



MONEY FLOWS: WHAT IS HOLDING BACK INVESTMENT IN AGROECOLOGICAL RESEARCH FOR AFRICA?



With the collaboration of



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EXECUTIVE SUMMARY

The rapidly evolving threats to food and farming systems — from climate shocks to pest stresses — make it more crucial than ever to ensure a continuous flow of knowledge and innovation. Agricultural research for development (AgR4D) is particularly important in sub-Saharan Africa, where climate threats are immediate and food insecurity remains high.

With unsustainable forms of intensification driving negative social and environmental impacts in Africa, and with COVID-19 revealing major vulnerabilities in food supply chains, agroecology is emerging as a viable pathway for building sustainable and resilient food systems. Agroecology combines different plants and animals, and uses natural synergies – not synthetic chemicals – to regenerate soils, fertilize crops, and fight pests. Diversity in the field increases access to fresh and nutritious foods for communities and keeps traditional food cultures alive. Agroecology also improves farmers' livelihoods through diverse income streams, resilience to shocks, and short supply chains that retain value in the community. In other words, agroecology has the potential to reconcile the economic, environmental and social dimensions of sustainability.

Around the world, farms, communities and regions are engaging in agroecological transitions, and delivering impressive results. Approximately 30% of farms around the world are estimated to have redesigned their production systems around agroecological principles. However, developing and disseminating knowledge on agroecology is crucial in order to sustain this progress and allow it to spread further.

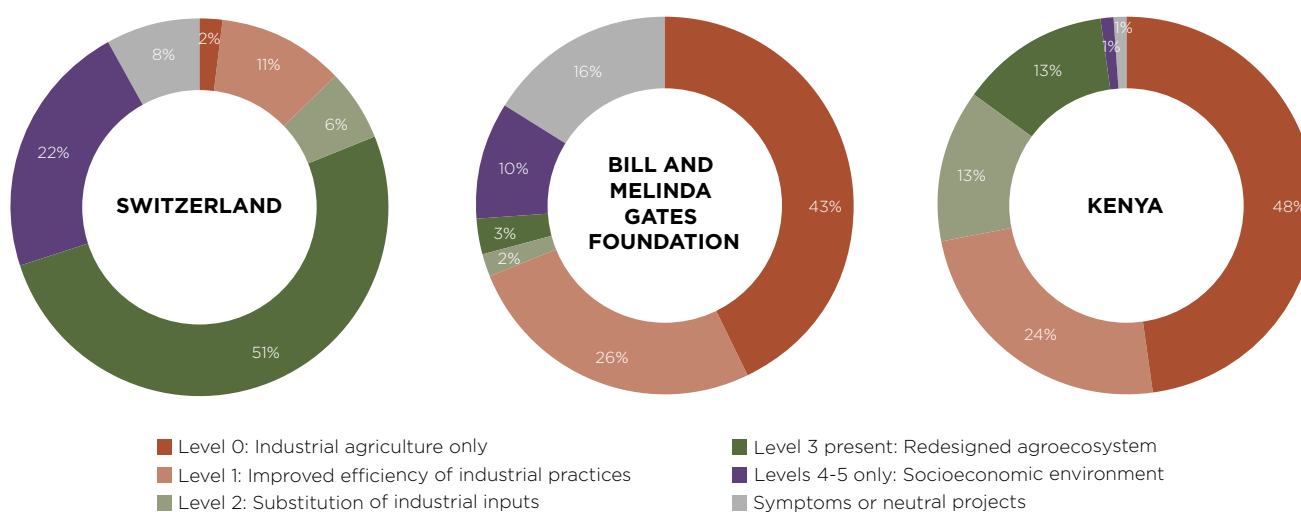
Adopting a holistic definition of agroecology, this report asks to what extent AgR4D flows are supporting the shift to agroecology that is urgently required to transform food systems. The amount of development aid channelled into agricultural research, education and extension has stagnated over the last 10 years, representing only 14% of agricultural aid in sub-Saharan Africa in 2017. The agri-development landscape is also increasingly complex, and donor priorities are highly divergent. Philanthropic donors now play a major role alongside governments and international organisations, with public-private partnerships (PPPs) increasingly widespread, and non-governmental organisations (NGOs) often involved in rolling out projects.

Only a handful of donors — including France, Switzerland, Germany, the Food and Agriculture Organisation of the United Nations (FAO) and the International Fund for Agricultural Development — have explicitly recognised agroecology as a key solution for building sustainable food systems. Recent studies have found that a fraction of United Kingdom (UK) and Belgian development aid, and minimal United States (US) agricultural research funding, goes to agroecology. This report adds to the emerging picture of what agri-development funders are supporting, and why. It shines a light on Switzerland, another major bilateral donor; the Bill and Melinda Gates Foundation (BMGF), the biggest philanthropic investor in agri-development; and Kenya, one of Africa's leading recipients and implementers of AgR4D.

The report found that agroecology remains marginal within many of these funding flows. As many as 85% of projects funded by the BMGF and more than 70% of projects carried out by Kenyan research institutes were limited to supporting industrial agriculture and/or increasing its efficiency via targeted approaches such as improved pesticide practices, livestock vaccines or reductions in post-harvest losses. Meanwhile, only 3% of BMGF projects were agroecological, i.e. they included elements of agro-ecosystem redesign. For Kenyan research institutes, the figure was 13%, with a further 13% of projects focussing on substitution of synthetic inputs.

By contrast, 51% of Swiss-funded AgR4D projects had agroecological components, and the majority of these (41% of all projects) also included aspects of socioeconomic and political change like decent working conditions and gender equality. Just 13% of Swiss-funded projects focussed only on industrial agriculture and efficiency-based approaches.

Overview of the degree to which agroecology has been integrated in AgR4D projects in three case studies



A considerable number of Swiss-funded (22%) and BMGF (10%) projects addressed socioeconomic or political elements of change directly, but did not include any production-related aspects of agroecology. Even for the better-performing Swiss programmes, truly systemic approaches were the exception: Individual components of agroecology (e.g. agroforestry, complex crop rotations) tended to be addressed in isolation. One Kenyan institute, the National Research Fund, had an agroecological focus in nearly one quarter of projects, but none focussed simultaneously on transforming agroecosystems and transforming socioeconomic/political conditions.

National agricultural research systems in sub-Saharan Africa continue to face numerous challenges, including low levels of public investment, dependence on external donors and volatility of funding flows. Research institutions based in the Global North continue to lead on the majority of AgR4D projects, and to attract larger sums of funding. African research institutes are the main funding recipient in just 9% of BMGF projects and 10% of Swiss-funded projects. The projects led by African institutions were often those with the most systemic focus.

Looking behind the money flows, this report found that the obstacles to agroecological research are deep-rooted — but not insurmountable. The majority of donors partially endorse some principles of agroecology while simultaneously supporting conventional approaches. Agroecology is often reduced to the biophysical dimension, and consequently donors like Switzerland pay less attention to concerns like the circular economy, local food webs, food cultures and the co-creation of knowledge with farmers and local communities. For others, agroecology does not fit within existing investment modalities. Like many philanthropic givers, the BMGF looks for quick, tangible returns on investment, and thus favours targeted, technological solutions. In Kenya, low awareness of alternatives to the (new) Green Revolution model emerged as the greatest barrier to supporting and implementing more agroecological projects. Concerns about the profitability and scalability of agroecology, and whether it could fit within short project timeframes, were recurrent across the AgR4D community.

In the three case studies and beyond, AgR4D stakeholders confirmed that research pathways are highly resistant to change, given that most incentives (e.g. funding timeframes, institutional specialisation and career opportunities) favour conventional, specialised approaches. PPPs and multi-donor programmes reinforce existing approaches and amplify the influence of leading donors. Large shares of AgR4D funding continue to be channelled through the Consortium of International Agricultural Research Centres (CGIAR), despite much of its work remaining limited to crop breeding and input efficiency.

But across the AgR4D community, people identified significant opportunities for changing course. Research pathways are aligned with national and global political priorities, and these priorities are changing with efforts being ramped up to meet the Sustainable Development Goals (SDGs). The agenda can also shift in light of crises or via global scientific assessments and landmark reports that usher in a new ‘consensus’. Bringing evidence to the attention of donors on the climate resilience of agroecological systems is a major opportunity to change the research agenda. Gender equity, biodiversity conservation, resource efficiency and soil health also transcend the boundaries between different actors, and could provide additional entry points for agroecology. In all organisations, the knowledge and worldview of key decisionmakers is paramount in deciding research priorities. Donor priorities can shift rapidly, particularly in top-down organisations like the BMGF, as shown with the recent engagement of BMGF to concentrate on the COVID-19.

Ensuring a steady flow of investment in agricultural research remains paramount. But it is crucial to rethink how, to whom and to what types of projects these funds are allocated. The huge potential of systemic, agroecological research for development has barely been tapped. A series of steps are required to overcome ‘lock-ins’, change the way priorities are set and accelerate the development and dissemination of agroecological knowledge. The following recommendations are addressed to those seeking to promote agroecology within their own institutions — notably bilateral donors, philanthropic funders and scientific research institutes — and more broadly in the AgR4D world.

RECOMMENDATION #1

FOCUS ON OPERATIONAL ELEMENTS OF AGROECOLOGY AS FIRST STEPS IN A WELL-SEQUENCED STRATEGY FOR TRANSFORMATION

- Use entry points such as climate change adaptation, human and environmental health, biodiversity conservation, natural resource management, gender equity and social inclusion to establish dialogues around agroecology.
- Focus on core practices and principles (e.g. closing natural resource cycles, agroforestry, diversification of crops and livelihoods, inter-cropping and crop rotation, push-pull technology, system of rice intensification, circular economy, co-creation of knowledge, localised food web, gender equity, inclusive decision-making) to introduce agroecology to new actors.
- Support organisations in their journey towards agroecology by assisting them in building increasingly systemic approaches into subsequent phases of programming.
- Emphasize agroecology’s contribution to normative commitments like the SDGs and the Paris Agreement.
- Organise equitable and inclusive multi-stakeholder dialogues based on evidence from agroecological research; enrol champions or figureheads who can help to enhance credibility and build alliances.

RECOMMENDATION #2

CAPTURE THE BENEFITS OF AGROECOLOGY BY MEASURING FOOD SYSTEM OUTCOMES HOLISTICALLY

- Develop a suite of indicators that can be used by donors and research institutes to understand whether existing projects are ‘agroecological’, building on the Agroecology Criteria Tool used in this study.
- Extend the analysis of AgR4D money flows to other regions and institutions, including the CGIAR system; undertake peer reviews to ensure coherent approaches throughout funding portfolios.
- Support the development of holistic performance measurements for agroecology (e.g. FAO’s Tool for Agroecology Performance Evaluation) that highlight alignment with the SDGs.

- Improve transparency and accountability as to how AgR4D projects are funded, how they are monitored and how their impacts are measured, e.g. through an extended common reporting system.
- Invite policymakers and funders to visit projects and get first-hand information about the added value of agroecological research projects; engage policymakers in sustained dialogue to challenge and counter the other perspectives influencing their thinking.
- Initiate an alliance to formulate principles and guidelines for agroecological research and to monitor practices.
- Showcase agroecological success stories by publishing in peer-reviewed journals and organizing awards for innovative agroecological research.

RECOMMENDATION #3

BUILD BRIDGES BETWEEN DIFFERENT PARTS OF THE RESEARCH WORLD

- Facilitate learning exchanges or ‘transdisciplinary labs’ with different knowledge-holders based on horizontal and peer-to-peer formats to enhance collaboration between farmer groups, civil society organisations and researchers.
- Provide grants for project development phases that allow for participatory project design and the exploration of farmer-researcher partnerships.
- Include requirements in funding calls on research modalities, including dissemination and research uptake phases, criteria on inclusive research and incentives for highly participatory approaches.
- Identify and showcase best practice transdisciplinary projects that provide benefits to society.

RECOMMENDATION #4

YOU CAN'T TEACH AN OLD DOG NEW TRICKS: CHANGE MUST BEGIN IN TRAINING AND EDUCATION

- Break down institutional silos in order to embed transdisciplinarity in the DNA of research and training institutes, starting with interdisciplinary courses at graduate and undergraduate levels that include non-academic actors.
- Provide training that includes practitioner-led learning; build a culture of accountability where research is undertaken with and for farmers as the ultimate beneficiaries.
- Develop agroecological curricula at colleges and universities and develop a network of decentralised centres of excellence on agroecology in sub-Saharan Africa.

RECOMMENDATION #5

SHIFT TOWARDS LONG-TERM FUNDING MODELS

- Promote institutional rules for donors that provide enhanced flexibility in programme planning and funding, including the removal of obstacles to funding subsequent phases of the same project or programme.
- Facilitate donor alliances with overlapping funding/financial periods, contributing to long-term research programmes.
- Harness large finance mechanisms for agroecology, such as Global Environment Facility funds, the Green Climate Fund and the Adaptation Fund.
- Include the delivery of public goods as well as the integration of different disciplines, perspectives and forms of knowledge in standard public funding criteria.

RECOMMENDATION #6**GIVE PRIMACY TO AFRICAN RESEARCH INSTITUTIONS AND SUPPORT BOTTOM-UP ALLIANCES**

- Set targets for i) the share of AgR4D going to Africa-based organisations and ii) the share of Africa-based organisations that are project leads.
- Support the development and functioning of bottom-up alliances with the involvement and ownership of farmers' groups, researchers, NGOs and social movements; use these alliances as a key partner in knowledge generation and sharing.
- Invest in management capacity-building of African institutions as well as in research facilities and equipment.
- Facilitate the establishment of South-South exchanges and collaboration on systemic agroecological research.
- Promote the adoption of clear rules by African institutions to govern their involvement in PPPs; undertake a high-level review of the effectiveness of the PPP model for AgR4D.
- For donors funding a relatively high share of AgR4D versus traditional agricultural aid, communicate the impacts to other donors regarding effectiveness and relevance vis-à-vis the SDGs.





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Download link: www.agroecology-pool.org/MoneyFlowsReport

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FOREWORD

In 2016, IPES-Food set out to understand why food systems were so resistant to change. The resulting report, *From Uniformity to Diversity*, found that one key imperative was hardwired into every aspect of the food system – to produce large volumes of cheap, uniform, calorie-rich and nutrient-poor commodities for global markets. In other words, the prevailing logic was an industrial one, and it was everywhere: from trade policies to agricultural subsidies, from market structures to research and educational priorities, from how we talk about food systems to how we measure them.

IPES-Food identified eight key factors locking industrial food systems in place. The most important of these was the concentration of power. To put it simply, industrial food systems allow unprecedented value to accrue to a handful of actors. This economic power translates into the power to shape food systems, through the marketing campaigns that influence people's diets, through the lobbying campaigns that mould the thinking of policymakers and through the financial flows — public and private — that drive research and innovation. Agroecology, at the other end of the spectrum, is locked out by the same mechanisms that lock industrial food systems in.

This report, co-developed by Biovision, IPES-Food and the Institute of Development Studies (IDS), zooms in on the all-important financial flows in food systems, with a view to understanding more about how the industrial model is perpetuated and where the opportunities lie for sparking agroecological transition. The analysis deploys Biovision's knowledge of the African context and its cutting-edge tools for tracking money flows while picking up where IPES-Food left off in 2016 and building on IDS' long-established traditions of power and political economy analysis.

The report shines a light on some of the most contentious flows of all. From the Green Revolution onwards, international development agencies, governments, philanthropic organisations and research institutes have invested heavily in agricultural development in the Global South. In particular, millions of dollars have been channelled into crop breeding programmes. Through agricultural research and development flows, imperatives are transmitted between public and private actors and between different regions of the world. In other words, there may be no better way to witness power at play in food systems than through these money flows.



In some ways, the findings of this report are unsurprising: 63% of the flows we tracked are focussed on reinforcing and tweaking existing systems. But, there are also some surprising and highly encouraging signs: 51% of Swiss-funded programmes and 13% of Kenyan research now supports agroecology, while concerns like gender equity and sustainable livelihoods are increasingly widespread. We may be turning a corner — albeit very slowly, and with plenty of new challenges coming into view.

The journey neither starts nor ends here. The three case studies in this report are intended to add to the rich data already provided by colleagues in the UK, the US and other parts of the world. We have drawn on their methodologies and insights, and we hope that others will build on our work in order to shine a light on other institutions, other countries and other types of financial flows in food systems. Together, these studies will allow a compelling picture of our food systems — and the money flows underpinning them — to emerge.

If we are to respond to the urgent challenge of transforming food systems, we must continue to follow the money.



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LIST OF ABBREVIATIONS

A4NH	Agriculture for Nutrition and Health
AATF	African Agricultural Technology Foundation
ACE II	World Bank's Eastern and Southern Africa Higher Education Centres of Excellence Project
ACT	Agroecology Criteria Tool
AfDB	African Development Bank
AfricaRice	Africa Rice Centre
AgR4D	Agricultural research for development
AGRA	Alliance for a Green Revolution in Africa
AU	African Union
BMGF	Bill and Melinda Gates Foundation
CAADP	Comprehensive Africa Agriculture Development Programme
CCAFS	Climate Change, Agriculture and Food Security
CDE	Centre for Development and Environment
CESAAM	Centre of Excellence in Sustainable Agriculture and Agribusiness Management
CGIAR	Consortium of International Agricultural Research Centres
CIAT	International Centre for Tropical Agriculture
CIFOR	Centre for International Forestry Research
CIMMYT	International Maize and Wheat Improvement Centre
CIP	International Potato Centre
CIRAD	French Agricultural Research Centre for International Development
CRP	CGIAR Research Programmes
CRS	Creditor Reporting System
CSOs	Civil Society Organisations
DFID	Department of International Development UK
ETHZ	Swiss Federal Institute of Technology in Zurich
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FARA	Forum for Agricultural Research in Africa
FiBL	Research Institute of Organic Agriculture
FOAG	Swiss Federal Office for Agriculture
FTA	Forests, Trees and Agroforestry
GEF	Global Environment Facility
GFAR	Global Forum on Agricultural Research and Innovation
GFRAS	Global Forum for Rural Advisory Services
GHG	Greenhouse gas
GLDC	Grain Legumes and Dryland Cereals
GPFS	SDC's Global Programme Food Security

HAFL	School of Agricultural, Forest and Food Sciences
icip	Centre for Insect Physiology and Ecology
ICRAF	World Agroforestry Centre
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDS	Institute of Development Studies
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IITA	International Institute for Tropical Agriculture
ILRI	International Livestock Research Institute
IPM	Integrated Pest Management
IPES-Food	International Panel of Experts on Sustainable Food Systems
IWMI	International Water Management Institute
JKUAT	Jomo Kenyatta University of Agriculture and Technology
JOUST	Jaramogi Oginga Odinga University of Science and Technology
KALRO	Kenya Agricultural and Livestock Research Organisation
KENIA	Kenya National Innovation Agency
NACOSTI	National Commission for Science, Technology and Innovation
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental organisation
NRF	National Research Fund
ODA	Official development assistance
OECD	Organisation for Economic Co-operation and Development
Prolinnova	Promoting Local Innovation
PPPs	Public-private partnerships
r4d	Swiss Programme for Research on Global Issues for Development
R&D	Research and development
RCTs	Randomised controlled trials
ROPRA	Réseau des organisations paysannes et de producteurs de l'Afrique de l'Ouest
RTB	Roots Tubers and Bananas
SDC	Swiss Agency for Development and Cooperation
SDGs	Sustainable Development Goals
SFIAR	Swiss Forum for International Agricultural Research
SNSF	Swiss National Science Foundation
ST&I	Science, Technology and Innovation
SysCom	Farming systems comparison in the Tropics
UK	United Kingdom
UKRI	UK Research and Innovation
US	United States
USAID	United States Agency for International Development
WLE	Water, Land and Ecosystems



1

INTRODUCTION

Agricultural research for development (AgR4D) is arguably more relevant than ever. The rapidly evolving threats to food systems – from climate shocks to pandemics – put a new premium on developing, deploying and adapting a whole range of solutions. The world is currently facing an unprecedented global crisis: the COVID-19 pandemic has laid bare the underlying risks, fragilities, and inequities in global food systems, and pushed them close to breaking point. Food systems have emerged as one of the drivers of disease risks, while many of the severest impacts are playing out through the food system, including supply chain disruptions, dangerous conditions for food and farmworkers, and critical food security risks for hundreds of millions of people (IPES-Food, 2020).

In the face of this multidimensional threat, agroecological transition is more relevant and more urgent than ever. Agroecology has the potential to build resilience and sustainability at all levels, by: slowing the habitat destruction that drives the spread of diseases; reducing vulnerability to future supply shocks and trade disruptions; reconnecting people with local food production; making fresh, nutritious food accessible and affordable to all, thereby reducing the diet-related health conditions that make people susceptible to diseases; and providing fair wages and secure conditions to food and farmworkers, thereby reducing their vulnerability to economic shocks and their risks of contracting and spreading illnesses.

Applied knowledge on agricultural practices is particularly crucial in sub-Saharan Africa, where farmers are on the frontlines of the battle against climate change, and where food insecurity remains severe, widespread and at high risk of being further exacerbated by COVID-19 (IPES-Food, 2020). Indeed, AgR4D has proven to be an effective use of public resources. In fact, agricultural research has a higher return on investment than other agricultural investments (Pardey et al., 2016a). Food and agricultural research in or of direct consequence for sub-Saharan Africa returns on average US\$30 in benefits for every US\$1 spent (Pardey et al., 2016a).

On the back of increasing investment, agricultural production grew in sub-Saharan Africa at an average annual rate of 2.6% between 1961 and 2008, as measured by the gross agricultural output (Fuglie & Rada, 2013). However, agricultural research continues to see low and variable investment (Beintema & Stads, 2017; Stads, 2011). The challenges, meanwhile, remain vast. Africa faces the growing scarcity of water and land, soil fertility depletion (Barbier & Hochard, 2016), persistent hunger, micronutrient deficiencies and insecure livelihoods for farmers, suggesting unsustainable forms of intensification in much of the region (Tittonell & Giller, 2013). Hunger is rising in almost all Africa's subregions, with undernourishment at almost 20% following adverse economic conditions (FAO, 2019). Climate change is also predicted to undermine yields for most of the major crops (Schlenker & Lobell, 2010; IPCC, 2019), while growing demand for food will accentuate the pressure on food systems.

In light of these challenges, many governments in sub-Saharan Africa have committed to agriculture-led development programmes aiming to deliver broad-based economic growth, poverty reduction and food security (Maputo declaration, 2003). In practice, the reinvestment in agriculture over recent years has largely followed a modernisation and industrialisation pathway focussed on increases in productivity, technological innovations and upscaling of farms (Collier & Dercon, 2014; Jayne et al., 2010).

However, opposition to mainstream approaches has grown. The ability of industrial agriculture to reconcile productivity growth with poverty reduction, environmental protection and human health and nutrition has been increasingly questioned (IAASTD, 2008). Agroecology has entered mainstream development debates as a more sustainable alternative to industrial agricultural modernisation (IPES-Food, 2016; Bernard & Lux, 2017). Different definitions and understandings of agroecology continue to abound (see Box ‘Agroecology as science, practice and social movement’). However, there is growing consensus on its potential for resolving the multiple food system challenges we face, and particularly its relevance for Africa. The transformative potential of agroecology has been increasingly recognised, i.e. its ability to raise agricultural productivity and resilience, and to improve livelihoods and empower communities. There has been growing appreciation and documentation of agroecology’s potential to increase and stabilise long-term production in Africa by optimising biological regulation processes, recycling nutrients and promoting diversified agroecosystems (Pretty et al., 2011), as well as providing a buffer against environmental and economic risks and accelerating climate adaptation (IPES-Food, 2016). It is of specific relevance for vulnerable communities that have limited access to external inputs in degraded areas. The fact that large-scale industrialised agriculture is not yet the norm in much of sub-Saharan Africa has been highlighted as a major opportunity for embarking, instead, on an agroecological transition (Pretty et al., 2011). Evidence is still sparse on the full potential of agroecology at scale and over time, although examples of agroecological transition at the farm, community and regional levels are being increasingly documented (see for example IPES-Food, 2018). Pretty et al (2018) estimated that some 30% of farms around the world have redesigned their production systems around agroecological principles.

Nonetheless, recent studies focussed on the United States (US) and United Kingdom (UK) have found that only a minimal share of public agricultural research funding or aid goes to agroecology (DeLonge et al., 2016; Pimbert & Moeller, 2018). Another study on Belgian development aid demonstrates similar trends (Vermeylen & De Schutter, 2020). The shortage of research funding has been identified as a key barrier to scaling agroecology up and out (De Schutter & Vanloqueren, 2011; HLPE, 2019). Furthermore, current AgR4D structures are generally ill-adapted to the modes of research associated with agroecology, i.e. transdisciplinary approaches involving the co-production of knowledge together with farmers, transdisciplinarity and moving from short-term productivity towards a focus on long-term sustainability (IPES-Food, 2016; Wezel et al., 2018).

Capturing the current distribution of funding for AgR4D in sub-Saharan Africa is therefore crucial in order to understand the scope of the challenge, to identify the factors holding back agroecological transformation and to consider how they might be overcome. A detailed analysis of what is funded in agroecological research — and where the gaps lie — is doubly important given the diverging applications and understandings of the term agroecology.

To shift agricultural development pathways towards sustainability, we need to get a better picture of the landscape. The present study seeks to answer the following questions: Where does AgR4D funding go? What agricultural development trends are funded over others? Is agroecology overlooked? How can we make a shift?

AGROECOLOGY AS SCIENCE, PRACTICE AND SOCIAL MOVEMENT

Various perspectives on what constitutes agroecology have emerged over the years in various regions of the world. The term agroecology first emerged within scientific literature in the 1930s as a combination of two traditional disciplines, agronomy and ecology, to study biological interactions between crops and other natural elements of the agroecosystem (Wezel et al., 2009). Agroecology gradually moved from a descriptive science to a more analytical approach and later to a prescriptive framework (Silici, 2014). Since the 1960s and 70s, this field of research has increasingly broadened its vision by expanding its scale of analysis (from plot to farm to landscape) and integrating other disciplines including socioeconomic and political considerations. The analysis of agriculture through an ecological point of view and the agroecosystem concept gained momentum in the 1970s.

While different perspectives remain, most approaches have the following elements in common:

- Agroecology is an integrated and transformational approach that considers together the different elements of the food system, from seeds and soil to table. It integrates different sectors and actors through a holistic vision and is based on a paradigm shift, not just marginal improvements.
- From a technical point of view, agroecology is about applying holistic ecological concepts, principles and knowledge to agricultural production; harnessing ecosystem functions to the maximum possible extent; maximizing functional biodiversity; and strengthening biological regulation in agroecosystems, rather than relying on external inputs.
- Agroecology is both transdisciplinary and participatory. It fosters the co-creation of knowledge among researchers, farmers and practitioners. Agroecological innovations are developed by combining multiple fields of science with the traditional, practical and local knowledge and values of producers and other stakeholders.
- It is based on farmers engaging in long-term, bottom-up and territorial processes, helping to deliver contextualised solutions to local problems. By enhancing autonomy and adaptive capacity, agroecology empowers producers and rural communities as key agents of change.
- It includes an explicit focus on social, cultural, economic and political dimensions of food systems, from production to consumption. Agroecology places a strong focus on food sovereignty and the rights of rural communities, women, youth and indigenous peoples. It addresses the need for socially equitable food systems within which people can exercise choice over what they eat and how and where it is produced.

Agroecology is understood in this report as a science, practice and social movement, in line with the more holistic aspects described above and the internationally agreed-upon Nyéléni definition (International Forum for Agroecology, 2015). This position is captured by the following (IPES-Food, 2018): *“Agroecology is the application of the science of ecology (the science of how nature works) to the study, design, and management of sustainable food systems, the integration of the diverse knowledge systems generated by food system practitioners, and the involvement of the social movements that are promoting the transition to fair, just, and sovereign food systems.”*

This study builds on and consolidates many recent attempts to identify the key principles of agroecology and to operationalise them for the purposes of analysis, notably the 10+ elements of agroecology approved by the Food and Agriculture Organisation of the United Nations (FAO) Council (FAO, 2019), and the five levels of food system transformation laid out by Gliessman (2015) (see discussion of methodologies in [Chapter 4](#)).

[Chapter 2](#) provides an overview of the main actors and trends in research on agriculture in sub-Saharan Africa. [Chapter 3](#) examines the political economy of AgR4D on a global level and identifies some of the main drivers and lock-ins that influence AgR4D investment decisions. [Chapters 4 to 7](#) explore three specific cases studies in depth. The studies were selected to cover various aspects and actors in the agricultural research system: Switzerland as a public donor, the Bill and Melinda Gates Foundation (BMGF) as a major private philanthropic organisation, and Kenya as an AgR4D recipient and implementing country in sub-Saharan Africa. For each case study, the share of funding currently directed to highly integrated research approaches that contribute to agroecology vs. research approaches promoting industrial agriculture are presented, as well as the viewpoints of different actors on how agroecological research might be strengthened.

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2

WHAT'S TRENDING IN AgR4D IN SUB-SAHARAN AFRICA?



KEY MESSAGES

- The AgR4D landscape in sub-Saharan Africa is increasingly complex and diverse, supported through a patchwork of funding streams and mechanisms. From regional and civil society organisations (CSOs) to the private sector and increasingly influential philanthropists, new actors are emerging alongside traditional institutional multilateral and bilateral donors.
- There is a lack of convergence in donor priorities. The limited coordination between different donors and funding mechanisms on regional and global priorities is holding back the ability of public investments to effectively address global challenges and support systemic solutions.
- Multilateral organisations are the key actors supporting the agricultural sector, and they provide global public goods in sub-Saharan Africa. These organisations are particularly influential in defining global, regional and national priorities, but their increasing preference for earmarked funding hampers strategic and coherent allocations.
- Funding for agricultural research, education and extension through official development assistance (ODA) has stagnated over the last 10 years; it represented only 14% of agricultural aid in sub-Saharan Africa in 2017.
- Three private companies dominate the agribusiness market as well as research and development (R&D), with business investment in agricultural R&D reaching US\$15.6 billion globally in 2014. In parallel, research approaches have narrowed, with 60% of funding invested in three crops: maize, wheat and soy.
- The sphere of influence of private philanthropic foundations is expanding, and the Bill and Melinda Gates Foundation has come to dominate the philanthropic AgR4D landscape.
- Research institutions based outside the continent have greater ability than their African counterparts to attract large sums of development and research funding, and thus to shape the AgR4D agenda. National agricultural research systems in sub-Saharan Africa face numerous challenges, including low levels of public investment, dependence on external donors and volatility of funding flows.
- The Consortium of International Agricultural Research Centres (CGIAR) Research Programmes (CRPs) still focus largely on breeding and efficiency in production systems. The CGIAR's dedication to a systemic sustainability transformation of the food system remains marginal.
- CSOs and grassroots movements are co-creating knowledge with local communities, as well as helping to develop and spread feasible and accepted solutions to food system challenges, but receive little recognition.
- There is growing interest in agroecological approaches by a number of bilateral and multilateral donors — notably France, Switzerland, Germany, FAO and the International Fund for Agricultural Development (IFAD) — as a key solution to achieving food security and building sustainable food systems. The majority of donors partially endorse some principles of agroecology while simultaneously supporting industrial agriculture.

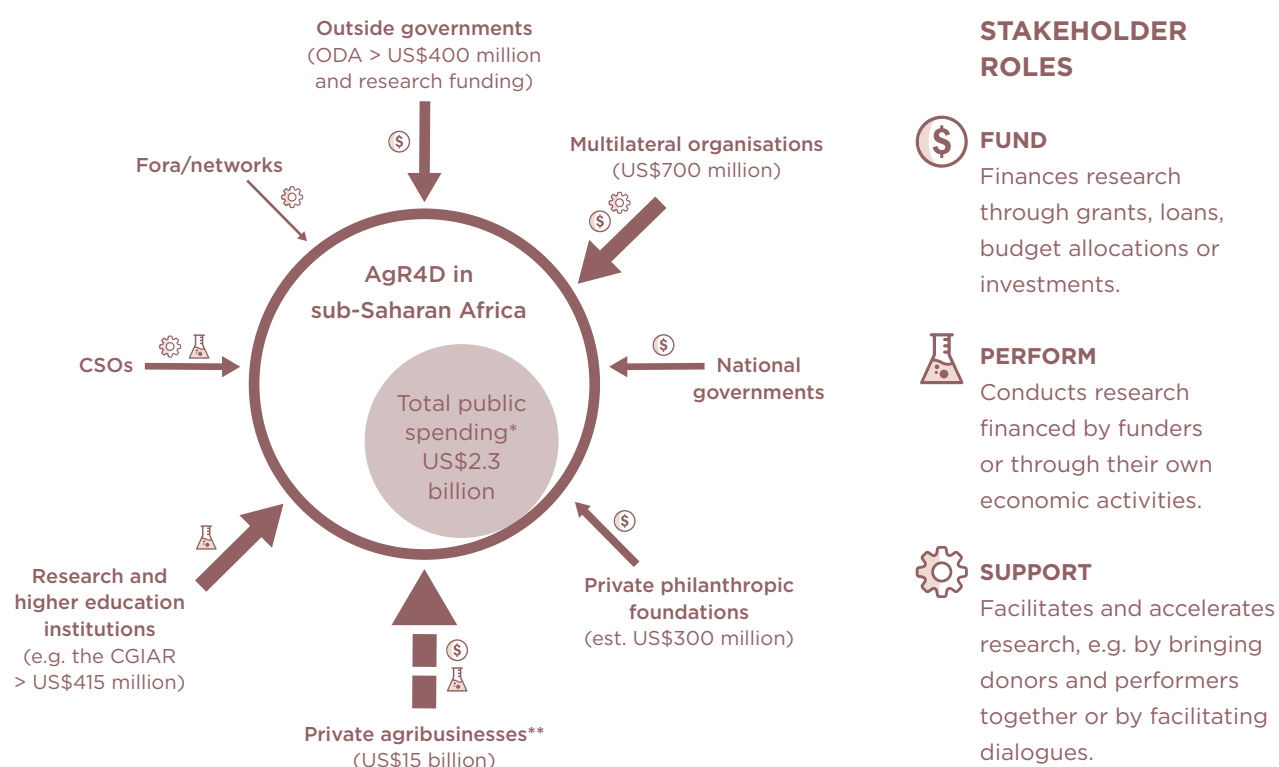
THE AgR4D FUNDING LANDSCAPE

AgR4D lies at the intersection of research, agriculture and development cooperation. Many actors contribute to it, and they have highly diverse objectives and degrees of influence. In 2011, total global public and private investment in AgR4D exceeded US\$70 billion (in purchasing power parity dollars) (Pardey et al., 2016b), and has been increasing. But, only a small portion of these investments targets sub-Saharan Africa.

This chapter provides a general picture of the AgR4D landscape with a focus on sub-Saharan Africa. First, it includes a summary of the funding trends. This is followed by a mapping of the main funders and recipients, who are either implementers or supporters of AgR4D in sub-Saharan Africa (see Figure 2.1), and includes analysis of research collaboration networks. The final section presents a short exploration of research funding within the CGIAR system.

Figure 2.1:

Overview of different stakeholders and their roles in AgR4D for Africa. The width of the arrows represents the relative scale of funding from and to different actors (IFPRI 2018).



* Total agricultural research spending in 2016 for all government, non-profit and higher education agencies that conduct agricultural research and that are based in sub-Saharan Africa (excluding the private, for-profit sector and institutions based elsewhere)

** Direct private R&D investments in sub-Saharan Africa are estimated at below US\$100 million. However, global R&D investments by agribusinesses focus on technologies targeting global markets, which include developing countries.

There is rapid institutional diversification with the emergence of new stakeholders alongside the traditional.

CSOs, private actors, public-private partnerships (PPPs) and regional fora have seen their roles expand in recent years (Oliveros, 2006) and AgR4D has undergone a number of shifts in focus and priorities in sub-Saharan Africa over time. After a decade of slow growth in the 1990s, agriculture has returned to the forefront of the international cooperation agenda with the onset of the global food price crisis in the late 2000s.

Global public investment in AgR4D increased by over 20% from 2000-2008 (Anandajayasekeram, 2011), but since then, public investment has stagnated or even fallen. Publicly and privately funded research for development approaches have mainly focussed on increasing food production through highly specialised research, as exemplified by an increase in the CGIAR budget from US\$650 million to US\$1 billion between 2008 and 2014, followed by a constant decline up until now.

The liberalisation of economies, strengthening of intellectual property rights and decline in economic resources available to public sector institutions for research, among others, have paved the way for increased private sector involvement in agricultural research.

Technology transfer, extension and training activities are increasingly combined into an integrated research-extension system in which developing and disseminating innovations is seen as a continuous process, and agribusiness firms often play a leading role. CSOs have also emerged in this space, filling the vacuum by providing social services to their communities.

Developing countries are increasingly viewing science and technology as potential drivers of economic growth, and AgR4D is expected to play a significant role in the process. The number of higher education institutions and their networks has grown over time, and the boundaries between government, business and CSOs are dissolving as overlapping mandates prevail.

