FARMING FOR MORE THAN 16 YEARS. THE GROUP PROMOTES ANALOG FORESTRY, AN AGROECOLOGICAL TOOL THAT ENCOURAGES BIODIVERSITY CONSERVATION AND SUSTAINABLE LIVELIHOODS. ANALOG FORESTRY RELIES ON PRINCIPLES OF ECOLOGICAL SUCCESSION, UTILISING ECOLOGICAL PROCESSES AND VALUING BIODIVERSITY, WHILE CONSIDERING THE EXISTING LANDSCAPE AND THE ECOSYSTEMS IN THE PARTICULAR TERRITORY. ANALOG FORESTRY CAN BE IMPLEMENTED IN DIFFERENT LAND FORMS, SUCH AS COMMUNITIES, FARMS OR HOME GARDENS. THROUGH ANALOG FORESTRY, RRI IS STRENGTHENING LOCAL COMMUNITIES BY ENSURING THEIR FOOD AND WATER SECURITY WHILE CONSERVING BIOLOGICAL DIVERSITY. RRI IS WORKING WITH WIDOWS IN SRI LANKA'S VAVNIYA DISTRICT TO IMPROVE THEIR LIVELIHOODS, AND ENHANCE BIODIVERSITY AND CLIMATE RESILIENCE THROUGH ANALOG FORESTRY PRACTICES.

A war widow harvesting coconuts in her analog forestry home garden. (Photo credit Lakshi Dilhari)

THE CHALLENGE OF DROUGHT, FLOODS AND DEFORESTATION

The northern dry zone of Sri Lanka is a largely agriculture-based area and home to about a third of Sri Lanka's population of about 21 million. The climate, which features one rainy season of four months and a long dry spell of eight months, makes farming difficult. Farmers must contend with flooding at the end of the rainy season and severe water shortages at the end of the dry season. Household incomes are around 10% lower in the dry zone than in other parts of the country. Deforestation is one of the most serious issues in Sri Lanka, which loses about one per cent of its forests each year.[1] The problem is mainly due to unsustainable development projects such as road and infrastructure development, and land encroachments for commercial cultivation (e.g. tea, palm oil). As a result of deforestation, a considerable number of natural habitats, faunal and floral species, and different ecosystems are gradually disappearing. With regard to the 1099 indigenous angiosperm species (flowering plants) assessed through the recent National Red Listing exercise, 675 species were found to be threatened, of which 412 (61 per cent) were endemics, and 37 per cent were Critically Endangered.[2] Significantly, a further 72 species (6.5 per cent) had already become extinct. The dipterocarps, with a remarkable endemicity of 100 per cent, comprised 6.5 per cent of the threatened plants in the list, with 42 threatened out of 58 species assessed, and one extinct species. Among fauna, 41 mammals, 46 bird species, 56 reptilians, 52 amphibian species and 28 freshwater species are under the threatened category.[3]

THE PRINCIPLES OF ANALOG FORESTRY

Analog forestry begins with an evaluation of the existing physiognomic structure of the original climax of a forest ecosystem. The gaps between the original forest ecosystem and the current structure are then identified to assess which species are missing from the plot. An ecological evaluation based on approaches like the Soil Foodweb determines the impacts of the land in three basic variables: soil quality, biodiversity and ecosystem structure.[4] During the ecological evaluation, RRI evaluates soil quality, including: physical components such as structure, texture, apparent density and infiltration; chemical components such as nutrients levels, soil PH, conductivity and organic matter content; and biological components such as soil biodiversity (e.g. earthworms, rate of residual, vegetation and decomposition).[5]
The land is then mapped out into two forms, one that includes topography and contours, and the other existing land use patterns with water streams, pasture, crops, forest, human settlement, etc. This helps to understand the state of the ecosystem, its characteristics and geographical positioning for development of an integrated land design. The basic design of the AF model includes three steps related to the selection of species, soil improvement and management activities. Species are selected to add a missing structural component in the system, eventually improving healthiness, growth, production, economic value, lignification and overall ecological services to the environment.[6]

One of the basic concerns of analog forestry is restoration of degraded lands. After evaluating the soil, the group takes several measures to accelerate the soil enrichment process, including by adding organic matter through mulching, use of green manure and the planting of hedgerows with suitable species on contour lines. An analog forest follows four major stages of ecological succession. At each level of succession, a roughly equal level of species is maintained. In the pioneer stages, to help increase diversity and productivity, RRI uses annual crops such as cereals, beans, squashes. In the later seral stages, perennials such as coffee and fruit are used. At the climax stage, the particular territory will be an ecosystem with a complexity comparable to a natural climax forest, including abundance of species diversity and complex interaction between biotic and abiotic components ensuring ecological and economic values (Figure 3).

DEVELOPMENT OF HOME GARDENS BASED ON ANALOG FORESTRY

The northern dry zone region is home to high number of war widows due to the country's 30-year-long civil war.[7] For six years, RRI has been working with 150 war-affected widows to address some of the challenges they face, including the need for steady income generation and climate resilience, by creating home gardens based on the principles of analog forestry.

The gardens produce marketable fruits, medicines, spices, tubers, cereals and vegetables which help the women earn a livelihood. Their products are mostly sold to the local market through community hubs, which have been initiated to improve market access. After four years, the women were able to harvest perennials in their analog forests. This, together with the produce from fruit trees, of which they have comparatively more than do conventional farmers, has enabled the women to earn more money than seasonal

crops. In addition to fresh fruit, the women are making dehydrated mango, jack fruit and pickles and jam, which are increasing in demand in the export market. Next to designing the gardens, RRI introduced analog forestry techniques and provides on-going guidance and support. Live fences around the farmers' lands provide compost materials and help reduce evaporation. The use of inorganic fertilizers such as pesticides, weedicides and insecticides has been replaced by analog forestry techniques. For example, if the fields are affected by different pests, RRI uses traditional pest control mechanisms (Kem methods, light and sticky traps) to avoid their spread.[8]

"Deforestation is one of the most serious issues in Sri Lanka, which loses about one per cent of its forests each year."

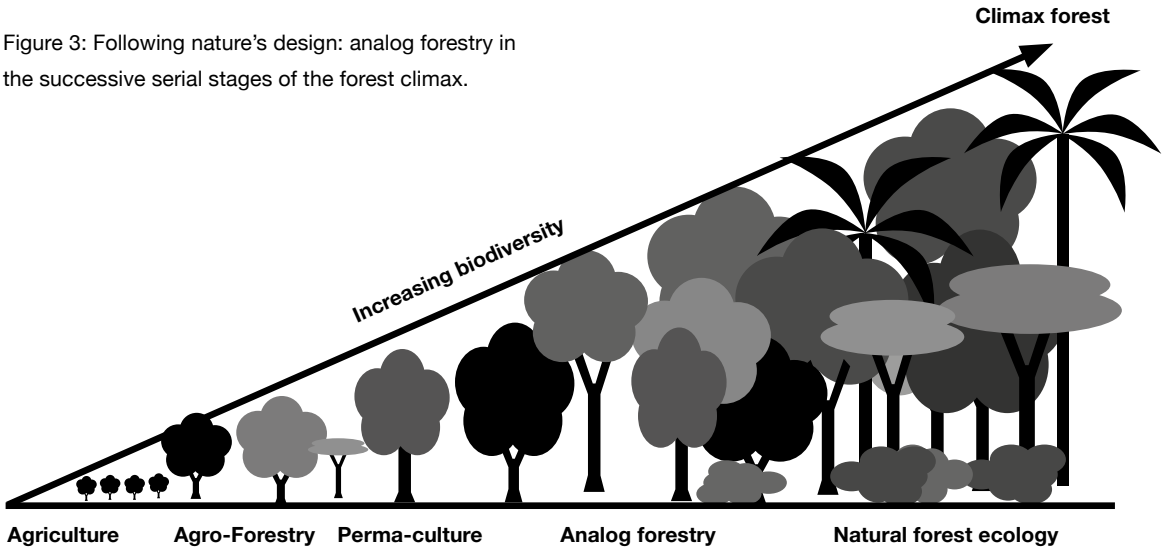
The women farmers have been trained in composting and mulching, and now use these techniques (e.g. wormy compost and liquid fertilizers) to enhance soil moisture content while also conserving soil. They are also generating additional income by selling excess compost. RRI has also established a community seed bank to enable farmers' self-sufficiency in heirloom seeds, which are vital for climate resilient farming.

Once the women started harvesting, RRI shifted its focus to post-harvest techniques, trainings on value addition and ensuring market links to increase farmers' income. By growing new crop varieties, the women farmers are linking to new and different local and international markets.

ANALOG FORESTRY AND SUSTAINABLE DEVELOPMENT

Analog forestry is contributing to various Sustainabel Development Goals (SDGs) in the northern part of Sri Lanka. A study analysing the benefits of home gardens (used interchangeably with analog forests) with regards to food security shows that home gardens in Sri Lanka provide farmers in general and widows in particular with additional food and income (SDG 1 and SDG 2) – they are "the poor farmers' insurance and safety-net in dire food situations, giving additional nutrition and calories".[9] Likewise, Analog Forestry is contributing to both climate change adaptation and mitigation (SDG 13). While the former is visible through the way Sri Lanka's home gardens/analog forests are efficiently and effectively made resilient to cope with climate change,[10] the latter is shown through the fact that analog forests store significant amounts of carbon.[11] Given that soil health is vital in analog forestry to provide macro and micro elements for new species to grow, big amounts of compost and mulch are being used through different techniques. Evaluating soil nutrients and other soil characteristics are considered crucial to identify the soil health. Finally, analog forestry is also increasing biodiversity by mimicking stratification of the natural forest and providing habitats for terrestrial fauna (SDG 15), something considered crucial given the alarming rates

Figure 3: Following nature's design: analog forestry in the successive serial stages of the forest climax.



of biodiversity loss in the country. Different species (trees for fruit and timber, shrubs, bushes, lianas, bromeliads and epypites) provide habitats and food for small mammals, reptiles, butterflies, as well as nesting and breeding places for birds. Land is restored through the use of plants with diverse growth forms and morphologies, including woody and non-woody plants, plants with deep rooted filtration plants, etc. RRI's efforts help to speed up the soil quality improvement process: organic matter is increased through mulching, use of cow dung and the planting of hedgerows on contour lines with different species. Drought tolerant crop species such as yams, fruit and perennials that grow in shade, help diminish problems caused by drought.

A TRADITION OF SUSTAINABLE AGRICULTURE

Sri Lanka has a rich history of sustainable agricultural practices. In ancient Sri Lanka, traditional farming systems included mix cropping, such as Kandyan forest gardens, Spice gardens and Ellanga systems.[12] Such practices provided income, while conserving water and biodiversity. RRI believes that there is much to be gained from documenting and reviving such practices. Despite the Ministry of Agriculture continuing to provide standardised tenure systems, hybridised seeds and fertilizer subsidies, different government institutes have started to engage in new research on organic farming practices, integrated crop management, and pest management to optimise yields. In addition, the national education system includes agriculture, agroforestry, and ecology aimed at enhancing the quality of sustainable farming while overcoming the issues regarding climate change, deforestation, resource depletion and other environmental issues.

However, RRI is concerned that the younger generation in Sri Lanka is struggling with modern technologies, and ignoring the ecological, spiritual and social values of the country. The group is also concerned about the lack of adequate policies and legislation around forest management in Sri Lanka. Therefore, the group is engaging in discussion with the government, advocating for more sustainable plantation management and implementation of policies to prevent deforestation, wildlife poaching, and biodiversity loss.

NOTES

1 Kariyawasam, R. & Rajapakse, C. (2014). Impact of Development on deforestation in Sri Lanka: An analytical study. *IOSR Journal of Environmental Science, Toxicology and Food Technology, 8* (7), 35-39. DOI: 10.9790/2402-08723539

2 Gunatilleke, N. (2008). Biodiversity of Sri Lanka. *Journal of the National Science Foundation of Sri Lanka, 36,* 25-62 DOI: 10.4038/jnsfsr.v36i0.8047

3 See 2

4 For more information on the Soil Foodweb Approach, visit: https://www.soilfoodweb.com/

5 International Analog Forestry Network (IAFN). (2012). *Analog Forestry: A Practitioner's Guide.* Retrieved from: http://www.analogforestry.org/wpsite/wp-content/uploads/2015/03/AF-Practitioners-Guide.pdf

6 See 5

7 Haynie, D. (2017). *Sri Lanka War Widows: The Women Left Behind.* Sri Lanka Brief. Retrieved from: http://srilankabrief.org/2017/05/sri-lanka-war-widows-the-women-left-behind/

8 Widanapathirana, C.U. & Dassanayake D.L.A.L.A. (2013). The Use Of Plant Parts In Pest Control Activities In Traditional Sri Lankan Agricultural Systems. *International Journal of Scientific & Technology Research 2,* 22-27.

9 Mattsson, E., Ostwald, M. & Nissanka, S.P. (2017). What is good about Sri Lankan homegardens with regards to food security? A synthesis of the current scientific knowledge of a multifunctional land-use system. *Agroforestry Systems, 92* (6), 1469–1484. DOI 10.1007/s10457-017-0093-6

10 Weerahewa, J. et al. (2012). Are Homegarden Ecosystems Resilient to Climate Change? An Analysis of the Adaptation Strategies of Homegardeners in Sri Lanka. *APN Science Bulletin, 2,* 22-27.

11 Mattsson, E. et al. (2013). Homegardens as a Multi-functional Land-Use Strategy in Sri Lanka with Focus on Carbon Sequestration. *Ambio 42,* (7), 892–902. DOI: 10.1007/s13280-013-0390-x

12 Pushpakumara, D.K.N.G. et al. (2012). A review research on homegardens in Sri Lanka: the status, importance and future perspective. *Tropical Agriculturist, 160,* 55-125.

case 05

Promoting agroforestry and indigenous seed varieties for healthy agroecosystems and livelihoods in Kenya

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Sustainable Devopment Goals:

FOR THE LAST DECADE, THE INSTITUTE FOR CULTURE AND ECOLOGY (ICE) HAS BEEN SPEARHEADING AGROFORESTRY AND THE RECUPERATION AND MULTIPLICATION OF INDIGENOUS SEEDS VARIETIES (MAINLY OF TRADITIONAL FOOD CROPS) IN CENTRAL AND EASTERN KENYA. BY SUPPORTING SMALL-SCALE FARMERS, THE INSTITUTE AIMS TO ENHANCE HEALTHY AGROECOSYSTEMS WHILE IMPROVING FOOD SECURITY IN THE REGION.

Collection of various indigenous and traditional seed varieties.
(Photo credit Institute for Culture and Ecology)

Agroforestry in Mrs. Ruth Kirimi's farm where a variety of fruit trees are integrated in the farming system. (Photo credit Institute for Culture and Ecology)

PRACTICES THAT LEAD TO LOW AGRICULTURAL PRODUCTIVITY

Agriculture continues to play a vital role in the Kenyan economy. It is the leading economic sector, accounting for around a quarter of the country's Gross Domestic Product (GDP).[1] In 2017, it also provided for almost two thirds of Kenya's total exports and constituted employment for at least 56 per cent of the population.[2] Almost 90 per cent of farmers in Kenya are small-scale farmers (operating on less than two hectares) whose majority depend on rain-fed agriculture for their livelihood.[3] These farmers experience low agricultural productivity, mainly due to degraded agroecosystems arising from ecologically and economically unsound soil management practices and a lack of crop diversification. Persistent nutrient depletion coupled with soil degradation have resulted in low overall soil quality. Crop diversity has been seriously eroded by farmer's focus on only a handful of crops, of which just two (maize and beans) were grown on 85 per cent of Kenya's cultivated land in the 2015/2016 growing season[4], with maize yields stagnating or even decreasing among small-scale farmers.[5] The aggressive promotion of a few exotic crops resulted in the abandonment and neglect of indigenous and locally adapted crop varieties, which has let to considerable genetic erosion.[6] Next to both biotic and abiotic factors, also policies can be attributed to this development, which, to a large extent, advocated for the use of high yielding cultivars and the displacement of traditional plant varieties.[7] Climate change, particularly the increased frequency of droughts, has worsened the situation for many small-scale farmers.[8]

ENGAGING SMALL-SCALE FARMERS TO IMPROVE FOOD SECURITY

Not only does Kenya's small-scale farming sector currently contribute the vast majority of the countries food production, it also remains the most important income source for the majority of the rural population.[9] Hence, it is crucial to include these farmers in interventions geared at climate adaptation and sustainably improving food security in Kenya. Since 2008, ICE has engaged more than 5,000 small-scale farmers in implementing projects geared towards environmental conservation and improved food security. The group promotes agroforestry and recuperation of lost indigenous and traditional varieties as a means to restore degraded agroecosystems and increase agricultural productivity. By doing so, ICE is addressing small-scale farmers' poor access to seeds as well adaptation to the threats of unpredictable weather patterns.

After conducting a research on indigenous seed varieties in its project areas in Central and Eastern Kenya, ICE started to recuperate and multiplicate various indigenous seed varieties, including sorghum, three types of millet, black and green grams, four types of cow/pigeon peas and castor bean, mainly in the semi-arid areas of Kivaa (Machakos County) and Tharaka (Tharaka-Nithi County). It then embarked on a campaign to promote seed sharing among members of farmer groups. Simultaneously, also the vegetative propagation of arrow roots, cassava, yams, sweet potatoes and indigenous vegetables has been encouraged. The results indicate that households' stock of seeds, food and incomes have increased significantly. At the same time, ICE has also tapped into the potential of increased tree cover on farms as a means to adapt to climate change. Farmer groups have been trained on agroforestry practices and supported in initiating nurseries to raise trees and shrubs suitable for use in agricultural systems.

STRATEGIES FOR SUSTAINABLE DEVELOPMENT

ICE's strategies are geared at contributing to several of the Sustainable Development Goals (SDGs). Despite Kenya's rapid economic growth in the last decade, resulting in the country acquiring lower-middle-income status, the increased wealth has not benefited the population equally. Over one third of all Kenyans still lives under the international poverty line of $1.90 a day and social, economic and gender disparities remain.[10] This is especially the case in rural areas, where nearly one in two people are poor compared to only three in ten in Kenya's urban areas.[11] Hence, ICE has taken up the challenge of SDG 1 on ending poverty in all its forms by engaging 500 households per year. By focusing on improving and diversifying agricultural production, the organisation's interventions have helped to improve household incomes by up to 30 per cent – thereby contributing to SDG 1 Target 1.1. of reducing extreme poverty. Equally, a diversified income stream and seed saving have built the resilience of marginalised farmers, which has *"reduced their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters"* (SDG 1 Target 1.5).