CURRENT TRENDS IN AgR4D FUNDING

- Funding for agricultural research through ODA to developing countries is stable, while overall ODA for agriculture is increasing (OECD, 2018a).
- Emerging economies are increasing their investments in AgR4D (especially China, India and Brazil), and could change the donor landscape for AgR4D in sub-Saharan Africa in the near future (Pardey et al., 2018).
- Public spending on agricultural research by national governments in sub-Saharan Africa as a whole is increasing. But, this is mostly due to increases in spending by South Africa, Nigeria and Kenya, while AgR4D expenditures for most sub-Saharan Africa countries are stagnating (IFPRI, 2018).
- Global private sector investment in AgR4D has risen faster than public research for development spending in OECD countries (Pray & Fuglie, 2015), especially developing countries (Fuglie, 2016).
- Several recent mergers have resulted in a strong concentration of research and development activities by a handful of companies (IPES-Food, 2017).
- Private philanthropic flows to AgR4D are still modest and highly concentrated, but are growing steadily. Philanthropic foundations are gaining in importance by engaging in coalitions with other AgR4D system actors (OECD, 2018b).

Fragmentation in AgR4D funding limits effectiveness, increases transaction costs and makes it difficult for countries in sub-Saharan Africa to align AgR4D funding to their national development priorities.

AgR4D in sub-Saharan Africa is characterised by a diversity of funding flows and mechanisms, in line with the diverging agendas of various donors and the range of associated stakeholders. A significant funding stream for AgR4D in sub-Saharan Africa comes from ODA, which aims to alleviate development challenges, improve economic development and enhance the overall welfare of developing countries (OECD, 2018a). The reporting system of the Organisation for Economic Co-operation and Development (OECD) distinguishes between bilateral aid granted by one country (mostly OECD countries) directly to another, and multilateral aid, which is channelled through multilateral development agencies. In addition to development aid, national research funding supplied within countries by their own governments and usually managed by research funding organisations (e.g. the European Research Council or the National Research Fund) can contribute directly or indirectly to institutions in sub-Saharan Africa. Agribusinesses, agri-food companies and private philanthropic foundations are also important funders of individual research programmes and endowed chairs in academia.

Research funded through ODA or private philanthropy is often more explicitly focussed on practical applications and impacts. The BMGF, for example, emphasizes measurable impacts on agricultural production and financial benefits for farmers (Martens & Seitz, 2015).

Research conducted under research funding schemes often focusses more on agricultural productivity, long-term approaches and academic excellence, and is measured by publications in highly ranked journals. Research for development projects often need to satisfy international development *and* academic criteria in order to access sufficient funding (Carbonnier & Kontinen, 2015).

The lack of transparency makes it hard to track global investments.

Tracking global AgR4D money flows from donors to recipients is difficult. While a number of agencies have built extensive public databases (for example research funding organisations in the UK and Switzerland), those databases are rarely compatible and data on multilateral development finance and private agribusiness investment is particularly limited. Money can flow through many and different entities, and this limits understanding of the impact of research for development investments.

There is no complete tracking system from member governments to international organisations and then on to recipient governments, private contractors and non-governmental organisations (NGOs). Despite efforts from the Development Assistance Committee of the OECD to track aid, most ODA data does not include details on recipients. Research institutions rarely provide details on the composition of their funding sources, including, notably, what comes from the private sector.

WHO'S WHO IN AgR4D

WHO AND WHAT IN AgR4D

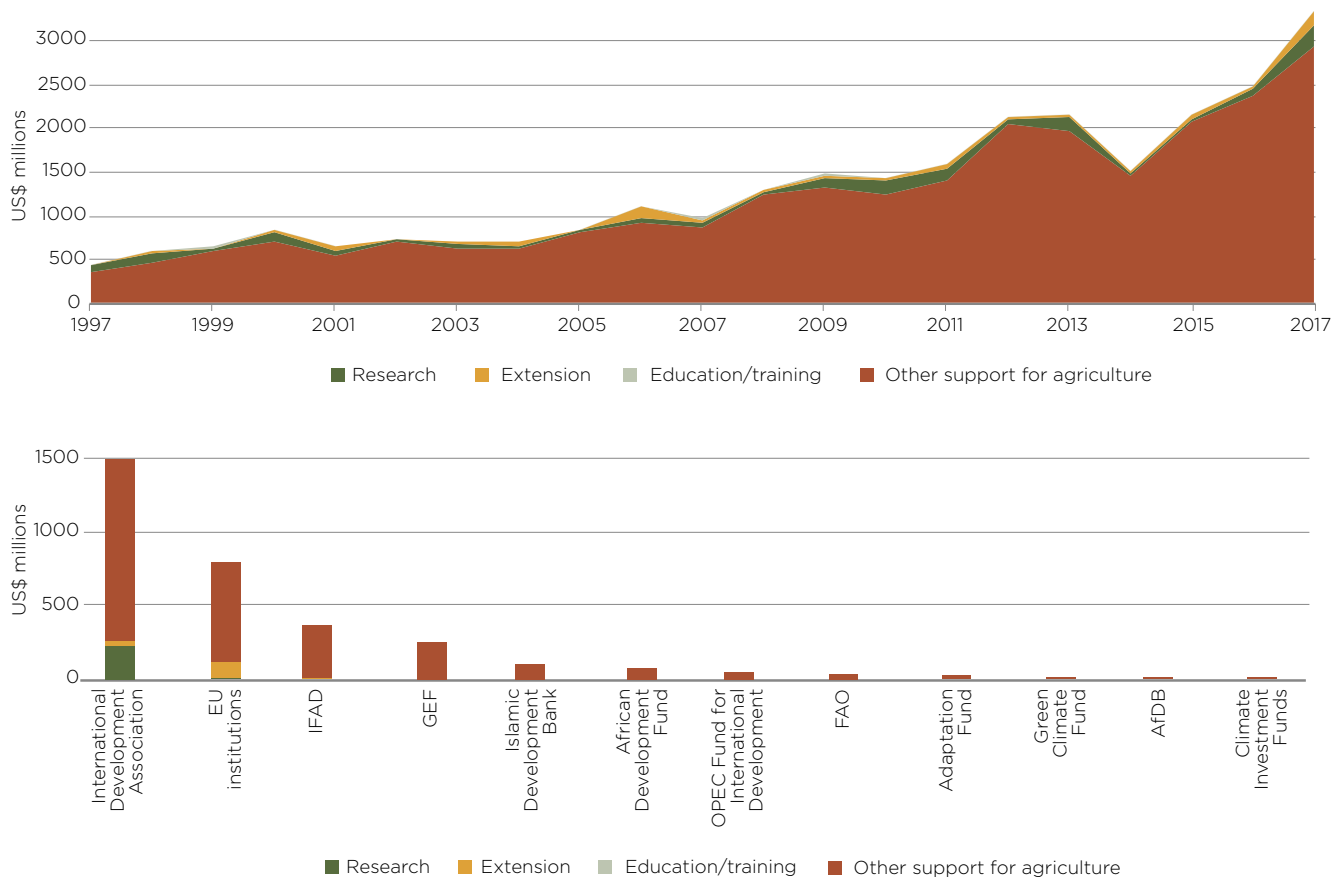
An interactive dashboard has been developed by the authors of this report to explore various aspects of the AgR4D landscape and its major stakeholders, and is available here: <https://tabsoft.co/2FZ4Xq6>

THE WORLD BANK AND OTHER MULTILATERAL ORGANISATIONS – KEY AgR4D BROKERS

ODA channelled through multilateral organisations is the most important – and still growing – funding source for AgR4D in sub-Saharan Africa.¹ However, specific contributions to agricultural research have flatlined over recent decades. ODA for agriculture in sub-Saharan Africa exceeded US\$3 billion in 2017, with US\$400 million going to research, education and extension.

Figure 2.2:

Multilateral ODA to sub-Saharan Africa: Trends and major donors to agriculture (OECD, 2018a)



¹ In this analysis, funding to sub-Saharan Africa means that at least one country in sub-Saharan Africa is identified as a beneficiary country.

Loans and grants from the World Bank are by far the most important source of funds for most sub-Saharan African countries and national research systems. The World Bank supports country-level projects financed through loans and supplemented by grants. Other important multilateral donors for agriculture are European Union (EU) institutions, IFAD, the Global Environment Facility (GEF) and FAO (see Figure 2.2), and they all have various funding priorities. Over the past decade, the World Bank has shifted the focus of its AgR4D support from the national to regional level through its regional productivity programmes. The EU and IFAD, on the other hand, are mainly investing in agricultural research via the CGIAR system.

Multilateral organisations are able to influence the global agenda through large financial contributions and their ability to pool resources and connect stakeholders.

The World Bank's African Agricultural Productivity Programme has shaped agricultural research since its establishment in 2008.

The decision to create a follow-up programme, starting in 2019, sent a strong signal about the importance of investments in agricultural research. But, an increasing preference from member states to fund specific projects or activities matching their own priorities through earmarked funding, and rising mistrust in multilateralism, might restrain growth and coordination of multilateral funding flows in the near future (OECD, 2018b).

The multilateral development system should be at an advantage in providing global public goods and reaching the most vulnerable people in fragile contexts, but the system is being called on to provide a broader and more complex development agenda to achieve all the Sustainable Development Goals (SDGs) (OECD, 2015a). FAO is currently the only multilateral organisation that specifically lists agroecology as a pathway to achieving sustainable transition,² despite a parallel longstanding support to Green Revolution approaches. Other institutions like IFAD are currently discussing the relevance of agroecology to achieving their objectives.

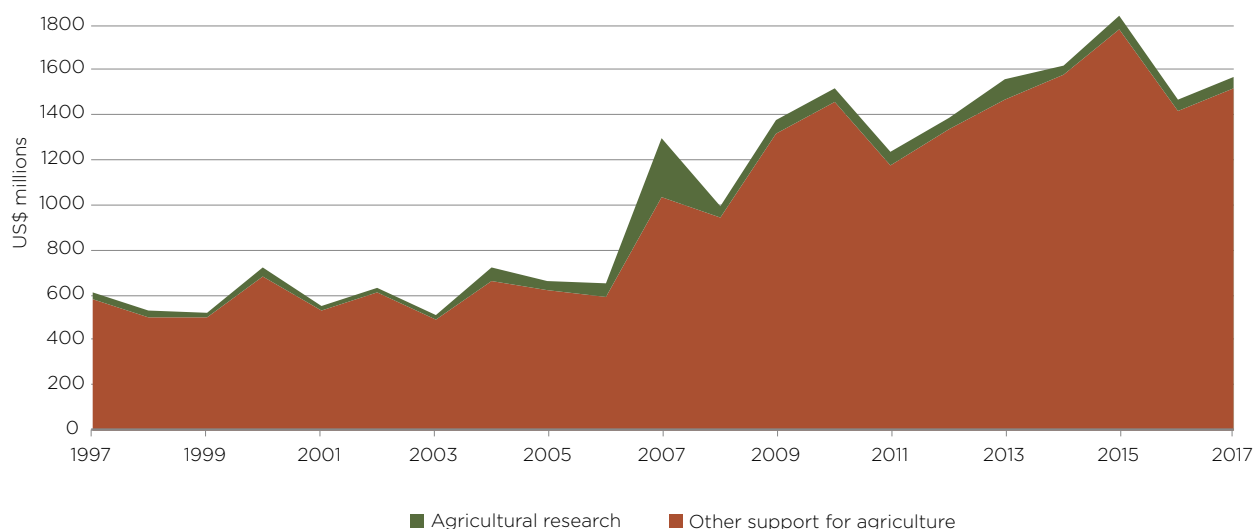
² This information is based on an analysis of the strategic documents of multilateral organisations.



DONOR COUNTRIES - DIVERSITY IN FUNDING

Figure 2.3:

Bilateral ODA for agriculture to sub-Saharan Africa (1997-2017 in constant US\$) (OECD, 2018a)



Bilateral ODA directed to agriculture in sub-Saharan Africa has tripled since 1997 (see Figure 2.3), and has hovered between 2-7% of overall ODA to sub-Saharan Africa. At the global level, the share of AgR4D to overall agricultural aid is decreasing.

Bilateral ODA for agricultural research, totalling more than US\$140 million in sub-Saharan Africa in 2016, is decreasing as a percentage of agricultural ODA.

According to the OECD Creditor Reporting System (CRS) (OECD, 2018a),³ top donor countries for AgR4D in sub-Saharan Africa include France, Germany, Canada, Ireland and Switzerland (see Figure 2.4).

The contributions of other key donors in the agricultural sector such as the US, Japan and the UK are modest.⁴

For example, in 2011 the US Agency for International Development (USAID) spent only US\$3 million on AgR4D in Africa (USAID internal data, 2011). USAID is nonetheless a major contributor to the CGIAR system and North-South research partnerships through two key programmes, Feed the Future Innovation Labs for Collaborative Research and Collaborative Research Support Programmes, which focus on 12 priority countries in sub-Saharan Africa. But, the commitment to AgR4D of the former initiative is stagnating and might decrease in the coming years (Donor Tracker, 2018).

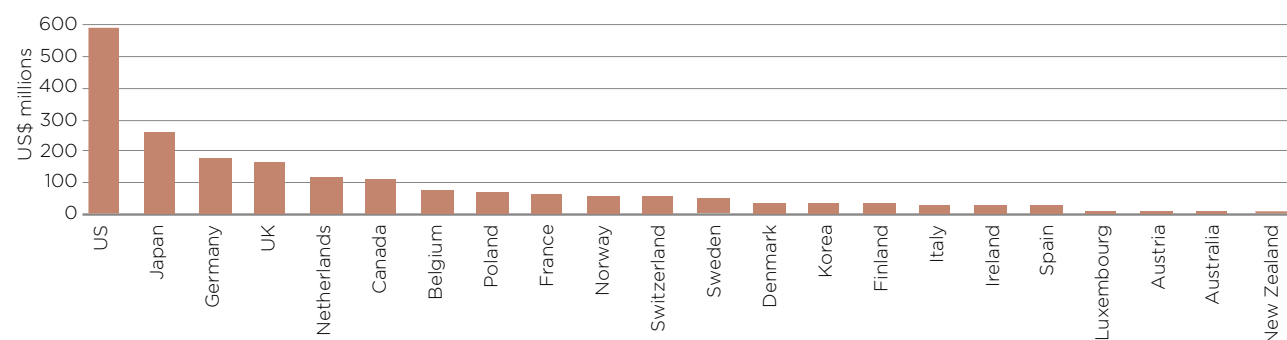
³ Data on the distribution of ODA is based on disbursement data for 2016.

⁴ Differences in budgets might be due to differences in the way countries report their disbursements in the OECD CRS system. The US and Japan report some research projects as general support to agriculture.

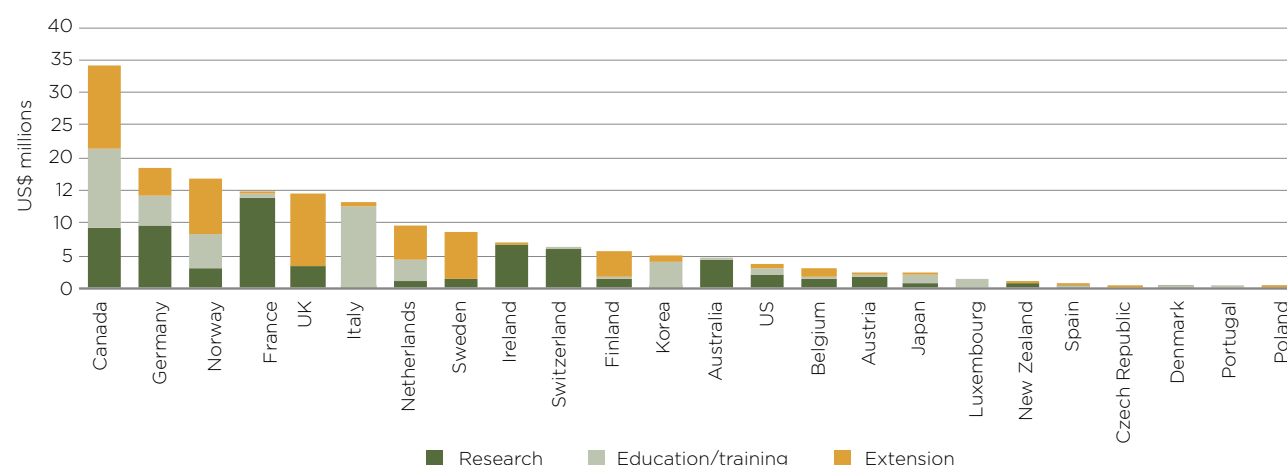
Figure 2.4:

Bilateral ODA for all agricultural activities (OECD, 2018a)

Bilateral ODA for agriculture to sub-Saharan Africa



Bilateral ODA for agricultural research, extension and education to sub-Saharan Africa



Despite a general lack of convergence in donor priorities, an increasing number of countries have expressed their interest in agroecological approaches.

France, Germany, Belgium and Switzerland, for example, have been supporting agroecology in their development aid strategies as a way to achieve sustainable food systems and food security. In the field of South-South cooperation, the Brazilian Agricultural Research Corporation, which explicitly promotes agroecology, supports and co-funds collaborative projects between Africa-based public and private institutions. Other countries such as the UK and the US, by contrast, are spending large portions of their funding on projects focussing on increasing input use and crop improvement. The UK has included environmental sustainability and climate-smart

agriculture in its framework for agriculture, but its Department for International Development (DFID) has not funded any projects with a specific focus on agroecology since 2010. And, less than 5% of its agriculture budget has been spent on programmes with some agroecological principles such as reduced inputs or recycling (Pimbert & Moeller, 2018). In May 2018, DFID announced an investment of more than US\$120 million in research for high yielding, biofortified, drought, heat or disease-resistant crop varieties as a partial solution to tackle food security and malnutrition.

Donor countries distribute their agricultural ODA through different channels. France channels a large share of its AgR4D investments through its own national research centres, notably the French Agricultural Research Centre for International Development (CIRAD).

Australia takes a similar approach by supporting the Australian Centre for International Agriculture Research and through a strategic alliance with the Commonwealth Scientific and Industrial Research Organisation. On the other hand, Switzerland dispensed most of its ODA for agricultural research through regional initiatives, CGIAR centres and other independent international research institutions such as the International Centre of Insect Physiology and Ecology (icipe).

Joint initiatives of research funding councils and ministries of foreign affairs are particularly significant for AgR4D.

North-South research programmes and collaborations between research funding councils

and ministries of foreign affairs have been developed to integrate research institutions in the South with global research systems, to strengthen research capacity and to contribute meaningfully to solve global challenges. For example, the NORGLOBAL programme in Norway and Japan's Science and Technology Research Partnership for Sustainable Development funds research that supports the implementation of the SDGs. Another prominent funding scheme of this nature is the EU's Horizon 2020 programme, which includes AgR4D. With overall funding of more than €80 billion over seven years (2014-2020), including almost €4 billion for projects on agriculture and food security, it is the biggest-ever EU research programme.



GOVERNMENTS AND INTERGOVERNMENTAL ORGANISATIONS IN SUB-SAHARAN AFRICA - INSUFFICIENT RESEARCH FUNDING AND NEW OPPORTUNITIES FOR COLLABORATION

Only a handful of sub-Saharan African countries are reaching agricultural research funding targets.

National research systems in sub-Saharan Africa remain partly dependant on domestic government funding. However, most countries in the region have a low level of agricultural research spending (see Figure 2.5). The exceptions are Nigeria, South Africa and Kenya, which together account for more than half of the total investments (Beintema & Stads, 2017).

According to the African Union (AU), more than 1% of agricultural GDP should ideally be reinvested in agricultural research. But, between 2010 and 2014, the overall investment ratio dropped below 0.5% and only a few countries reached the target (Beintema & Stads, 2017).

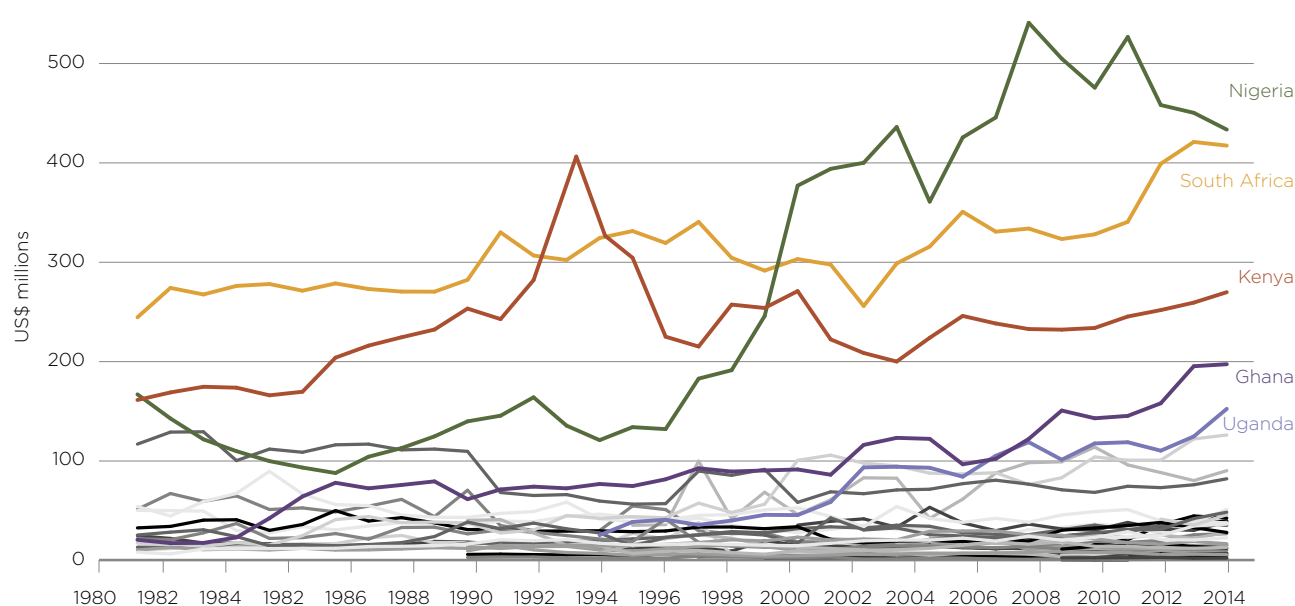
Another challenge with public investment in agricultural research in sub-Saharan Africa is the discrepancy between government commitments and actual disbursements. Such budget uncertainties pose significant struggles for the day-to-day operation of national agricultural research systems (Beintema & Stads, 2017).

Regional and global intergovernmental initiatives are increasingly coordinating research and development efforts.

Several important pan-African initiatives of the AU aim to accelerate the socioeconomic and political transformation of the continent's agricultural sector. A prominent example and important stakeholder for AgR4D is the New Partnership for Africa's Development (NEPAD) and its framework for agriculture, the Comprehensive Africa Agriculture Development Programme (CAADP). NEPAD's mandate is to conduct and coordinate agricultural research, manage knowledge and mobilize the necessary resources to implement programmes as stated in the CAADP.⁵ The AU's Forum for Agricultural Research in Africa (FARA) is a coordinating body that is strongly involved in

Figure 2.5:

Development of public expenditures for agricultural research by sub-Saharan African countries from 1981-2014 (IFPRI, 2018)



⁵ For example, the Alliance for Accelerating Excellence in Africa (AESA) and its Coalition for African Research and Innovation (CARI), launched by NEPAD, aim to catalyze investments, strategies and research programmes.

setting research agendas and improving capacity development. FARA also coordinates regional research organisations that aim to coordinate research and development activities, facilitate partnerships and harmonize policies.⁶ They are primarily supported by the World Bank through its regional African Agricultural Productivity Programmes and by the establishment of 46 regional centres of excellence (total > US\$500 million invested in loans), with one of them, the African Centre for Agro-Ecology and Livelihood Systems at Uganda Martyrs University focussed on agroecological approaches.

Most of these regional bodies support a variety of agricultural approaches that generally aim at increasing production and sustainability. Global-level coordination initiatives also play a major role in the AgR4D world. For example, the Global Forum on Agricultural Research and Innovation (GFAR) is a joint initiative of FAO, IFAD, the CGIAR, national research and development systems, representatives from civil society and the private sector. GFAR is mostly active in advocating for AgR4D by framing research priorities and by facilitating access to information and knowledge in the field.

⁶ Regional research organisations include the West and Central African Council for Agricultural Research and Development (CORAF/WE CARD), the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA) and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA).



RESEARCH INSTITUTIONS – POWER IMBALANCES AND AGENTS OF CHANGE

Through a bibliometric analysis,⁷ Figure 2.6 shows which research institutions are actively publishing on agriculture in sub-Saharan Africa and on agroecological approaches.

Global South-based research institutes are trailing in access to funding and in the quantity and quality of research.

The most visible researchers in sub-Saharan Africa agriculture and agroecology are based at research institutions with a specific agricultural research mandate based in the Global North such as CIRAD and the University of Wageningen. Another important group is the international CGIAR centres, whose presence in sub-Saharan Africa has increased over the years. The CGIAR centres are actively publishing on agriculture in general as well as on agroecological practices, and are producing highly cited outputs.

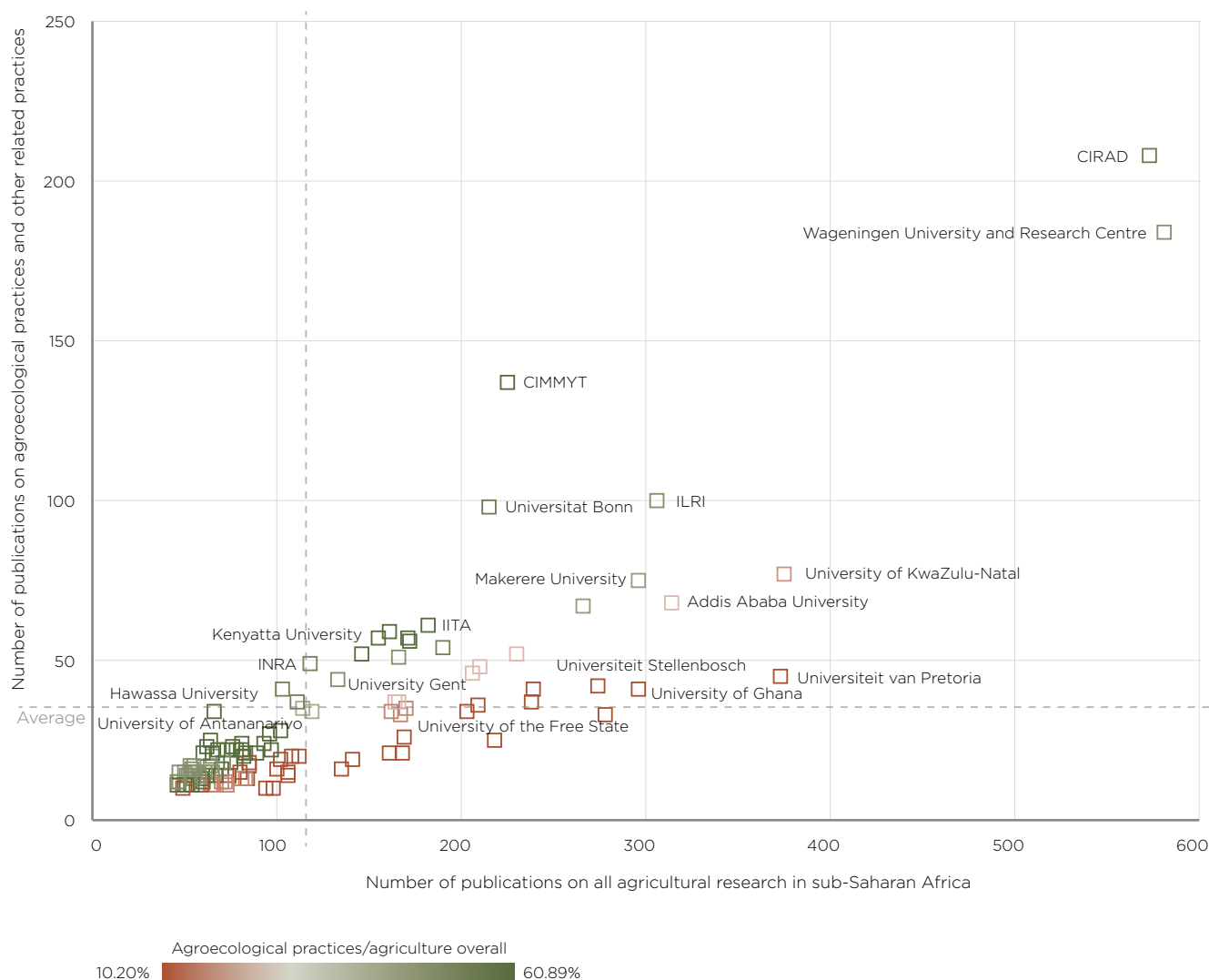
Non-African research institutes significantly influence research agendas through their capacity to attract substantial development and research funding. African funding agencies have limited capacity to provide counterpart funds reinforcing the power imbalance.

Many national universities in sub-Saharan Africa such as Uganda's Makerere University and Addis Ababa University in Ethiopia also contribute a high number of articles on agriculture and agroecological practices among all research institutions. In addition to low levels of public investment, dependence on external donors and the general volatility of funding, universities in sub-Saharan Africa and national agricultural research systems face other challenges such as non-renewal and ageing of scientific staff (Stads & Beintema, 2015). Available resources for national agricultural research systems are spread too thinly over too many staff and programmes, and this can constitute an additional hurdle in the development of innovative and long-term approaches.

⁷ The present analysis uses the Scopus database of peer-reviewed literature to identify the major research institutions for AgR4D in sub-Saharan Africa based on number of publications. A list of search terms related to agroecological practices were used to identify the institutions involved in research on agroecology. Those terms include alternative practices substituting industrial inputs (e.g. cover crops, biological pest management) or ecological management at the agroecosystem level (e.g. diversified production, participatory breeding), as listed in the [Agroecology Criteria Tool](#) (ACT, criteria of transition Level 2 & 3 in [Annex 1](#)). In addition, a separate analysis of highly cited papers was conducted.

Figure 2.6:

The contributions of research institutes to research publications on agriculture (X-axis) and agroecological practices (Y-axis) in sub-Saharan Africa for the period 2010-2018 (compiled from Scopus data, 2018). The colour coding is based on the share of publications on agroecological practices compared to the overall publications on agriculture of a research institution. The institutions in red have a below average share of publications on agroecological practices and those in green are above average.



Large research institutes tend to have a parallel focus on highly divergent models of agriculture.

Agroecological practices and approaches can be more or less prominent in research institutions (see Figure 2.6). Several important agricultural research institutions and universities host research groups in separate departments with focusses ranging from genetically modified organisms and improved varieties to agroecological practices such as agroforestry.

The present bibliographic analysis (Figure 2.6) is based on the use of the term 'agroecology' or other related agricultural practices in line with Levels 2 and 3 of food system transformation (Gliessman, 2015) in the scientific literature. Such research approaches are historically rooted in agronomy and ecology, with popular research topics including soil properties, species richness and tillage systems (Wezel et al., 2018). However, it does not include economic and social aspects.

The change agents in agroecology and the co-creators of knowledge lack visibility.

There are other pioneering institutions in the field of agroecology that have not been identified in the previous section, either because they do not have a geographic focus on sub-Saharan Africa, they are relatively new to the research landscape or because they are less focussed on peer-reviewed scientific papers. Examples include the Centre for Agroecology, Resilience and Water at Coventry University, the Stockholm Resilience Centre and research-oriented think tanks such as the International Institute for Environment and Development that promote holistic and transformative research approaches.

This analysis of the main actors based on peer-reviewed publications does not take into account one of the main requirements and revolutionary elements of transformational agroecological research – decentring the 'experts', and valuing knowledge held by farmers and communities alongside conventional science. Institutional pressure and scientific disciplinary traditions push research organisations (even those more focussed on agroecological practices, Figure 2.6 in green) to conform to the classical model as providers of knowledge – with peer-reviewed publications a key indicator of scientific productivity and funding allocation – rather than as co-creators of knowledge. One counter example is the US\$30 million Climate Change Adaptation in Africa research and capacity development programme,⁸ with participatory action research as the methodology of choice.

Agroecology research partnerships involve more sub-Saharan African research institutions than agricultural research partnerships.

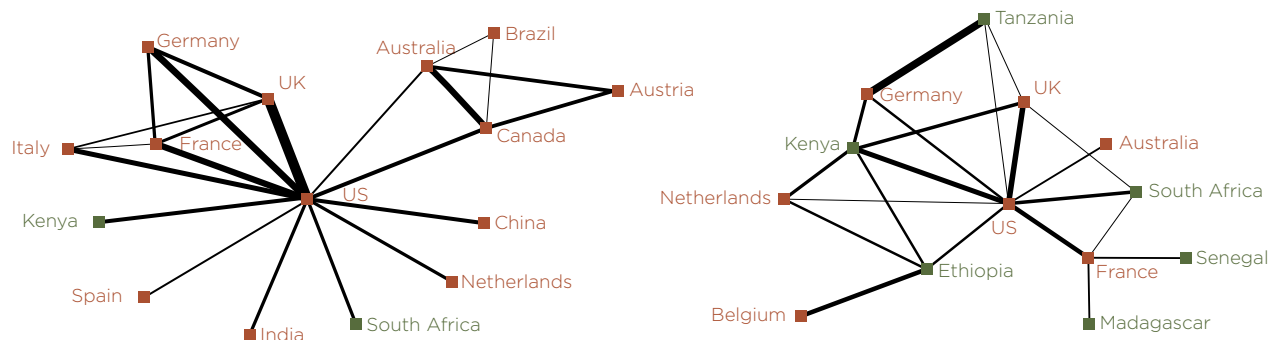
Bibliometric analysis using peer-reviewed literature on agriculture in general and on agroecological practices in sub-Saharan Africa⁹ provides a more detailed picture of who is involved in agricultural and agroecological research. The network of researchers collaborating on all agricultural topics in sub-Saharan Africa differs from the research networks on agroecology (see Figure 2.7). The latter includes more North-South collaborations (e.g. Germany-Tanzania), as well as South-South partnerships (e.g. Kenya-Ethiopia). Mainstream agricultural research networks are more centralised around a few research-intensive nations like the US and UK. The involvement of emerging countries like India, Brazil and China is growing, especially in the overall agriculture research network. This is in line with emerging countries' increased involvement as agricultural research donors (Pardey et al., 2018).

⁸ Joint initiative of Canada's International Development Research Centre and the UK's DFID.

⁹ Publications on agriculture in sub-Saharan Africa and publications mentioning 'agroecology' or other related practices as listed in the [Agroecology Criteria Tool](#) (ACT, criteria of transition Level 2 and 3 in Annex 1) were filtered and analysed separately from the Scopus database. The networks are defined by co-authorships in peer-reviewed articles. The strength of the links between two countries represents the number of co-authored publications of research institutions based in the two countries.

Figure 2.7:

Main research network on agriculture (left) and on agroecological practices (right) in sub-Saharan Africa (compiled by authors from Scopus data). Wider lines represent a greater number of collaborations.



International research consortia help African institutes to participate in the global knowledge system, but do little to bridge the underlying gap between Global North and South.

Research funding is increasingly allocated to scientific consortia, which are one of the main avenues for sub-Saharan African institutions to access competitive funding opportunities. However, institutions in sub-Saharan Africa are rarely in the lead in managing and coordinating such projects. The publication pressure from academia and funders may lead research institutions from the Global North to focus on publishing outputs rather than co-creation and co-management of knowledge (Carbonnier & Kontinen, 2015).

PRIVATE BUSINESSES – CENTRALISATION OF MARKET POWER AND R&D

Investments in private R&D in the agricultural sector have nearly tripled from 1990 to 2014.

Private business investments in agricultural R&D totalled US\$15.6 billion in 2014 (Fuglie, 2016). R&D conducted by private companies is generally focussed on increasing the productivity of a small number of crops and livestock breeds, with high financial returns through technological and commercialised solutions (e.g. new breeding methods and improved agrochemicals) (IPES-Food, 2017).