"The aggressive promotion of a few exotic crops resulted in the abandonment and neglect of indigenous and locally adapted crop varieties, which has let to considerable genetic erosion."

At the same time, ICE is also focusing on SDG 2 of achieving food security and improved nutrition in its target communities in Central and Eastern Kenya. Given that access to adequate quantities of nutritious food remains a challenge for many people in rural areas, both agroforestry practices as well as indigenous seeds are able to provide households with diversified sources of food. In Kenya, indigenous food crops like sorghum, millet and various of the traditional legumes mentioned above have shown significant nutritional superiority over the corresponding exotics like maize and field beans[12], indicating that their preservation and dissemination helps in tackling SDG 2 Target 2.1 of *"ensuring access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round".* Including different fruit trees in the farm through agroforestry practices on the other hand increases overall production and diversifies the system, thereby *"ensuring sustainable food production systems through the implementation of resilient agricultural practices that increase productivity"* (SDG 2 Target 2.4).

Another SDG that is influenced by the organisation's interventions is SDG 13 on climate action. A study on agroforestry in Western Kenya has shown the practices to be an effective strategy to help farmers reduce their vulnerability to climate change[13], which is at the heart of SDG 13 Target 13.1 on *"strengthening resilience and adaptive capacity to climate-related hazards and natural disasters"*. At the same time, the integration of tress in farming systems also constitutes an effective way of bringing carbon back into the soil, highlighting the important role agroforestry can play in mitigating climate change.[14] By recuperating traditional crops like sorghum and millet known to be relatively drought tolerant, ICE also helps farmers to diversify and increase the resilience among their staple crops, something crucial given the increased frequency of droughts in the arid and semi-arid parts of Kenya.

Finally, also SDG 15 (life on land) has been addressed by ICE's interventions through tackling both soil and genetic erosion. Agroforestry practices have shown to address the former through significantly decreasing surface run-off while at the same time increasing soil fertility[15] – a considerable contributing to SDG 15 Target 15.3 of combating desertification and restoring degraded land and soils. The recuperation and multiplication of indigenous seeds varieties on the other hand helps in maintaining genetic diversity of food crops, which helps safeguarding and promoting the benefits arising from the utilisation of genetic resources (SDG 15 Target 15.6).

MOVEMENTS BRINGING AGROECOLOGY FORWARD

ICE has been working with small-scale farmers in promoting agroforestry and the use of indigenous and traditional seeds as a sustainable way of enhancing food security and adapting to climate change, particularly in Kenya's semi-arid areas. Next to the work on the ground, ICE is also engaged in different networks throughout the country and abroad. ICE is a member of Participatory Ecological Land-use Management (PELUM) Kenya, the African Biodiversity Network (ABN), Greenpeace Africa and the Alliance for Food Sovereignty in Africa (AFSA).[16] Being present in such networks has been instrumental in spearheading advocacy initiatives collaboratively as a movement on both national and region level, calling for policies to protect farmer's rights, access to indigenous seeds and the preservation of agrobiodiversity.

These efforts are crucial given that over the years, indigenous seeds have been under threat as they are either undermined by the radical introduction of hybrid varieties or attempted to be commodified to serve corporate purposes.[17] Hence, there is a need to counteract genetic erosion and protect farmer's rights as agreed upon in several international agreements like the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). While lobbying responsible institutions can help in publicly supporting those struggles, there is also need to upscale activities that build the capacities of farmers on how to effectively protect their both their rights as well as indigenous seeds. Given the recent wake up calls on the alarming trends of agrobiodiversity loss[18], initiatives like this are crucial for achieving food and income security while preserving our planet's biodiversity.

NOTES

1 World Bank Group (2019). *Unbundling the Slack in Private Sector Investment - Transforming Agriculture Sector Productivity and Linkages to Poverty Reduction.* Report. Retrieved from: http://documents.worldbank.org/curated/en/820861554470832579/pdf/Kenya-Economic-Update-Unbundling-the-Slack-in-Private-Sector-Investment-Transforming-Agriculture-Sector-Productivity-and-Linkages-to-Poverty-Reduction.pdf

2 See 1

3 See 1

4 See 1

5 Njagi, T. (2017). *Use technology to increase maize production in Kenya*. Standard Digital. Retrieved from: https://www.standardmedia.co.ke/article/2001232559/use-technology-to-increase-maize-production-in-kenya

6 Wambugu P.W. & Muthamia Z.K. (2009). *The State of Plant Genetic Resources For Food and Agriculture in Kenya*. Kenya Agricultural Research Institute and National Genebank of Kenya. Retrieved from: http://www.fao.org/3/i1500e/Kenya.pdf

7 See 6

8 Ochieng, J., Kirimi L. & Mathenge, M. (2016). Effects of Climate Variability and Change on Agricultural Production: The Case of Small-Scale Farmers in Kenya. NJAS - *Wageningen Journal of Life Sciences 77,* 71-78. DOI: 10.1016/j.njas.2016.03.005

9 See 1

10 World Food Programme. (2019). *WFP Kenya*. Country Brief. Retrieved from: https://www1.wfp.org/countries/kenya

11 Musyoki, M. (2018). *Kenya National Bureau of Statistics Study Reveals Counties With Lowest Poverty Rate, 45.2% Kenyan Population Poor.* Kenyans.co.ke. Retrieved from: https://www.kenyans.co.ke/news/20426-kenya-national-bureau-statistics-study-reveals-counties-lowest-poverty-rate-452-kenyan

12 Muthoni, J. & Nyamongo, D.O. (2010). Traditional Food Crops and Their Role in Food and Nutritional Security in Kenya. *Journal of Agricultural & Food Information 11* (1), 36-50. DOI: 10.1080/10496500903466745

13 Thorlakson, T. & Neufeldt, H. (2012). Reducing subsistence farmers' vulnerability to climate change: evaluating the potential contributions of agroforestry in western Kenya. *Agriculture & Food Security 1* (15). DOI: 10.1186/2048-7010-1-1

14 De Stefano, A. & Jacobson, M.G. (2017). Soil carbon sequestration in agroforestry systems: a meta-analysis. *Agroforestry Systems 92* (2), 285-299. DOI: 10.1002/ldr.3136

15 See 13

16 For more information, see: www.afsafrica.org

17 African Centre for Biodiversity. (2015). *The expansion of the commercial seed sector in sub-Saharan Africa: Major players, key issues and trends.* Report. Retrieved from: https://acbio.org.za/wp-content/uploads/2015/12/Seed-Sector-Sub-Sahara-report.pdf

18 FAO. (2019). *The State of the World's Biodiversity for Food and Agriculture.* J. Bélanger & D. Pilling (eds.). Retrieved from: http://www.fao.org/3/CA3129EN/CA3129EN.pdf

case

06

Farmer-managed natural regeneration and other agroecological practices to restore soil fertility and improve agricultural production in Senegal

EL HADJI FAYE,
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www.endapronat.org

Sustainable Devopment Goals:

ZERO HUNGER

CLIMATE ACTION

LIFE ON LAND

FOR MORE THAN FORTY YEARS, ENDA PRONAT HAS WORKED WITH FARMERS' ORGANISATIONS TO PROMOTE AGROECOLOGICAL ALTERNATIVES IN SENEGAL. SINCE 2008, THE ORGANISATION HAS BEEN ACTIVE IN THE COMMUNE OF DIOUROUP (FATICK REGION), WHERE AGROECOLOGICAL PRACTICES HAVE SIGNIFICANTLY CONTRIBUTED TO LOCAL FOOD SECURITY, IMPROVED INCOMES AND REGENERATION OF DEGRADED ECOSYSTEMS. ENDA PRONAT IS ALSO INVOLVED IN NATIONAL AND PAN-AFRICAN NETWORKS TO EXCHANGE KNOWLEDGE AND RESULTS, AND TO SCALE UP AGROECOLOGICAL PRACTICES.

FMNR is based on the pruning of shrubs present in farmer's fields to enable the growth of healthy trees. (Photo credit Enda Pronat)

SOIL DEGRADATION AND FOOD INSECURITY

Two-thirds of the arable land in Senegal is considered considerably degraded.[1] This is mainly due to the combined effects of conventional farming practices (e.g. stumping, monoculture, low organic amendments, and slash-and-burn), disturbances in rainfall, and the erosion of soils through wind and water. Salinisation also plays an important role, with more than 1.2 million hectares (around a third of all cultivable land) being affected in the country.[2]

This soil degradation significantly affects the productivity of family farms and, consequently, their food security. The prevalence of food insecurity in the Fatick region, part of the so-called 'groundnut basin', is currently around 30 per cent.[3] This situation has inspired agricultural producers, researchers, state and non-state actors, including Enda Pronat, to support alternative soil fertility practices, based on locally available resources, to increase agricultural production.

AGROECOLOGICAL INTERVENTIONS BASED ON PARTICIPATORY DIAGNOSES

Enda Pronat's activities in Diouroup began with a participatory diagnosis of the ecological state of the environment. Responding to the previously mentioned constraints, farmer field schools were set up to promote local and scientific knowledge. The schools served as a framework for experimentation and sharing of knowledge between farmers and technicians to test the application of different types of organic matter, farmer-managed natural regeneration (FMNR) and the cultivation of fertilizing plants and different varieties of short cycle certified seeds (e.g. groundnuts, millet and cowpea, etc.). Market gardeners also benefited from advisory support and training for the production of organic vegetables (i.e. nursery preparation, solid and liquid compost production, crop combinations, rotations, biological pest treatments, etc.). Technical capacity building and experimentation were complemented by the strengthening of local governance systems, which was accomplished through the implementation of a local convention on the sustainable management of natural resources.

Based on action research, Enda Pronat focused its efforts on three main practices: millet-cow pea intercropping, intensified use of organic amendments, and FMNR. While the mixing of millet and cow-pea was already practiced by a few producers, Enda Pronat improved the technique by suggesting to farmers to intercrop in lines rather than mixing the crops randomly throughout the field. Enda Pronat also facilitated intensification of soil organic amendments, which consisted of increasing the quantities of organic matter applied; diversifying the sources of supply by adding domestic waste, slaughterhouse waste and peanut shells; and improving the quality of organic amendments by training farmers on the composting of organic residuals of both agricultural as well as household origin. Finally, while FMNR and reforestation were already introduced in the area, Enda Pronat helped to intensify these practices not only within farms, but also in community spaces throughout the area to contribute to the restoration of fertilizing trees.

RESULTS IN DIOUROUP CONFIRM THE PROMISE OF AGROECOLOGICAL PRACTICES

In 2017, two studies evaluating the effects of agroecological practices were conducted in Diouroup in collaboration with students and professors of AgroParisTech and the universities of Dakar and St. Louis. One study involved around 400 farms (200 beneficiaries and 200 referents)[4] and the other 66 farming plots.[5] The studies showed that 58 per cent of the 200 beneficiaries adopted agroecological practices recommended by Enda Pronat. The evidence showed that application of agroecological practices can be considered a main pathway towards achieving several Sustainable Development Goals (SDGs), particularly SDG two of eradicating hunger. (SDG 2). They had a major impact on millet yields (+17 per cent among beneficiaries), cowpea (+19 per cent) and to a lesser extent peanut (+4 per cent).[6] It was also observed that the higher the level of integration of agroecological practices, the higher the yield of millet (+5 per cent between parcels that had a low level of integration of agroecological practices and those with a high level of integration). The combined effect of repeated use of agroecological practices for several years in a row was even more significant. The parcel with the highest level of integration of agroecological practices over three years recorded a yield of 2,890 kg/ha of millet in 2016, nearly four times the average yield of the 66 parcels surveyed.[7]

The increase in yields of food products resulting from agroecological practices contributes not only to Target 2.3 of the SDGs, which aims to improve agricultural productivity, but also to the access of poor households to healthy food (SDG Target 2.1). Indeed, studies have shown that the average amount of food (millet, groundnuts, cowpeas, etc.) produced by the 200 farmers who practice agroecology in Diouroup is 14 per cent higher than that of the reference group. In low-income groups, the advantage is close to 60 per

cent. The adoption of agroecological practices has also contributed to the increase in farmers' incomes (Indicator 2.3.2). In systems with a high degree of integration of agroecological practices, the income of receptive families is two to four times higher than that of other families for the equivalent size of an area.[8]

"In systems with a high degree of integration of agroecological practices, the income of receptive families is two to four times higher than that of other families for the equivalent size of an area."

The comparison and modelling of different production systems made it possible to highlight the positive effect on agricultural income of those who have integrated the principles of agroecology. The families concerned can more easily escape situations of economic, social and ecological crisis, which affect a large part of West African family farming. These positive effects reinforce the climate resilience of farming communities through increased land fertility and yields, contributing significantly to SDG Target 13.1 (Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries).

Moreover, the improvement of soil fertility was confirmed by soil tests carried out with ten producers who regularly incorporated different types of organic matter at doses equivalent to 10 t/ha. The results of the analyses were positive. They showed significant increases in pH, and more than a doubling of both percentage of carbon (0.22 per cent to 0.47 per cent) as well as the amount of organic matter (from 0.38 per cent to 0.8 per cent) between 2015 and 2017, although soils still remain relatively poor in both. They also showed good mineralisation, noticeable through a stable C/N ratio.

In addition to building farmers' climate resilience, Enda Pronat's considerable efforts to promote FMNR – about 20 local species with 205 producers on 142 hectares – has contributed to SDG Targets 15.3 and 15.5, which aim for restoration of degraded lands and to stop the loss of biodiversity. The 2017 University of Dakar and AgroParisTech-supported study[9] showed that in just two years:

- the floristic richness has increased in the FMNR bands, with 49 species recorded, compared to 42 in the fields without FMNR (Faidherbia albida being the most frequent species with 67 per cent)
- the tree density (young and adults) has been recorded to be twice as high in the FMNR bands as in the other types of land use
- the rate of regeneration, given by the percentage ratio between the total number of young plants (diameter of less than 3.5 cm and less than 1.3 m in height) and the total population, has been reported higher in the bands of FMNR (59 per cent) than the average of the soil (48 per cent).

Evaluating the study revealed that a period of two years was too short to comprehensively measure all the eventual effects. Nonetheless, it also showed that after the continuous application of practices over a longer period of time, and especially when trees have improved soil fertility, the real benefits of agroecology should become more visible.

Women harvesting beans in a field where FMNR has been applied. (Photo credit Enda Pronat)

ADEQUATE RESOURCES AND A CLEAR POLICY OF SUPPORT FOR FAMILY FARMING AND AGROECOLOGY

Enda Pronat is now spreading agroecological practices in two other communes neighbouring Diouroup – Tattaguine and Diarrère – and in six communes in the regions of Tambacounda, Thiès and Saint-Louis. The group participates in several key networks, including the National Federation of Organic Farming, which brings together 22,000 farmers in the 14 regions of Senegal; the Alliance for Agroecology in West Africa which is composed of about fifty farmers' organisations, research institutes/universities, international NGOs and social movements; and the Alliance for Food Sovereignty in Africa (AFSA), a broad alliance of different civil society actors who are part of the fight for food sovereignty and agroecology in Africa. The results in Diouroup highlight the considerable potential that agroecology represents for agricultural production, economic and social development, food and nutritional security and the regeneration of degraded ecosystems. Yet Enda Pronat believes that large-scale efforts cannot be achieved without a coherent set of interventions, including public policies.

Enda Pronat calls on the national government to provide adequate resources and operationalise the country's National Strategic Investment Framework for Sustainable Land Management (adopted in 2014), and support to producers through, for example, subsidies for organic inputs. The group advocates for a clear government policy in favour of family farming and agroecology.

NOTES

1 Doukkali, M.R., Guèdègbé, T. & Sinsin, T. (2018). *La neutralité en termes de dégradation des terres en Afrique est-elle envisageable?* Retrieved from: http://www.ocppc.ma/publications/la-neutralité-en-termes-de-dégradation-des-terres-en-afrique-est-elle-envisageable

2 Sidy, A. (2011). *Salinisation des sols au Sénégal : sur les 3 800 000 ha cultivables, plus de 1 230 000 ha sont affectés.* Retrieved from: http://xalimasn.com/salinisation-des-sols-au-senegal-sur-les-3-800-000-ha-cultivables-plus-de-1-230-000-ha-sont-affectes/

3 World Food Programme. (2017). *ICA Senegal, 2017 - Recurrence of Food Insecurity, 2010-2017.* Retrieved from: https://geonode.wfp.org/layers/geonode%3Asen_ica_firecurrence_geonode_20170508

4 Bachmann, L. & Seck, S.M. (2018). *Promouvoir l'agriculture saine et durable auprès des exploitations familiales - Voies durables pour un meilleur système alimentaire au Sénégal.* Retrieved from: http://www.endapronat.org/wp-content/uploads/2018/10/Etude_agroécologie.pdf

5 Assemat, A. (2017). *Analyse-diagnostic d'une petite région agricole en pays Sérère au Sénégal. Projet CALAO, pour l'étude des impacts et conditions de développement de l'agroécologie en Afrique de l'Ouest*. Mémoire de Master Agroparistech. 47p. For more information on the CALAO Project, check: https://www.avsf.org/public/posts/2211/rapport_etude_calao_2018-web_avsf_gret_cedeao.pdf

6 See 4

7 See 5

8 See 5

9 See 5

case 07

Coexisting with semiarid conditions: Combining agroecological practices to face climate change and desertification in Brazil's drylands

PAULO PEDRO DE CARVALHO
CAATINGA – BRAZIL

www.caatinga.org.br

Sustainable Devopment Goals:

- 2 ZERO HUNGER
- 3 GOOD HEALTH AND WELL-BEING
- 5 GENDER EQUALITY
- 6 CLEAN WATER AND SANITATION
- 13 CLIMATE ACTION
- 15 LIFE ON LAND

FOUNDED IN 1988, CAATINGA WORKS WITH PEASANT FAMILIES LIVING IN THE CHALLENGING SEMIARID CONDITIONS OF NORTH-EASTERN BRAZIL. THE ORGANISATION OFFERS ADVICE, TRAINING AND POPULAR EDUCATION ON AGROECOLOGICAL TECHNOLOGIES AND PRACTICES THAT ARE APPROPRIATE FOR AND SUSTAINABLE IN SUCH CONDITIONS. AMONG OTHER THINGS, CAATINGA FACILITATES EXPERIMENTATION AND EXCHANGE OF GOOD PRACTICES OF WATER STORAGE AND MANAGEMENT FOR BOTH DOMESTIC USE AND AGRICULTURAL PRODUCTION. CAATINGA VALUES AND MAKES VISIBLE THE WORK AND INTERESTS OF WOMEN AND YOUNG PEOPLE, STIMULATING THEIR POLITICAL IMPACT AND CONSOLIDATION OF THEIR RIGHTS, ESPECIALLY FOOD AND NUTRITION SECURITY AND SOVEREIGNTY, AND ACCESS TO WATER. TOGETHER WITH OTHER CIVIL SOCIETY ORGANISATIONS, THE ORGANISATION BUILDS SOLIDARITY BETWEEN COMMUNITIES AND HELPS TO STRENGTHEN THEIR CAPACITY FOR ADVOCACY AND POLITICAL IMPACT TOWARD A DIGNIFIED AND SUSTAINABLE COEXISTENCE WITH THE SEMIARID ENVIRONMENT.