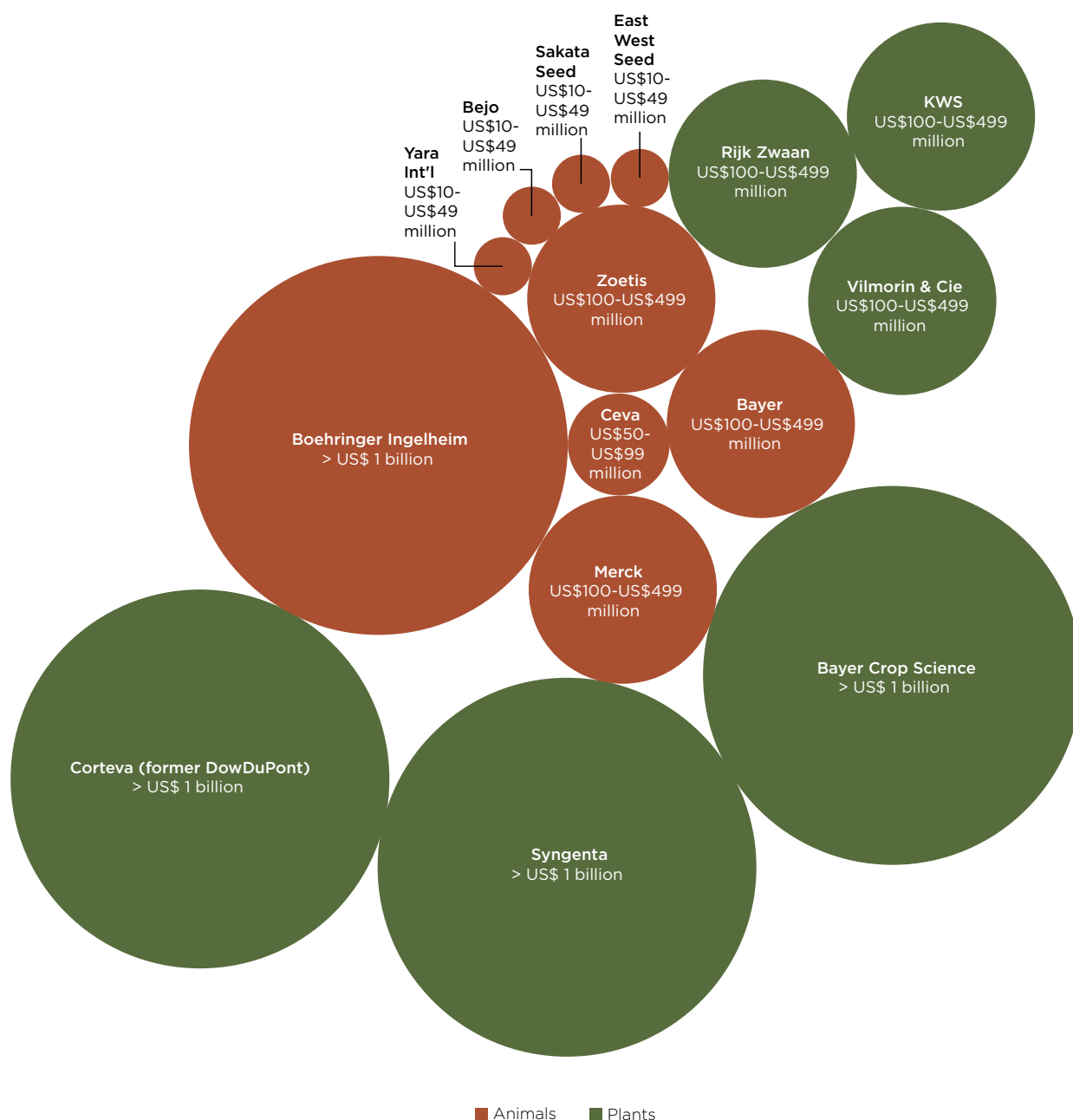
Mega-mergers are narrowing the scope of agricultural R&D.

Mergers and acquisitions in the agribusiness sector have accelerated at unprecedented pace in recent years (IPES-Food, 2017). The three (formerly six before mega-mergers) big players, Corteva, Bayer and Syngenta (owned by ChemChina), in the commercial seed sector are not only dominating the market in terms of market share but also in terms of investments in R&D (see Figure 2.8). The

main consequence has been a further reduction in the scope of research and innovation (focussed on major crops), the creation of increasing barriers to entry and a refocussing on low risk and defensive investment strategies such as protecting patented innovations. Start-ups and smaller companies are generating a range of food and farming innovations, but the potential of these innovations tends to be diluted as these firms are rapidly bought out by mega-firms (IPES-Food, 2017).

Figure 2.8:

Annual R&D investments of major agribusinesses (Fuglie, 2016; IPES-Food, 2017)



In sub-Saharan Africa, the private sector is playing an increasing role in crop breeding.

The CGIAR centres have established several PPPs with international seed companies (Gareth, 2015). Meanwhile, the Alliance for a Green Revolution in Africa (AGRA), set up by the BMGF, the Rockefeller Foundation and USAID, is supporting the development of crop-breeding partnerships between smaller private seed businesses and research institutes. Successful examples are Pannar Seed, Seed Co Limited, the National Seed Research Institute of Kenya, the Maize Research Institute of Kenya and Zamseed (Gareth, 2015). Several have been at least partially acquired by multinational agribusinesses.

Local agribusinesses involved in crop breeding frequently partner with national research institutions and CGIAR centres, or with local

farmers, in order to undertake participatory breeding. For example, NASECO, one of the biggest seed companies in Uganda, collaborates with Makerere University and invests in participatory breeding. Another example is Zamseed, which works with the International Maize and Wheat Improvement Centre (CIMMYT), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the International Institute for Tropical Agriculture (IITA) on the development of new maize varieties (Access to Seeds Foundation, 2016). Local agribusinesses remain marginal in breeding-focussed R&D, and are mostly involved in the distribution of seeds and other inputs. Nevertheless, they are important stakeholders as they often provide extension services to the farmers that buy their products. Capstone Seeds, for example, sells hybrid as well as open pollinated maize seeds, but also promotes the use of cover crops as natural nitrogen sources.



PRIVATE PHILANTHROPIC FOUNDATIONS – RISING EXPECTATIONS TO BRIDGE THE FUNDING GAP

Though small in funding volume, the importance of private philanthropic foundations in AgR4D is on the rise.

Philanthropic foundations are increasingly seen as an alternative funding source for AgR4D. One-third of overall philanthropic funding goes to agriculture, of which almost two-thirds goes to sub-Saharan Africa. In 2017, philanthropic foundations disbursed more than US\$500 million to agriculture in Africa (OECD, 2018c; Global Alliance for the Future of Food and Meridian Institute, 2015).

Funding from private philanthropic foundations generally flows into earmarked projects rather than to general budget support or debt relief, and on average it covers shorter time periods than ODA funding. The inherent flexibilities of this form of funding allow philanthropies to adapt their funding priorities to address new challenges (OECD, 2018c). With agricultural research, philanthropists generally favour large established partners such as the CGIAR centres or universities in the Global North like Cornell and the Michigan State University.

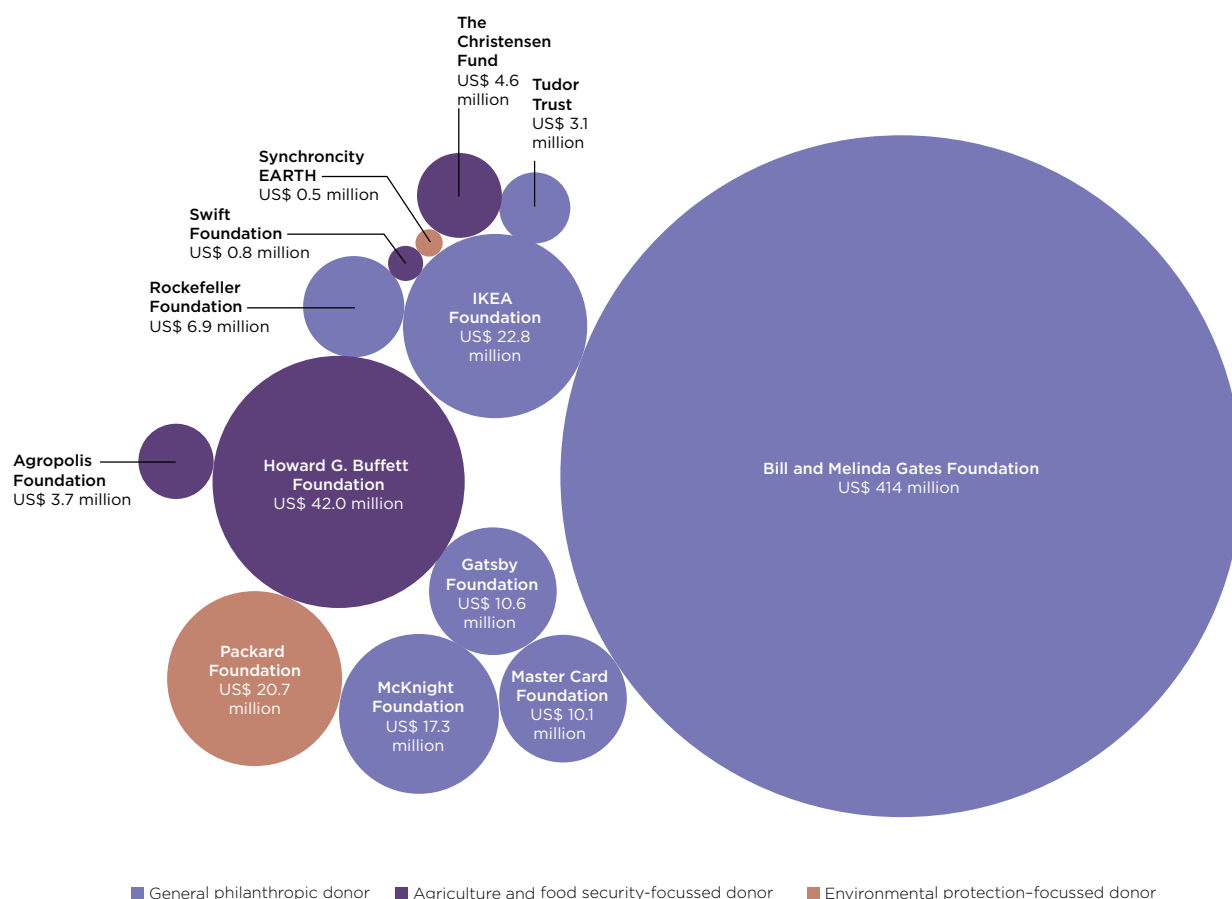
The philanthropic landscape for agriculture in developing countries is highly concentrated, and dominated by US-based foundations.

The BMGF dominates philanthropic investments in agriculture (see Figure 2.9),¹⁰ while US-based philanthropic foundations like the Ford Foundation and the Rockefeller Foundation have long supported and shaped the Green Revolution research agenda (Martens & Seitz, 2015). The majority of philanthropic foundations work within coalitions involving governments, donors and international organisations (OECD, 2018c). They also seek to strategically influence governments and multilateral organisations directly: For example, the BMGF sits on the Advisory Group of the Committee on World Food Security and the CGIAR systems council (Martens & Seitz, 2015). Other important private philanthropies for agriculture such as the IKEA Foundation and the McKnight Foundation have recently increased their support for regenerative agriculture, agroforestry and farmer-researcher agroecological networks. Foundations focussing on nature conservation and environmental issues often tend to invest more in the promotion of agroecological practices and science (e.g. Packard Foundation).

¹⁰ A more detailed analysis of BMGF funding to AgR4D can be found in [Chapter 7](#).

Figure 2.9:

Main private philanthropic foundations supporting agricultural projects in sub-Saharan Africa, average disbursement per year for agricultural projects (OECD, 2018b; Global Alliance for the Future of Food and Meridian Institute, 2015)



Funders' alliances pool resources for bigger impact and better coordination.

Philanthropic actors are extremely heterogeneous in their missions, core areas of work and practices, including in their support for agroecology. Some private philanthropic foundations are organised in funder alliances. Such alliances aim to increase coordination and communication between the various funders working on similar topics, thereby creating more efficient funding mechanisms.

Among those alliances, the Agroecology Fund and the Global Alliance for the Future of Food have prioritised agroecology projects and initiatives, although the total amounts of funding remain modest in the wider AgR4D context.

The Agroecology Fund, for example, provides funding of approximately US\$1 million per year. Philanthropic alliances are also more willing to take an active part in the global development dialogue.

CSOs – CO-PRODUCERS OF KNOWLEDGE

CSOs involved in research, extension and training for agriculture in sub-Saharan Africa are heterogeneous, and include international, national and local NGOs, farmers' cooperatives, farmer organisations, fora, membership organisations and federations.

Civil society plays a major but often under-recognised role in AgR4D.

Aid agencies have invested in CSO development in sub-Saharan Africa from the 1990s when support to government institutions was reduced. CSOs were generally preferred not for their scientific expertise but rather their strong ties to farmer communities and knowledge of local contexts. The most common roles for CSOs in AgR4D are in the dissemination of innovations, product deployment, provision of extension services and training for farmers. They are also regularly involved in facilitating on-farm trials and monitoring and evaluation, including performance assessments of agricultural practices. Beyond being an intermediary between researchers and farmers, CSOs increasingly initiate and conduct their own applied research and demonstration and extension programmes, which are generally less focussed on academic publication. International NGOs and large networks are at an advantage compared to local CSOs and farmers' organisations when it comes to competing for research funding.

CSOs are increasingly participating in PPPs. The implications of this model will be discussed in the chapter on political economy of AgR4D ([Chapter 3](#)).

Rural development CSOs have been key in promoting alternatives to techno-scientific knowledge.

Farmer-led and other forms of participatory research in which innovation stems from farmers, indigenous peoples or other knowledge systems have emerged through the grassroots work of CSOs and in opposition to globalised agricultural research. Those CSOs have made greater efforts to understand the specific and differentiated nature of small farm production (Shrum, 2000). A multitude of CSOs in Africa now support a transition towards agroecology through new forms of research and knowledge creation.

The African Centre for Biodiversity, a South African NGO, is one example, conducting research and advocacy on agroecology, global seed systems and participatory breeding methods. International NGOs such as Groundswell International and Action Aid have included strengthening agroecology in their strategies as well as in their research and extension projects. Farmers' organisations such as ROPPA in West Africa or the international community of practice ProInnova are promoting and conducting farmer-led research and participatory approaches.

THE CGIAR – GLOBAL RESEARCH PARTNERSHIP FOR A FOOD SECURE FUTURE

The CGIAR comprises 15 centres located mostly in the Global South that aim to bring “evidence to policymakers, innovation to partners, and new tools to harness the economic, environmental and nutritional power of agriculture”. Founded in 1971, the CGIAR played a key role in the Green Revolution and, especially in the early phase of its existence, focussed mostly on breeding (Pingali, 2012). From the 1980s onward the CGIAR started integrating components such as natural resource management, responding to donor pressure to align its work to the multifunctionality of agriculture and develop a more systemic perspective (Oasa, 1987). The partnership restructured in 2008 and established the CRPs, which conduct cross-cutting research on food systems, mostly with an emphasis on the sustainable intensification of agriculture.¹¹

Levels and modalities of CGIAR funding have shifted dramatically over the past decade.

Until the late 1990s, donations to the CGIAR were largely unrestricted. After 2000 and especially after the 2007-08 food price crisis, restricted funding (i.e. earmarked for specific CRPs, CGIAR centres or projects) increased significantly and total funding surpassed US\$1 billion in 2014. Since then, funding has decreased but is still far above pre-2008 levels. The decrease is symptomatic of a general questioning of the role of the CGIAR centres. Meanwhile, the funding shift toward earmarked, shorter-term projects reflects the increasing pressure from large donors to demonstrate quick results (Roy-Macauley et al., 2016).

The CGIAR centres depend on a few key donors that wield considerable power over research agendas.

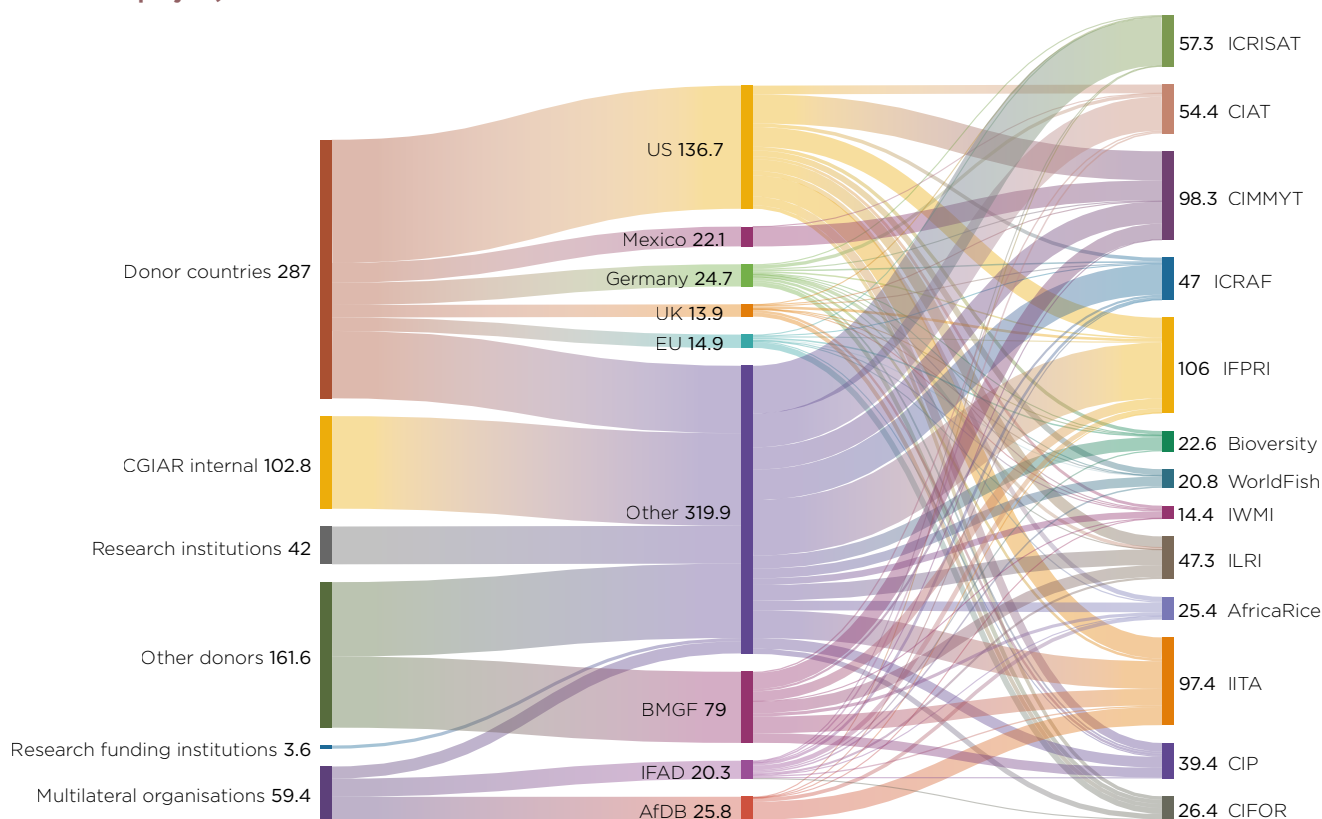
Each CGIAR centre has its own thematic focus and a distinct stance on how food security should be achieved. In terms of total restricted funding across the CGIAR centres, a few key donors stand out: the US, Germany, Mexico, the UK and the EU, as well as the BMGF, IFAD and the African Development Bank (AfDB) (see Figure 2.10). While many donors support each of the CGIAR centres, there are significant differences in the respective amounts, meaning that the research priorities of individual CGIAR centres may be liable to be shaped by key donors.¹² For example, the IITA, the largest CGIAR centre in sub-Saharan Africa, depends on three donors (the US, the AfDB and the BMGF), which provide around 65% of funding. Furthermore, donors tend to focus their resources on the CGIAR centres that naturally align with their interests. The US, for example, provides 24% of its funding to CIMMYT, which like the IITA is focussed primarily on crop breeding and efficient use of synthetic inputs. The US grants a further 16% to the International Food Policy Research Institute (IFPRI, 2018). One of IFPRI's activities is supporting countries to adapt regulations in favour of biotechnology, thus preparing the policy environment for the research activities of other centres. The BMGF has priorities similar to the US. The EU directs 44% of its restricted funding to the Centre for International Forestry Research (CIFOR, now merged with the World Agroforestry Centre [ICRAF]), with a more pronounced focus on systemic sustainability through advancing agroforestry and community engagement in land management. Finally, the AfDB has a more regional approach, providing the largest share of its funding to IITA (78%) and the Africa Rice Centre (AfricaRice) (16%), both based in West Africa.

¹¹ Sustainable intensification is defined as a “process or system where agricultural yields are increased without adverse environmental impact and without the conversion of additional non-agricultural land” (Pretty & Bharucha, 2014). The term and its usage, however, have drawn considerable criticism for its “productivist” nature and its potential for “greenwashing” (ibid.).

¹² For an exemplary discussion of this issue, see Stone, G.D. & Glover D. (2017). Disembedding grain: Golden Rice, the Green Revolution, and heirloom seeds in the Philippines. *Agriculture and Human Values*, 34(1): 87-102

Figure 2.10:

Donor contributions and distribution of restricted funding to CGIAR centres, in US\$ million for the year 2017 (total funding: US\$654.4 million) (multiple sources, CGIAR centres with limited activities in sub-Saharan Africa are not displayed)



The CRPs mostly focus on breeding and increasingly efficient production systems, contributing little to a systemic sustainability transformation of the food system.

While Leeuwis et al. (2017) state that “at various stages in the history of the CGIAR there have been calls for complementing crop- and technology-focussed research with more holistic and systems-oriented perspectives”, they conclude that in general the “CGIAR environment was not conducive to implementing systems research” – even after the reform in 2008 that led to the establishment of the CRPs. Analysing the strategies of each of the CRPs with the [Agroecology Criteria Tool](#) (ACT, see [Chapter 4](#) and [Annex 1](#)) leads to a very similar conclusion (see Figure 2.11).

On average, the CRPs contribute above all to increasing efficiency of industrial practices (CRPs fulfil on average 46% of Level 1 indicators), while transformational approaches are much embedded in CRP strategies (CRPs fulfil on average less than 20% of the indicators of Level 3 and above).

The CRPs with a focus on a specific crop or group of crops (Grain Legumes and Dryland Cereals [GLDC]; Maize; Rice; Wheat; Roots, Tubers and Bananas [RTB]) aim primarily at breeding and disseminating improved varieties, and contribute little to developing sustainable agroecosystem management on a landscape or regional scale. A partial exception is GLDC, which aims at researching and promoting more diversified systems in which the synergies between individual components are maximized.

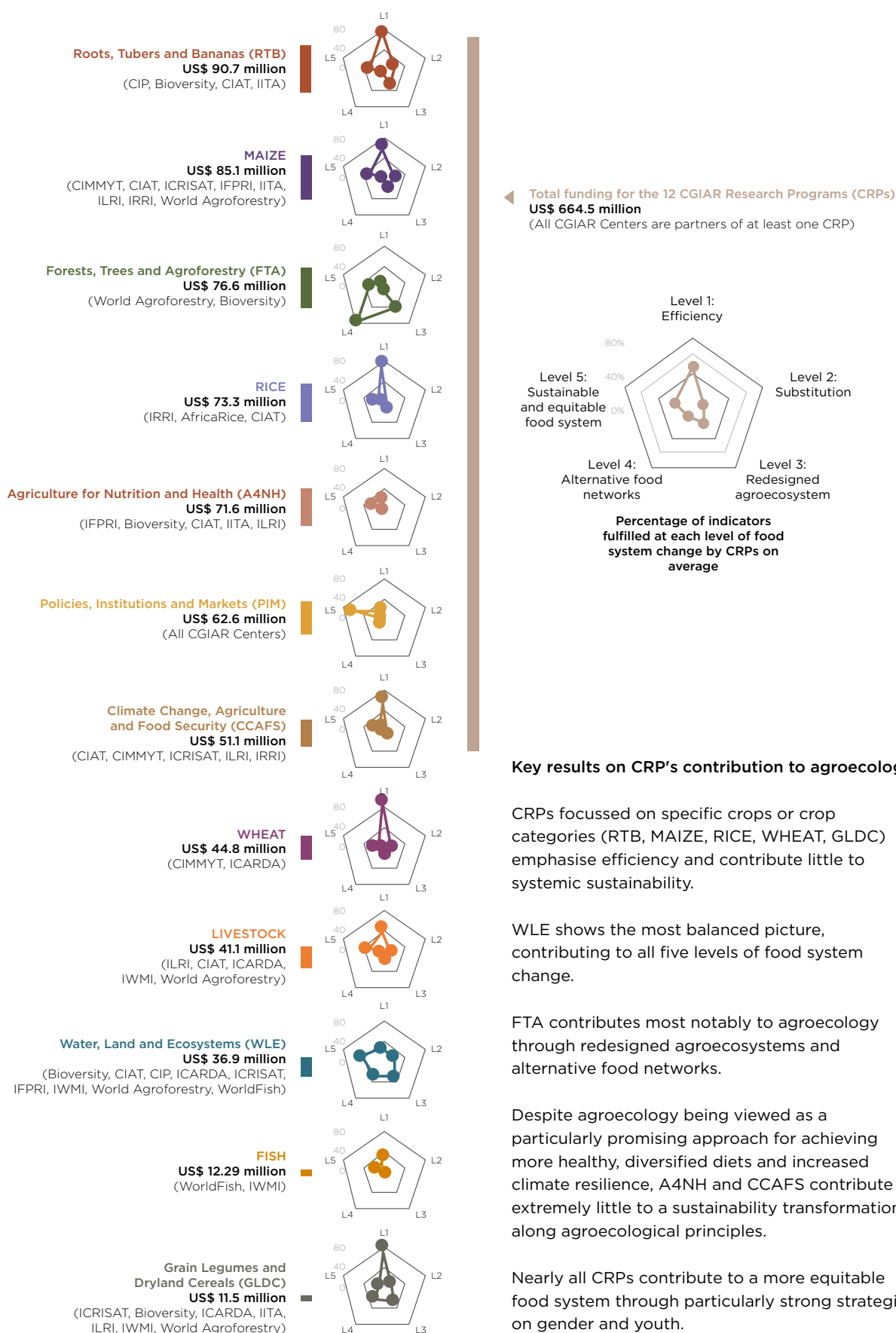
While agroecology is often seen as a promising approach to achieving healthier, diversified diets and increasing the climate resilience of agriculture, neither of the two Global Integrating Programmes directly dealing with these issues (Agriculture for Nutrition and Health [A4NH] and Climate Change, Agriculture and Food Security [CCAFS]) show a strong commitment to systemic transformation in line with the principles of agroecology. A4NH emphasizes biofortification and biosafety, hardly mentioning production diversification and, if so, only in relation to value chain development and income generation. Likewise, in the CCAFS strategy, a comprehensive resilience framework and an emphasis on systemic approaches to achieving climate resilience are largely absent.

Two CRPs stand out for their more holistic strategies: Forests, Trees and Agroforestry (FTA) and Water, Land and Ecosystems (WLE). Both clearly emphasise the multifunctionality of agriculture, but have comparably small budgets. Indeed, there appears to be little correlation between the extent a given CRP focusses on systemic sustainability and how much funding it receives. All of the CRPs do, however, demonstrate extensive integration of gender and youth aspects in their strategies. Other vulnerable groups like indigenous people, landless farmers, the elderly or the urban poor are far less frequently mentioned.



Figure 2.11:

Breakdown of the CRPs. The total amount of funding to each CRP is indicated in US\$ millions,¹³ and the size of the coloured bar is proportional to total funding. Using the Agroecology Criteria Tool, the strategy of each CRP was assessed along the five levels of food system transformation (Gliessman, 2015).



Key results on CRP's contribution to agroecology

CRPs focussed on specific crops or crop categories (RTB, MAIZE, RICE, WHEAT, GLDC) emphasise efficiency and contribute little to systemic sustainability.

WLE shows the most balanced picture, contributing to all five levels of food system change.

FTA contributes most notably to agroecology through redesigned agroecosystems and alternative food networks.

Despite agroecology being viewed as a particularly promising approach for achieving more healthy, diversified diets and increased climate resilience, A4NH and CCAFS contribute extremely little to a sustainability transformation along agroecological principles.

Nearly all CRPs contribute to a more equitable food system through particularly strong strategies on gender and youth.

¹³ Based on Table 7 of the 2017 CGIAR financial report (<https://cgspace.cgiar.org/bitstream/handle/10568/97418/2017-CGIAR-Financial-Report-Web.pdf?sequence=6&isAllowed=y>). As GLDC was not yet included in this report, the approximate funding is based on the CGIAR Funding Allocations for 2018 (www.cgiar.org/wp-content/uploads/2017/11/SC5-09A-Revision-1_2018-Budgeting.pdf).



3

THE POLITICAL ECONOMY OF AgR4D



KEY MESSAGES

Based on a literature review and qualitative analysis of 24 semi-structured interviews with the global donor and research communities, the following conclusions can be drawn on the political economy of AgR4D:

- The focus on for-profit product development is an ever-present characteristic of private-led research, and reflects the commercial interests at play. Research carried out by the private sector typically focuses on producing tangible private goods that can be marketed as products for commercial sale, rather than intangible outputs such as ecosystem services that are readily appropriated by other actors in society and serve as public goods.
- Ideology often plays an important role in decisions about whether to fund agricultural research, and of what type.
- Global and national political priorities, often reflecting underlying ideologies or worldviews, are also key drivers of research pathways.
- Research pathways are highly resistant to change. This chapter identifies three 'lock-ins' that reinforce current trajectories in the world of AgR4D: individual and institutional motivations, self-validating scientific methods, and cross-sectoral partnerships and coalitions.
- The individual and institutional motivations of researchers and research institutes help to reinforce highly specialised, single-discipline research pathways, in line with the prevailing incentives — particularly alignment with donor priorities.
- Self-validating scientific methods further reinforce existing pathways, and hold back the adoption of agroecological research based on interdisciplinary and transdisciplinary approaches.
- Ideologies, motivations and discourses tend to leak between organisations via cross-sectoral partnerships and coalitions, potentially reinforcing or changing trajectories as they act in expectation of each other's prerogatives.
- Our interviewees drew particular attention to three potential openings, i.e. windows of opportunity for promoting an agroecological agenda. New research directions can emerge in response to: emerging crises and threats arising at various scales in food systems; consensus statements arising from scientific assessments and landmark reports that serve to galvanise action and to mobilise dissent; and institutional strategy reviews that provide moments of reflexivity, offer changes in direction and open up new research areas.
- Worldviews on agricultural research diverge significantly and substantively. There are, however, common concerns between almost all of these perspectives and paradigms. In order to increase the potential for agroecological research trajectories to emerge, it is crucial to identify entry points which resonate with the preoccupations of diverse constituencies.

INTRODUCTION

The previous chapter has examined important stakeholders and trends in agricultural research focussed on sub-Saharan Africa. This chapter investigates more generally why funding is directed to particular types of agricultural research. It considers the political economy of investment in agricultural research globally, while

maintaining this report's special focus on research relevant to sub-Saharan African agriculture. The goal of the chapter is to understand better why funding is directed towards certain kinds of agricultural research projects and programmes, and to identify mechanisms that could promote greater investments in agroecological research.

CONCEPTUAL FRAMEWORK

A political economy approach to the study of research considers the roles of actors and their motivations in shaping and steering research programming. This is relevant in the case of agricultural research, which is pursued as part of national and international development agendas. In the context of African agriculture, international dimensions are key because of the importance of donor funding.

While the political economy of investments in African agriculture and agricultural research has been discussed in academic and advocacy literature, a body of work on the sociology of science helps to understand the politics of knowledge construction in agriculture and agricultural research (Sumberg & Thompson, 2012; Sumberg, 2017). This perspective explicitly considers the social processes and relations of negotiation and prioritisation through which scientific agendas are constructed by actors, who are themselves constituted by the beliefs, values and worldview they hold and by the narratives they have learned and reproduce, for example as to what constitutes valid agricultural science (Feldman & Biggs, 2002; Seshia & Scoones, 2003; Sumberg & Thompson, 2012). It recognises that such processes include funding and conducting

research. The epistemological paradigm within which a research project sits informs what it takes for granted and what it ignores. The research questions and methods that are invested in define what are considered to be important and relevant research concerns, while other subjects, perspectives and approaches are then necessarily deemphasised and deprioritised.

We used ideas from these bodies of work to carry out a multilevel analysis, in which the funding and conduct of research are recognised as fundamentally political activities through which scientific and agricultural knowledge are socially constructed and framed. Using this framework, we identify commercial, ideological and political drivers that inform research regimes. We conceptualise such regimes as self-reinforcing systems comprising research funders and researchers, as well as the ideas, discourses and objectives they consider important. We then explore the factors that lock in research regimes, which relate to institutional and individual motives, scientific methods and alliances and partnerships. We also identify potential openings through which alternative research agendas might emerge. These drivers, lock-ins and openings are illustrated in Figure 3.1.

METHODOLOGY

We carried out a non-systematic, purposive (targeted) literature review, and collected data through interviews. We conducted 24 remote and face-to-face interviews with select key informants, including philanthropic, bilateral and multilateral donors, and researchers from academia and the public and private sectors. As a major objective of this chapter was to understand the dynamics of dominant research systems, interviewees were primarily drawn from formal research and funder settings. However, it is important to simultaneously recognise the importance of more bottom-up, farmer-led research, i.e. the forms of knowledge generation and exchange that characterise and distinguish agroecology in the eyes of many of its proponents, and which have often been undertaken in isolation from and in opposition to mainstream research organisations and funders (see below). The challenges in capturing the perspectives of these highly distinct components of the agricultural research world, and reconciling them in future research agendas, are addressed in the conclusions of the report.

The semi-structured interviews were guided by the following topics:

- the interviewee's career trajectory and current involvement in agricultural research;
- decision-making in their organisation;
- their opinions and experience of shapers and drivers in the wider agricultural research sector;

- their understandings and definitions of sustainable agriculture and agroecology;
- their opinion on valid forms of scientific knowledge.

The interviews were conducted in two phases. The initial phase covered research and funder perspectives. The second stage targeted research funders only, and was designed to fill gaps in understanding. The interviews were conducted, recorded, annotated and analysed by the first author of this chapter.

Sociologists of science and political economy researchers have often used case studies to investigate political and sociological aspects of knowledge construction. This has proved an appropriate way to combine multiple viewpoints and interpretations of a given series of events. While we were able to interview important figures in contemporary agricultural research, including individuals with decades of experience, it was not easy during brief and often remote interviews to fully explore the programmes and episodes in which individual informants had played roles. To overcome this limitation, we explored the case of AGRA from multiple secondary data sources and connected this with the relevant primary interview data.



INTERPRETATIONS OF AGROECOLOGY

This report has adopted an explicit definition of agroecology based on Gliessman's five levels of food system transformation (Gliessman, 2015) and FAO's 10+ elements of agroecology ([Chapter 1](#)) (FAO, 2019). Yet, we encountered diverse definitions of agroecology in the literature and among our interviewees, and this has an implication for the entry points proposed for agroecology towards the end of this report. Drawing on a key paper by Wezel and colleagues, agroecology can be defined as a science, a practice and a social movement (Wezel et al. 2009). At least one of these elements was mentioned by every interviewee, but they used the term agroecology in ways that varied considerably. Some of the interviewees identified as advocates of agroecology, and several of them referred to its equity dimensions, reflecting elements of a 'political agroecology' standpoint (see Table 3.1). Others were critical. Typical criticisms of agroecology as a science focussed on its perceived lack of rigour, while criticisms of agroecological practices attacked their perceived lack of benefits for farmers' livelihoods.

Various interviewees recognized the political tenets of agroecology, some with exasperation and some with conviction.

Some interviewees were fairly agnostic about agroecology, seeing it as one of a range of possible ways to achieve the goals they were concerned with, such as improving livelihoods.

Some informants conflated approaches such as conservation agriculture, sustainable intensification, climate-smart agriculture and indigenous technical knowledge with agroecology. Some interviewees considered that there was room for what they termed agroecological techniques alongside the private sector's provision of inputs, e.g. through the commercialisation of biological pest control agents. This viewpoint could be perceived as well-meaning and optimistic, as deliberate ignorance of the more political elements of agroecology, or as co-option of the concept to promote conventional approaches to agricultural development.

Several informants mentioned the multiplicity of definitions adopted by different organisations around the world. Those who favoured agroecology were generally optimistic that the concept was receiving attention from mainstream research for development organisations, and were not worried that the term would be co-opted by commercial actors. Some of those who aligned themselves with an agroecological agenda were aware of the possibilities and risks of such but deliberately adopted a pragmatic stance.

The broad perspectives we encountered are summarised in Table 3.1.¹⁴ These do not represent a continuum but rather a set of standpoints emerging from different preoccupations.

¹⁴ The fact that interviewees were free to adopt their own definition of agroecology was a complicating factor when asking them to give opinions on it, but was preferred to the alternative of imposing one standard version. Table 3.1 seeks to reflect the differing views of interviewees and organisations, but the definitions given here were not necessarily the actual terms used by those interviewed.

Table 3.1:

Perspectives on agroecology

PERSPECTIVES ON AGROECOLOGY	REPRESENTATIVE ORGANISATION
Agroecology is an irrelevant idea. High input agriculture is the effective way to raise yields and maximise profits and incomes.	African Development Bank (AfDB)
Ecological agricultural science. Within a paradigm of high productivity agriculture, the ecological and biological mechanisms of agriculture should be recognised and understood.	CGIAR International Centre for Tropical Agriculture (CIAT)
Hi-tech agroecology. The environmental impact of high productivity agriculture can be alleviated by using a range of technical solutions. This definition of agroecology includes and overlaps with sustainable intensification, conservation agriculture or climate-smart agriculture.	CGIAR research program on Climate Change, Agriculture and Food Security (CCAFS)
Environmental agroecology. Agroecology is a distinct set of sustainable agricultural practices that works harmoniously with natural processes.	FAO agroecology hub
Political agroecology. Agroecology is not only a distinct set of sustainable agricultural practices that works harmoniously with natural processes, but crucially a normative valorisation of social justice and food sovereignty.	Via Campesina, GRAIN

The proponents of the positions in the bottom two rows share, in a very general way, some of the high-level concerns of the FAO's elements of agroecology and Gliessman's Level 4 and 5 (see [Chapter 4](#)). Specifically, they are concerned with rural livelihoods, wellbeing, governance, sustainability and equity. They do not, however, necessarily concur that these will be achieved using the techniques espoused by agroecology. The positions in the top three rows are largely committed to changing the agroecosystem using the techniques of agroecology, e.g. co-creation of knowledge and diversity of practices (FAO) and substituting alternative practices and inputs (Gliessman).