Local food market selling agroecologically produced fruits and vegetables. (Photo credit CAATINGA)

DESERTIFICATION IN THE CAATINGA

Brazil's semiarid region, known as the Caatinga (the inspiration behind the organisation name), covers an area of 850,000 km² – approximately eleven per cent of the country. Home to 27 million people, it is the region of Brazil most affected by climate change. The decrease in rainfall has caused longer periods of intense drought, while the increase in temperature is above the global average. Prolonged droughts and higher temperatures are causes and consequences of desertification which, in turn, have generated more poverty in rural areas and consequential migration to cities.[1]

The Caatinga is one of the most degraded and least protected biomes in Brazil. According to the Ministry of Environment, almost 46 per cent of its original plant cover has been removed.[2] Many areas are in an advanced state of desertification. The intensive use of firewood for mining and other industrial and domestic uses has caused serious deforestation. Forests rich in biodiversity have been replaced by large areas of pastures and monocultures of maize, cassava, cotton and other crops. This has led to degraded and compacted soils which hinder water infiltration. The larger surface runoff increases erosion, drains the water sources (rivers, streams, reservoirs, dams) and reduces the recharge of groundwater. The water available for the domestic and agricultural needs of peasant families has increasingly diminished. As a consequence, rates of vulnerability and poverty in rural areas has increased considerably, as has migration to cities.

TACKLING THE SUSTAINABLE DEVELOPMENT GOALS (SDG) BY STRENTHENING FAMILY FARMING

Since its founding, Centro de Assessoria e Apoio aos Trabalhadores e Instituições Não Governamentais Alternativas (CAATINGA) has worked with approximately 10,000 farmers and their families providing advice and mobilising support for a wide variety of agroecological practices, including:

- capture and management of rainwater for domestic use and production, reuse of 'grey' water and sustainable use of groundwater;
- soil recovery and conservation (level curves, vegetation cover and dead covering, diversification and crop rotation);
- agroforestry systems, including productive backyards and plots with vegetables, tubers, medicinal plants, etc. along orchards;
- livestock (goats, sheep, pigs, poultry), beekeeping and meliponiculture;
- beneficiation and storage (food, forage, seeds), access to fair and solidary markets and commercial mechanisms (agroecological fairs, sales in communities, institutional markets), and seedling nurseries (species of the Caatinga and agricultural cultivars), and craft production; and
- education in rural schools.

CAATINGA's technical advice ensures that agroecological food production takes advantage of local potential for water and food stocks.[3] CAATINGA's efforts have helped increase families' food and nutrition security (SDG Target 2.1) and their access to clean water (SDG 6). Its focus on families with children has helped to significantly reduce hunger and infant mortality in the area (SDG 2 Target 2.2 and SDG 3 Target 3.9). For example, the establishment of so called *cisterna de placas* (round water tanks that are partially below ground) has helped democratise access to water, enabling families to collect and manage their own water instead of negotiating access to water from surrounding large private properties. Stable access to (more) water is critical for families to be able to produce their own food. During the most recent multi-year drought, CAATINGA reports that 90 per cent of the 10,000 families with whom it works were able to maintain at least three different sources of agricultural produce. In 2017, CAATINGA advised 1,800 families who, in sum, sold over 500,000 Brazilian reals in agricultural produce per year on local agroecological markets, selling points in towns, direct sales in communities and sales to the National Program for School Nutrition. On average, these families earned about 10,000 Brazilian real per year alongside of non-monetary income (e.g. family consumption of agricultural produce) of the same value.

CAATINGA is also challenging the exploitation of the Caatinga's natural resources, which is causing desertification, polluting soils and water, and contributing to climate change.[4] The organisation strengthens family farming that values local resources and biodiversity, combining food production with the restoration and preservation of the Caatinga biome (SDG 15 Target 15.3 and 15.5). This is done especially by the promotion of agroforestry, the recovery of springs and riverside forests and ecosystems. Several actions are devoted to the recovery of degraded areas using reforestation and rainwater soil retention techniques. With the recovery of soil fertility and intensification of the use of some cultivable areas, it

is possible to reduce the opening of new areas in the Caatinga.[5] CAATINGA's strategy of coexistence with the semiarid region contributes to the mitigation of the effects of climate change (SDG 13).[6]

CAATINGA is also advancing the health and well-being (SDG 3) of farmer families, which includes not only the absence of diseases, but involves physical, mental and social well-being. The organisation encourages the production of healthy foods that guarantee food security and sovereignty for farmers' families. These foods are also provided to public schools and ensure that children have the necessary nutrients to prevent against malnutrition, obesity and diseases.[7] The organisation promotion of equality and respect also contributes to well-being, as it shows people that they can live in harmony with nature. CAATINGA facilitates exchange of and appreciation for popular and ancestral knowledge so that people become more autonomous in relation to the food and pharmaceutical industry.[8]

CAATINGA also strives to ensure gender balance in team composition, debates and internal decisions. In coping with the violation of women's rights, the organisation prioritises specific training with peasant and urban women on agroecology, rights, public policies and social organisation.[9] The Araripe Women's Forum, which CAATINGA supports, promotes the formation and political participation of women and formulates proposals for policies and programs appropriate to the vulnerabilities, needs and interests of young and adult women. The Forum also enables dialogue sessions with groups of women in communities. The organisation offers training and advice on specific productive activities for women to generate income and contribute to healthy eating habits for their families. Hence, CAATINGA actively supports the achievement of SDG 5 Target 5.1 to give women equal rights to economic and natural resources.

"The group believes that operating within a network strengthens the effectiveness and promotion of agroecology."

IMPROVING EFFECTIVENESS THROUGH NETWORKS

CAATINGA works together with other civil society organisations and in partnership with international networks, governments and private sector companies. The organisation believes that operating within a network strengthens the effectiveness and promotion of agroecology. The group is a founder of the Articulação no Sémiárido (ASA, Articulation in the Brazilian Semiarid Region)[10], which for nearly 20 years has been proposing and implementing public policies to democratise access to water and land for family farming. ASA is one of the most important networks of Brazilian civil society, contributing directly to the eradication of hunger in the country.

CAATINGA is also a founder of the Articulação Nacional de Agroecologia (ANA - National Articulation for Agroecology)[11] and participates directly in the formulation of the National Policy for Agroecology and Organic Production (PNAPO) and other policies for family farming and for the semiarid region. The group is part of the ATER Northeastern Network of Agroecology, which strengthens rural extension in Brazil with an agroecological perspective.

Woman keeping poultry for manure and additional income. (Photo credit CAATINGA)

At the international level, CAATINGA is part of the Drynet network.[12] Its members, which cover four continents, are all operating in drylands susceptible to desertification. More recently, CAATINGA has participated in a regional network of civil society organisations in Latin America and the Caribbean focused on the United Nation Convention to Combat Desertification (UNCCD). It is also within the UNCCD that CAATINGA has until recently played a role as Focal Point of the Civil Society Organisations in Brazil. The actions performed by CAATINGA are multiplied nationally and regionally from its activities in these networks and in other political spaces. Looking forward, the new political context in Brazil may affect support for CAATINGA's activities if the government shifts investments and programmes toward development of large-scale agribusiness.

Typical small-scale farm in the dry Caatinga. (Photo credit CAATINGA)

NOTES

1 Ministério do Meio Ambiente (MMA). (2005). *Programa de Ação Nacional de Combate à Desertificação e Mitigação dos Efeitos da Seca.* MMA Secretaria de Recursos Hídricos. Retrieved from: http://www.mma.gov.br/estruturas/sedr_desertif/_arquivos/pan_brasil_portugues.pdf

2 UNESCO Brazil, Pernambuco State Government & MMA. (2007). *Região do Araripe, Pernambuco: diagnóstico florestal.* Retrieved from: http://www.mma.gov.br/estruturas/sedr_desertif/_arquivos/129_08122008042625.pdf

3 Grupo de Trabalho da Sociedade Civil para a Agenda 2030. (2018). *Relatório Luz da Agenda 2030 de Desenvolvimento Sustentável – Síntese II*. Retrieved from: http://actionaid.org.br/wp-content/files_mf/1499785232Relatorio_sintese_v2_23jun.pdf

4 See 1

5 See 1

6 See 1

7 Conselho Nacional de Segurança Alimentar e Nutricional (CNSAN). (2015). *Relatório Final Encontro Nacional 5ª Conferência Securanca Alimentar E Nutricional.* CNSAN. Retrieved from: http://www4.planalto.gov.br/consea/eventos/conferencias/conferencias-2/5mais2/Web.pdf

8 See 1

9 See 1

10 For more information, visit: http://www.asabrasil.org.br

11 For more information, visit: http://www.agroecologia.org.br/

12 For more information, visit: https://dry-net.org/

case 08

Productivity and resilience through a cooperative, agroecological, community-supported market garden in the United Kingdom

DEE BUTTERLY AND ADAM PAYNE, SOUTHERN ROOTS ORGANICS – UNITED KINGDOM

www.southernrootsorganics.org

Sustainable Devopment Goals:

SOUTHERN ROOTS ORGANICS IS A COOPERATIVELY RUN MARKET GARDEN USING AGROECOLOGY TO ADDRESS CHRONIC ISSUES FACING SMALL-SCALE FARMERS IN THE UNITED KINGDOM (UK). IT IS AN ACTIVE PART OF THE LANDWORKERS' ALLIANCE, A GRASSROOTS UNION OF FARMERS, GROWERS AND LAND-BASED WORKERS IN THE UK WHO SHARE A VISION OF A FOOD SYSTEM BASED ON AGROECOLOGY AND FOOD SOVEREIGNTY.

Community farm day and squash harvest showing crop diversity in the field. (Photo credit Dee Butterly)

THE LOSS OF THOUSANDS OF SMALL FARMS

In the UK, lack of support for small-scale farming is having a detrimental impact on the farming population, ecosystems, communities and local economies.[1] The UK has one of the highest levels of concentrated land ownership[2] and inflated land prices in the world.[3] Between 2005 and 2015, almost 30,000 English small to medium-sized farms closed down or were consolidated into larger holdings (Figure 2).[4] The average farmer's age is above 60.[5] Many farmers live in poverty or in precarious economic situations as the food market become increasingly concentrated.[6] Farmers receive less than ten per cent of the value of their produce sold in supermarkets[7] and eight supermarkets control over 95 per cent of the food retail markets.[8] Meanwhile, industrial agriculture continues to rely on unsustainable inputs of fossil fuels and chemicals that are contributing to climate chaos and jeopardising the future of food production. The UK already has low self-sufficiency in food, producing only 60 per cent of its needs.[9]

MARKET GARDEN FARMING BASED ON AGROECOLOGY AND FOOD SOVEREIGNTY PRINCIPLES

Southern Roots Organics, located in in South West England, is a 2.5-acre organic market garden that uses the ecological, economic and social principles of agroecology and food sovereignty to address the problems faced by farmers across the UK. Southern Roots Organics aims to provide local communities with good, healthy and nutritious food that is produced sustainably and in harmony with the land and ecosystems.

Southern Roots Organics is based on a Community Supported Agriculture (CSA) scheme: the farm has a contract with local customers in which the responsibilities, risks and rewards of farming are shared. In practice this means that customers sign up and commit to a weekly box of fresh vegetables for the duration of the growing season. This provides the farmers with a guaranteed market and stable, regular income, while also supporting the local economy. In addition, throughout the growing season customers are invited to participate in open farm days and other events. Southern Roots Organics supplies 50 local households and over 20 independent, local greengrocers, cafes, farms shops, caterers and restaurants. The farm is structured as a co-operative and provides a living wage income for four new entrant farmers.

Southern Roots Organics uses knowledge and practices that have been developed by small-scale farmers and peasants around the world. The farm uses a mixed rotation system to grow over 50 types of vegetables and 200 varieties. It grows rare and heirloom seed and vegetable varieties, helping to preserve and strengthen threatened species. It also raises all its own seedlings and saves seeds from specific crops to improve their performance. A wide range of flowers and herbs are planted to attract bees, insects, birds and other pollinators and create equilibrium in the farm's ecosystem. Southern Roots Organics is minimising external inputs and working towards a 'closed loop farm system'. Compost is made from the farm's plant waste, animal manure and hay. Water comes from the farm's own spring. No chemical pest or disease control products are used.

The principles of social ecology are also an important feature of Southern Roots Organics' CSA model. The farm provides meaningful work opportunities and a living wage to new entrant farmers. By selling directly to households in the local area, the farm is supporting the local economy.

PROTECTING AND INCREASING SMALL-SCALE AGROECOLOGICAL FARMING CONTRIBUTES IS KEY TO SDGS

Protecting and increasing small-scale agroecological farming, creating meaningful farm livelihoods, re-distributing land, reinvigorating short supply chains and supporting industrial farms to transition to agroecological practice are key to achieving many Sustainable Development Goals (SDGs).

Southern Roots Organics' agroecological farming is contributing to SDG 2 Target 2.4 of ensuring sustainable food production systems. The farm makes use of on-farm fertility by composting plant and animal wastes and applying it to the soil. Leguminous 'green manure' crops and cover crops are grown to provide a sustainable source of minerals and nutrients for the soil so that vegetable production requires no external inputs of nitrogen, fertilisers or nutrients. Nitrogen fertilizer production uses large amounts of natural gas and some coal, and can account for more than 50 per cent of total energy use in commercial agriculture.[10] Crop rotation is also key for increasing the resilience of the production system, biodiversity, ecosystem habitats and soil heath, and reducing the energy requirements of the farm. Over 200 varieties of 50 crops are grown in a rotation each season. Crops are

grouped by their biological family, pest and disease pressures, fertility needs and harvesting schedule, and then rotated around the field. The combination of diversity and rotation significantly reduces pest and disease, so that chemical controls are not necessary. And given that nearly 15 per cent of overall total energy used in agriculture is attributed to pesticides, the method not only increases productivity but also significant energy savings.[11] Research carried out by the Landworkers' Alliance on 69 farms has shown that small-scale agroecological farming using these techniques can achieve higher yields than conventional and large-scale organic production for a number of crops.[12]

"The practices and principles we use on our farm are some of the most ancient and traditional ways of producing food in harmony with the earth and our communities."

As a result of climate change, UK agriculture is facing both extreme droughts during the summer and unpredictably wet and cold weather during the early spring. Southern Roots Organics' agroecological practices contribute to SDG 13 Target 13.1 as they strengthen resilience and adaptive capacity to these challenges. Applying compost builds soil organic matter, thus increasing the capacity of the soil to retain moisture and support crop growth. Growing a very wide range of crops allows the farm to spread the risk of crop failure due to a volatile climate. Moreover, growing lots of crops in a relatively small area makes use of different plants' rooting depths and moisture needs, thus allowing better plant growth than would be possible in a monoculture. Plants are also inoculated with mycorrhizal fungi, creating a symbiotic relationship with plant roots which allows the plants to access water from much greater depths, which is essential in summer droughts. In the 2018 drought, for example, conventional growers lost around 20 per cent of their yields on crops, including potatoes, onions and carrots.[13] Southern Roots Organics, however, suffered no perceptible yield decreases of these three crops, nor of the majority of other crops grown.

Southern Roots Organics also uses a combination of measures to reduce the impact of unpredictable weather in early spring. While conventional growers who buy all of their plants on contract cannot adjust their planning time, Southern Roots Organics can time its sowings according to the weather by growing all seedlings in the farm. The farm also uses polytunnels for under cover cropping and overwinter mulching systems so that some areas of the field are ready to plant in spring without needing to plough, which causes severe soil damage in wet conditions.

Taking urgent and significant action to reduce the degradation of natural habitats and halt the loss of biodiversity (SDG 15 Target 15.5) is crucial. The UK has lost more than 44 million breeding birds in the last 50 years[14], including a 95 per cent reduction in populations of tree sparrow, 40 per cent decline in lapwing, 52 per cent decline in skylark and a 54 per cent decline in linnet numbers since the 1970s.[15] The causes include a loss of habitat – over 200,000 miles of hedgerow have been removed between 1947 and 1990[16] – and an increase in monocultures, pesticides and herbicides that disrupt the food chain. Meanwhile, soil damage from erosion, degradation and compaction seriously damages soil habitats and is estimated to cost £1.2 billion a year.[17]

Southern Roots Organics takes a proactive approach to habitat restoration on the land we manage. These techniques include managing soil to maintain its health and prevent damage of soil habitats; maintaining and planting hedges and shelter-belts to provide habitat for wildlife; and leaving crop residues standing to provide winter feed for wildlife. In addition, the farm maximises diversity in the field. Southern Roots Organics also focuses on SDG 15 Target 15.6 of promoting fair and equitable sharing of the benefits arising from the utilisation of genetic resources and promote appropriate access to such resources, as internationally agreed through being part of the South West Seed Savers Co-operative (SWSSC) – a seed production group in the South West of England, supported by the Gaia Foundation's Seed Sovereignty programme.[18] The SWSSC trains farmers on how to produce and save seed, and integrate seed saving into crop plans to improve the availability and range of open pollinated and heirloom seed varieties and seed adaptation to the UK climate. It is one of several initiatives to retrain farmers in the vital but dying

knowledge of seed production and seed saving in the UK. A national network of small-scale seed producers is being built to counter the loss of seed varieties and the increased control, concentration of ownership and patenting of seed by multinational corporations.

Finally, the co-operative CSA market garden business models, like that of Southern Roots Organics, can provide collectively managed, part-time income and meaningful work for farmers, thereby contributing to productive activities, decent job creation, entrepreneurship, creativity and innovation (SDG 8 Target 8.3). The farm is increasing productivity and income by creating secure and reliable local markets based on community involvement and direct sales. This helps the farm avoid the fluctuations of price and demand that characterise national and international commodity markets and is a common strategy used by small-scale agroecological producers.