Overall, our interviews suggested that the diversity of ways the term agroecology is used makes it harder for actors to embrace agroecology as defined in [Chapter 1](#) of this report and in the bottom row of Table 3.1. This illustrates a dilemma: Using various apparently less contentious interpretations of agroecology – for example, the term regenerative agriculture – may make it more palatable to actors wary of political agroecology, and may be welcomed by some as an opportunity for the concept to become mainstream. Yet, for others, this is co-option.

A HISTORY OF AGRICULTURAL RESEARCH AND ITS FUNDING

At the turn of the 20th century, much of the world's agricultural research investment focussed on large-scale farming systems and commodity production. By establishing the Land Grant universities at the end of the 19th century, the US began a major programme of public investment in large-scale agricultural research (Buttel & Busch, 1988). Agricultural research at that time in the UK was largely funded by and benefitted richer farmers. In low-income countries, which were then colonies, research funds were geared towards developing the export crop economy (Buhler, 2002). On-farm research conducted by farmers in these countries was not formally recorded in this era.

The political economy of private philanthropy in the US in particular means that private foundations have had an important influence on areas their founders are concerned with. By the middle of the 20th century, philanthropist anxiety about food security and political stability led to the beginning of the era of publicly funded international agricultural research: the precursor to what became known later on as AgR4D. Beginning in Mexico in the early 1940s, the Rockefeller Foundation led funding in agriculture and laid the policy groundwork for the formation of international agencies charged with responsibility for the global food system such as FAO. Philanthropists with origins in the private sector played central roles alongside governments, as the Rockefeller and Ford foundations encouraged the US to establish the first International Agricultural Research Centres. Eventually, in the 1970s, the CGIAR was founded, with funding provided by member countries and multilateral organisations such as the World Bank, FAO, the United Nations Development Programme and the United Nations Environment Programme.

Geopolitical considerations were essential to this process as a constellation of Western powers and non-state actors considered the alleviation of hunger an important tool in their struggle against communism (Cullather, 2010; Patel, 2013).

Into the 1990s and the 21st century, the volume of direct state funding for agricultural research declined as other policy imperatives overtook food security (Anderson, 1998; Alston et al., 1998). In some prominent industrialised countries, this was complemented by withdrawal and privatisation of state functions such as agricultural research, based on convictions that private interests should and would largely fund (domestic) agricultural research henceforth. Between 2000 and 2008, public funding of agricultural research by higher-income countries grew by 7% to US\$16.16 billion, whereas investments from lower- and middle-income countries grew much faster, by 42% to US\$15.53 billion (Beintema et al., 2012).¹⁵

Privately funded research has expanded faster than public research over the last two decades in a context of rising food prices.

Still, privately funded research remained at a lower level (US\$8.4 billion) than public spending (US\$31.7 billion) by 2008 (Fuglie, 2016). The development of the agricultural biotechnology sector in particular has driven an expansion in private investment in food and agriculture research, especially in high-income countries (Heisey & Fuglie, 2018). This private investment has focussed principally on proprietary technologies with the potential to create rapid and substantial financial returns for their owners, and has not, therefore, substituted for the decline in public research seeking longer-term payoffs through the generation of public goods (Pray & Umali-Deininger, 1998).¹⁶

¹⁵ Investments are expressed in 2005 purchasing power parity prices.

¹⁶ In economics, public goods are defined as *non-excludable*, meaning that potential consumers cannot be prevented (excluded) from consuming the good in question, and *non-rivalrous*, meaning that they can be consumed simultaneously by more than one individual. Knowledge is a classic public good, unless intellectual property rights prevent knowledge from being released to the public, as is the case with much privately funded innovation.

Furthermore, private research and product development often draws on public research efforts, or benefits directly and indirectly from expertise developed through publicly funded training. Patent legislation, such as the Bayh-Dole Act in the US, can steer publicly funded research toward proprietary technologies.

Precise disaggregation of the relative contributions of private and public investment is difficult, both between sectors, due to the rise of PPPs (see discussion below), and between countries, because firms based in the developed world may invest in agricultural technologies that may be used in developing countries. For example, national agricultural research centres may now seek funding from private sources as well as from user fees or commodity taxes (Rukuni et al., 1998). Private philanthropy remains an important source of funding for the CGIAR centres, especially in Africa (Seshia & Scoones, 2003).

Formal research on agroecology, referring initially to ecological interactions and processes within cropping systems, was undertaken at plot and field scales between the 1930s and 1970s, as presented in [Chapter 1](#). Between 1970 and 2000, agroecology continued to be pursued as a scientific discipline, but at the same time a broader conception of agroecological research emerged, linked to wider movements of environmentalism, rural development, sustainable agriculture, food sovereignty and food justice. The focal scale was expanded to the whole farm and the broader agroecosystem (Wezel et al., 2009). Concerns about the socioeconomic and environmental consequences of the Green Revolution model, which underpinned agricultural investments in the post-World War II years, gave impetus to alternative forms of agriculture. These new conceptualisations of agroecology were debated in new fora, such as the Rio Earth Summit in 1992, and informed the creation of transnational social movements such as La Via Campesina (The Peasant Way) in 1996.

From the beginning, La Via Campesina positioned itself against corporate-led and top-down agricultural research, and prioritised peer-to-peer learning (e.g. farmer field schools and farmer-to-farmer methodologies) that would be embedded in locally specific knowledge, corresponding to specific social and (agro)ecological territories.

These developments built on bottom-up participatory approaches rooted in popular education, such as the Latin American Farmer-to-Farmer (Campesino a Campesino) movements (Holt-Giménez, 2006). La Via Campesina adopted the term agroecology explicitly in 2005, including a clear definition that was rooted in equity as well as ecology. In common with other social movements which support agroecology, La Via Campesina resists what they see as the co-option of the concept, as well as loose definitions and uses of the term, including its association with concepts such as climate-smart agriculture, conservation agriculture and ecological intensification (La Via Campesina International Peasant's Movement, 2015).

This strand of ideologically committed, political agroecology has encouraged participatory, autonomous and action-oriented research by farmers, farmer associations and CSOs, based on transdisciplinarity and knowledge co-creation (Agroecology Now!, 2018). Over the past two decades, participatory approaches used in agroecology aimed to involve other food system actors like consumers within a systemic approach (Francis et al., 2003; Pimbert, 2006). This more political and social type of agroecology has concentrated less on accessing conventional sources of funding, rather seeking more equal relationships and two-way knowledge flows between public research institutions and farmers, and aiming to create spaces for autonomous research by farmers and other food system actors.

DRIVERS OF RESEARCH

This section describes the principal drivers of current research trajectories, which reflect the historical evolution of agricultural research, alongside new and emerging imperatives. These drivers reflect the context in which institutions and individuals are conducting agricultural research. The specific ways in which these actors react to the opportunities and constraints they face are described in more detail in the following sections on lock-ins and openings.

COMMERCIAL INTERESTS

Several interviewees pointed out that a focus on for-profit product development is a non-negotiable characteristic of private-led research, and reflects the commercial interests at play. Research carried out by the private sector typically focusses on producing tangible private goods that can be marketed as products for commercial sale, such as planting materials (e.g. seeds) and associated inputs and production technologies (e.g. agrochemicals, machinery), rather than intangible outputs such as crop management techniques (e.g. methods of soil regeneration) that are readily appropriated by other actors in society and serve as public goods. For private sector developers, it is often important to retain intellectual property rights over their products so that they can be profitably marketed. Nonetheless, the outputs of commercially oriented agricultural research can potentially be defined as in the public interest if they constitute innovations that bring new value to society, that are made available for farmers to purchase or are licensed to researchers for further R&D (Pray & Naseem, 2007). Such approaches are generally framed by private sector actors as a 'win-win', i.e. what is good for the farmer is also good for the private company.

Private sector discourse rarely reflects on what may happen when the interests of companies and farmers diverge nor on the consequences of the early adopter syndrome, whereby economic rifts between 'early adopters' and 'late adopters' are widened, and the resulting products are not necessarily affordable to all farmers.

The reality of who research belongs to and who it benefits is complex, especially when there is a close interaction between the private sector and the state.

An example of public-private interactions is when private sector research is facilitated by the state, or when public organisations benefit from private sector research. Competing narratives about public and private interest have been particularly acute in relation to the rollout of biotechnology in developing countries.¹⁷

There may also be spillovers from private research, especially in the long term, whenever the private sector is unable to appropriate all of the benefits or if their intellectual property rights are unenforceable (Heisey & Fuglie, 2018). Newell describes an instance of such a situation, when Argentinian farmers saved and informally distributed transgenic soya seeds developed by Monsanto – in spite of the legal implications (Newell, 2009). Some donors have begun to make PPPs mandatory, with the result that public research funding increasingly requires co-financing by the private sector. This implies the risk of agricultural research being focused on crops the private sector is particularly interested in, while other research areas are being side-lined.

¹⁷ For example, in the Drought Tolerant Maize for Africa project, germplasm developed by Monsanto was donated free of charge to assist in the development of new maize varieties within the CGIAR system. This has been interpreted differently by different commentators: as a virtuous act by a private company, as a grudging acquiescence to pressure from the philanthropic sector, or as a cynical strategy designed to make farmers more dependent on purchasing fresh seeds annually.

IDEOLOGIES

Ideologically rooted assumptions may be revealed through statements about how agriculture should be practised and with what objectives, for example, as an ecologically sustainable livelihood for a community or as a commercial, income-generating activity for individual farmers cast as entrepreneurs.

Research trajectories are often informed at least partly by ideology, meaning a commitment to a normative worldview or moral position.

It is evident from our interviews that ideology often played an important role in decisions about what kinds of research to fund, but also whether to fund agricultural research of any type in the first place. From the perspective of international development and poverty reduction, contributions to AgR4D are seen in the context of wider commitments to enhance sustainable development and alleviate or eliminate poverty – increasingly in relation to the SDGs. Many of our interviewees cited the objectives of poverty reduction, improving livelihoods and the SDGs as key motivations driving their personal commitments to agroecological or industrial (high-input) agricultural research activities. Ideals of justice and equity were sometimes invoked as a justification for people in low-income countries being granted access to the modern technologies of agricultural intensification that have been and are used in the Global North. In our interviews, however, these ideals were more often invoked by advocates for modes of agriculture that would be more environmentally sustainable or would involve farmers gaining greater control within the food system.

ALIGNMENT WITH NATIONAL AND GLOBAL POLITICAL PRIORITIES

For the informants that we interviewed, particularly those working with bilateral donors, it was recipient governments' priorities that shaped

the research agenda. In some cases, this meant a focus on creating markets, accelerating structural transformation of agrarian economies, maintaining livelihoods for rural communities, supporting wider economic development or prioritising the stability and growth of existing crops and production systems – particularly export crops. New technologies, for example biological pest control agents, can be perceived as risky and expensive by potential recipients governments.

Political priorities, often reflecting underlying ideologies or worldviews, are also key drivers of research pathways.

Commitments to align with international norms, processes and objectives such as the SDGs, and the Kyoto Protocol and Paris Agreement of the UN Framework Convention on Climate Change are also influential in shaping agricultural research. The imperative of achieving the SDGs now shapes many funding calls in the development field, one example being the UK's Global Challenges Research Fund.

Our informants did not explicitly recognise crises as drivers of their research agendas. However, Buhler has described how public opinion about health scares such as Bovine Spongiform Encephalitis and Foot and Mouth Disease has a strong influence on the direction of nationally funded public research (Buhler, 2002). Likewise, climate change and food insecurity were often invoked by interviewees as critical issues to which research is now responding. Rapidly evolving agricultural problems such as pest attacks were perceived as more immediate crises that required tried and trusted approaches involving conventional technologies such as synthetic biocides. Research was sometimes sidestepped in initial reactions and introduced by governments as a medium- or longer-term step when a perceived crisis, such as Striga infestation, persisted.

LOCK-INS

While research pathways are shaped by the range of drivers described above, they remain resistant to change. Growing awareness of the climate crisis, for example, is driving a shift in the global political agenda as well as raising questions about what approaches will be commercially viable and effective. Yet, as shown by the case studies (Chapters 5 to 7) gathered in this report, this has not translated into a radical shift in the research agenda and the accompanying allocation of resources. The concept of 'lock-ins' can help to explain such inertia. In the 2016 report *From Uniformity to Diversity* (IPES-Food, 2016), IPES-Food identified eight lock-ins of industrial food systems, referring to the self-reinforcing dynamics and vicious cycles that keep the prevailing model in place, in spite of its negative impacts.¹⁸ Below, we bring together the findings from interviews and a literature review in order to identify a series of lock-ins at play in the AgR4D world, with some reference to the broader lock-ins of industrial food systems. This approach shows the complex interaction among factors that inform a commitment to the range of research approaches labelled as 'conventional', and portrays the development and reproduction of research trajectories more as confluences of circumstances than deliberate attempts to shape research agendas. The resulting trajectories are not necessarily those envisaged or designed by any given actor.

INSTITUTIONAL AND INDIVIDUAL MOTIVATIONS

Individuals and institutions within the agricultural research world interact in processes of validation and agenda setting. Research organisations, including those with solely agricultural remits, often need to identify a specific niche in which they have expertise in order to be able to lay claim to research funding.

The CGIAR centres were considered by some interviewees to be good examples of this: Many have commodity- or value chain-specific foci, and they also have particular expertise developed over years and in specific methods of research, especially conventional crop breeding.

There have been attempts in some research institutions, including many CGIAR centres, to diversify to a more interdisciplinary approach, including the integration of the social and natural sciences. However, donors have not been forthcoming in funding systemic programmes, and these efforts have often remained peripheral (e.g. CIMMYT's socioeconomic programme) or been discontinued (e.g. the CGIAR Aquatic Agricultural Systems research programme).

Individual researchers also face barriers in this regard. Buhler describes how academic researchers try to cement their expertise by publishing in high-ranking scientific journals (Buhler, 2002), and our interviewees also referred to this preoccupation. The highest-ranking journals focus on single disciplines and publish technical and experimental science, whereas social, mixed methods, interdisciplinary or holistic research is more frequently presented in lower ranking journals. Our interviewees mentioned the particular difficulties associated with publishing interdisciplinary and transdisciplinary research. These challenges are not confined to the research world, and reflect the compartmentalised thinking across policymaking and priority-setting identified by IPES-Food as one of the key factors locking in an industrial food and farming model.

Furthermore, in order to gain or retain employment, individuals need to have a track record of projects and, for researchers, publications that demonstrate their relevance to

¹⁸ These lock-ins are: the path dependency of industrial agriculture where upscaling, rationalization and specialisation reinforce one another; the export orientation of food and farming systems in many countries, based around large-scale monocultures; the societal expectation of cheap food, requiring low-cost (and high externality) commodity production; the compartmentalised and short-term thinking that prevails in politics, research and business, driving short-term, productivist approaches; the 'feed the world' narratives that focus attention on increasing production volumes of staple crops above all else; the correspondingly narrow measures of success used to identify progress in food systems; and the concentration of power in food systems, whereby value accrues to a limited number of actors, strengthening their economic and political dominance and thus their ability to influence the policies and incentives guiding those systems.

a given organisation's target agenda. Individuals are aware of the specific development paradigms informing the hiring strategies and project foci of particular institutions, and mould their work and profile in reference to these. Individuals often have an interest in maintaining the existing identity and trajectory of their organisation, and ensuring this matches their professional background and training. To maintain a position within their organisation, researchers are incentivised to develop their portfolios in the direction in which their institution and key funders have experience and comparative advantage.

Expectations of donor priorities also shape research trajectories. In order to maintain relevance and secure resources, institutions and individuals tend to design research programmes to fit the funding calls of donors, a trend that all researcher interviewees described. Directors of funding programmes also described how the funders employing them had particular interests, which they sought to perpetuate. Scientists working in the private sector related that they needed to demonstrate that their results had led to the commercialisation of products that generated revenue. All the researchers interviewed described how, once employed, they paid careful attention to the objectives of given funders. They almost always designed their research to match funder agendas as encapsulated in specific calls, informed by their knowledge of funders' overall profiles and their own and colleagues' experience working with them.

For some institutions and individuals, it is also imperative to create demand for and deliver the specific forms of research in which they already have a comparative advantage. Senior managers of research institutes we interviewed explained how they had sometimes advertised their work to funders, organising meetings to make funders aware of their research agenda and capabilities, thereby hoping to generate funding for the type of research they were already doing.

The majority of CGIAR funding has indeed continued to be project-specific and focussed on core crop- and animal-breeding expertise (CGIAR, 2017). The case studies gathered in this report also demonstrate the reluctance of public and private donors to shift away from this model. Once a research programme has taken shape, institutional mechanisms tend to support the consolidation and extension of the existing research agenda, which cements the identity of organisations over the longer term. This includes applying for follow-on funding or drafting in junior staff to work on existing projects, creating a body of expertise in a particular domain within an institution. Junior and senior researchers may work together to develop programmes that span careers, while internal seminars and workshops serve to disseminate key ideas and methods among a workforce. Among our informants, staff members of funding bodies related how they had been invited by like-minded peers to apply for jobs in organisations that matched their personal convictions and previous experience.

At moments of change such as institutional reorganisation, development of a new organisational strategy or launch of a new funding or research programme, institutions as well as individuals within funding and research organisations may emphasise existing expertise in given areas. This can help them to be seen as safe or providers of good value.

SELF-VALIDATING SCIENTIFIC METHODS

A second lock-in can be identified that relates to the use of given research methodologies. Cementing the individual and institutional expertise and relevance explained in the preceding section involves developing and privileging discipline-specific methodologies. This can hamper development of the interdisciplinary methods used in agroecological research.

Selection of research methods is a routine way to determine which kinds of knowledge, and whose knowledge, are deemed relevant and important.

Industrial and agroecological approaches diverge considerably in terms of what types of knowledge they seek to generate, and at what scale. Conventional agronomic research and breeding typically bases research at the level of the cell and the organism, and experiments are typically performed under controlled conditions on small plots located at research stations before attempting to scale up research outcomes as a distinct, subsequent step. In contrast, agroecological researchers emphasise the importance of conducting research within a landscape or territorial perspective, beyond the scale of individual fields and farms, encompassing the specific socioeconomic and ecological dynamics of a given locale. Agroecological researchers have also recognised that relevant knowledge about agricultural situations and problems may emerge not only from formal academic research but also through the experiences of agricultural practice, as tacit understanding develops. In our interviews, farmer knowledge was considered valid to greater or lesser extents by different informants.

These approaches are rooted in different epistemologies¹⁹ and different views of what constitutes valid science. Controlled experiments and randomised controlled trials (RCTs) are usually aligned with a positivist epistemology, while qualitative interviews fit within constructivist research approaches. Participatory research uses methods that involve farmers in problem framing and decision-making, allowing them to take control over the research process and the interpretation of results. Farmer field schools and farmer-to-farmer exchanges, for example, often blend research with activism, and therefore may not be accepted as scientifically valid by researchers trained in the dominant positivist conventions of biological science (Scoones, 2009). Scientists' disciplinary training and conceptions of objectivity and rigour inform their determination of which methods are acceptable in agricultural research,

and thus whose perspectives can credibly be encompassed within science. According to some interviewees, methods commonly used in agroecological research, for example variety tests with insufficient replications for a traditional RCT, were of low quality according to the standards of conventional agronomic or biological science. When people with backgrounds in conventional research became influential within funding bodies, for example as reviewers or programming consultants, they carried this disciplinary perspective (which some agroecological researchers would term a bias) with them.

These diverging approaches and epistemologies also manifest themselves in different views of how success should be measured — itself one of the central lock-ins of industrial food systems (IPES-Food, 2016). For example, lowering food prices and raising productivity were far more commonly referred to by interviewees than less tangible objectives such as equity or well-being. As an example of the differential interpretation of data and prioritisation of certain metrics, we heard from some respondents that there is no evidence that industrial agriculture is more productive than agroecological agriculture. Simultaneously, others interpreted scientific evidence to show agroecological methods lack effectiveness, especially to increase production, and therefore were convinced to preferentially fund research into conventional and industrial agriculture.

Use of specific methodologies also tends to reflect – and validate – technological or political priorities and preferences. For example, De Roo et al. (2019) describe how technological agendas can make RCTs attractive. When researchers, funders or product managers wish to promote a certain technology, a RCT is an easy way to test its performance in optimum conditions rather than a farmer's field. Indeed, a private sector researcher noted that a field trial would never be designed in a way that could disadvantage the company's products. Economic modelling often carries weight because it produces a quantification, backed by measures of statistical significance. This lends economics a unique power, distinct

¹⁹ Ways of conducting agricultural research can be roughly distinguished as participatory, constructivist and positivist according to their underlying notions about knowledge, or their epistemologies. Very loosely and succinctly defined, the participatory paradigm privileges practitioners' knowledges. Constructivist epistemologies allow room for multiple knowledges to be considered simultaneously, while positivist ways of working consider that detached research can discover an objective truth. Suites of methods are associated with each of these paradigms.

from the other social sciences (Fine, 1999). Moreover, it has been argued that economics has 'economised' real markets, influencing farmers, businesses and policymakers to behave in ways suggested by theories of rational economics, or at least to believe that such behaviours exist (Çalışkan & Callon, 2009).

Correspondingly, the participatory and territorially embedded research approaches that are central to agroecology – and have the potential to yield diverse and locally specific solutions – have hitherto rarely been adopted in mainstream institutions. Some of our interviewees expressed the view that funders may find it risky to fund qualitative or participatory research that has the potential to challenge institutional commitments to certain political or economic worldviews by yielding research results that are contrary to existing policy directions. Some National Agricultural Research Systems and some funders of international agricultural research were said to limit their participatory work to allowing farmers to assess and select technologies or crop varieties that had already been developed by researchers.

Similarly, when rapid results are needed, the participatory and deliberative approaches associated with agroecology may not be considered capable of delivering answers in time. Some kinds of social science research methods take longer to carry out and can produce complex insights, for example about the performance of technologies in context, which research institutions and funders may struggle to grapple with (Vanloqueren & Baret, 2009). One interviewee cited the example of an outbreak of Fall Army Worm that in their view demanded a rapid, chemical response, while ecological solutions to such a problem were perceived as expensive and long term.²⁰

Research pathways are self-reinforcing not only in terms of validating existing assumptions, but also by virtue of sidelining alternative worldviews and specific groups of actors and concerns. For example, economic research that represents agriculture as an economic endeavour rather than, for example, a social and cultural activity,

represents 'selective ignorance' about elements of farming that are not financially quantifiable (Elliott, 2012).

This discussion about research methods, privileged knowledges and 'selective ignorance' can be connected to the opening observations regarding agroecology's multiple definitions. In some cases, mainstream research organisations and agribusiness companies that have adopted agroecology have been accused of 'co-opting' the term by some of the proponents of a more political definition (Giraldo & Rosset, 2018; Rosset & Altieri, 2017). If the term agroecology is used only to refer to technical practices in agriculture, it becomes a formal discipline within which only expert scientists can provide interpretations and frame solutions. Thus it avoids questions about political dimensions such as land reform or farming practices that work with non-commoditised inputs. The holistic elements of agroecology are ignored, and there is less possibility for systemic change. This process is similar to the way participation may be co-opted and instrumentalised, as described by Pretty's typology of participation (Pretty, 1995).

PARTNERSHIPS AND DISCOURSE COALITIONS

A third lock-in of research pathways can be identified in cross-sectoral partnerships and coalitions that characterise the AgR4D sector in Africa.

Ideologies and motivations tend to leak between allied organisations, potentially reinforcing or changing the trajectory of each as they act in expectation of each other's prerogatives.

Currently, cross-sectoral partnerships are lauded by development actors across Africa, with an emphasis on how they can facilitate business-focussed alternatives to state-led models of agriculture. This section explains how these partnerships and coalitions act through the mobilisation of multiple forms of power and

²⁰ This informant felt it was necessary to target scarce research resources to tackle immediate needs rather than commit resources to longer-term farming systems and agroecological studies into methods and practices that could help to prevent such problems from arising. Factors holding back research of this nature were perceived to include limited government funds and short-term political horizons.

the role of individuals in this, noting the specific role of philanthropic organisations in the African agricultural context. It then shows how this contemporarily dominant set of alliances have tended to bring market imperatives to the forefront, largely through PPPs.

Newell (2019) has shown how wide-ranging partnerships are capable of applying pressure on multiple fronts in support of specific research and agri-development paradigms, notably biotechnology. Newell's case study of transgenic soya in Argentina shows how discursive power, or the power of suggestion and of ideas, works alongside organisational and material power²¹ to configure such a coalition: transnational companies and their home governments apply pressure to the state; individuals move between the government and the private sector; and the media is used to deflect awkward questions about the desirability of a favoured technology. As partnerships like these help ideas and technologies to cross sectors, they can be perceived as discourse coalitions or actor networks, that is, groups of actors, ideas, practices, technologies, ideologies, economic models and ways of constructing knowledge that coalesce around a proposed trajectory of development (Ghini et al., 2018). These networks are political, and actors within and around them use different forms of power to enrol some allies or block others (Newell, 2009).

Schnurr (2013) similarly uses this model of power in his case study of the development of biosafety legislation in Uganda, where the USAID-supported Agricultural Biotechnology Support Programme liaised between national research organisations and American biotechnology companies that were promoting their products, using a pro-poor narrative. Simultaneously, IFPRI organised efforts to harmonise East African biosafety regulations that would facilitate the commercialisation of crop biotechnologies. This alliance of public and private actors assisted the development of a particular type of agricultural research trajectory.

This combined aid funding and legislation as well as information services targeting the public and ministers (via radio broadcasts and print media).

The idea of discursive power can show how coalitions and networks that favour a certain agricultural research paradigm work to discourage the dominance of others. Writing from an agroecological perspective, Holt-Giménez argues that research focussed on the development of new crop cultivars and chemical inputs promotes the notion that such inputs are the solution to low productivity and hunger, which works to deflect the more politically contentious possibility of land redistribution (Holt-Giménez, 2006).

In our interviews, the role of individuals in constructing institutional power was particularly stark. Personal networks are as important in research as in any other industry. Movement of staff between organisations is therefore a very important route through which institutional partnerships are confirmed, identities are consolidated and discourse coalitions are constructed. In the context of agricultural research in Africa, staff movements between national and international agricultural research systems and between the CGIAR and philanthropic and multilateral funders have been critical to the formation of discourse coalitions.

Individuals also play important roles as champions or key decisionmakers, influencing organisations to coalesce around certain research agendas or priorities at key moments. However, these individuals cannot act alone. Their effectiveness stems from representing larger groups of people or acting as figureheads for a particular agenda (Sumberg et al., 2012). Particularly influential individuals can bridge sectors and organisations. They act as brokers in that they carry ideas between different institutions and arenas, and can also act as catalysts that draw institutions into specific research projects or direct funding towards specific types of research. The ability of researchers to do this is normally based on personal networks, but a track record of acknowledged success in academic work is also necessary.

²¹ Discursive power: reinforcing the hegemony of a given idea by deflecting ideas about alternatives, for example through the media or advertising
Material power: using infrastructure and capital to exert influence
Institutional power: having access to decision-making structures and bureaucracies through formal systems of representation but also personal social relationships.

These trends are self-reinforcing over time. Relationships develop between organisations that have histories of collaboration. It can be a lower risk strategy to capitalise on these existing relationships and a shared agenda. Beyond individual relationships, these relationships develop through mechanisms such as memoranda of understanding, research contracts and registration on electronic funding application systems.

However, struggles within networks of actors mean that they do not always successfully align to form lasting partnerships and discourse coalitions. Our interviews showed that situations involving co-funding obliged the respective funders to work hard to ensure that they had an effective say in the research their grantees carried out.

Nor does continuity of relationships imply that discourse coalitions are static. Both funders and research organisations seek to develop new institutional relationships and to enrol new organisations into existing networks. Funders may nurture research by specific organisations in areas they are interested in by inviting proposals on particular themes, including agroecology. As described above, research organisations may present themselves to funding organisations in order to highlight their fields of work and expertise. This is one entry point to being invited by a funder to present a proposal.

Furthermore, some organisations are heterogeneous, with divergences of approach between departments. Some deliberately align with components of multiple discourses, not committing to one in particular. This reflects the potential points of agreement and convergence between approaches which may initially appear to be mutually exclusive (see Table 3.3 and discussion below). It also reflects the fact that agricultural research organisations do not necessarily define themselves or their activities in relation to agroecology or sustainability. Unless these concepts are deemed central to their work, representatives of such organisations may find it hard to even comment on them. This apparently was the case for several of our interviewees.

Philanthropic funders have historically dominated agricultural research funding in Africa, and continue to do so.

It is worth noting the prominence of philanthropic organisations as key brokers of wide-ranging research and agri-development partnerships. The biggest and most well-known include the Rockefeller Foundation, which partnered with the Ford Foundation in the era of the first Green Revolution, and the BMGF, Rockefeller's partner in the current drive for a Green Revolution in Africa and its key vehicle – AGRA (see Box 'Zooming in on AGRA'). Foundations have played a central role in facilitating the transfer of ideas between national governments, agribusinesses, agri-food companies and other actors in the agricultural sector.



ZOOMING IN ON THE ALLIANCE FOR A GREEN REVOLUTION IN AFRICA (AGRA)

AGRA was founded in 2006 by the Rockefeller Foundation and the BMGF. AGRA partners include government bodies, bilateral and multilateral donors, universities, CGIAR centres, private sector agro-input companies, other private foundations, the AU and UN bodies. UN Secretary General Kofi Annan's call for a "uniquely African Green Revolution" is cited as one of the motivations for establishing AGRA.

AGRA focusses on modernising smallholder farming to raise yields, and thereby increase incomes and improve livelihoods. AGRA is a grant-making organisation that sees modern digital, financial and biological technologies and external inputs, as well as private sector strengthening, as keys to achieving its mission. Alongside the promotion of modern technologies to farmers, AGRA seeks to influence national governments to adapt policies to support uptake of these technologies. Prior to 2017, AGRA focussed more strongly on research, largely in the area of crop and fertiliser development, and the Alliance has released and commercialised hundreds of new varieties. AGRA's scholarship programme supports students to gain PhD and MSc degrees in crop breeding, agronomy and soil science.

AGRA is linked to multiple organisations that share the positive views of its founders towards high-input agriculture, not only through formal agreements but also in the composition of its board and the employment histories of many of its key staff. Alongside representatives of the Rockefeller Foundation and BMGF, AGRA board members are associated with the CGIAR and private sector organisations as well as African governments. One high-profile board member is Akinwumi Adesina, formerly with the CGIAR's West African Rice Development Association (now AfricaRice) and the Rockefeller Foundation. He was Vice President of Policy and Partnerships at AGRA before becoming Nigeria's Minister of Agriculture and then President of the AfDB. At the AfDB, he spearheaded the Feed Africa initiative, an agricultural modernisation programme that focusses on raising yields through applications of modern technology and raising agricultural revenue through integration into export chains.

AGRA has rapidly achieved a wide influence and a reputation for achieving its objectives. However, the Alliance has also been criticised by academics and civil society organisations that claim that it exists to promote biotechnology and concentrate the power of large commercial companies in agriculture.

AGRA is presented as a grantee by the Rockefeller Foundation and BMGF, but was established by them to perform the type of technical research the Rockefeller Foundation has historical experience funding. Research partners are already associated with this funder, i.e. largely CGIAR centres, and the staff and board personnel are associated with the technical style of research historically favoured by these organisations. Through these mechanisms, AGRA reinforces a style of agricultural research by expert technicians into high-tech solutions.

The effect of the partnership-brokering mechanisms described above has been to intertwine public and private research agendas in such a way that market imperatives have been infused into public institutions. For example, Pray et al. (2011) describe how CGIAR centres collaborated with Monsanto scientists to facilitate the development and commercial release of drought tolerant maize seed in the Water Efficient Maize for Africa project. Maize breeding lines developed in the public sector were handed over to the private sector to develop further in their commercially oriented research for development programmes. To go further, Holt-Giménez (2006) characterises the World Bank's funding of CGIAR research as one of the ways capitalist organisations keep agriculture capital-intensive. Córdoba et al. describe the ideological component of this situation, arguing that the neoliberal project does not necessarily require the market to replace the state, but rather to come to underpin how the state works, as public agencies are made more market-oriented (Córdoba et al., 2014).

PPPs are particularly successful at achieving this effect. They are widely seen as a viable way to organise and finance successful agricultural research. The private sector is often cited as critical for agricultural R&D in Africa, with the state seen as providing an environment to stimulate and enable private sector activity. The notion of the 'win-win' situation, used in many cross-sector partnerships, hinges on the idea that any agricultural research or development project must ultimately be focussed on realising a profit somewhere, regardless of whether the outputs are intended as public goods. One notion frequently used to justify this is to assert that farming is above all a business, and that each farmer is interested primarily in the financial bottom line. This notion is at the core of agricultural growth strategies and programmes such as AfDB's Feed Africa Strategy. It is relevant to note that PPPs are only viable when the private sector has an interest in engaging with them, because they will generate profit and advance their market position.

Views diverge radically in terms of how beneficial these effects are. Some find these coalitions concerning because they imply a concentration of power, not only in the world of agricultural research but across food systems more broadly (Moseley, 2016). Advocacy groups such as GRAIN and some critical scholars describe the African Green Revolution as subjecting farmers to the profit-making imperatives of large companies, rendering them dependent on products from which companies profit such as seeds, biocides and fertilizers (Thompson, 2012). Academic commentators have criticised the un-contextualised technical approaches funded by the foundations at the heart of many partnerships (Kerr, 2012). Furthermore, the win-win concept contrasts radically with strong agroecological propositions that assert that the most essential and valuable aspects of agriculture and rural livelihoods – such as cultural associations, environmental protection and healthy nutrition – cannot be expressed in monetary terms.²² These factors are treated very differently within an agroecological frame that values multifunctional farmer livelihoods, incorporating elements beyond profit, and a development model that prioritises the profits of agriculture as a business over other components of livelihood (Holt-Giménez & Shattuck, 2011). On the other hand, people involved in cross-sectoral partnerships invoke the idea of equity, in terms of providing access to modern technologies for all farmers. Ideological convictions as well as profit imperatives are therefore at stake.

Despite these critical views, the paradigms espoused by the major contemporary partnerships generally hold sway, and tend to exert influence beyond the immediate network of partners. In this business-oriented paradigm of AgR4D policy that dominates in Africa today, public and philanthropic as well as private sector funders value economic growth in agriculture, positioning income generation and maximisation through market engagement as the primary route to improved livelihoods at multiple scales. The following quotations illustrate this.

²² One interview yielded an anecdote of anti-profit discourse used by some food sovereignty activists that was perceived as an unhelpful element of agroecological discourse. A politician was convinced to alter a speech, removing any mention of smallholders making profits, because this phrase was perceived as potentially unacceptable ideologically to a group of peasant activists.

“Efficient market systems that respond to demand and supply of technologies and ensure smallholder farmers have the necessary inputs at the right time, right quantities and quality and can access output markets is essential for Africa’s agriculture to effectively grow incomes for the farmer, business and country.”

“According to World Bank estimates, the African agriculture sector could more than triple in size by 2030, from US\$300 billion today to US\$1 trillion, driving strides forward in poverty reduction and food security (AATF, 2019).”

The majority of our interviewees ascribed to this idea, rationalising in this way: In the context of smallholder agriculture in developing countries, integration into marketplaces provides

opportunities to generate income to pay for social services that are not publicly funded in developing countries such as education, utilities and healthcare. Thus, a discourse emphasising productivity prevails, and this means that industrial, growth-focussed agricultural research maintains a place even in programmes that focus on livelihoods and social justice.

Table 3.2 shows the variety of agricultural development paradigms encountered in our interviews and literature review which underpin the views of different actors on the role and function of AgR4D. This is not necessarily an exhaustive list. Nor are these paradigms mutually exclusive, as actors may orient themselves differently in relation to specific situations or contexts.



Table 3.2:

Paradigms of AgR4D

AGRICULTURAL DEVELOPMENT PARADIGMS	PARAMETERS EMPHASISED	EXEMPLAR ACTORS	NARRATIVE
New Green Revolution	Productivity, wealth, gender equity	NEPAD, AGRA, IFDC, AfDB, USAID	High-input agriculture and high productivity are key to economic prosperity. There is a focus on smallholder integration into international value chains, for example through outgrower models, and adoption of new technology, developed and tested through positivist research. Food systems are value chains, market integration is the key to improving livelihoods. The private sector is the driver of growth and the state should support it.
Agriculture as economic sector	Profit, resource efficiency, livelihoods, equity	DFID, UKRI, IFPRI	Agriculture is one way to improve livelihood outcomes. Eventually, structural transformation should occur as people move to non-agricultural employment to improve their livelihoods. Econometric modelling is often used to understand impacts of livelihood changes, and participatory methods may be used to understand people's perceptions of such changes.
Resilience	Adaptation to environmental and climate change, equity, socioecological systems, ecological functionality	CCAFS, Stockholm Resilience centre	Maintaining functional socioecological systems is paramount, especially in the contemporary context of environmental destruction. There is a focus on the ecological processes underlying resource use systems, which can be investigated using ecological scientific methods, and their relations to social systems, which may be investigated using qualitative methods. Environmental change and adaptation to it should not disadvantage the poorest.
Pragmatic agroecology	Productivity, resource efficiency, environmental sustainability, livelihoods	CCAFS, icipe, FAO, Global Alliance for Future of Food, Agropolis Foundation	Environmental sustainability is important and genetic modification, biotechnology, conservation agriculture and other technical solutions can play a role in achieving it. Technology, developed using technical and participatory research, is needed to survive climate change and keep farmer livelihoods resilient to other forms of environmental change.
Strong agroecology	Agrobiodiversity, ecological functionality, environmental sustainability, people's empowerment, social justice and equity, well-being	ROPRA, La Via Campesina, GRAIN	Well-being of farmers and consumers can be enhanced based on using processes that mimic ecological processes in food systems. These will be developed with participatory on-farm research. Political empowerment is central, and secure access to land is a central component of this as well as social justice and equity.

OPENINGS

In the course of describing the drivers and lock-ins, some moments were mentioned at which the direction of a research trajectory could potentially change. Although these instances can be used to consolidate and reinforce existing research agendas, they could also be opportunities for the emergence of new agendas that diverge at least partially from existing pathways. Our interviewees drew particular attention to the following openings, which represent an opportunity for change, providing that individuals or groups take deliberate steps to harness them.

CRISES

New research directions can emerge in response to critical issues and threats arising at various scales in food systems.

Examples of crises that lead to openings include pest attacks, disease outbreaks, migration, land conflict, drought, soil fertility degradation, loss of biodiversity and climate change. While perceived crises may spark rapid political interventions and injections of funding, they can also create space for longer-term responses in the shape of new or reoriented research programmes. IPES-Food (2020) has argued that the 2019-2020 COVID-19 pandemic has exposed the fragilities and inequities of the contemporary food system, yet simultaneously offers an opportunity to imagine and enact more resilient and just alternatives. However, crises can also be used to reinforce existing agendas.

CONSENSUS STATEMENTS

Our interviewees often mentioned prominent declarations, conferences and reports as motivations, justifications or reference points for their R&D activities. These landmark events have the effect of announcing and advancing a new 'consensus', and establishing long-term goals and imperatives in the intergovernmental space.

Examples include:

- The AU's 2006 Abuja declaration on fertilisers for an African Green Revolution
- The 2008 IAASTD report
- The 2014 UN IPCC special report on 1.5 C
- The AU's 2014 Malabo declaration on accelerated agricultural growth
- The UN 2015 SDGs
- FAO agroecology symposia and FAO regional agroecology meetings, 2014-2018
- The 2019 HLPE report on agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition

These documents and declarations consolidate ideological concerns and normative agendas, frame institutional interests and inform the reaction to perceived challenges and crises in food systems, thereby shaping the research agenda.

Consensus statements can serve to mobilise dissent as well as agreement.

Research can be framed in opposition to certain positions such as the need for an African Green Revolution, or in terms of trying to find alternatives. The consensus therefore acts not solely as an indicator of an agreed political or research trajectory, but more broadly as a marker that a specific issue such as soil fertility or greenhouse gas (GHG) emissions is at stake.

INSTITUTIONAL STRATEGY REVIEWS

Most research and funding organisations have points at which they periodically reassess their strategy. Instances also arise when they are obliged to do so because of external factors. For example, the CGIAR has experimented with different ways of organising its research in the context of changing funding arrangements. As described above, these moments can be used to reinforce existing pathways: icipe, for example, has maintained its focus on 'four healths' through several directors, decades and strategies.

However, these moments of reflexivity when new ideas get a hearing may also prompt changes in direction and open up new research areas. We heard how charitable foundations had needed to formally renew their agendas, seeking advice from experts in the process. Prominent researchers had also responded to invitations to advise philanthropic funders on their strategic direction because they saw this as a chance to influence their agendas.

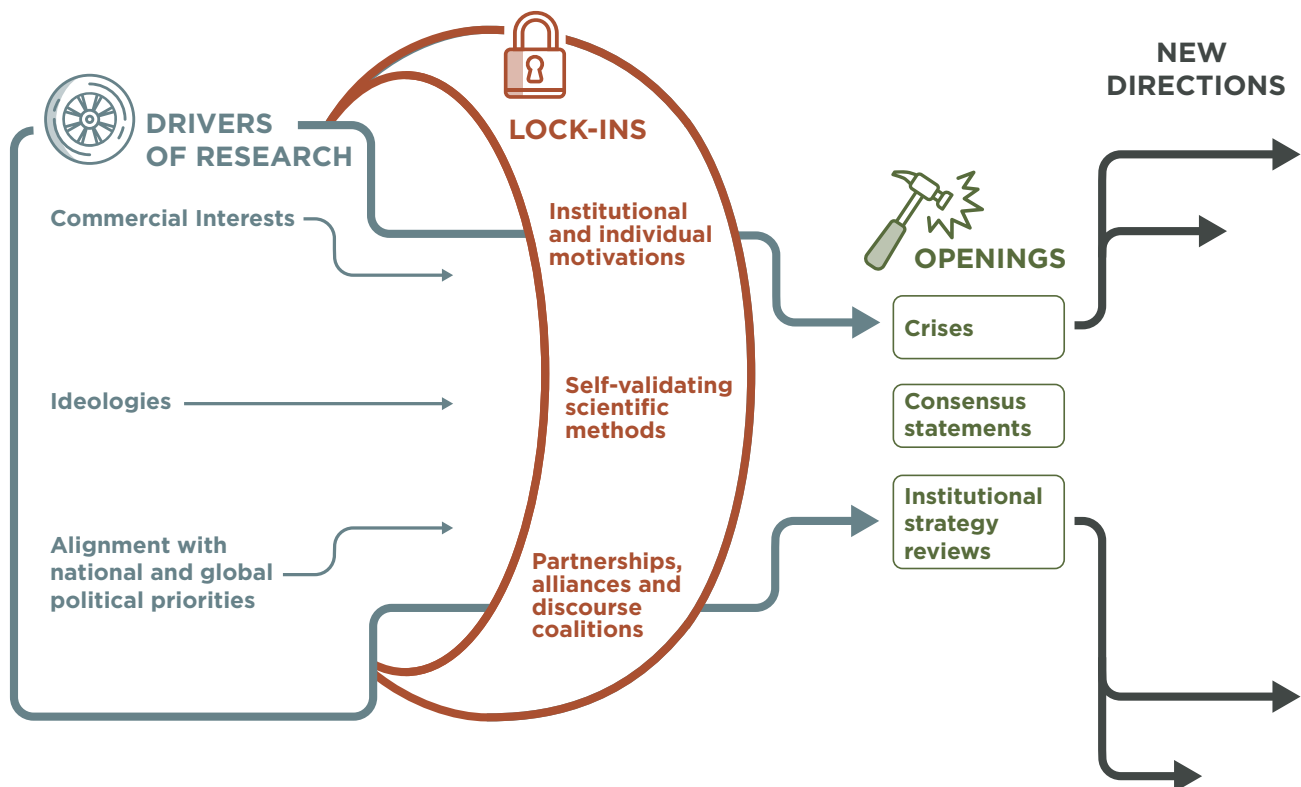
Through formal review exercises and beyond, organisations may take the chance to react to national or international discourses or events (encapsulated in the documents and declarations mentioned above) in such a way as to further their interests, and may build alliances in the process of doing so. This was the case in the development

of the FAO agroecology hub. Another example is the way the president of the AfDB mobilised attention around a perceived food security crisis to garner support for the Feed Africa programme promoting export-oriented agriculture.

When private companies review their strategy, they also refer to international development agendas in ways that align with their commercial objectives. Syngenta, for example, has reacted to concern about chemical pesticides, broadening its focus to encompass other technologies. Altered research trajectories may thus relate to prominent or emergent international agendas, or reflect a cosmetic change and retrenchment of existing positions. The Figure 3.1 below summarizes the main findings on the drivers, lock-ins and potential openings of agricultural research trajectories.

Figure 3.1:

How research trajectories are formed, reinforced, and opened up



CONCLUSIONS: HARNESSING THE OPENINGS FOR AGROECOLOGY

USING INDIVIDUAL-LEVEL FLEXIBILITIES

When opportunities for change have arisen via the three openings described above, individuals or small groups of likeminded people have proven to be effective in harnessing the openings to deliberately pursue an agroecological agenda. In agroecologically focussed research institutes, these individuals were supported organisationally. In other cases, working groups on agroecology were convened within mainstream institutions and raised the profile of these issues at opportune moments, an example being FAO's agroecology hub.

Such individuals and small groups are persistently preparing for such opportunities to effect change. While researchers usually shaped their research to conform to funders' agendas, they often exploited loopholes in existing programmes to push alternative approaches. Some diverted research funds into projects and studies that, they said, diverged from the goals that a given funding opportunity was intended to promote. For example, they tried to integrate farmer knowledge. They also tended to approach funders they knew were sympathetic to their interests or flexible enough to allow them to work on issues they deemed important. Some interviewees from research funding organisations indicated openness to researchers' ideas about how to conduct funded research. Some public sector researchers said that they enjoyed a degree of freedom to pursue their personal research interests, for example on plant-derived preservatives or biocontrol agents, mobilising small pools of unrestricted funds.

These actions represent a connection to more grassroots, bottom up research carried out by farmers and researchers outside the formal system, in that they take place on the periphery of conventional research systems. These alternative forms of knowledge construction, and their integration with formal research systems, will be mentioned in this report's conclusion.

FINDING COMMON ENTRY POINTS

Worldviews on agricultural research diverge significantly and substantively. However, there are common concerns between almost all of these perspectives and paradigms.

In order to increase the potential for agroecological research trajectories to emerge, it is crucial to identify entry points that resonate with the preoccupations of diverse constituencies. Table 3.3 identifies potential common ground between the different agri-development paradigms guiding AgR4D (see Table 3.2), and the different perspectives on agroecology expressed by interviewees (see Table 3.1). The cells coloured in shades of green show possible entry points to various types of agroecology based on common key parameters. Words in bold show where the greatest opportunities lie, based on highly congruent parameters. The table also reveals intersections where there may be limited convergence of views.

As might be expected, the more agronomic and less political definitions of agroecology yield more entry points for engaging different actor groups. Furthermore, resource efficiency emerges as a clear catchall term, suggesting it is likely to be a good entry point. However, the table does not offer simplistic guidance on this front. Indeed, this raises a number of questions regarding when, how and to what extent different definitions and aspects of agroecology should be highlighted in order to increase its reach, while avoiding risks of co-optation and dilution. For example, while resource efficiency is a concern for all actors, a discussion focussed primarily on resource efficiency in agriculture certainly does not guarantee a meaningful engagement with food system transformation. These questions are addressed in the [Conclusions](#) section.

Table 3.3:

Opportunities to introduce agroecology to adherents of various AgR4D paradigms

The matrix shows how advocates of AgR4D paradigms can be convinced by versions of agroecology. The cells in shades of green show possible entry points to various types of agroecology based on common key parameters. **Bolded** entry points are direct confluences between agroecology and a certain agri-development paradigm. Those unhighlighted are weaker connections.

			PERSPECTIVES ON AGROECOLOGY FROM TABLE 3.1			
			Ecological agricultural science: recognition of and research on ecological basis of agriculture	Hi-tech agroecology: reliance on technologies to increase productivity sustainably	Environmental agroecology: distinct set of sustainable agricultural practices that works harmoniously with natural processes	Political agroecology: distinct set of sustainable agricultural practices, but crucially a normative valorisation of social justice and food sovereignty
EXEMPLAR ACTORS						
AgR4D paradigms from Table 3.2	New Green Revolution	NEPAD, AGRA, IFDC, AfDB, USAID	Productivity	Productivity, resource efficiency		Gender equity
	Agriculture as economic sector	DFID, UKRI, IFPRI	Livelihoods	Resource efficiency	Resource efficiency	
	Resilience	CCAFS, Stockholm Resilience Centre	Ecological functionality	Environmental sustainability	Environmental sustainability	Ecological functionality
	Pragmatic agro-ecology	CCAFS, icipe, FAO, Global Alliance for Future of Food, Agropolis Foundation	Productivity, resource efficiency, environmental sustainability, livelihoods	Productivity, resource efficiency, environmental sustainability, livelihoods	Resource efficiency, environmental sustainability	Environmental sustainability
	Strong agro-ecology*	ROPRA, La Via Campesina, GRAIN	Environmental sustainability, ecological functionality, livelihoods	Environmental sustainability, synergy between local and expert knowledge, livelihoods	Environmental sustainability, local knowledge, well-being	Agro-biodiversity, ecological functionality, environmental sustainability, people's empowerment, social justice and equity, well-being

* This row, listing political agroecology as an AgR4D paradigm, is included for completeness as it will be appreciated that this groups is not a target for advocacy, being



4

ANALYSIS OF INVESTMENT FLOWS IN AgR4D: METHODOLOGICAL APPROACH



MONEY FLOWS IN AgR4D: THREE CASE STUDIES

[Chapter 3](#) presented key drivers and lock-ins of agricultural research trajectories, as well as potential openings for alternative research pathways. In the following chapters, we illustrate and unpack the distribution of AgR4D funding through a series of case studies. Each case study combines a *quantitative* analysis of where AgR4D flows are going with a *qualitative* assessment of the main obstacles to and opportunities for enhancing research into agroecological solutions.

Three case studies were selected to cover various aspects of and actors in the AgR4D system. First, analysis of Switzerland's development aid and cooperation system and Africa-focussed research funding schemes offers an example of a North-South bilateral donor perspective ([Chapter 5](#)). Second, the agricultural development programme of the BMGF, the largest private philanthropic organisation, is examined ([Chapter 6](#)). Finally, investments channelled through Kenya's agricultural research institutions from a range of sources — including development aid and domestic research budgets — are analysed ([Chapter 7](#)). While these case studies were selected to represent major AgR4D stakeholder groups, they should not be viewed as fully representative of bilateral donors, philanthropies and African countries, respectively. A different choice of case studies might have produced drastically different results as AgR4D actors are very heterogeneous.



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development
and Cooperation SDC

SWITZERLAND

Switzerland is characterised by a strong commitment to agri-development in sub-Saharan Africa. In 2018, Switzerland dedicated US\$132 million to agricultural ODA (OECD, 2018c), making it the ninth largest donor in this sector.

The Swiss Agency for Development and Cooperation (SDC) identifies food security and agriculture as a priority topic, with a global mandate to reduce poverty, hunger and malnutrition, and promote sustainable agriculture.

By comparing Swiss AgR4D support against agroecological criteria and exploring how priorities are set within the relevant bodies, this case study will explore the extent to which Switzerland adheres to a pro-poor and sustainable agri-development agenda, in a context where the missions of aid agencies are so often aligned with the commercial and political mandates of donor countries (Nunnemkamp, 2009).

BILL &
MELINDA
GATES
foundation

THE BILL AND MELINDA GATES FOUNDATION (BMGF)

The BMGF is the world's biggest private philanthropic foundation in terms of financial endowments. Agricultural development is one of its core areas of work in sub-Saharan Africa, and the BMGF's agricultural development programme accounts for approximately US\$395 million per year (BMGF, 2016). The BMGF invests in multiple areas of agricultural research in sub-Saharan Africa, in line with the 'scientized' and technical vision of development that underpins the foundation (Schurman, 2018; Morvaridi, 2012; Matthews & Ho, 2008). Its organisational culture is often described as akin to a business culture, with a strong emphasis on top-down strategic planning (Schurman, 2018), an accountability culture focussed on monitoring and sometimes very narrow target-setting, and little emphasis on learning and experimentation. At the same time, the BMGF, in its constant search for innovation, demonstrates quick strategic repositioning.



KENYA

Kenya is second only to Ethiopia in terms of the amount of bilateral and multilateral agricultural aid it attracts, approximately US\$153 million per year (OECD, 2015b), including US\$13 million for agricultural research, extension and education. The top donors for development aid in Kenya are the US, the BMGF, the EU, Germany, the World Bank's International Development Association and Japan (OECD, 2018a). At US\$274 million per annum, the Kenyan government's investments in public agricultural research are the third highest in Africa (IFPRI, 2018). With 37 national agricultural research institutes, the Kenyan research community covers a wide range of topics and is relatively well integrated into global knowledge systems. Kenya offers an example of the complex institutional landscape of AgR4D, with the major involvement of public institutions, the private sector, international organisations and a range of civil society groups. This case study will explore the extent to which a recipient country's research institutions and agenda are driven by the priorities of large donors, even in a context of institutional diversity.

GENERAL APPROACH

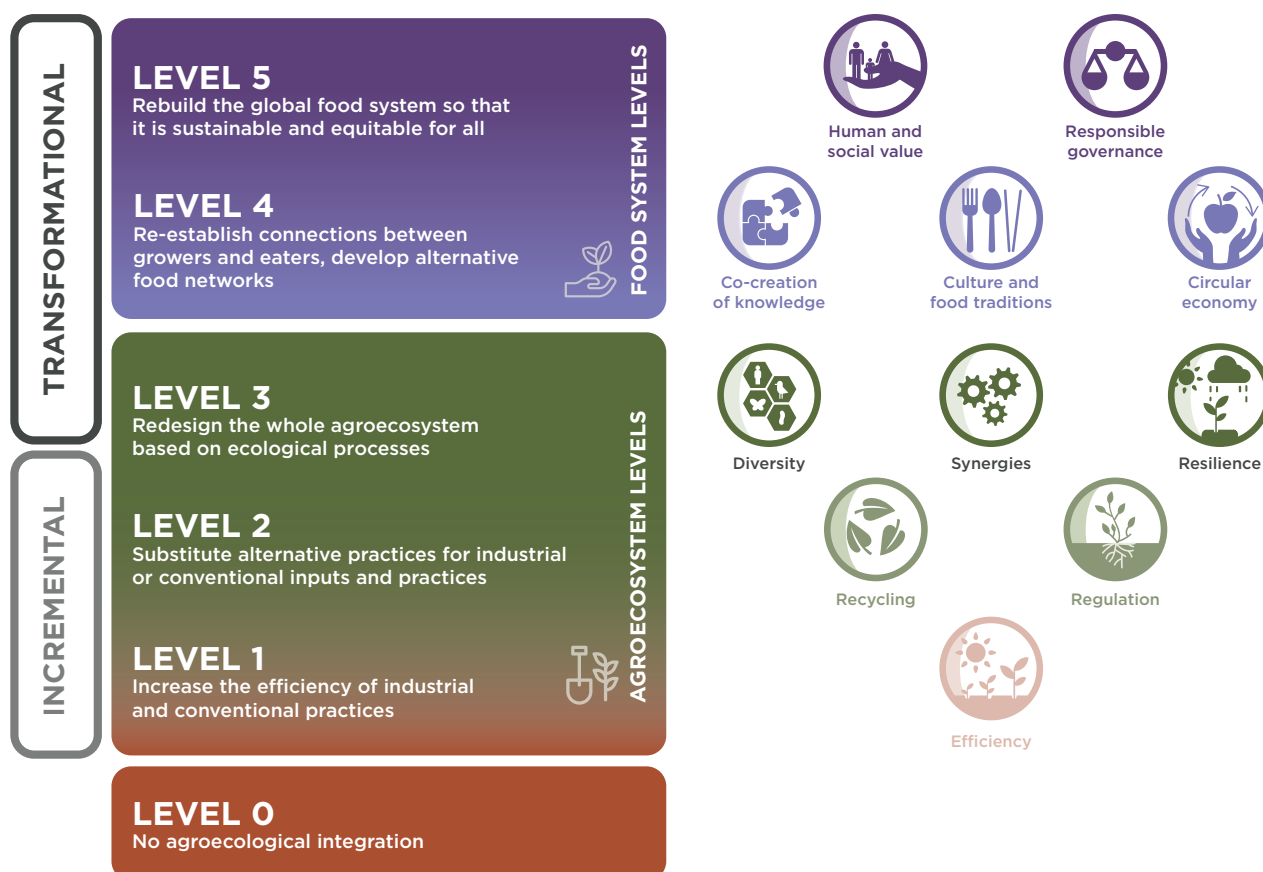
In all three case studies, a mixed methods approach was applied. The qualitative portion is based on the methodological approach of [Chapter 3](#). Semi-structured interviews were carried out to generally identify the main factors underlying decision-making in key institutions and specifically identify the major obstacles and barriers, as well as windows of opportunity, for increased funding and implementation of AgR4D.

In the quantitative part, each case study identifies the share of funding being directed to agroecology-focussed research compared to research focussed on industrial agriculture approaches. For this purpose, an assessment

grid was developed combining Gliessman's analytical framework on the five levels of food system transformation (2015) with FAO's 10+ elements of agroecology (2019) (see [Figure 4.1](#)). Relevant research topics – or criteria of transition – are ascribed to each of these elements, based on analysis by DeLonge et al. (2016) and the Biovision Foundation for Ecological Development and Global Alliance for the Future of Food (2019). In total, 54 criteria were developed and built into a mechanism for assessing the alignment of specific research projects and programmes with the principles of agroecology – the Agroecology Criteria Tool (ACT, available at: www.agroecology-pool.org/methodology and in [Annex 1](#)).

Figure 4.1:

The five levels of food system transformation and 10+ elements of agroecology



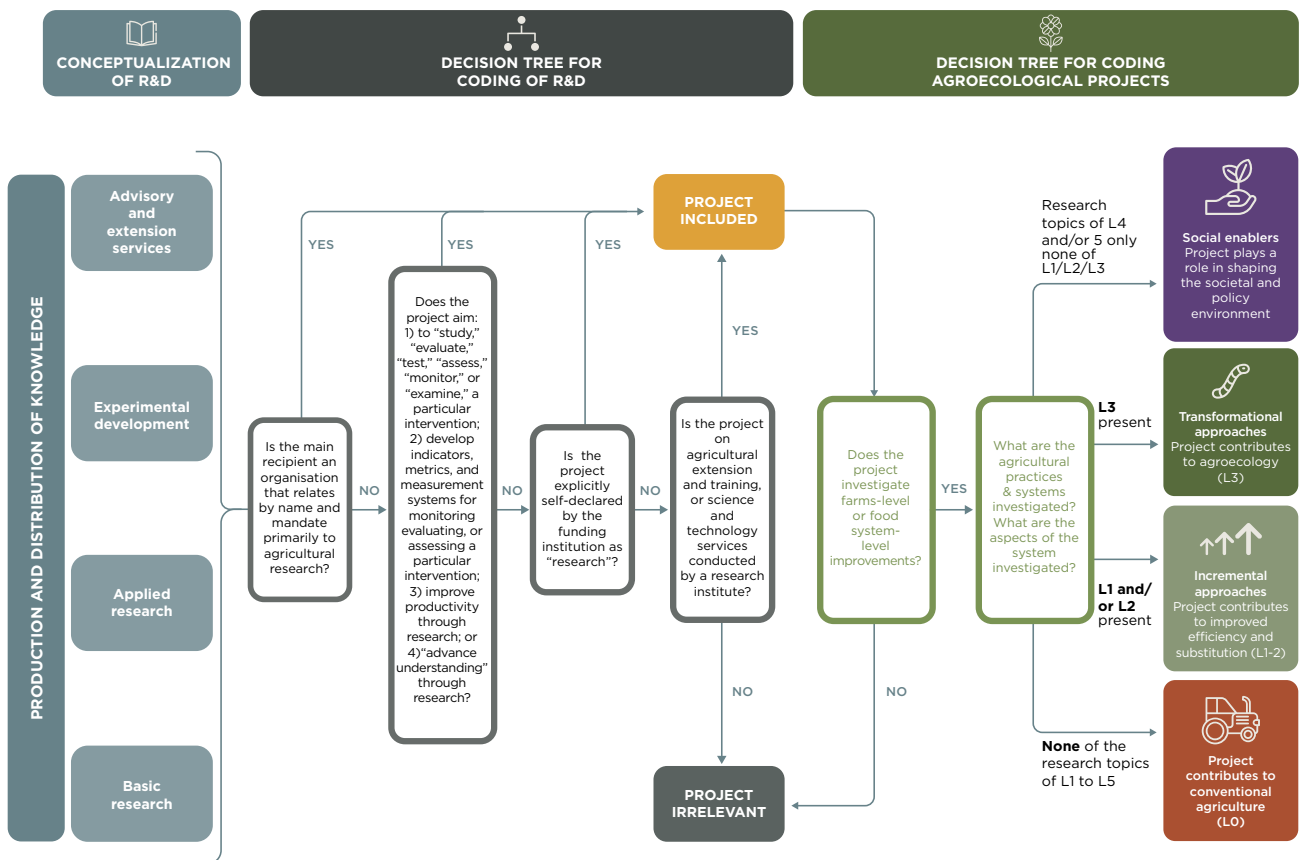
In this analysis, all projects not reaching Level 3 are outside the realm of agroecology as they do not provide transformational changes to the food system. Projects at Level 1 and 2 may be part of the transition of the food system towards sustainability and contain some agroecological elements. Still, they only support incremental changes to the dominant external input-intensive system and thus cannot be considered agroecological projects, especially if there is no sign of these projects being part of a longer transformational change process. On the contrary, there is even a risk that projects at Level 1 and 2 hinder transformational change, as they seemingly

address the need to make agricultural systems more sustainable without making fundamental changes to the dominant external input-intensive system.

The intention to improve agricultural practices and agricultural systems was evaluated as an entry point to classify research projects, (Figure 4.2, Level 0 to 3). Commitments to research-specific topics and ideas would be assessed, as well as the goals or intentions of the project, rather than its impacts or outcomes. Level 4 and 5 go beyond production and focus on socioeconomic aspects, and were considered in a second phase.

Figure 4.2:

Decision tree to classify AgR4D projects



MAIN STEPS FOR QUANTITATIVE ANALYSIS

CONCEPTUALISATION AND BOUNDARIES OF AgR4D PROJECTS

Research was defined as the production and distribution of knowledge. Different types of research were considered — basic research, applied research and experimental development — as well as a limited range of advisory and extension services with a clear role in disseminating knowledge, i.e. training-based extension such as farmer field schools and farmer-to-farmer training, and science and technology information services conducted by organisations with a clear research mandate.

The analysis was focussed on knowledge production concerning the ecological, economic and social dimensions of food production. Thus, projects solely focussing on food processing, product development or similar fields were not included. AgR4D projects were included if they aimed to help to understand different aspects of food system sustainability and/or to support specific agricultural practices.

For the case studies and main funding streams, all projects that started between 2013 and 2018 (for Switzerland and Kenya), and between 2015 and 2018 (for the BMGF) were considered.²³ While some of the projects included in the Swiss and BMGF cases were led by organisations outside Africa, all projects explicitly targeted the sub-Saharan African context, with the exception of a handful of global-level studies of high relevance for Africa.

AGROECOLOGY CRITERIA AND CODING PROCEDURE

Each of the AgR4D projects considered relevant for the analysis (based on the decision tree, Figure 4.2) was subjected to a detailed analysis of its respective contribution to the levels of food system transformation.

The intention to improve agricultural practices and systems was evaluated as an entry point to classify research projects, while aspects beyond production (i.e. the socioeconomic aspects corresponding to Levels 4 and 5) were considered in a second phase (see Figure 4.2).

We assessed a project's goals and intentions in terms of researching specific topics and ideas, rather than its impacts or outcomes, drawing on all publicly available material describing the goals and intentions of the projects. A single mention of a term (e.g. compost, biological pest management or climate resilience) sufficed for a project to be considered to have met the relevant criteria of the [Agroecology Criteria Tool](#). In light of more extensive data availability, the Swiss case study also includes a more critical assessment based on a project proposal or description needing to demonstrate a clear commitment to fulfilling the more demanding definitions of each level, element or indicator of transition, as described in the assessment grid. Each project can be attributed more than one criterion, and therefore also classified as fulfilling various elements and levels.

This process enabled projects to be classified into the following categories in order to provide a basic snapshot of a funder or recipient entity's commitment to agroecological research, thereby allowing the practices of different research programmes, institutes and funders to be compared and contrasted.

Industrial agriculture (Level 0).

Relevant projects that do not fit any of the criteria of transition were considered at Level 0, i.e. projects corresponding to a business-as-usual industrial agriculture paradigm. This includes projects that improve agricultural productivity through adoption of new technologies without any reference to other components of Levels 1-3, or approaches focussed solely on increasing profit and productivity with no other sustainability

²³ The time periods were chosen based on data availability and funding periods for each case study.

consideration, or environmental or social benefits. Projects that addressed environmental and social externalities of the current agricultural system (but without an accompanying focus on transition to different practices) were classified separately as “symptoms”.

Efficiency and substitution (Level 1 and/or 2 present).

While projects corresponding to Levels 1 and 2 may be delivering sustainability improvements, and may in the future evolve into more ambitious projects, there is no guarantee that they are steps towards agroecosystem redesign and food system transformation. These projects are singled out in the data, but for the purposes of this analysis are not considered as funding flows to agroecology/ agroecological research.

Agroecological (Level 3 present).

Projects meeting at least one criterion at Level 3 were considered ‘agroecological’. Such projects were considered to have transformational potential, in that they are based on redesigning the agroecosystem so that it functions on the basis of a new set of ecological processes. In practice, this means research that seeks to integrate various elements of farming systems by creating multiple levels of interactions, identifies key ecological functions and places a specific focus on increasing the diversity and resilience of the whole system. A key component of agroecological redesign is recognizing the complexity of interactions within agroecosystems and optimizing the resultant synergies.

Systemic (Level 3 + 4/5).

The transformational potential is even greater insofar as a research project/programme combines agroecosystem redesign (Level 3) with a focus on broader political and socioeconomic changes (Levels 4 and 5). Research corresponding to Level 3 plus Levels 4 and 5 is thus particularly significant, and is sometimes referred to in the ensuing case studies as ‘systemic’.

Social enablers (Levels 4 and/or 5 only).

Projects that contribute to Level 4 and/or 5 only were classified as ‘social enablers’. Such projects are likely to play an important role in shaping the societal and policy environment in a way that facilitates transition to sustainable food systems. However, in the absence of agricultural components (i.e. criteria met at Levels 1-3), these projects cannot be considered ‘agroecological’ or ‘systemic’.

When the coding was complete, the following calculations were computed: number of projects and total budget reviewed in the AgR4D sector, share of projects and share of funding addressing each level of the transition and each element of agroecology.

LIMITATIONS AND BIASES

Several limitations of the assessment were identified: i) possible biases linked to the reliability and representativeness of the dataset; ii) missing information on matching funds, or projects with multiple sources of funding; iii) biases linked to the coding procedure; and iv) the fact that for most projects classified as agroecological the totality of project funding did not appear to be dedicated to agroecological approaches.

Various solutions were implemented to address the limitations. A pre-test of the methodology was conducted on 20-30 projects to adjust the criteria of transition and set additional rules. In order to validate the analysis, a second independent coder analysed a random subset of these projects. The mixed method approach, which includes qualitative interviews, was used to validate the findings of the quantitative analysis and to fill some of the remaining gaps.



5

SWISS-FUNDED AgR4D:

**DAWN OF AN AGROECOLOGICAL
TRANSITION?**



KEY MESSAGES

Based on a quantitative analysis of 146 publicly funded AgR4D projects and qualitative analysis of 15 interviews with stakeholders across different sectors of society, the following conclusions can be drawn:

- The role of the SDC in the Swiss AgR4D landscape is pivotal; the SDC provides the overwhelming majority of funding and strongly influences other stakeholders' priorities and strategies.
- The majority of Swiss-funded AgR4D projects include individual elements and components of agroecology. However, projects that are focussed on agroecosystem redesign, and projects combining ecological and social components of agroecology, are still in the minority.
- Local and regional value chains, traditional knowledge and cultural aspects of food systems are underrepresented in Swiss AgR4D funding, and only a handful of projects take a participatory approach to research.
- Projects led by Africa-based institutions tend to be more systemic and inclusive, but these organisations receive relatively little AgR4D funding from Swiss public donors.
- Most Swiss AgR4D actors are supportive of agroecology. However, many avoid endorsing it publicly, given that agroecology is often seen as idealistic and in complete opposition to industrial agriculture.
- For Swiss donors, the most compelling arguments in favour of agroecology are its multifunctionality, its circularity, its systemic nature and its ability to contribute to multiple SDGs. On the other hand, scepticism prevails regarding agroecology's economic viability and competitiveness in terms of productivity and profitability, although most stakeholders acknowledge that true cost accounting and the impacts of the climate crisis may shift perceptions in that regard.
- Stakeholders from across the Swiss AgR4D spectrum believe that donors should support systemic, multi-, inter- and transdisciplinary research and provide the long-term funding this requires. Multi-stakeholder dialogues based on scientific arguments, not ideology, are needed to define this agenda.
- Switzerland has an opportunity to lead by example and pioneer more sustainable agri-development pathways among donors, but to do so it must enhance its support for systemic, integrated, multifunctionality-based approaches.

THE SWISS AgR4D LANDSCAPE

The SDC and Swiss National Science Foundation are the major public donors for Swiss AgR4D.

The SDC is the main implementer of Switzerland's foreign policy on humanitarian aid and development cooperation. In agricultural research, the SDC "pursues a holistic approach based on integrated systems" (SDC, 2016). The SDC's Global Programme Food Security (GPFS) is one of five overarching programmes (SDC global projects, n.d.). In its 2017-2020 strategy (SDC, 2017) the GPFS highlights the need for a shift from a focus on productivity to more sustainable food systems, to consider externalities and to take a "systemic view of innovation with the participation of different actors". Thus, "the GPFS strategy is to positively shape the transformation of the global food system," including through a "more sustainable, resource efficient, and agroecological agriculture".

In 2012 the SDC joined forces with the Swiss National Science Foundation (SNSF) to manage and fund the Swiss Programme for Research on Global Issues for Development (r4d programme). Food security and ecosystems are two of the five thematic modules of the r4d programme; the focus areas of the food security module are agricultural innovation for sustainable food systems, natural resource management and resilience, as well as an enabling policy environment (r4d programme, n.d.).

The SNSF was established as a private foundation to ensure its independence. With an annual budget of roughly US\$750 million, the SNSF funds research across scientific disciplines (SNSF profile, n.d.). The SNSF commits to a transparent and impartial evaluation procedure in which the "quality of the research is the central criterion", but also stresses the importance of research providing benefits to society (SNSF, 2011).

The Swiss Federal Office for Agriculture (FOAG) and the affiliated multisite centre of excellence for agricultural research Agroscope focus on agriculture in Switzerland, with only limited reference to international development cooperation. Nonetheless, it is noteworthy that FOAG emphasizes the multifunctionality of agriculture and the importance of "maintaining natural resources and the rural landscape" (FOAG, 2016; FOAG, n.d.).

Research institutes and NGOs are the major domestic recipients of public AgR4D funding.

Switzerland is home to a disproportionate number of high-ranking research institutes, many of which maintain active collaborations with partners in developing countries. ETH Zurich (ETHZ) and the universities of Berne, Lausanne and Zurich rank among the top 100 research institutes in agricultural sciences (ShanghaiRanking, n.d.). Switzerland is home to the Research Institute of Organic Agriculture (FiBL), one of the world's leading institutes for research on organic farming with a strong commitment to international development. And, there are several Swiss research groups and institutes with a declared focus on international development cooperation, including the Centre for Development and Environment (CDE) at the University of Berne, ETHZ's Centre for Development and Cooperation and the Geneva-based Graduate Institute of International and Development Studies.

Switzerland also has a thriving civil society sector, with several NGOs working on agricultural issues in sub-Saharan Africa. While the focus is mostly on rural development rather than AgR4D strictly speaking, NGOs frequently collaborate with research institutes based in partner countries or Switzerland. For example, the School of Agricultural, Forest and Food Sciences (HAFL) features regularly in partnerships between international development cooperation actors and Swiss research institutes.

The Swiss AgR4D landscape is well organised and institutionalised.

All of the above-mentioned stakeholders are members of the Swiss Forum for International Agricultural Research (SFIAR), which also includes leading private companies such as Syngenta AG and Nestlé S.A. The SFIAR is an impartial network,

aiming at “promoting collaboration, synergies and complementarities between different actors involved in international agricultural research” (SFIAR mission statement, n.d.). Other important multi-stakeholder institutions include the SDC Agriculture and Food Security Network and the ETH World Food Systems Centre, both emphasizing a systems approach to AgR4D.