Producers selling directly to local markets gain a higher share of the retail price, thus making smaller enterprises more profitable. Locally-owned and operated businesses are also more likely to circulate and return money spent in their operations back into the local economy, which creates a multiplier effect.[19] Additionally, local food systems encourage enterprise development and diversification, creating new jobs and teaching people new skills. It is estimated that spending in local food and farming businesses generates ten times the local economic wealth[20] and three times the number of people in employment compared with spending in supermarkets.[21]

OPPORTUNITIES

Southern Roots Organics is actively involved with the Landworkers' Alliance (LWA), a union of small-scale farmers.[22] LWA was established in 2012 and already has a membership of over 1,000 small-scale

Polytunnel with companion plants to attract polinators. (Photo credit Dee Butterly)

farmers who are committed to agroecological and food sovereignty principles. Many members are new entrant farmers and the majority of organiser roles are held by women. To spread agroecological and food sovereignty principles, LWA members are developing a training programme and exchange network. This includes farmer-to-farmer exchange groups, best practice guidelines for traineeships and on-farm apprenticeships, farm-start incubator farms, mentoring schemes and accredited agroecology training schemes. These efforts are in response to the chronic lack of formal learning and training opportunities in agroecological practices for farmers. LWA also campaigns and lobbies at a national level for government recognition and support of agroecology. The Alliance advocates for state support of farmer-led education programmes and capital grants to support new entrants and local food systems. Institutional support is essential to ensure food sovereignty and an agroecological food farming system that is resilient to climate chaos and sustainable for generations to come.

Figure 2: Numbers of commercial holdings by size of farmed land in England (in size groups), June Survey.[4]

	Number of holdings/hectares (thousand)				Change (+/-%)	
	2005		2015		2005-15	2005-15
Size band	Holdings	Hectares	Holdings	Hectares	No of holdings change	Aerea of holdings change
Under 20 hectares	57.9	426.9	38.5	318.4	-33.5%	-25%
20 to under 50 hectares	26.3	869.5	20.5	685.0	-22%	-21.2%
50 to under 100 hectares	21.5	1,544.8	19,0	1,372.3	-11.6%	-11.1%
100 to under 200 hectares	16.4	2,284.2	15.2	2,131.2	-7.3%	-6.7%
200 hectares and over	10.4	4,043.	11.0	4,485.0	+5.7%	+10.9%
Total	**132.4**	**9,168.4**	**104.2**	**8,991.8**	**-21.3%**	**-1.9%**

Mixed Brassicas in rotation block showing crop diversity. (Photo credit Dee Butterly)

NOTES

1 Driver, A. (2014) *CAP Reform in England - Your Questions Answered.* Farmers Guardian Insights. Retrieved from: https://www.fginsight.com/vip/vip/cap-reform-in-england-your-questions-answered-374

2 Transnational Institute (TNI). (2013) *Land Concentration, Land Grabbing and People's Struggles in Europe.* Retrieved from: https://www.tni.org/files/download/land_in_europe-jun2013.pdf

3 Knight Frank. (2016) *Farmland Index Q2 2016.* Knight Frank Research. Retrieved from: https://kfcontent.blob.core.windows.net/research/157/documents/en/q2-2016-3897.pdf

4 Department for Environment, Food and Rural Affairs. (2015) *Agriculture in the United Kingdom 2015.* Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/557993/AUK-2015-05oct16.pdf

5 See 4

6 See 4

7 Kind, M. (2017). *A Pebble in the Pond: Opportunities for Farming, Food and Nature after Brexit.* People Need Nature. Retrieved from: http://peopleneednature.org.uk/wp-content/uploads/2016/12/A-Pebble-in-the-Pond-final.pdf

8 Kantar World Panel (2017). *Grocery Market Share – Great Britain.* Retrieved from: https://www.kantarworldpanel.com/en/grocery-market-share/great-britain

9 See 4

10 Woods, J. et al. (2010). Energy and the food system. *Philosophical Transactions of The Royal Society B, 365* (1554), 2991–3006. DOI: 10.1098/rstb.2010.0172

11 Pimentel, D. (1992) Chapter 2 - Energy Inputs in Production Agriculture. In Fluck, R.C., ed. *Energy in Farm Production.* In Energy in World Agriculture, 6, 13-29. DOI: 10.1016/B978-0-444-88681-1.50007-7

12 Laughton, R. (2017). *A Matter of Scale: A study of the productivity, financial viability and multifunctional benefits of small farms (20 ha or less).* The Landworkers' Alliance and the Centre for Agroecology, Water and Resilience, Coventry University

13 Harvey, F. (2018). *Falling yields of key UK crops could raise food prices and leave farmers struggling.* The Guardian. Retrieved from: https://www.theguardian.com/environment/2018/sep/03/falling-yields-of-key-uk-crops-could-raise-food-prices-and-leave-farmers-struggling

14 Hayhow, D.B. et al. (2016). *The state of the UK's birds 2015.* RSPB, BTO, WWT, JNCC, NE, NIEA, NRW and SNH. Retrieved from: https://www.rspb.org.uk/globalassets/downloads/documents/conservation-science/sukb-2015.pdf

15 Portugal, S. (2002). *The Plight of Britains Farmland Birds.* Birds of Britain. Retrieved from: http://birdsofbritain.co.uk/features/birds-farming-jun-02.asp

16 Willis, G. (2016). *New model farming: resilience through diversity.* Campaign to Protect Rural England (CPRE). Retrieved from: https://www.cpre.org.uk/resources/farming-and-food/farming/item/4347-new-model-farming

17 Graves, A.R. et al. (2015). The total costs of soil degradation in England and Wales. *Ecological Economics, 119,* 399-413. DOI: 10.1016/j.ecolecon.2015.07.026

18 For more information, visit: https://www.seedsovereignty.info/

19 Nourish Scotland. (2014). *Growing the Local Food Economy in Scotland.* Retrieved from: http://www.nourishscotland.org/wp-content/uploads/2015/06/Local-Food-Economy-Report.pdf

20 Sacks, J. (2002). *The Money Trail: Measuring Your Impact on the Local Economy Using LM.* New Economics Foundation. Retrieved from: http://b.3cdn.net/nefoundation/7c0985cd522f66fb75_o0m6boezu.pdf

21 Willis, G. (2012). *From Field to Fork: The Value of England's Local Food Webs.* Campaign to Protect Rural England (CPRE). Retrieved from: http://www.cpre.org.uk/resources/farming-and-food/local-foods/item/download/2096

22 For more information, see: www.landworkersalliance.org.uk

CONCLUSION

The global food and agricultural system continues to contribute significantly to the global challenges of climate change and environmental degradation without having been able to provide everyone with sufficient access to safe and nutritious food. Consequentially, it is unable to reveal its own potential in accelerating the achievement of the SDGs and other important landmark agreements. The persistence and urgency of the above-mentioned challenges means that governments and donors need to look beyond business-as-usual approaches to agricultural investment to stimulate radical and profound changes. It is time to rethink how we grow, share and consume our food. If done right, agriculture can provide nutritious food for all and generate decent incomes, while supporting people-centred rural development and protecting the environment.

This report shows how agroecology can constitute a transformative pathway for agriculture to take up its role as a catalyst for sustainable development. By comprising eight case studies from around the world, the report is meant to provide an open space for civil society organisations and community-led initiatives to relate their grassroots work to international agreements like the SDGs, often considered abstract and difficult to associate with. Although some of the case studies are limited in terms of quantitative and scientific substantiation, taken together they provide in-depth examples of how agroecology at the grassroots level can contribute considerably towards achieving several of the SDGs. In particular, all cases studies have shown the positive contribution of agroecology to ending hunger and achieving food security (SDG 2), to taking urgent action against climate change (SDG 13) and to protecting and restoring ecosystems (SDG 15). This is crucial given that the industrial model of agriculture is failing to eradicate hunger, is contributing substantially to climate change and has radically exhausted our (agro-)ecosystems. Additionally, contributions were also reported on ending poverty (SDG 1), on ensuring healthy lives and promoting well-being (SDG 3), on achieving gender equality (SDG 5), on ensuring availability and sustainable management of water (SDG 6) and on promoting decent work (SDG 8). At the same time, the report highlights the limited support for agroecology – shown unanimously throughout the cases studies – and calls for further institutional and financial support in scaling-up successful agroecological initiatives.

Recommendations

Although governments, (inter-) national development agencies and global financial mechanisms are inherently interlinked – given that all of them can be considered public financing tools – the following recommendations are going to address each tool separately. The reason for this is that all of them have unique roles to play in scaling up the transition to agroecology. While the government section focuses on steps governments can take to actively support agroecology on the national level, the section on international cooperation gives suggestions to (inter-) national development agencies on appropriate distribution of official development assistance (ODA) beneficial for agroecological transitions in recipient countries. The final section focuses on financial support provided by global financial mechanisms, in particular climate finance through the Green Climate Fund.

GOVERNMENTS

Governments can play a key role in transforming our food and agricultural systems towards more sustainability and inclusiveness, thereby working towards achieving the SDGs and other international landmark agreements. As the eight case studies above have clearly demonstrated, agroecology can play a central role in this. While the social, environmental and economic components of agricultural systems around the world can differ significantly, agroecology has shown to be responsive to all of them through principles that provide contextualised solutions to local problems. Hence, we suggest governments to do the following:

• **Think out of the box and show openness towards transformative approaches like agroecology.** Agroecology is about creating innovation through the co-creation of knowledge, combining science with the traditional, practical and local knowledge of producers. This shows that agroecology is not a one-size-fits-all approach, but rather a set of principles that can and must be applied site specifically.[1] Agroecological practices have shown to improve the economic and environmental sustainability of both intensive as well as low-input farming systems, focussing on improved efficiency, recycling and resilience. At the same time, it is based on human and social values that stress the importance of dignity, equity, inclusion and justice as a prerequisite to improved livelihoods. Hence, agroecology can provide solutions to several of the lock-ins in which food and agricultural systems currently find themselves.