MONEY FLOW ANALYSIS

146 AgR4D projects from three public sector databases were analysed.

In this case study we chose to focus on public donors in light of the good data availability and specific position of state actors vis-à-vis public accountability. The data pool used in this analysis was drawn from three databases:

- **ARAMIS:** The Swiss Confederation’s R&D information system database “contains information regarding research projects and evaluations that are run or funded by the Confederation itself” (SERI, n.d.).
- **SDC project database:** This includes all SDC projects that are either ongoing, planned or completed, and (mostly) approved since 2012 (SDC project database, n.d.).

- **SNSF’s P³ database:** This includes all research projects approved by the SNSF (SNSF P³ database, n.d.).

In total, these databases contain over 100,000 projects. However, the majority of projects in ARAMIS and SNSF’s P³ are not on issues related to the food system or contain no reference to sustainable development in sub-Saharan Africa. Further, the majority of projects in the SDC database are likewise not related to the food system and many do not include any components of research or knowledge creation and dissemination. Thus, 146 projects met the inclusion criteria for this study (see [Chapter 4](#)) for the assessed period (15 November 2013 – 15 November 2018).



Figure 5.1:

Overview of the methodological approach and contribution of major Swiss public donors to Ag4RD projects directed towards sub-Saharan Africa.

> 100,000 projects in the 3 source databases:

SNSF's P3 (70,827), ARAMIS (> 30,000) and SDC project database (3,928)



Comprehensive **search query**

2,231 pre-selected projects: P³ (859), ARAMIS (594), SDC (778)

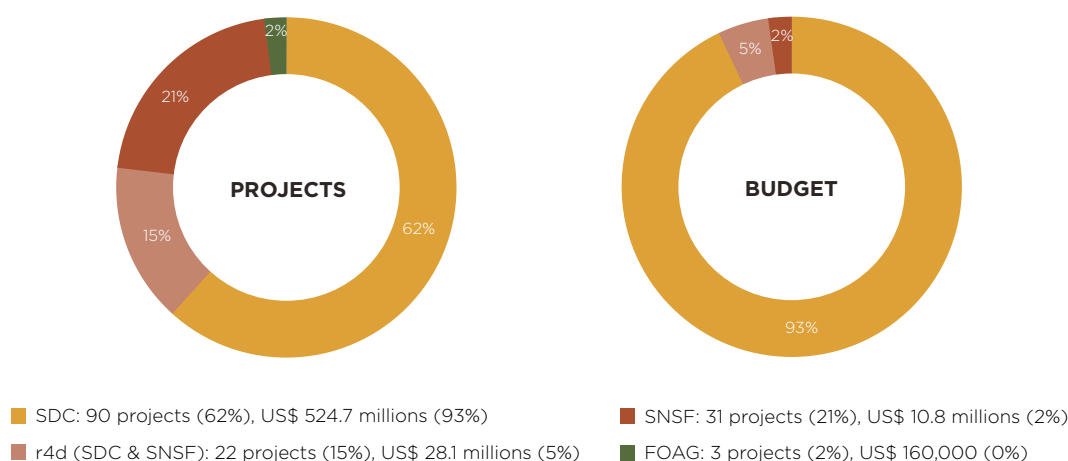


Thematic, geographic and temporal **inclusion criteria** and exclusion of duplicates

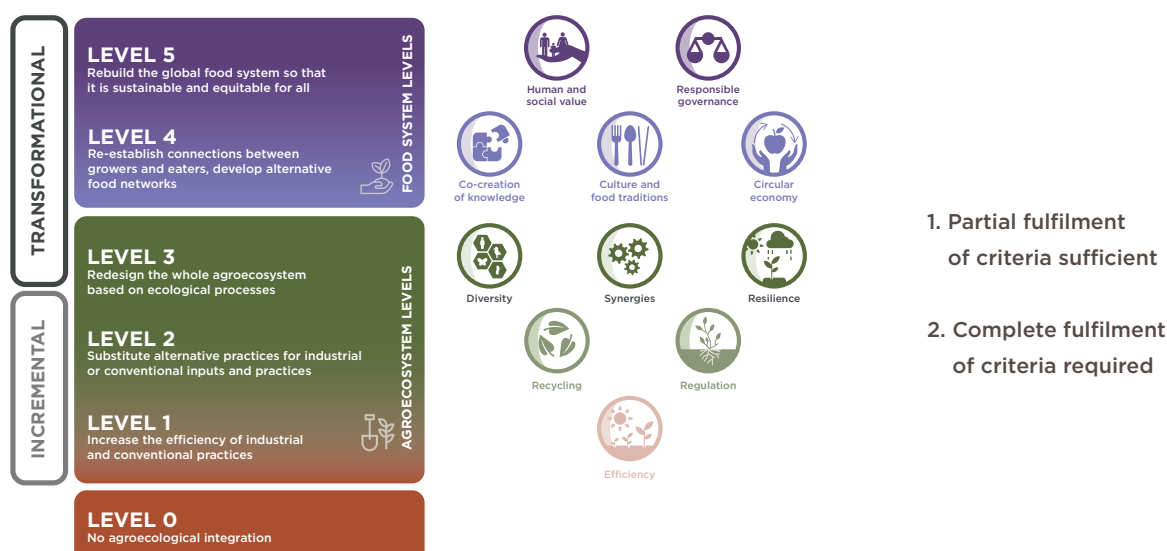


Disaggregation of 5 core contributions to 12 CGIAR research programmes (CRPs)

146 selected projects with a total budget of USD 563.8 million



Two step analysis using the agroecology criteria tool based on Gliessman's 5 levels of food system change and FAO's elements of agroecology



SDC is by far the most important public donor for Swiss AgR4D.

The 146 projects have a total budget of US\$563.8 million,²⁴ of which the SDC contributes the lion's share with over 96% (see Figure 5.1). While SNSF contributes to the funding of 53 projects (36%), its financial contribution to AgR4D pales in comparison to that of the SDC. FOAG contributes small amounts to two networks and one research institute in the form of general contributions.

26% of 'projects' are core contributions to programmes, organisations, networks or research institutes.

While designated as 'projects' in the source databases, the actual scope of these grants is much broader and their budgets much higher than in any single research for development project. For example, 15% of the total assessed budget is accounted for by core contributions to IFAD and its very broad portfolio. This highlights a major limitation of this study: In all the projects,

we were not able to disaggregate budgets in terms of which portion is dedicated to research or specific research foci such as agroecology.

SDC channels a large proportion of its AgR4D budget to the CGIAR system.

Almost one quarter (US\$129.2 million) of SDC's contribution to AgR4D projects is accounted for by five core contributions to the CGIAR. These contributions are divided between the 12 CGIAR CRPs according to the approximate figures provided by SDC's CGIAR focal point.²⁵ Projects with a general, breeding or nutrition and human health focus have proportionally larger budgets. This is a result of the breeding focus of many CRPs, and SDC's major contribution to the CRP A4NH and IFAD. Environmental aspects including climate change feature heavily in many of the assessed projects. However, projects with an environmental focus have a considerably smaller average budget than those focussing on breeding or input provision.



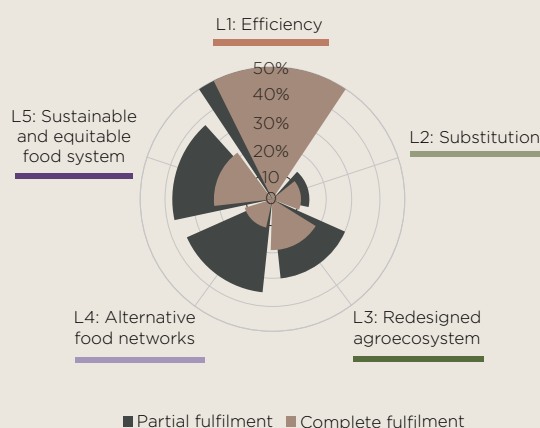
ZOOM #1:

The CGIAR Research Programmes (CRPs)

SDC channels a large proportion of its AgR4D budget through the CGIAR fund, supporting particularly the CRPs on Agriculture for Nutrition and Health (A4NH); Climate Change, Agriculture and Food Security (CCAFS); Grain Legumes and Dryland Cereals (GLDC); Roots, Tubers and Bananas (RTB) and Water, Land and Ecosystems (WLE).

While the focus of most CRPs is on breeding and distribution of improved varieties, ecological and systemic aspects (especially agroforestry and crop-livestock integration) are increasingly being integrated and sustainable intensification has become the overarching goal. This notwithstanding, the major focus is still on increasing production and efficiency. A partial exception is the CRP on Forests, Trees and Agroforestry (FTA), possibly because the 'feed the world narrative' is traditionally less important in forestry than in agriculture. Further, WLE, GLDC, RTB and the CRP on Maize overproportionally contribute to Levels 2 and 3.

Percentage of indicators fulfilled at each level by the CGIAR



²⁴ Throughout this chapter we converted Swiss Francs (CHF) to US Dollars with an exchange rate of 1:1 to facilitate understandability for international readers.

²⁵ M. Evéquo, personal communication.

Good data availability allows for a more detailed analysis.

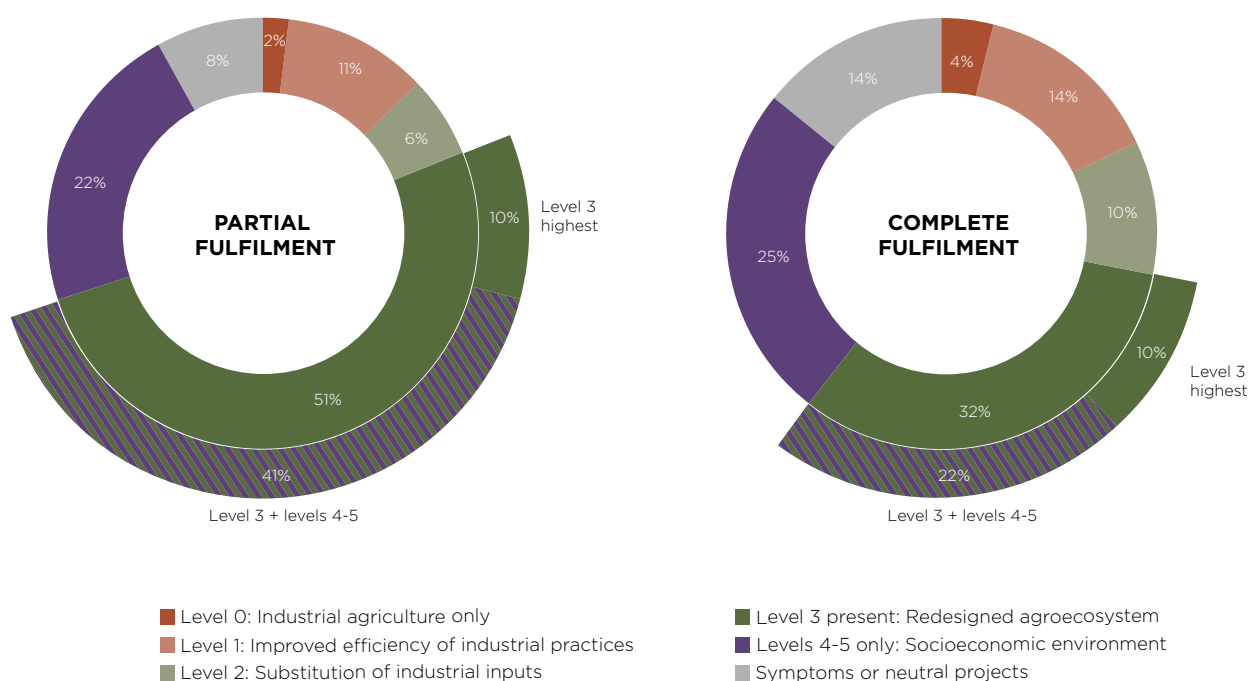
Like the other two case studies, the 146 projects were assessed in terms of reference to criteria corresponding to the 10+ elements of agroecology and five levels of food system change, i.e. using the Agroecology Criteria Tool (ACT) outlined in Chapter 4. This was done through detailed analysis of publicly available documents, including

the descriptions in the three source databases as well as project websites, programme strategies and action plans, and scientific publications. Given the relatively high availability of data for this case study, we were able to extend the assessment and compile a second set of figures based on complete fulfilment of criteria (a 'critical' assessment), as opposed to individual indicators being mentioned (i.e. the 'generous' assessment used through the three case studies).

ANALYSIS ALONG THE FIVE LEVELS OF FOOD SYSTEM TRANSFORMATION

Figure 5.2:

Distribution of Swiss-funded projects contributing to the various levels of food system change for the two types of assessment (146 projects).



Very few projects focus exclusively on industrial agriculture.

Of the projects, 10% do not even partially fulfil any of the indicators of the [Agroecology Criteria Tool](#) (see Figure 5.2). This number rises to 18% in terms of complete fulfilment. Nine projects were classified as neutral because they are based on connecting stakeholders and facilitating the exchange of ideas, without prejudicing the specific models of agri-development. Six projects (4%) aim at increasing yields and profits of industrial production systems, without describing any efforts to increase efficiency, reduce the environmental footprint or enhance social inclusion and equity. A further 12 projects (8%) address the 'symptoms' of industrial agriculture (e.g. environmental degradation, human health impacts).

Nearly a quarter of projects are focussed on the socioeconomic components of food system transformation.

A total of 32 projects (22%) do not even partially fulfil any of the criteria for sustainability on a farm to landscape scale (i.e. Level 1 [efficiency], 2 [substitution] or 3 [redesigned agroecosystems]) but investigate or support aspects relating to re-established connections between consumers and producers (Level 4) or a more equitable and sustainable food system (Level 5) on a regional to global scale (i.e. 'socioeconomic environment only'). Although they do not build knowledge on agroecology at the farm level, it is important to capture these projects in the data as they are part of the evidence base on the contribution of agroecological systems to the SDGs and food system transformation. For example, the University of Berne-led FoodSAF project compares different food systems "(e.g. agro-industrial and agroecological, from production to consumption)" in terms of their outcomes on "realization of the right to food, environmental sustainability, reduction of poverty and inequality, and resilience of food systems going beyond just producing enough" (CDE, n.d.).



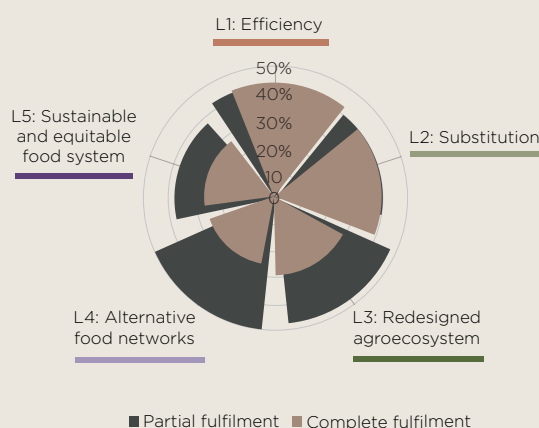
ZOOM #2:

icipe

In the assessed period, SDC supported icipe with three core contributions totalling US\$21.3 million. icipe's strengths in AgR4D are its holistic IPM programs and its focus on natural regulation as well as optimised synergies between different components of agroecosystems.

While being primarily an entomological research institute, icipe recognises the paradoxical nature of insects as both major agricultural pests and as offering sustainable solutions to many issues in tropical agriculture. icipe further acknowledges its social responsibility as an Africa-based research institute to contribute to poverty alleviation and environmental health. This social responsibility is also reflected in its participative approach to research, respecting and promoting traditional knowledge and cultural values aiming at finding innovative and sustainable solutions appropriate for local contexts. This includes the promotion of indigenous vegetables and the investigation of insect larvae for animal feed and human consumption.

Percentage of indicators fulfilled at each level by icipe



Just 17% of projects are limited to efficiency and/or substitution components of food system transformation

Requiring complete fulfilment, the number of projects rises to 24%. About one third of projects include at least efficiency-based concerns (Level 1), particularly reducing post-harvest losses and ensuring more efficient use of (irrigation) water in the remit of climate change adaptation. References to reducing the use of pesticides are quite rare in the assessed projects, but IPM plays an important part in many projects and strategies.

40 projects contribute both to substituting more sustainable inputs and practices and to redesigning agroecosystems.

However, just 27 projects (19%) completely fulfil at least one criterion at both Level 2 and Level 3. Such projects make important steps on the path to a sustainability transformation in agricultural production systems. Level 2 practices (e.g.

composting, biological pest management, cover crops, beekeeping and reduced tillage) can often be more easily implemented than a more fundamental redesign of the agroecosystem, and may thus help to bridge the gap between industrial agriculture and more systemic agroecological approaches.

Systemic, transformative projects exist – at least on paper.

Sixty projects (41%) partially fulfil the criteria for contributing to redesigned agroecosystems (Level 3) and simultaneously to social and political change at regional to global scales (Levels 4 and 5). Of these, 32 projects (22%) completely fulfil the various criteria. These projects contribute to enhanced diversity, synergies or resilience at farm to landscape level and simultaneously promote food system change on a larger scale. Further, 22 projects (15%) completely fulfil criteria for both Level 2 and Level 3 and at least one indicator of Levels 4 to 5.

FiBL

ZOOM #3:

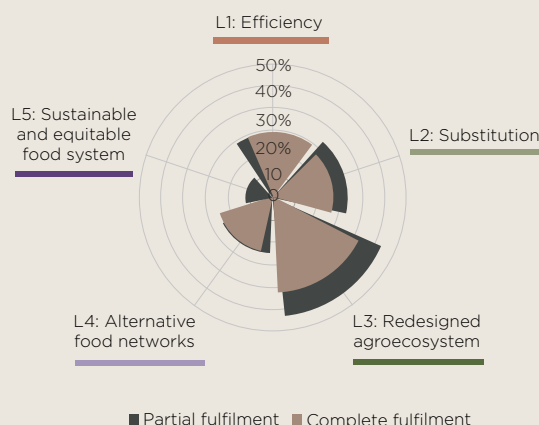
Faming systems comparson in the tropics (SysCom)

SysCom received US\$3.6 million in SDC funding to carry out long-term trials in Bolivia, India and Kenya, comparing industrial and organic production systems. While led and coordinated by FiBL, the project involved numerous other research institutes from Bolivia, Europe, India and Kenya.

The research aimed to provide solid agronomic, economic and ecological evidence of the advantages of holistic and systems-oriented agriculture, adapted to the specific conditions and requirements of different agroecological regions in the tropics.

The project thus contributes particularly to Level 2 (e.g. conservation tillage, organic fertilization and pest management) and Level 3 (e.g. agroforestry, biodiversity, crop rotation, inter-cropping, systemic climate change mitigation and resilience). Further, participatory on-farm research and interactive knowledge sharing play a key role in the methodology.

Percentage of indicators fulfilled at each level by SysCom



Projects of this nature appear to take a highly systemic perspective to transforming the food system, entailing farm-level changes to increase recycling, regulation and balance while simultaneously aiming at redesigned agroecosystems at the landscape level and promoting enhanced equity and inclusion at a regional to global scale.

It should be noted, however, that these 22 'projects' are mostly core contributions to large organisations or programmes with a broad research portfolio, including the CGIAR's CRPs. These focus mostly on breeding and distribution of improved varieties, and individual components of agroecology are rarely prominently mentioned (see Zoom #1). On the other hand, also included are core contributions to the Nairobi-based icipe (see Zoom #2). icipe is renowned for advancing innovative approaches to agricultural development in Africa, combining cutting-edge entomological research with a systemic vision

of food production, poverty alleviation and conservation of natural resources. While not all of icipe's projects contain elements of agroecology, understanding and enhancing synergies between different trophic levels plays a key role in its research strategy.

The 22 projects also include examples of long-term research that explicitly emphasizes agroecology or at least components of agroecology such as the FiBL-led farming systems comparison in the tropics project (SysCom, Zoom #3).

Another example is the ETHZ-led YAMSYS project (see Zoom #4), which not only investigates individual Level 2 and 3 practices (e.g. composting, complex crop rotations and agroforestry) but also considers local cultural values linked to the food system and traditional ecological knowledge, as well as promoting the co-creation of knowledge through the active participation of farmers.

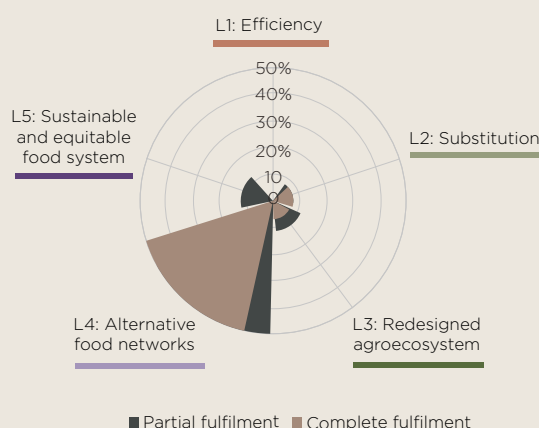


ZOOM #4: YAMSYS

Receiving over US\$3 million in funding through the r4d programme, the YAMSYS project is led by ETHZ, and carried out in collaboration with researchers from FiBL and several West African research institutes. It focuses on soil fertility management in the cultivation of the orphan crop yam (*Dioscorea* spp.), a staple in many African countries.

YAMSYS aims at increasing crop productivity and food security as well as incomes of different actors along the yam value chain, as well as environmental sustainability. Thus it stands out as a particularly systemic research project, including soil and crop management (e.g. organic fertilizers and crop rotations) and socio-cultural aspects (e.g. beliefs, desires and social pressures) related to farming and local food systems. Meanwhile it also demonstrates the limitations of most scientific research projects, as only isolated indicators of agroecology are addressed.

Percentage of indicators fulfilled
at each level by YAMSYS



ANALYSIS ALONG THE 10+ ELEMENTS OF AGROECOLOGY

Overall, analysis of Swiss AgR4D shows a balanced picture (see Figure 5.3). While there is much focus on improving efficiency of input use, more complex elements of agroecology also receive considerable attention.

Circular and solidarity economy, cultural values and food traditions as well as co-creation of knowledge receive very little support and attention.

Just 26 projects (17.8%) completely fulfil the criteria for at least one indicator of these three elements. While a considerable number of projects include value chain approaches, the focus is mostly on facilitating access to international markets and income maximisation, with little attention to local food systems and shorter value chains. Regional value addition through localised processing and marketing is in fact absent from most projects.

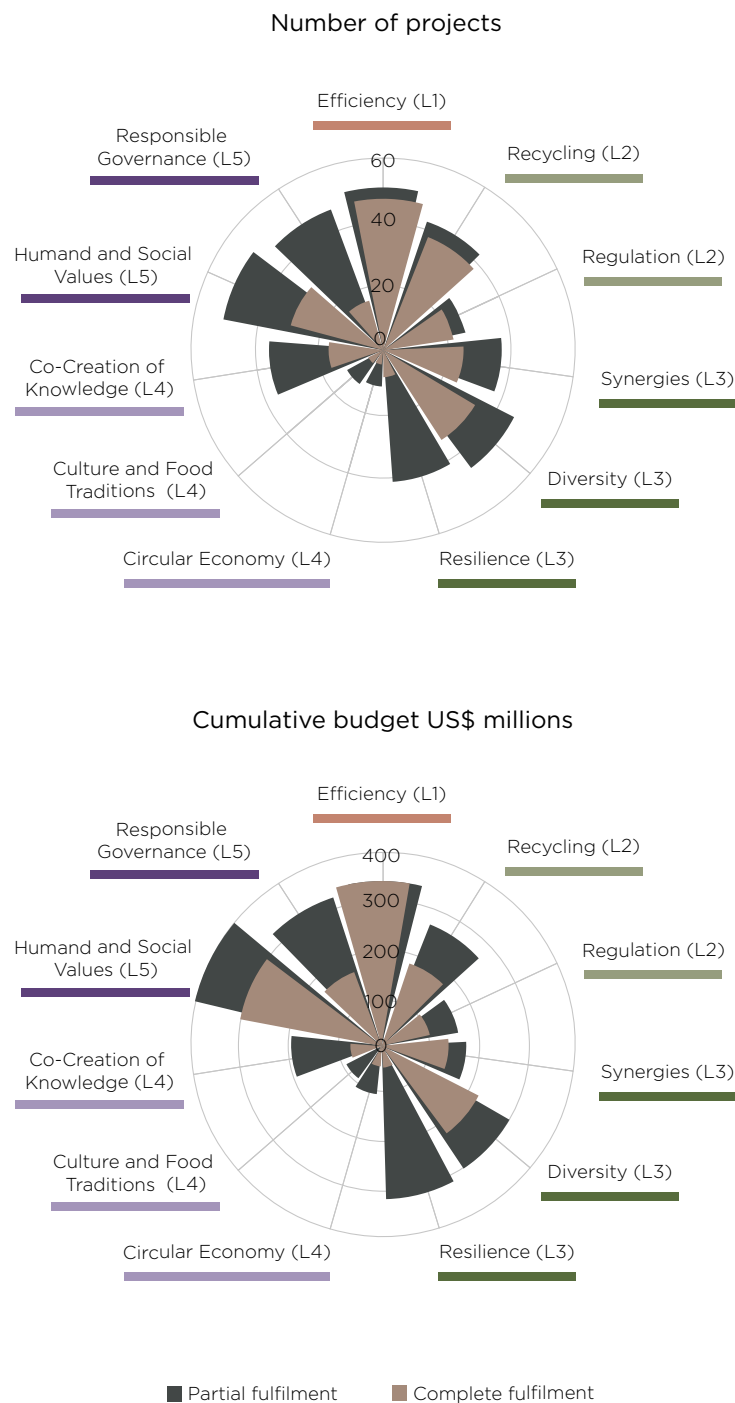
Likewise, the limited number of projects working on cultural values reflects insufficient efforts, to date, to promote transdisciplinary and interdisciplinary research that combine aspects of social sciences with agronomy and ecology.

On the other hand, the fact that a considerable number of projects commit to participatory research is promising, in that the enhanced inclusion of local perspectives (e.g. through the inclusion of local and traditional knowledge, farmer field schools) will bring to light the demands and requirements of smallholder farmers that can be assumed to go beyond mere increases in productivity. This will, however, only be possible if participatory approaches are applied in earnest and a shift occurs from paternalistic, top-down approaches to co-creation processes that valorise local knowledge and culture. Such a shift is crucial given that cultural values, at present, tend to be assessed only as potential barriers to the adoption of modern technologies.



Figure 5.3:

Total number and cumulative budget of Swiss-funded projects focussed on at least one element of agroecology. Projects focussed only on the socioeconomic environment (i.e. Levels [L] 4 and 5) were excluded in the graphic.



**Synergies and diversity:
Most projects contribute only to
singular components of these core
elements of agroecosystem redesign.**

Sixty projects (41%) partially fulfil at least one indicator of these elements, but on average each of the projects completely fulfils just 2.5 of the 15 indicators of the *Agroecology Criteria Tool*. Agroforestry and the integration of crop and livestock farming are the most frequently occurring entry points for achieving 'optimised synergies'. Pest management through habitat manipulation is in most cases only mentioned as a part of broader IPM strategies and other landscape planning activities such as windbreaks and water harvesting measures, and generally without explicit reference to enhanced ecosystem services or optimised synergies. Climate mitigation approaches at a systemic or landscape level are rarely mentioned, and even fewer projects detail how emissions reductions are to be achieved and measured.

Twenty-three projects aim at diversifying diets but just 14 of them include a focus on increasing the diversity of locally or regionally produced foods. This is even the case for the CRP A4NH, which emphasizes biofortification and biosafety while the few references to agricultural diversification are in relation to value chain development and income generation. In a similar vein, a number of projects, including most CRPs, mention that breeding will be performed to adapt crops/races to biotic and abiotic conditions prevailing for example in certain mega-environments, but few of the 146 assessed projects aim at supporting localised breeding and adaptation to truly local or regional needs. Further, protecting or enhancing (agro-)biodiversity is often mentioned briefly, but few projects provide any information as to how this is to be achieved.

Also, aspects like crop rotation and mixed cropping are often looked at as isolated individual practices and not as part of a more holistic redesign of the agroecosystem.

**Resilience, equity and social inclusion
are often mentioned, but rarely
approached comprehensively.**

Resilience is very much in vogue in international development cooperation and donors often require resilience-enhancing approaches. It has become a major buzzword, pervasive throughout proposals and strategies. However, at the same time, resilience is a highly complex topic and inherently difficult to measure. Thus, 40 projects (27%) mention resilience (especially to climate change) by name, yet very few are explicit in how they define resilience and how it is to be achieved. A systemic notion of enhancing resilience is absent from all but seven projects (5%).

Similarly, many projects include elements such as evidence-based policy development and science-policy interfaces, yet references to truly inclusive, pro-poor or multi-stakeholder approaches to policy development are much less common.

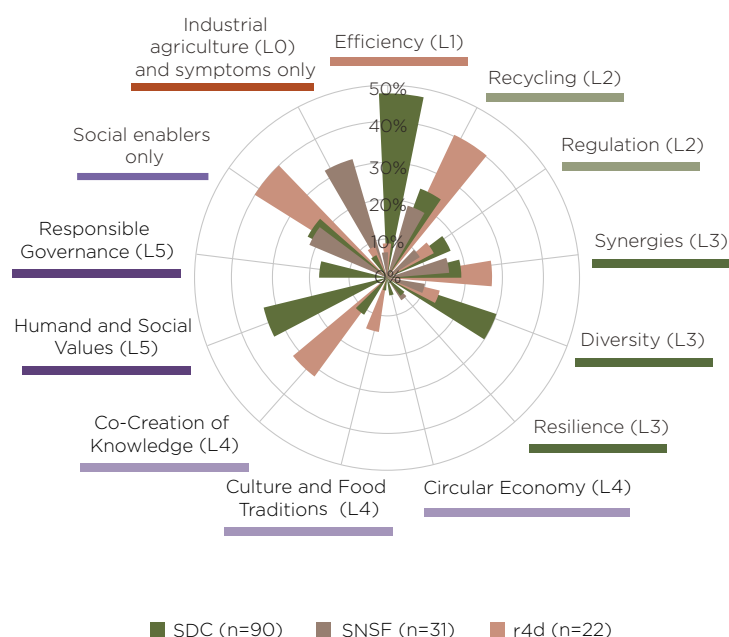
**Gender-sensitive approaches are
common due to the mainstreaming
of gender in most organisations.**

The fact that most projects aim at empowering women and/or creating opportunities for youth should considerably contribute to sustainability and inclusion. It should be noted that the CRPs demonstrate particularly advanced integration of gender and youth dimensions in all their strategies. However, other vulnerable groups such as indigenous people, landless farmers, the elderly or the urban poor are far less frequently mentioned, suggesting that the mainstreaming of individual issues does not necessarily go hand in hand with participatory and pro-poor approaches.

RESULTS DISAGGREGATED BY KEY DONORS

Figure 5.4:

Percentages of projects funded by the SDC, SNSF or both jointly through the r4d programme that completely fulfil at least one criterion of each element of agroecology. The diagram includes projects focussed only on the socioeconomic environment (Levels [L] 4 and 5) or on industrial agriculture (L0) and its symptoms.



Nearly all projects focussing only on industrial agriculture are funded by the SNSF.

Almost one third of projects funded directly by the SNSF are focussed on industrial agriculture and do not have clearly specified sustainability components (see Figure 5.4). This could be due to the fact that many Swiss research institutes rely heavily on biotechnology and cooperation with the private sector. Also, while sustainability has been on the development agenda for a considerable amount of time, it has only come to the forefront of mainstream agricultural research in recent years.

Increasing the efficiency of industrial input use plays an important role in SDC-funded projects, but is hardly considered at all by SNSF-funded research projects.

This can likely be explained by the argument that in development projects, providing inputs and guaranteeing its efficient use is still an important component, whereas from a research perspective this is not a particularly interesting field for innovation and investigation.

Addressing socioeconomic and political aspects of food system transformation plays a key role in SDC-funded research, yet is virtually absent in traditional SNSF-funded research.

A possible explanation for this difference is that in a traditional SNSF project, impact through scientific publication is most important, whereas for SDC funding (including through the r4d programme) socio-political impact is pivotal. r4d projects generally have a longer timeframe than traditional research projects, and are therefore better-placed to take on complex systemic and interdisciplinary research. Furthermore, the average number of indicators completely fulfilled in SDC-funded projects (4.2) and in r4d projects (2.4) is considerably higher than in SNSF-funded projects (1.1), which usually address singular issues.

Recycling and optimising synergies plays a major role in SNSF-funded projects; diversity is particularly salient in SDC's project portfolio.

There is a particular focus on composting and rearing insects on waste material, especially in projects funded through the r4d programme. In SNSF-funded projects (including r4d projects), agroforestry plays a key role. Very few projects, however, address more than one indicator of the core element of agroecology, optimizing synergies, underlining the general lack of systemic research approaches under SNSF funding schemes. For SDC, with its emphasis on food and nutrition security, crop and diet diversification are of particular importance.

RESULTS DISAGGREGATED BY RECIPIENT TYPES AND LOCATION

Just 10% of projects have the main recipient based in sub-Saharan Africa, but those performed the best in our assessments.

Not only do these projects disproportionately include agroecological farm-level approaches, but they also tend to promote social values and responsible governance at a regional scale. Particularly noteworthy is that projects led by African institutions are far more devoted to participatory approaches in knowledge generation and dissemination (see Figure 5.5).

Projects led by international institutions are particularly focussed on improving efficiency, as well as promoting gender equity and opportunities for youth.

Examples here are projects and programmes led by large multilateral organisations such as IFAD and FAO, as well as the CRPs. The focus on efficiency with limited dedication to systemic landscape approaches is also prevalent in the few projects led by Swiss NGOs, which were included in this study. Indeed, those eight projects, which received a total of US\$31.3 million in SDC funding, focus mostly on post-harvest loss prevention, irrigation and water management, and private sector and value chain development, without a specific focus on local or regional markets.

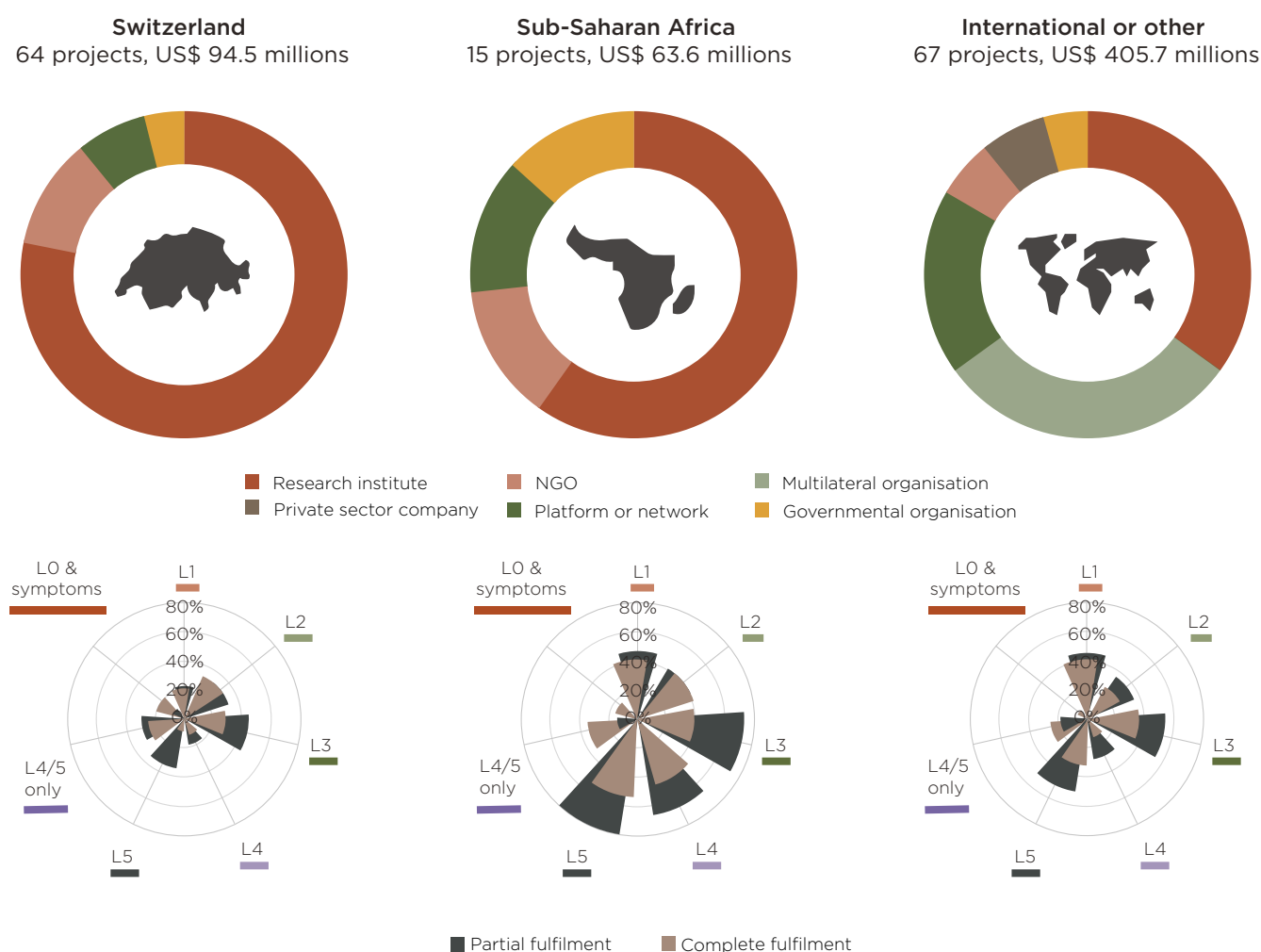
The majority (78%) of Swiss-based recipients are research institutes and most projects address only isolated issues.