• **Recognise the potential of agroecology in reducing negative externalities** throughout the entire food system. By taking a holistic and integrated approach, agroecology seeks to transform food and agricultural systems by addressing social, economic and environmental dimensions of food production. Agroecology aims to create circular and solidarity economies that reconnect producers and consumers, stressing transparency and fairness throughout a shortened supply chain that reduces exploitation, waste and food miles. Together with the mitigative potential of different agroecological practices on climate change, the approach should be recognised by governments in efforts to transition towards inclusive and circular low-carbon economies.

• **Put new and innovative governance structures in place that incentivise production based on agroecological principles** as a means to improve the sustainability of current agricultural production and distribution. Laws, regulations, public awareness campaigns and fiscal incentives are all mechanisms that can cut across different sectors and integrate the entire food system. This food system should be based on locally available resources and capacities, focussing on stimulating needs through a more equitable and sustainable market system. Such market systems bear great potential for innovation, tapping into the increased demand for healthy food. Support could therefore go to both sustainable production as well as the social and institutional innovations in marketing, including cooperatives, local producer markets, appropriate labelling schemes and e-commerce, amongst others. Subsidies through direct payments (like in the EU's CAP) should prioritise

socially and environmentally sound farming rather than scale, thereby encouraging small-scale agroecological farming and a revival of rural areas.

• **Increase focus on agroecology in (agricultural) research and development, extension services and education.** So far, the promotion of agroecological research and innovation in many educational institutions is still limited. Given the potential of agroecology to generate new knowledge and technical, social and political innovation, resources should be geared towards studying new farming systems that differ significantly from current mainstream production systems. Next to traditional knowledge institutions, agroecological research also recognises the knowledge-generating role of farmers and other food producers, indigenous peoples, social movements and civil society. At the same time, it also stresses the importance of intergenerational and gender-based knowledge of land and resources. Overall, more interdisciplinary food systems research is needed for agroecology to bear its full potential.

• **Support agroecology as the central approach to agricultural development in multilateral and intergovernmental institutions and policy processes** – including FAO, the Committee on World Food Security (CFS), the International Fund for Agricultural Development (IFAD) and alike. Moreover, governments could consider **promoting and strengthening key international agreements** like the Convention on Biological Diversity (CBD), the ITPGRFA, the CFS Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGTs), the recently adopted UN Declaration on the Rights of Peasants and Other People Working in Rural Areas, and the UN Decade of Family Farming.

INTERNATIONAL COOPERATION AND ODA

While governments of economically advanced economies have several options to support agroecology domestically as described above, they have also the opportunity to support agroecological transition abroad through international cooperation and ODA. Given the increased attention on agriculture in recent years as a cause, but also potential solution to climate change and environmental degradation, agroecology can constitute a pathway for agriculture towards solving those issues while maintaining its mandate of ending hunger and achieving food security. Hence, we suggest the following to national and international development agencies:

• **Value the systems approach that agroecology incorporates**, tackling multiple issues within malfunctioning food and agricultural systems in order to make progress on multiple development objectives. By focussing on the transformation of such systems, agroecology takes a transdisciplinary stake at addressing the intersection of ending poverty, achieving food security, protecting and restoring ecosystems and taking urgent action to combat climate change. An option for (inter-) national development agencies is to embrace agroecology as a tool to jointly address a wide range of sustainable development targets.

• **Increase support for community-led initiatives, farmer's organisations and different civil society actors** implementing agroecology at the local level. This calls for breaking up institutional and professional biases towards major established clients with limited interest in transformative and innovative approaches like agroecology. To help effectively reach the local level and let agroecology flourish, (inter-)national development agencies could consider making use of appropriate institutions able to channel investments to the grassroots. Networks of CSOs and farmers' organisations just like small grants facilities can play an excellent role in this.

• **Express long-term commitment to agricultural support in general and innovative approaches like agroecology in particular**. Agroecology is providing technical innovation by replacing external inputs with natural processes, social innovation by encouraging genuine cooperation and co-creation between various actors, and political innovation by recognising the knowledge and experiences of local land users. Given that investments in sustainable agriculture often only pay back after a longer period of time, it is important that support is long-term to make sure that objectives based on sustainability are achieved. This is especially relevant given the importance that trees play in sustainable food systems, which often take a number of years to mature.

Such long-term commitment would help agroecology to bear its full potential, revealing positive externalities like healthy soils, carbon storage above and under the ground, increase in (agro-) biodiversity and enhanced resilience of farming systems.

• **Look at positive examples among donor agencies** that have endorsed and financially supported agroecology successfully over a longer period of time. As already indicated in the introduction of this report, there are several donor agencies that have recognised the potential of agroecology, including the Agence Française de Développement (AFD) and the Swiss Agency for Development and Cooperation (SDC), among others. By exchanging outcomes and experiences with them, other national and international development agencies can learn and further develop their grant portfolio in favour of agroecology.

GLOBAL FINANCIAL MECHANISMS

While there are currently a number of global financial mechanisms in place able to provide potential support for agroecology – the Global Environmental Facility (GEF) and the Green Climate Fund (GCF) being the most prominent ones – this set of recommendations is going to focus specifically on the latter given its role as the largest multilateral climate fund on the one hand and persistent shortcomings in terms of agricultural funding on the other. At the same time, this does not mean that agroecology should not be a serious consideration for the GEF or other financial mechanisms, which, despite having recognised the role of agriculture in achieving progress on several development objectives, have little tapped into the potential of agroecology so far. As already stated in the introduction, the GCF currently only provides twelve per cent of its total budget for projects considered primarily agricultural. Given the crucial role of agriculture in contributing to climate change mitigation and adaptation, we suggest to the GCF the following:

• **Recognise and actively support agroecology as a transformative approach to climate change adaptation and mitigation**, noticeably shown in the eight cases studies provided previously. Also recognise its distinctiveness in comparison to other approaches like climate-smart agriculture, by having a transformative vision that is rooted at the local level. By recognising the adaptive potential of agroecology in particular, the **GCF should live up to its initial promise of delivering a 50:50 balance between mitigation and adaptation allocations**, ensuring that at least half of adaptation funding goes to particularly vulnerable countries.[2] Given that of all allocations approved so far almost two thirds go to mitigation projects, increased attention to agroecology could provide an excellent opportunity for the GCF to strengthen its adaptation portfolio.

• **Build on the few existing projects that do incorporate some aspects of agroecology**. This is especially relevant to ensure that good practices and successful initiatives are further upscaled. The Banking on Seeds project by the United Nations Development Programme (UNDP) for example incorporates several agroecological practices (albeit referred to as climate-smart agriculture) like community-managed seed banks and kitchen gardens.[3] After first being funded by the Adaptation Fund (managed by GEF), it is now receiving follow-up support through the GCF in an enlarged project (FP056). Similar to the agroecological practices presented above, this project has helped in taking climate action, improving food security and protecting local (agro-)biodiversity – supporting progress particularly on achieving SDG 1, SDG 2, SDG3, SDG 6, SDG 13 and SDG 15.

• **Enhance access for community-led initiatives, farmer's organisations and CSOs** implementing agroecology on the ground.[4] An option for global financial mechanisms to reach out to communities and land users groups is to simplify the complex and time-intensive accreditation process, making it easier for smaller entities like subnational or non-state actors cherishing agroecology to receive climate funding for locally-based adaptation and mitigation initiatives. At the GCF for example, there could be further support for and continuation of the Enhanced Direct Access (EDA) modality, enabling national entities to make independent funding decisions and opening the potential to devolve funding and decision-making to the local level. This principle of subsidiarity would help making decisions for investments at the level that is consistent with their resolution and is equally relevant for other financial mechanisms. There are well-established small grants funds on

regional and national level that can serve as a bridge between global financial mechanisms and actors implementing agroecology on the ground.

• The *Koronivia joint work on agriculture* (KJWA) decision reached during the 23rd Conference of the Parties of UNFCCC has been a landmark step for agriculture at the UN climate talks, recognizing the role of agriculture within the UNFCCC framework. While this can be considered an important step forward, it is **important to move from decisions to decisive action**. Given the urgency of the challenges presented by climate change, transformative actions are needed in the nearer future to increase resilience of farming systems whilst tapping into their mitigative potential. Actively supporting agroecology could be one of those actions to efficiently address the intersection of agriculture and climate change.

NOTES

1 FAO. (2018). *The 10 Elements of Agroecology. Guiding the Transition to Sustainable Food and Agricultural Systems*. Retrieved from: http://www.fao.org/3/i9037en/i9037en.pdf

2 For more information, see: https://www.greenclimate.fund/publications/gcf-in-brief-adaptation-planning

3 For more information, see: https://undp-adaptation.exposure.co/banking-on-seeds

4 Both ENDS, Heinrich Böll Stiftung North America, Aksi! & Prakriti Resources Centre (2018). *Local actors ready to act: Six proposals to improve their access to the Green Climate Fund.* Report. Retrieved from: https://www.bothends.org/en/Whats-new/Publicaties/Local-actors-ready-to-act-six-proposals-to-improve-their-access-to-the-Green-Climate-Fund/

Field trials of organic soybean production. (Photo credit PROBIOMA)

Both ENDS
Connecting people for change

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Cenesta
Centre for Sustainble Development

Keystone Foundation

Rainforest Rescue International
working for a sustainably managed world

ICE Institute for Culture and Ecology

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