For most SNSF funding schemes, the main applicant needs to be based in Switzerland, yet in most cases (68%) some form of collaboration with an African research institute is detailed in

the proposals or project descriptions. Among the projects led by Swiss research institutes, most go beyond efficiency-only approaches, and there is considerable focus on investigating environmentally sound farm-to-landscape level improvements. However, most address only single indicators of the [Agroecology Criteria Tool](#), and truly systemic approaches are still largely lacking.

Figure 5.5:

Breakdown of project percentages led by different types of organisations and based in different locations (Switzerland, sub-Saharan Africa, international). The diagram also shows performance by location in relation to the five levels of food system transformation.



QUALITATIVE ANALYSIS

The interview guide used in [Chapter 3](#) was adapted to the Swiss case and structured around three sections: (i) the interviewee's personal background, career and opinions regarding AgR4D; (ii) the strategic focus of the represented institution as well as institutional lock-ins and leverages regarding enhanced support for agroecology; and (iii) the interviewee's perception of the general Swiss AgR4D landscape and windows of opportunity for advocating for agroecology with different key stakeholders and sectors of society.

The interview guide was pre-tested and further adapted to each interviewee. A total of 15 individuals, with employment ranging from strategic positions in governmental institutions (SDC and SNSF), research institutes (ETH, FiBL, HAFL, University of Berne), NGOs (Helvetas, Swisscontact, Syngenta Foundation) and the inter-institutional network SFIAR, were interviewed. The results were analysed qualitatively and the answers to key questions semi-quantified, based on post hoc defined categories (see Figure 5.6).

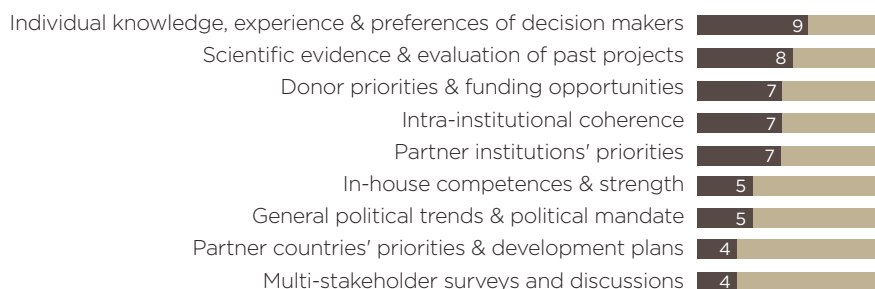


Figure 5.6:

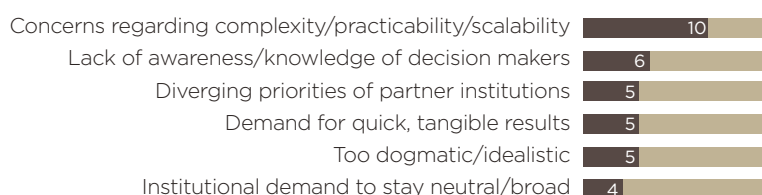
Overview of the answers of 15 interviewees (multiple answers possible for each question) from different sectors of society to selected questions. The answers were categorized post hoc, based on patterns in the opinions expressed by different stakeholders.

NUMBER OF ANSWERS TO SOME KEY QUESTIONS BY 15 INTERVIEW PARTNERS

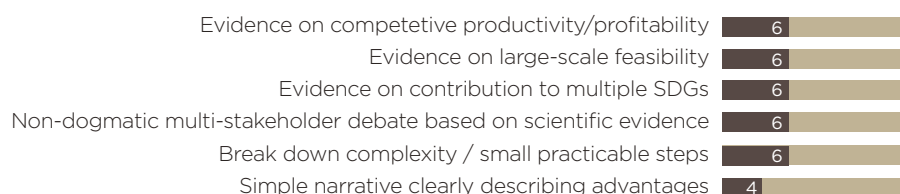
Key factors influencing decisions on AgR4D strategy and funding/research priorities



Barriers and limitations for enhanced institutional support for agroecology



Requirements for enhanced institutional support for agroecology



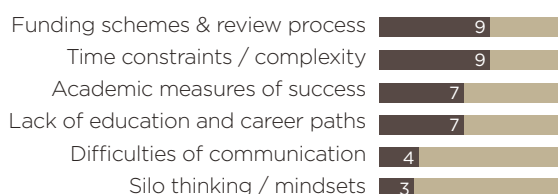
Institutional support for agroecology (avg.)



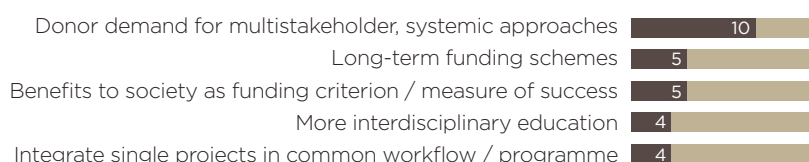
Flexibility regarding funding/research priorities (avg.)



Limitations for systemic interdisciplinary AgR4D



Approaches for fostering systemic AgR4D



Support for agroecology is high among Swiss AgR4D institutions, but most stakeholders are concerned that agroecology is too complex for research and implementation and that it may not be economically viable on a large scale.

For Swiss AgR4D actors, the most compelling arguments in favour of agroecology are its multifunctionality, its circularity (i.e. its focus on closing natural cycles), its systemic nature and its potential to improve the health of producers and consumers alike – and to contribute to multiple SDGs.²⁶

On the other hand, scepticism prevails regarding agroecology's economic viability and competitiveness in terms of productivity and profitability, although most stakeholders acknowledge that true cost accounting and the impacts of the climate crisis may shift perceptions in that regard and tip cost-benefit ratios in favour of agroecology.

A key point of concern for many institutions is the inherent complexity of agroecology: researching or implementing agroecological systems under the typically limited timeframes of both research and development cooperation projects was seen as a major challenge. Further, a number of stakeholders expressed doubts regarding the scalability of agroecology, perceiving it mostly as an option for individual smallholders with limited potential for integration in regional or global value chains.

Consequently, there is a strong demand among Swiss institutions for evidence that shows that agroecological production systems can compete with industrial systems on a larger scale while still maintaining their multifunctionality and contributing to multiple SDGs. A number of stakeholders also called for breaking down the complexity of agroecology and focussing on individual aspects – such as agroforestry, mixed-

or intercropping, complex crop rotations – to make the research and implementation of agroecology feasible under the financial and time constraints of individual research or development projects. This rationale may help to explain why most Swiss AgR4D projects currently address only isolated aspects of agroecology (see previous sections), although most interviewees acknowledged that the systemic nature of agroecology is one of its key strengths.

There is a need for more long-term funding and increasing demand from donors and research institutions for systemic and multi-stakeholder approaches.

According to respondents, systemic, interdisciplinary and transdisciplinary research is held back by the fact that scientific funding schemes, proposal review processes and broader educational and career opportunities tend to be sector- or discipline-specific, as well as the narrowly focussed measures of success used in academia. Further, systemic research inherently is more complex and resource-intensive (in terms of time, money and human resources). As the siloed thinking in academia is slow to change, a majority of interviewees called for donors to be more demanding in regards to including systemic perspectives and transdisciplinary multi-stakeholder approaches in research projects from the beginning, although this may require longer timeframes in AgR4D funding. Further, interviewees saw an urgent need to make academic training and scientific career paths more permissive for inter- and transdisciplinarity, which would also imply changing the current measures of success – focussed excessively on publications in sectorial journals – and rewarding researchers that aim at providing benefits to society through their work. Some respondents highlighted steps that are already being taken in this regard.

²⁶ This positive view of and interest in agroecology as well as the perceived need for holistic, systems-oriented approaches were also highlighted in a recent report by SFIAR upon a mandate by SDC: SFIAR (2018). *Challengers, needs and competencies in agricultural research for development (ARD). Mapping among Swiss institutions and current donor strategies.* (unpublished)

As long-term funding opportunities such as through the r4d programme are rare, institutions like the ETH World Food Systems Centre aim at combining individually funded and managed research projects in a systemic and integrated work stream. Further, the SDC hopes to be able to promote more long-term and large-scale systemic AgR4D by establishing international and inter-sectorial donor alliances and by influencing large AgR4D actors like the CGIAR.

Dogmatism by parts of the agroecology community is perceived as counterproductive.

Nearly all institutions view agroecology very favourably and include many of its components and principles in projects and strategies, but few commit fully and openly to agroecology, partially to avoid being 'branded' as opponents of industrial agriculture. Many institutions are obliged by their own strategy, a political mandate or their dependence on diverse donors to stay broad and neutral in their AgR4D portfolio. Hence, most stakeholders call for a pragmatic view of agroecology, not only focussing on truly transformative systems but also on stepwise sustainability improvements in industrial systems through the integration of individual agroecology practices.²⁷

Most interviewees consider an open, non-dogmatic debate about the future of AgR4D involving all relevant stakeholders as the best

means for promoting a transition to sustainable food systems. The discourse should be based on scientific evidence rather than ideological arguments, and no actors or approaches should be "demonized", but rather held accountable vis-à-vis their commitments and contributions to the SDGs.

Building awareness of the multiple benefits of agroecology among individual decisionmakers is of fundamental importance in enhancing support for agroecology.

Awareness and knowledge of agroecology among the interviewees and within their institutions is generally quite high. Nonetheless, around half of the interviewees expressed confusion regarding the different definitions and scales of agroecology. For many, agroecology simply provides an ecological perspective to agricultural production, while the social and economic dimensions and considerations of agroecology appear to be much less well known. Spreading this broader awareness is particularly important, given that individual decisionmakers tend to enjoy considerable freedom to determine research and funding priorities in Swiss AgR4D institutions. This may require simple narratives focussing on the macroeconomic costs of industrial agriculture ("cheap food is too expensive") and the multiple benefits of agroecology ("healthy food, produced by healthy people in a healthy environment").

²⁷ For a similar opinion see: Eyhorn, F., et al. (2019). *Sustainability in global agriculture driven by organic farming*. Nature Sustainability 2, 253-5, doi.org/10.1038/s41893-019-0266-6.



6

THE BILL AND MELINDA GATES FOUNDATION'S AGRICULTURAL RESEARCH FUNDING: AGRICULTURE WITHOUT ECOLOGY?



KEY MESSAGES

Below are the key findings regarding the investments of the BMGF between 2015 and 2018, based on a review of the relevant literature, quantitative analysis of 137 AgR4D projects worth US\$807 million, and qualitative analysis of interviews with relevant stakeholders:

- As many as 85% of BMGF investments in AgR4D are limited to supporting industrial agriculture and/or increasing its efficiency. More than one third of the projects addressing Level 1 of food system change, i.e. increasing the efficiency of industrial practices, are focussed on livestock vaccines.
- Only 3% of the Foundation's projects have agroecological components, although none of these refer to agroecology explicitly.
- Of the projects, 10% addressed some socioeconomic or political elements of agroecology (i.e. corresponding to Levels 4 and 5) without addressing any production-related agroecology elements.
- International research institutes, including the CGIAR centres, account for more than 70% of the BMGF's AgR4D projects and budget. Grants to the CGIAR and its research programmes are on average 20% higher than other grants.
- NGOs are another major funding recipient, receiving 17% of all funding, highlighting their importance as research for development actors.
- BMGF research funding is focussed on organisations outside sub-Saharan Africa, with only 2% of funding directed to research institutes in sub-Saharan Africa. The African Agricultural Technology Foundation (AATF) receives nearly half of the total funding directed to African institutions.
- Scalability and scientific evidence of what works are key drivers of decision-making within the BMGF. In this context, agroecology has struggled to gain institutional support. There is, nonetheless, individual support within the BMGF for moving beyond productivity, and considerable degrees of adaptability exist. Building an agroecological evidence base at the level of production is key, including showcasing its role in larger-scale transformation.

INTRODUCTION

The BMGF's philanthropic activities began in 1997. Over the next 20 years, the number of donations increased significantly, making it the largest global philanthropic foundation. The OECD's 2019 assessment of the role of private philanthropic foundations shows that BMGF accounts for almost half of global philanthropic donations recorded (OECD, 2019).

Among the BMGF's grantmaking areas, its Global Growth and Opportunity Programme includes agricultural development grants. Despite its relatively recent involvement in such work, the BMGF has come to dominate the field with total donations of US\$4.9 billion since the programme's inception in 2006 (Schurman, 2018). Universities, CGIAR research programmes, inter-governmental and governmental organisations, and private research institutes are among the primary recipients of funding.

Given its funding volumes and global network of partners, the BMGF has significant ability to shape the global agri-development agenda, making it vital to understand the drivers of the BMGF's funding decisions.

The BMGF agricultural development strategy focusses on increasing smallholder incomes in sub-Saharan Africa (BMGF, 2019) via agricultural intensification and improving access to markets. The rural development challenges the foundation prioritises include low productivity of smallholder farmers, low agricultural profitability, insufficient market development and limited inclusion of vulnerable groups, in particular women.

The BMGF seeks to address these challenges and support agricultural transformation (BMGF, 2019) through four focus areas: women's empowerment in agriculture; agricultural productivity; increased smallholder household income; and increased consumption of safe, affordable and nutritious diets

At the core of the strategy is agricultural modernisation with a focus on smallholders transitioning from subsistence to commercial production and thereby moving out of poverty. The BMGF's most recent strategy specifically aims to invest in (i) productivity-enhancing global public goods, including research and extension of new technologies; (ii) enabling country systems (policies, strategies) in support of agricultural transformation; and (iii) supporting partners in scaling up impact for farmers. Regarding AgR4D, three areas receive particular attention within the strategy: seed systems and variety improvement in response to the changing climate; high-risk, high-reward crop development with specific reference to increased yields; and livestock productivity growth and health (BMGF, 2019).

The BMGF's strategic focus on productivity, incomes and agricultural transformation to lift smallholders out of poverty fails to explicitly reference sustainability concerns, ecological principles or systemic approaches to agriculture. Given the increasing emphasis on sustainable agriculture around the world, and in particular the recent momentum around agroecological approaches, this chapter analyses the extent to which BMGF investments in AgR4D – which on the surface appear to support industrial agricultural practices – take into account or support alternative approaches.

METHODOLOGY

To analyse the directionality of agricultural investments in AgR4D, the following quantitative and qualitative methods were used.

QUANTITATIVE METHODS

To identify the BMGF's investments in AgR4D, the publicly available awarded grants database was used.²⁸ Based on the dataset, the following six variables were recorded: primary recipient name; date; purpose statement in the form of a descriptive paragraph; geographic regions or countries served; location of the recipient; and amount in US Dollars (US\$).

To filter for AgR4D, a decision tree (outlined in [Chapter 4](#)) was developed. Projects were included based on meeting a broad definition of research for development that included advisory and extension services along with basic research, applied research and experimental development. If the purpose statement and primary recipient name failed to reveal sufficient information, supplementary web searches were undertaken. Two additional filters were used: first, geographically irrelevant (i.e. not in sub-Saharan Africa) projects were excluded; second, the purpose statement was used to determine whether investments were related to farm-level improvements.

As of March 2019, 137 out of a total of 734 projects in the Global Growth and Opportunity Programme between 2015 and 2018 qualified as AgR4D projects relevant to sub-Saharan Africa.

These were exported and coded²⁹ according to the [Agroecology Criteria Tool](#) which is derived from the analytical framework of Gliessman's five levels of food system transformation (see [Chapter 4](#) for more details on the methodological framework).

The lack of detailed information on funding proposals in the database raised challenges in terms of categorising projects and getting more detailed picture of the funding distribution.

QUALITATIVE METHODS

The qualitative methods included as a first step a review of existing literature on the BMGF. Second, semi-structured interviews of former key BMGF employees and funding recipients were conducted using nonprobability, snowball sampling.

In order to protect interviewees' identities, names are not used in the report. Their positions included a former deputy director, two former programme officers and recipients of BMGF funding past and present. While some remain close to the Foundation, the interviewees were particularly well-placed to speak to the BMGF's venture into agricultural development starting in the late 2000s.

The qualitative analysis had the main shortcoming of failing to secure an interview with a current member of the BMGF team. As a saturation point was reached during the interviews of past staff members, it is unlikely, albeit possible, that such an interview would have provided major new insights into the current funding strategy.

²⁸ www.gatesfoundation.org/How-We-Work/Quick-Links/Grants-Database

²⁹ using Atlas.ti software

OVERVIEW OF MONEY FLOW ASSESSMENT

RECIPIENT TYPES AND DIVERSITY OF INSTITUTIONS

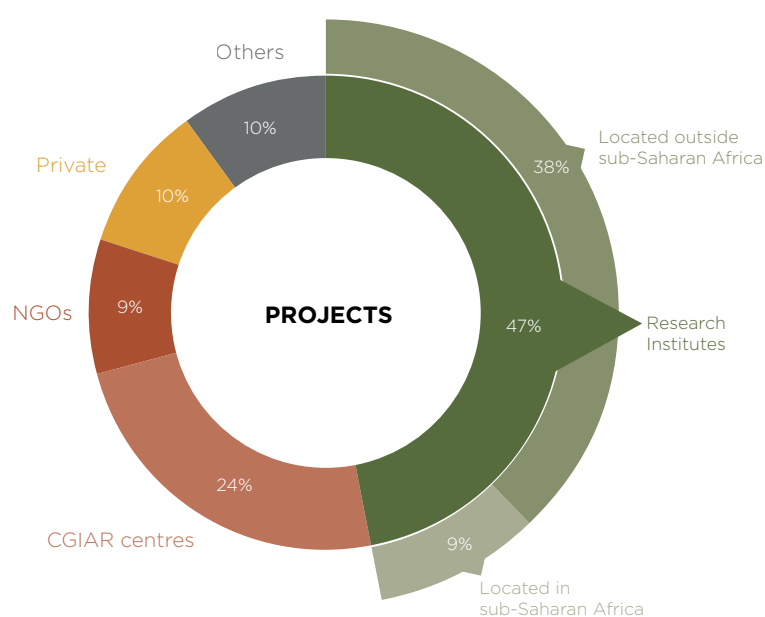
Four major types of recipients of BMGF AgR4D funding for the period 2015-2018 were identified. These are research institutes (including private and public universities), CGIAR research centres, NGOs and private enterprises. In addition to these major categories, BMGF AgR4D funding also goes to governmental organisations, intergovernmental and multilateral organisations and platforms. This latter group represents a minor share of BMGF funding both in number (10%) and absolute value (8%). Research institutes and the CGIAR

research centres stand out over other grantees in terms of the share of projects and total funding they represent. Of the 137 AgR4D projects, CGIAR centres and other international research institutes together account for 71% (98) of all AgR4D projects. The largest recipient in terms of number of projects financed is Cornell University (4) for research institutes and CIMMYT (8) for the CGIAR centres. NGOs (9%) and private enterprises (10%) account for a limited share of BMGF grants (Figure 6.1).

Over 70% of BMGF AgR4D investments flow through CGIAR centres and other international research institutes.

Figure 6.1:

Distribution of BMGF-funded AgR4D projects by recipient type (Total: 137 projects)



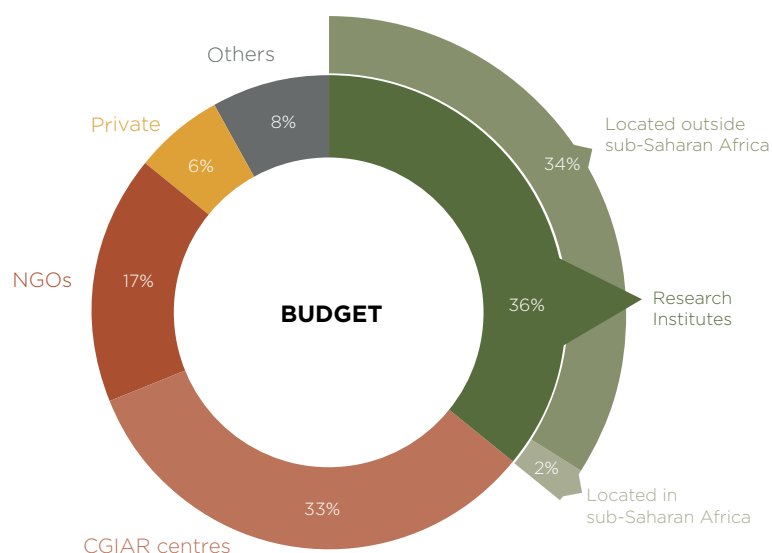
CGIAR centres receive one third of all funding.

Research institutes remain the biggest beneficiaries in terms of net funding (see Figure 6.2), although by a smaller margin, with CGIAR centres (33%) and NGOs (17%) increasing their

share. Among the CGIAR CRPs, GLDC and RTB are the biggest recipients of funding, and account for 80% of all funding to CRPs (US\$40 million out of US\$50 million total funding between 2015 to 2018; see [Chapter 2](#) for a detailed breakdown of CGIAR funding).

Figure 6.2:

Distribution of BMGF budget for AgR4D by recipient type (Total funding: US\$807 million)



Projects by the CGIAR and its research programmes receive on average 20% more funding.

CGIAR research centres receive a significant share of BMGF funding. This amounted to more than US\$265 million in total over the period in question, at an average of about US\$8 million per project and around US\$2 million more than other research institutes tended to receive.

Only a handful of research institutes located in sub-Saharan Africa receive funding.

US and UK-based research institutes receive the most funding from the BMGF both in terms of number of grants and funding volumes. Of the 52 grants to research institutes located outside sub-Saharan Africa, 25 were US research institutes receiving 27% of total funding, while the 12 from the UK received 10% (see Figure 6.3). Research institutes located in sub-Saharan Africa received 12 grants corresponding to 9% of all projects.

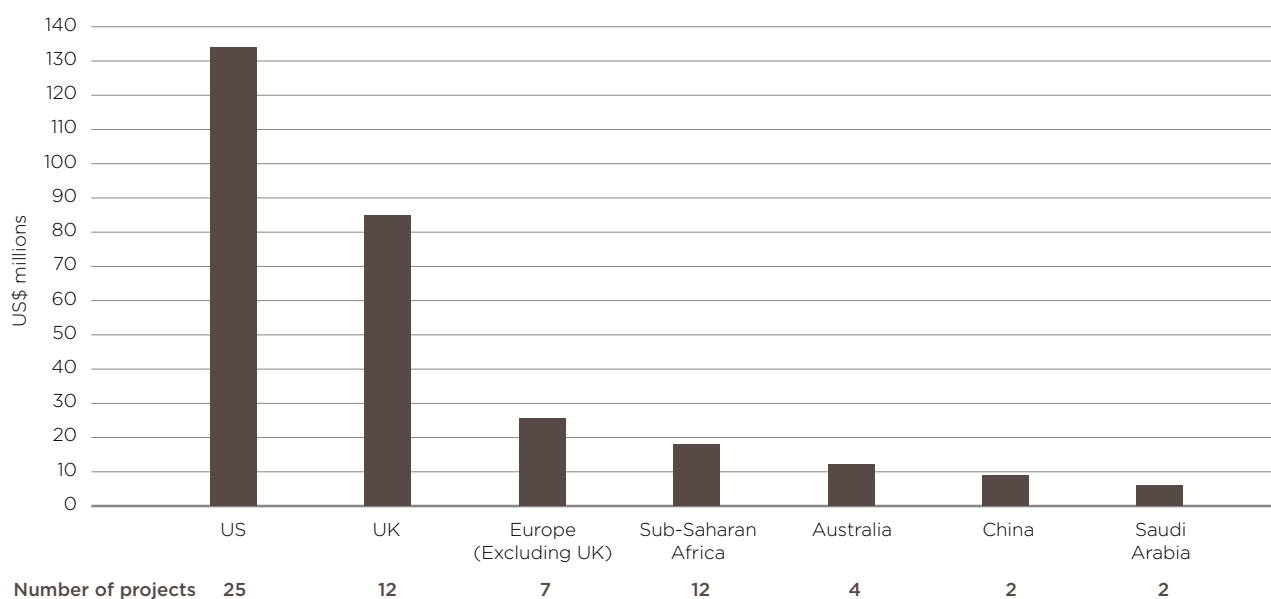
Moreover, the budgets of these projects were much lower compared to the counterparts from outside sub-Saharan Africa. With one exception (i.e. Obafemi Owolowo from the University of Nigeria), all BMGF grants to African research institutes were below US\$0.5 million. This is 14 times lower than the average amount of funding received by the CGIAR research centres. This also explains the considerably smaller 2% share of funding directed to research institutes in sub-Saharan Africa (see Figure 6.2).

The African Agricultural Technology Foundation (AATF) receives nearly half of the total funding to Africa-based projects.

The trend of organisations in sub-Saharan Africa receiving fewer and lower grants can also be observed for other recipient types. The AATF alone accounted for nearly half of the US\$79 million of cumulative AgR4D funding that went to recipients in Africa. The other half was shared by research institutes, NGOs and governmental agencies.

Figure 6.3:

Distribution of projects and their cumulative funding by location



ANALYSIS OF BMGF INVESTMENTS BY LEVELS OF FOOD SYSTEM CHANGE

The majority of BMGF investments in AgR4D contribute to industrial agriculture and related practices.

Further, only one project is focussed on alleviating the symptoms of industrial agriculture.

In total, 80 projects (58%) do not meet any of the criteria for food system transformation. The majority of these (43% of all projects) are classified at Level 0, as they focus on increasing profits and productivity within conventional systems without any substantial reference to sustainability. While agroecological practices appear to be lacking, these projects are well aligned with the BMGF's agricultural development strategy (see below). Their focus is on the development of technologies such as hybrid seeds with potential to deliver quick results, meaning increasing productivity and incomes for smallholder farmers.

In addition to the Level 0 projects, 20 research investments (15%) are classified as neutral. They relate, for example, to strengthening agricultural development research portfolios of research institutes, general institutional support to platforms and broad support to human health and environment without specific reference to any of the levels of food system transformation. The cumulative value of funding received by these projects represents less than 3% of the total funding for the years concerned.

LEVEL 1: INCREASED EFFICIENCY OF INDUSTRIAL INPUTS

Thirty-six projects (26%) focus on increasing the efficiency of industrial and conventional practices, suggesting an incremental approach to improving sustainability.³⁰ Examples include CIMMYT's efforts to develop hybrid seeds for more efficient use of inputs by resource-poor farmers, and the University of Illinois' work to improve the photosynthetic efficiency of crops.

It is important to note that for the majority of these projects, increasing farm-level income or productivity through crop development (e.g. improved varieties) or preventing livestock productivity losses (e.g. vaccines) was the key imperative. Thus, these projects contribute to increased efficiency of the dominant external input-intensive model of production, as opposed to deliberate steps towards a different model or structure of production.

³⁰ Meaning at least one component relating to a Level 1 increase in farm-level efficiency was included in the project's objective.

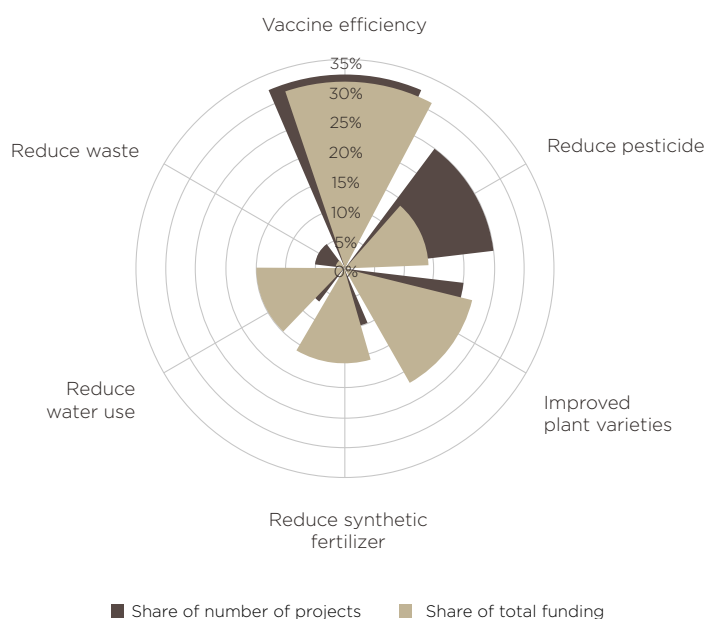
Over one third of funding for increasing efficiency is channelled into vaccines.

Among this group, investments in research into the development or improvement of livestock vaccines stand out. Over one third (13 out of 36) of these projects focus on increasing the efficiency of or developing new vaccines (see Figure 6.4). Significant quantities of spending in this category of projects also went to reductions in pesticide use, improved plant varieties, reduced water use and reduced synthetic fertilizer.

As regards the cumulative budgets of projects contributing to increasing efficiency, livestock vaccines received the largest share with over 30% of the aggregate funding, while projects focussed at least partly on improving plant varieties received as much as US\$90 million. The CGIAR centres and research institutes from outside sub-Saharan Africa accounted for the majority of this crop breeding research.

Figure 6.4:

Comparison of share of number of projects versus funding, disaggregated by criteria for Level 1, i.e. increasing efficiency of industrial agriculture. Shown are the respective percentages of all 36 projects that contribute to Level 1.



FUNDING BEYOND LEVEL 1

Support for agroecology and systemic approaches represents a much smaller share of total projects and net funding.

Of the projects funded by the BMGF, only 15% went beyond the efficiency focus of Level 1 (see Figure 6.5), and only four projects have an agroecological component (Level 3). Examples of projects that go beyond Level 1 include the

Netherlands Institute of Ecology's project to build on the potential of microbiomes to control the prevalence of the parasitic pest plant striga (Level 2, received US\$8 million in 2016) and ILRI's efforts to improve systemic resilience of livestock and livestock-based livelihoods (Level 3, US\$2.2 million in 2016). Projects going beyond Level 1 received significantly lower average funding than projects only focussed on increasing efficiency (see Figure 6.6).

Figure 6.5:

Distribution of BMGF projects contributing to the various levels of food system change (Total: 137 projects)

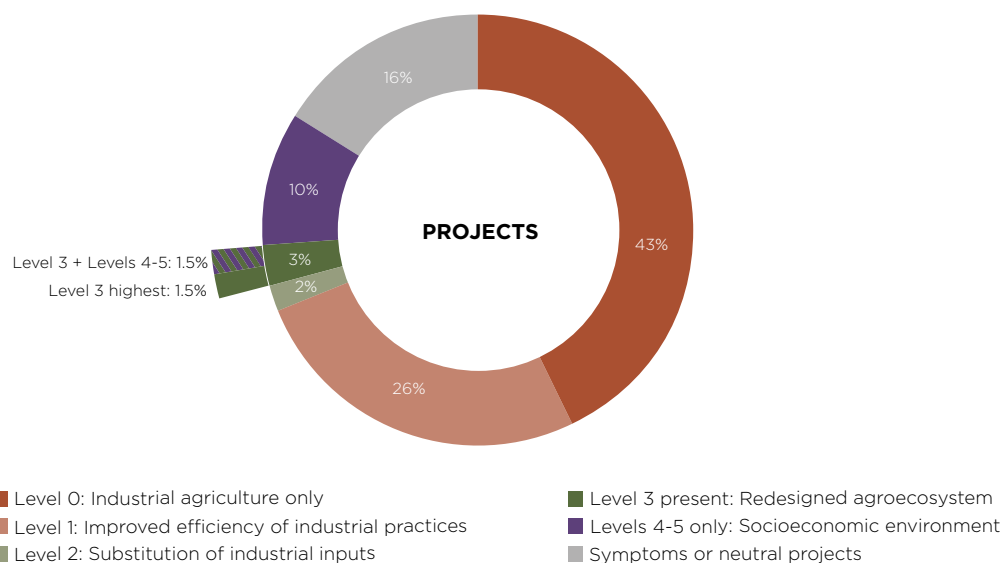
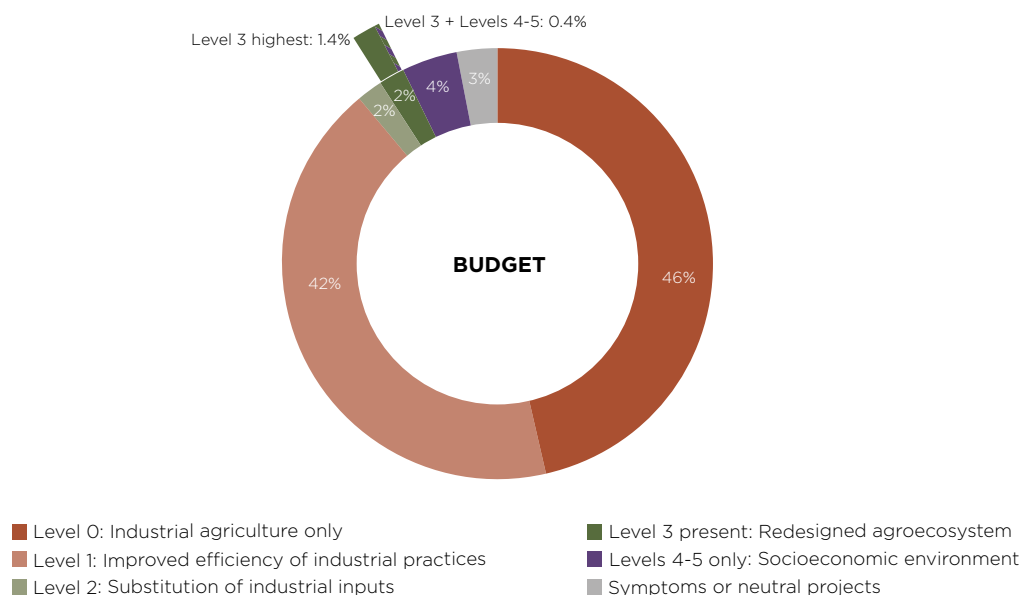


Figure 6.6:

Distribution of BMGF funding contributing to the various levels of food system change
(Total funding: US\$807 million)



No project explicitly mentions agroecology, but there are some efforts to address sustainable agriculture beyond productivity within BMGF funding.

Only four projects, all led by CGIAR centres, combine improvements at the farm level (Levels 1 to 3) with efforts to increase equity, inclusion and social well-being (Levels 4 and 5). For instance, one US\$30 million flagship project led by ICRISAT combines breeding for climate-resilient varieties with support for women smallholder farmers and vulnerable groups (Level 1 and Level 5).

In summary, one quarter of BMGF-funded AgR4D projects address sustainability by focussing on increasing the efficiency of industrial production, but just 15% go beyond that. The CGIAR centres (i.e. CIMMYT, ICRISAT, ILRI) stand out as having successfully leveraged BMGF funding to implement more holistic projects that are partially aligned with agroecological approaches.

PROJECTS FOCUSED ON THE SOCIOECONOMIC AND POLITICAL DIMENSIONS OF AGROECOLOGY BUT NOT ECOLOGICAL PRODUCTION

The BMGF invests in a significant number of research projects that focus on responsible governance and equity without including any components of Levels 1 to 3, i.e. the production dimensions of agroecology.

One example is ICRAF. ICRAF received a total investment of US\$4.5 million in 2016 with a core focus on improving gender inclusiveness in agricultural research in Africa. Fourteen AgR4D projects aim at improving the societal, environmental and policy environments, thereby providing a base for more sustainable practices, corresponding to 4% of the total funding for the years concerned.

QUALITATIVE INSIGHTS OF BMGF FUNDING

BMGF funding is clearly focussed on technological innovation pathways, such as the development of new plant varieties or agricultural mechanization, that are believed to deliver quick results. As the interviews confirmed, Bill Gates' personal belief in technological 'fixes' (e.g. adoption of new, improved crop varieties, vaccines and fertilizers) and his background with the Microsoft Corporation shape the Foundation's overall strategy. The BMGF's emphasis on strategic planning – reflected in their hiring of management consultants – demands a simplification of farming realities while reducing heterogeneities and complexities (Schurman, 2018).

While it would be easy to reduce the BMGF's interventions to hybrid seeds, discussions among the Foundation's leadership have evolved to include issues such as soil ecology. But, as one interviewee confirmed, Gates' focus on technological fixes is pervasive even on this topic:

"He's now discovered soil ecology recently. I have just seen a newsletter of his discussing soil ecology. But he comes then, in terms of fixing it, with very technical solutions. This is the very heart of the Foundation: they are not about saving the world; they are about putting their money into what gives the biggest bang for your buck."

AgR4D investments adhering to this approach, meaning support for technologies to fix productivity problems, receive the largest shares of funding despite awareness amongst staff of the environmental limitations of such investments.

"There is a very broad understanding of environmental consequences of certain kinds of agricultural development, but there is a very pressing need to raise yields above abysmally low levels... [Therefore] there is an embracing of markets, of helping farmers access better quality inputs."

This paradigmatic focus on productivity undermines broader support for more systemic approaches, and has contributed to the phasing out of capacity-building efforts in sub-Saharan Africa. Environmental or ecological considerations, as one respondent summarizes, are subsequently reduced to "doing no harm".

What delivers quick tangible results at scale is the key driver of funding decisions, and agroecology does not fit easily in this frame.

According to the interviewees, "what works" is defined within the BMGF based on what works at scale, what brings guaranteed returns to BMGF investments and what reduces poverty. The existing evidence-base of what works plays a decisive role in defining the way funding flows within BMGF programmes. This is accentuated by internal assessments relying heavily on expert knowledge and monitoring of quantitative metrics rather than experiential knowledge or smallholder expertise (Schurman, 2018). Further, global assessments demonstrating the need to transform the food system tend to be discounted. Rather, there is a shared understanding at the BMGF that the economic benefits of practices affiliated with industrial agriculture are well endorsed.

“... the things that were being funded by the crop improvement staff was being funded by the AgR&D team, it already had a pipeline of varieties in trial. So, you put the money into that pipeline almost always, virtually always, through the CGIAR system plant breeding programmes and something is going to come out. It will come out anyhow, but you [BMGF] can put money in that system and more varieties are released and you have got the general evidence that the new variety is technological change. It is going to shift that production function up; you are going to get that increase in productivity at zero cost...”

There is widespread institutional support for the hypothesis that technological fixes will increase farm-level returns, thereby lifting more people out of poverty. But this is not perceived to be the case for agroecology. Various benefits of agroecology are recognised at an institutional level, but the perceived longer timeframe for agroecological practices to deliver returns in incomes or yields vis à vis industrial practices is seen as a drawback.

“Agroecology is knowledge-intensive, it creates risk for people, it doesn’t have direct benefits within the first year that are tangible for people.”

These concerns are accentuated when it comes to the complexity of agroecological practices and the challenges in scaling them up. Lack of tools for and evidence of the widespread adoption of agroecological practices raised persistent questions about its scalability, against the backdrop of industrial practices whose adoption potential has been well established.³¹

“There is a lot of pressure on scale and I think that really drives the focus towards grants that can show changes in yields. If the agroecology world has stronger evidence that shows that [potential to scale and increase yields], I do not see any reason why Gates would not jump in and fund those.”

The BMGF currently lacks institutional support for agroecology or more systemic approaches to agriculture.

What emerges clearly from the interviews is that there is no institutional support for agroecology at the BMGF. According to the interviewees, this is due to common perceptions regarding the complexity of agroecology and that it hinders scalability, as well as lack of awareness of the evidence that holistic approaches to agriculture need not undermine productivity. Interviewees confirm that the strategic focus of AgR4D investments is to contribute to poverty reduction through increased agricultural production, and by connecting smallholder farmers to value chains in sub-Saharan Africa. The BMGF is broadly interested in supporting an enabling environment for the transformation of African agriculture, but that transformation is centred on increasing the productivity of commercial smallholder farmers, and tends to exclude broader sustainability concerns or the needs of more marginalized farming populations. This is in line with the foundation’s general strategy across its workstreams, which one respondent summarized as “fixing the human systems rather than fixing the planet”.

³¹ This quote resonates well in comparison to a Gates official interviewed by Schurman (2018), who stated that s/he “(...) can give you thousands of tiny examples that worked and aren’t replicable ... They are so labour intensive that you can’t [apply them]... So if you really want to change things ... you can’t have five thousand little dots on the map when you need five million.”

COMPARATIVE ANALYSIS AND DISCUSSION

As confirmed in the interviews, funding is densely clustered around proven technologies, including seeds or vaccines, which are also embedded in BMGF health programmes. The findings confirm that the BMGF's vision of development is rooted in a 'scientisation' of societal challenges, technical approaches to development and a preference for generalizable solutions. The Foundation's business-centric approach translates into a belief in, and funding of, market-based solutions, as well as the practice of awarding funding to both larger, well-established international organisations (e.g. the CGIAR), and trusted parties (including former employees who now work at those organisations) (Schurman, 2018). This latter point resonates strongly with the lock-ins of partnerships, alliances and discourse coalitions described in [Chapter 3](#). Furthermore, the BMGF exerts significant influence on other donors and grantees – as project officers work closely with their counterparts in an environment of highly competitive funding.

The interviews not only confirm the lack of institutional support for agroecology, but also indicate that the BMGF may not even be considering agroecology as an avenue of transition towards sustainable food systems. A key barrier is the BMGF's focus on quick technological fixes, which contrasts with the holistic and multidimensional approaches emphasized in agroecology. Nonetheless, the overall findings suggest that further evidence of agroecology's potential at the production level could shift the BMGF's strategic investments in the medium- to long-term. The BMGF in its constant search for innovation can quickly and strategically reposition, and might be prone to quickly refocussing its work on emerging approaches such as sustainable intensification or soil restoration.

The organisational culture of “managing up” (towards Bill Gates) (Schurman, 2018) means that the complexities of agroecosystems and smallholder livelihoods are overlooked, but it also paves the way for rapid funding shifts: Projects that rest outside the current strategy can still receive funding when supported directly by BMGF leadership.³² As stated by one interviewee:

“In some ways, I think it is the most flexible institution in the world. At least it should be, because they don't have to worry about the political concerns at all. It is just two to three people that decide we want to do this and then do it. In that sense it is very flexible.”

A case in point is the embedding of gender equality in the BMGF's strategy (Fejerskov, 2017). As articulated by Melinda Gates, “(w)e will not use the complexity of resolving gender inequality as an excuse for failing to think and act more intentionally about putting women and girls at the centre of what we do” (Gates, 2014).

The institutionalization of gender equality – embedded in theory across all agricultural projects (Fejerskov, 2018) – offers insights into how politically salient ideas are translated and internally negotiated within the BMGF. Both intersectionality and a strategic focus on agency and empowerment³³ could potentially offer an entry point for agroecology, as well as the acknowledgment of complexity and systemic approaches in the remit of gendered development.

In order to harness these opportunities, improved documentation of the adoption pathways and socioeconomic aspects of agroecology will surely be necessary.

³² Accentuating this potential malleability is the observation that established and trusted pipelines of plant breeding programmes within the CGIAR system also receive funding in the Swiss case – where 90% of projects reviewed address at least one level of food system change – and represent the largest share of AgR4D funding for both case studies.

³³ https://docs.gatesfoundation.org/Documents/BMGF_EmpowermentModel.pdf

The vast majority of adoption studies are focussed on capital-intensive investments (e.g. seeds and livestock vaccines) rather than knowledge-intensive techniques (e.g., as envisioned at Level 2 or 3).³⁴ This documentation will need to cover the implications of agroecology not only for more marginalized farmers, but also for the productivity of commercial smallholder farmers, given their centrality in the BMGF approach (see influential work by Mellor [2017] that guides the BMGF strategy).

Lastly, it is important to recognise that any uptake of agroecology by the BGMF would by default include a process of translation, whereby the concept gets interpreted and localised

(Czarniawska & Joerges, 1996; Latour, 1986; Nadelmann, 1990, cited in Fejerskov, 2017).

The fact that agroecology encompasses such a range of context-specific practices may increase the chances of BMGF being able to embrace and internalise aspects of it. However, given the pre-eminence of BMGF in the agri-development space and its deep-rooted attachment to technological fixes, such shifts in AgR4D funding could lead to co-optation of agroecology on a new scale, and the voiding of its transformative potential. The risks and rewards associated with the mainstreaming of agroecology are further explored in the conclusions and recommendations ([Chapter 8](#)).

³⁴ Albeit not mentioned explicitly, the rise of ICT in sub-Saharan Africa could provide opportunities to not only support tools facilitating such knowledge transfer, but also their monitoring.





7

AGROECOLOGY BY DEFAULT NOT DESIGN?

**TRENDS IN AGRICULTURAL
RESEARCH AND INVESTMENT
IN KENYA**



KEY MESSAGES

A total of 196 AgR4D projects funded by diverse national and international donors and 249 agricultural research projects of national research institutes and universities were quantitatively assessed for their contributions to a transition to sustainable food systems. This was supplemented with a qualitative analysis of 13 interviews with key stakeholders from the research development communities. In combination, the two approaches yielded the following key findings:

- The majority of funding is directed towards projects focussing on industrial agriculture or increasing efficiency of input use. A Green Revolution narrative dominates in Kenya, leading to an emphasis on efficiency and markets rather than ecological sustainability, equity and well-being.
- Individual elements of agroecology are addressed in a considerable number of projects although most actors in key positions have only a limited notion of agroecology, and many actors understand it as a geographical zoning concept. If used as a term to describe environmentally sound agriculture, the socioeconomic and political dimensions of agroecology are ignored.
- Of the 249 projects implemented by the Kenya Agricultural and Livestock Research Organisation (KALRO) or Kenyan Universities, 72% are limited to industrial agriculture and/or increasing its efficiency (Levels 0 and 1). While 13% of the projects contain components for redesigning the agroecosystem (Level 3), just 1% further address the socioeconomic aspects of agroecology (Levels 4-5).
- The National Research Fund supported 63 agricultural projects, of which 21% include agroecological practices at Level 3. However, not a single project further addresses Level 4 or 5 criteria and 66% are limited to industrial agriculture and/or increasing efficiency.
- Of the US\$69 million of funding from bilateral donors, 66% went to projects that do not address any of the criteria for a food system transformation. Single, multi-country programmes funded by bilateral donors or through multilateral institutions demonstrate a systemic approach by enhancing diversity, synergies and resilience of the agroecosystem (Level 3) with promoting equity, inclusion, participation and fairness (Levels 4-5).
- Promoting more participatory research and integrating farmers' perspectives is seen as a priority by many actors, particularly in order to ensure successful uptake of technologies.
- A systems approach is emerging, but is framed in market terms. Reflection is therefore needed on how to leverage systems thinking in support of agroecology, and how to interact with the corporate private sector in this regard.

OVERVIEW OF THE KENYAN AGRICULTURAL RESEARCH LANDSCAPE

Kenya is rated one of the most competitive research systems in Africa (Tijssen, 2007). Further, Kenya ranks third in sub-Saharan Africa – after Nigeria and South Africa – in spending on agricultural research, with a total investment of US\$274 million in purchasing power parity dollars in 2014. With 1,157.6 agricultural researchers (in full-time equivalents, FTE), Kenya also ranks third in sub-Saharan Africa in research staff – surpassed only by Ethiopia with 3,024.6 FTE and Nigeria with 2,975.5. The degree of professionalization is particularly high, as 85% of Kenyan agricultural researchers have a MSc or PhD degree – compared to 46% in Ethiopia and 66% in Nigeria (Beintema et al., 2018; Beintema & Stads, 2017).

National research priorities are established every five years through a multi-stakeholder process.

Research in Kenya is managed and regulated by the National Commission for Science, Technology and Innovation (NACOSTI) – a state corporation established by the Science, Technology and Innovation (ST&I) Act, No. 28 in 2013 (National Council for Law Reporting, 2014). The ST&I act mandates NACOSTI to set national priorities for research and innovation. These priorities are informed by the prevailing socioeconomic policies, the country's national planning strategy and Kenya's international commitments under the SDGs, the AU's Science, Technology and Innovation Strategy for Africa 2024, and the African Development Agenda 2063. Every five years, the research priorities are set through a multi-stakeholder consultative process, involving various key individuals from institutions including KALRO, universities, farmers' associations and international research organisations.

The research priority areas for 2018-2022 are based on the "Big 4 Agenda": food and nutrition security, manufacturing, housing and universal health coverage (NACOSTI, 2019).

Regarding food and nutrition security, the emphasis is placed on increasing production and productivity, reducing post-harvest losses and enhancing value addition, as well as combating climate change and micronutrient deficiency (NACOSTI, 2019). NACOSTI (2019) highlights the need for sustainable use of natural resources, enhanced nutritional diversity and the integration of traditional and local knowledge in pursuing these priorities.

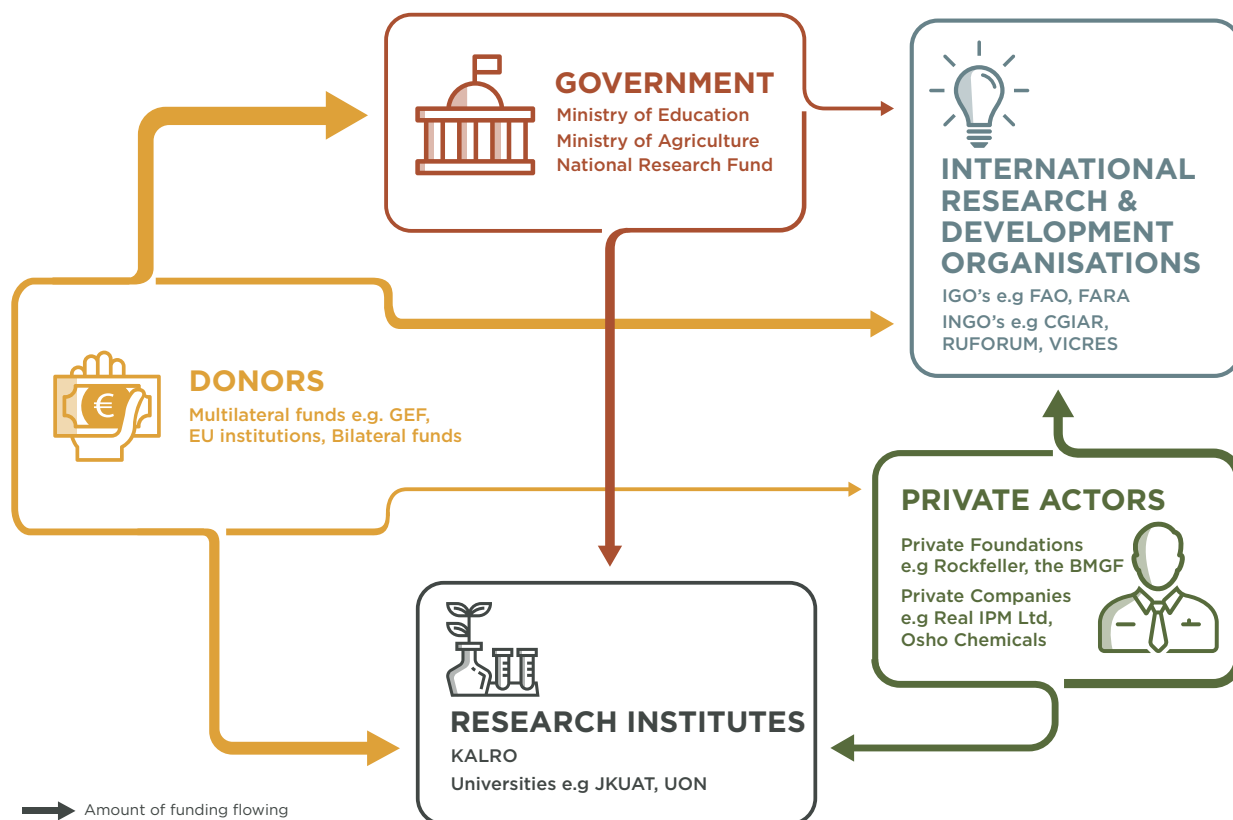
The National Research Fund is Kenya's national research funding mechanism – KALRO is the major public agricultural research institution.

The ST&I act established the Kenya National Innovation Agency (KENIA) and the National Research Fund (NRF). KENIA's role is to manage the national system for commercialization of innovations by linking academia, government agencies, the private sector and civil society. The NRF mobilizes resources for the generation of new knowledge and advancement of ST&I. Kenya was one of the first African countries to establish a dedicated national mechanism for research funding in 2015. However, the NRF suffers from regular budget cuts and its long-term financing has been called into question (Waruru, 2019). Currently, Kenya spends around 0.5% of its GDP on research, well below the self-set goal of 2% (Waruru, 2019).

"To promote cross-sectoral integration and collaboration" (Beintema et al., 2018) as well as increase efficiency and prevent duplication, several agricultural research institutions were merged to form KALRO in 2014. KALRO's mandate is to promote, streamline, coordinate and regulate agricultural research, technology generation and dissemination in order to ensure food security through improved productivity and environmental conservation. KALRO oversees 18 research institutes, bringing together research on agricultural socioeconomics; food; horticultural and industrial crops; and livestock, land and water management.

Figure 7.1:

Overview of the main stakeholders of the Kenyan AgR4D landscape and how they are connected by funding flows. The strength of the arrows is approximately proportional to the amount of financing connecting the respective actor groups.



Kenya hosts national and international research centres with diverse thematic foci.

The major Kenyan universities conducting agricultural research include Egerton University, the University of Nairobi, Moi University, Jomo Kenyatta University of Agriculture and Technology (JKUAT), Jaramogi Oginga Odinga University of Science and Technology (JOOUST) and Pwani University. Egerton, Moi and JOOUST were selected for the World Bank's Eastern and Southern Africa Higher Education Centres of Excellence Project (ACE II). Established in 2016, the World Bank invested an initial US\$148 million in ACE II to "support the selected [24] Eastern and Southern African higher education institutions to deliver quality post-graduate education and

build collaborative research capacity in the [five] regional priority areas", which included agriculture (ACE II, 2019). Of particular relevance to the present report is Egerton's Centre of Excellence in Sustainable Agriculture and Agribusiness Management (CESAAM), with an organisational description that frames "sustainable agriculture" in relation to biotechnology and climate-smart agriculture (CESAAM, 2018). The long-term sustainability of the funding provided through ACE has been questioned (Nordling, 2018).

Finally, Kenya is also host to numerous international research institutes that have a focus on AgR4D. Most notable among these are CABI's regional centre for East Africa, icipe, and the CGIAR-affiliated ICRAF and International Livestock Research Institute (ILRI), all based in

Nairobi. Several other CGIAR centres have regional offices based in Kenya. CABI Kenya focusses on invasive species and plant health, including through biological control measures (CABI, 2019). icipe's (2019) "mission is to use insect science for sustainable development, to ensure food security and improve the overall health of communities in Africa by addressing the interlinked problems of

poverty, poor health, low agricultural productivity and environmental degradation". ICRAF (2019) describes itself as "the only institution that does globally significant agroforestry research in and for all of the developing tropics". ILRI (2019) focusses on "research for efficient, safe and sustainable use of livestock".

MONEY FLOW ANALYSIS

A total of 445 projects with a cumulative budget of nearly US\$1.2 billion were analysed.

Information on AgR4D projects was obtained from data available online and directly from various institutions, with donors and recipients treated separately (see Table 7.1). In order to

be included in the analysis, projects had to specifically focus on agriculture, involve at least one research institution and have a declared a focus on Kenya or be carried out in the country. Using the [Agroecology Criteria Tool](#), each project was analysed for its fulfilment of the criteria for one or more indicators for the five levels of food system transformation.

Table 7.1:

Total number and budgets of projects analysed from different institutions and sources

INSTITUTIONS	NO. OF PROJECTS	CUMULATIVE BUDGET (US\$)	AVERAGE PROJECT BUDGET (US\$)
a. Donors			
National Research Fund	63	8,214,068	128,344
Bilateral donors	69	69,308,966	1,004,478
Multilateral donors	26	1,055,858,629	40,609,947
Foundations	38	21,207,366	558,089
b. Recipient institutions			
KALRO	179	23,361,676	130,512
Universities (Egerton University, JKUAT, Kenyatta University)	70	14,190,833	202,726

Information on projects and funding was obtained from the following sources:

- **KALRO:** The organisation directly provided data on ongoing projects from 18 different institutes. Additional information was obtained from KALRO's online platform where a project description is often included.
- **Universities:** Information on projects implemented from 2013 to 2018 at Egerton University, JKUAT and Kenyatta University was obtained directly from the institution and/or from university grant websites (Egerton University, 2019; Kenyatta University, 2019).
- **NRF:** Data on all grants awarded by NRF in 2018 was directly obtained from NRF. NRF started operation in 2015 and has only sent out two calls for funding. Previous data on grants provided by NRF in the first call and research grants awarded by NACOSTI before establishment of NRF were not available.
- **The OECD and GEF:** All AgR4D projects carried out in Kenya and approved or implemented from 2013 to 2018 were selected from the Creditor Reporting System of the OECD and the GEF project database. These databases provide detailed information on disbursements from bilateral and multilateral aid and some private foundations.

We do not claim comprehensiveness as there were a number of limitations noted during data collection from various institutions. Some databases provide incomplete or very superficial information, and cover only a certain range of time periods.

CONTRIBUTIONS TO TRANSFORMING THE FOOD SYSTEM IN PROJECT PORTFOLIOS OF KEY DONORS FUNDING AGRICULTURAL RESEARCH IN KENYA

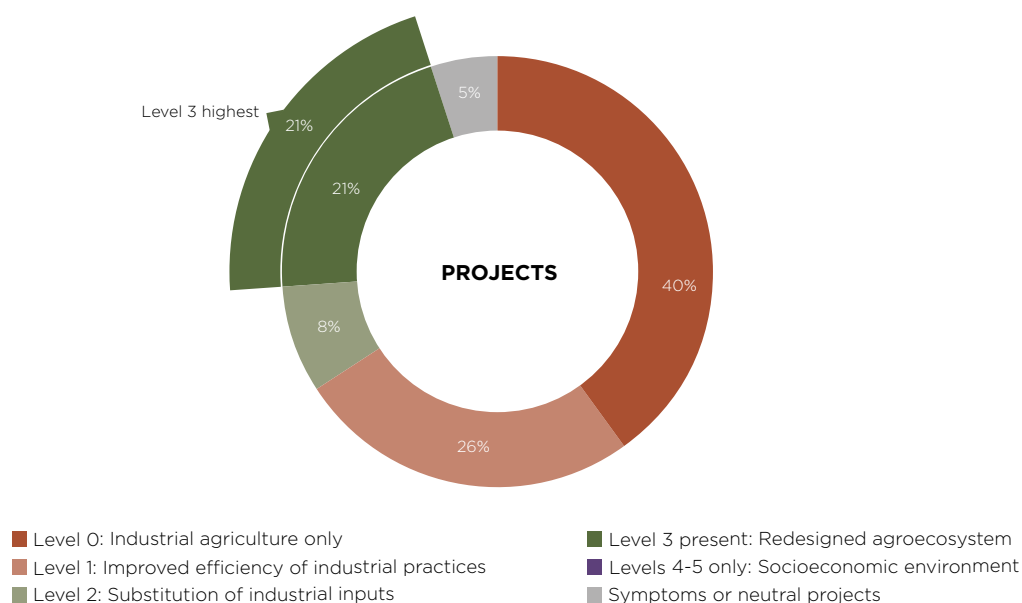
21% of projects funded by the National Research Fund (NRF) contribute to a redesign of agroecosystems, but the portfolio contains no systemic projects.

A large number of projects (45%) do not fulfil any of the indicators of the [Agroecology Criteria Tool](#) (Level 0 or symptoms of industrial agriculture). One quarter only reach Level 1 of food system change, i.e. they focus only on increasing efficiency, especially through reducing post-harvest losses as well as more efficient use of veterinary drugs and pesticides. On the other hand, over a fifth of NRF-funded projects are *agroecological* in that they meet criteria for the individual components of Level 3 of food system change (see Figure 7.2). However, *systemic* research, in which a redesign of the agroecosystem (Level 3) is combined with socioeconomic or political components of sustainability (Level 4 and 5), is absent. This may reflect unfavourable conditions for research of this nature, particularly the short timeframes (maximum three years) and relatively small budgets (US\$128,000 on average with a maximum of US\$191,000) of NRF-funded projects. The distribution of funds by levels of food system change is almost identical to the proportion of projects (additional graph not shown).

The NRF only funds research led by domestic research institutes, both public and private. Universities received 67% of the funding for agricultural projects and KALRO received another 26%. The NRF encourages multidisciplinary and multi-institutional proposals, but NRF funding is usually low and intermittent due to delays by the national treasury in releasing funds. The projects funded by the NRF are based on the national research priorities set by NACOSTI.

Figure 7.2:

Distribution of projects funded by the NRF contributing to the various levels of food system change
(Total: 63 projects with a cumulative budget of US\$8.2 million)



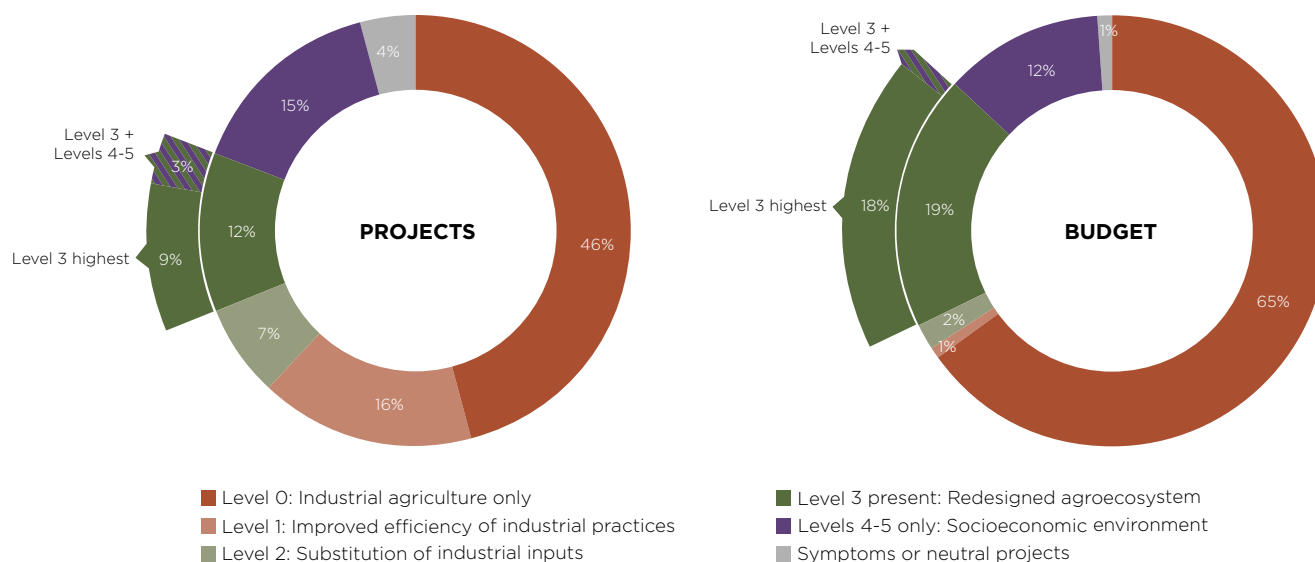
Bilateral donors focus on research on industrial agriculture, but there are singular exceptions.

Half of the projects funded by bilateral donors do not comply with any of the indicators of the [Agroecology Criteria Tool](#), and these projects received above-average amounts of funding (see Figure 7.3). The US and Germany are by far the most important bilateral donors, followed by France, Canada and Australia. The US provided over US\$43 million of funding to Kenyan AgR4D projects between 2013 and 2018. Over 99% of

these US-funded projects fail to meet any criteria for food system transformation (Level 0). In stark contrast to this, 93% of the funding provided by Germany (with a total of US\$11.96 million) went to projects contributing to at least one of the five levels of food system transformation. In essence, however, this is due to a single large project, which involves KALRO and the International Potato Centre (CIP) and includes agroecological components such as nutritional diversity, crop rotations and biodiversity management (GIZ, 2019).

Figure 7.3:

Distribution of projects and their cumulative budgets funded by bilateral donors contributing to the various levels of food system change (Total: 69 projects with a cumulative budget of US\$69.3 million)



Multilaterally funded projects are few but long-term and with large budgets, allowing for a more systemic research approach.

All 26 projects funded by multilateral donors, mostly through the GEF Trust Fund, fulfil at least one indicator of the *Agroecology Criteria Tool* (see Figure 7.4). These projects are nonetheless different in nature as they tend to be multi-country programmes with much larger budgets (US\$40.6 million on average) rather than projects funded by the NRF (US\$128,000), bilateral donors (US\$1 million) or foundations (US\$558,000). The *environmental* focus of the funding stream may also explain the general emphasis on ecosystems.

As much as 90% of the total US\$1 billion of multilateral funding flows in Kenya goes to projects that contribute to Level 3 of food system change

(i.e. redesigned agroecosystem). This, however, is largely due to a single IFAD-led US\$805 million programme with the goal “to safeguard and maintain ecosystem services into investments improving smallholder agriculture and food value chains” in up to 12 African countries (GEF, 2019). This programme includes several elements related to agroecology, including integrated sustainable landscape management for enhanced ecosystem services and integrated crop-livestock systems. The IFAD programme highlights a key limitation of the present study: Unfortunately, the available data does not allow for a differential analysis specifying the portion of a project’s total budget actually dedicated to agroecological research in Kenya. Further, due to the methodological approach taken in this study (reliance on OECD and GEF data), a number of multilateral donors have not been considered, most notably regional actors like the AfDB.

Philanthropic foundations overwhelmingly fund research on industrial agriculture.

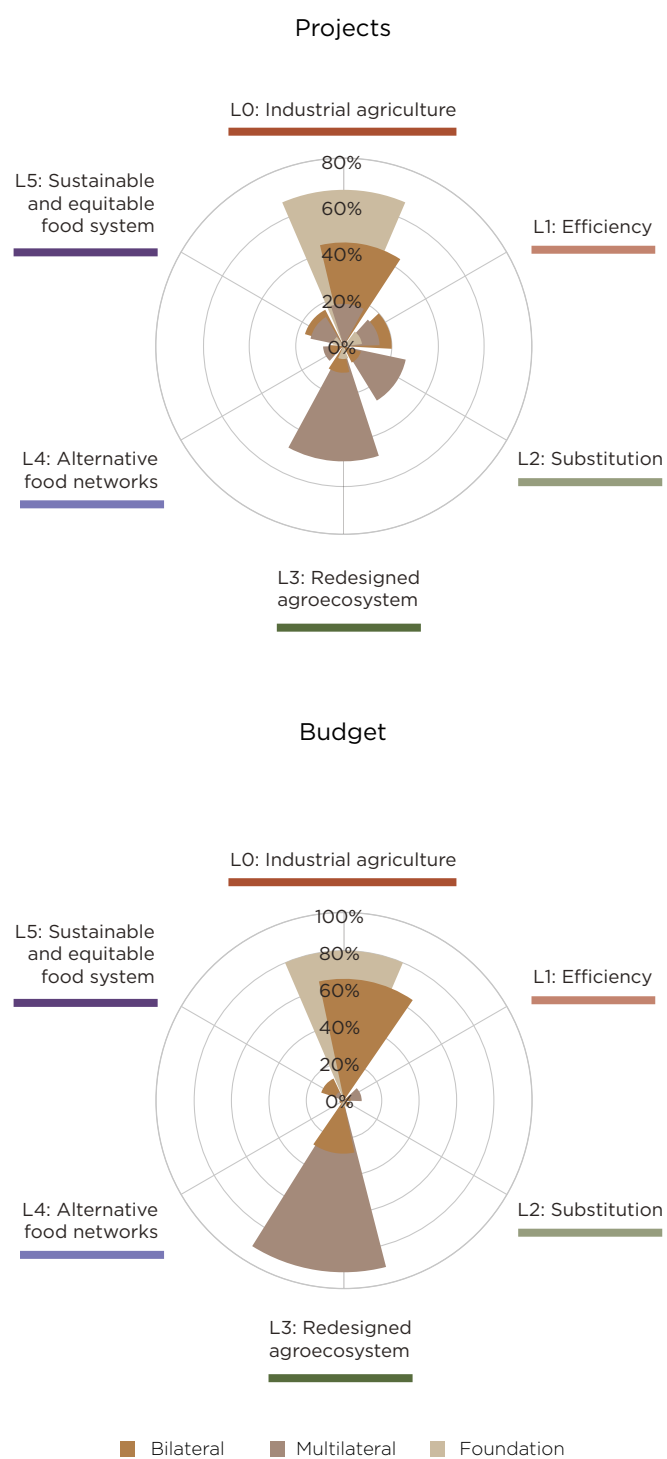
By far the largest contributor to the US\$21 million of funding from private foundations to AgR4D projects focussing on Kenya is the BMGF, with almost 99% of the total. Agroecology aspects are virtually absent from the projects funded by the BMGF (see also [Chapter 6](#)). The direct recipients of BMGF funding are mostly located outside of

Kenya, whether universities in North America, Wageningen University in the Netherlands or international CGIAR centres. An exception is ILRI, a CGIAR centre co-hosted by Ethiopia and Kenya that receives a considerable portion of the BMGF's funding for agricultural research. It needs to be pointed out that very few foundations are included in the OECD reporting system, which introduced a considerable bias in the present analysis.



Figure 7.4:

Percentages of projects and cumulative budgets fulfilling at least one indicator at each level of food system change for three donor types: bilateral, multilateral and private foundations



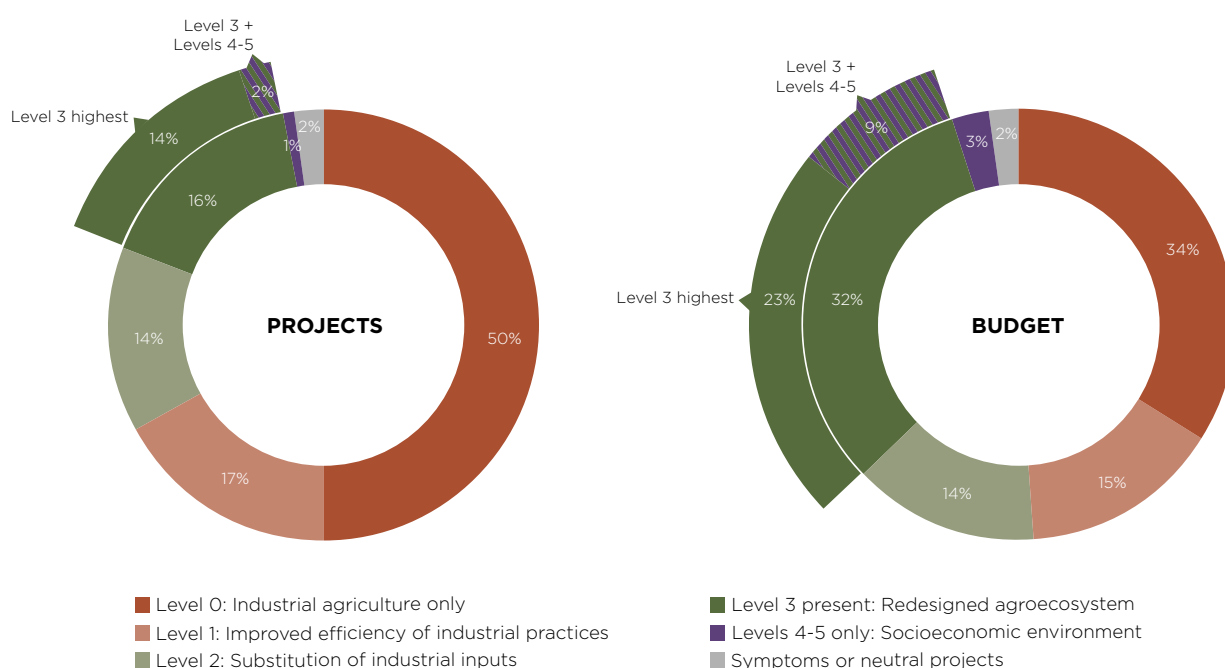
LEVELS OF FOOD SYSTEM CHANGE ADDRESSED IN AGRICULTURAL RESEARCH PROJECTS CARRIED OUT BY KALRO AND THREE MAJOR NATIONAL UNIVERSITIES

On average, KALRO has just over US\$130,000 in funding for each of the 179 research projects carried out by its 18 research institutes. This does not include, however, the considerable financial contributions from the Kenyan government, which mostly cover salaries, goods and services rather than direct project costs (KALRO, 2016). Around two-thirds of KALRO's projects only investigate aspects related to industrial agriculture (Level 0) or means for increasing the efficiency (Level 1) of production systems (see Figure 7.5). A smaller portion of the projects (30%) aim at substituting industrial inputs with more sustainable alternatives (Level 2) or redesigning the agroecosystem to increase

synergies, diversity and resilience (Level 3). Projects contributing to Level 3 tend to meet a single criterion only such as integrated crop-livestock systems, increasing crop diversity or pest management using the push-pull method. Only 2% of KALRO's projects combine research at Level 3 with some considerations of the socioeconomic or political dimension of agroecology (Level 4 and 5). Such systemic projects tend to be more long term with higher budgets, and carried out by a multi-partner research consortium. One example is ProEcoAfrica, which includes several donors, research institutes and multi-stakeholder networks. With a budget of nearly US\$2.3 million, KALRO is a major implementing organisation of ProEcoAfrica, which aims to "generate comparative scientific evidence on the productivity and profitability of industrial and organic production systems in Ghana and Kenya with an emphasis on the gender dimension to farming" (ProEcoAfrica, 2019).

Figure 7.5:

Distribution of projects and their cumulative budgets, implemented by KALRO contributing to the various levels of food system change (Total: 179 projects with a cumulative budget of US\$23.4 million)



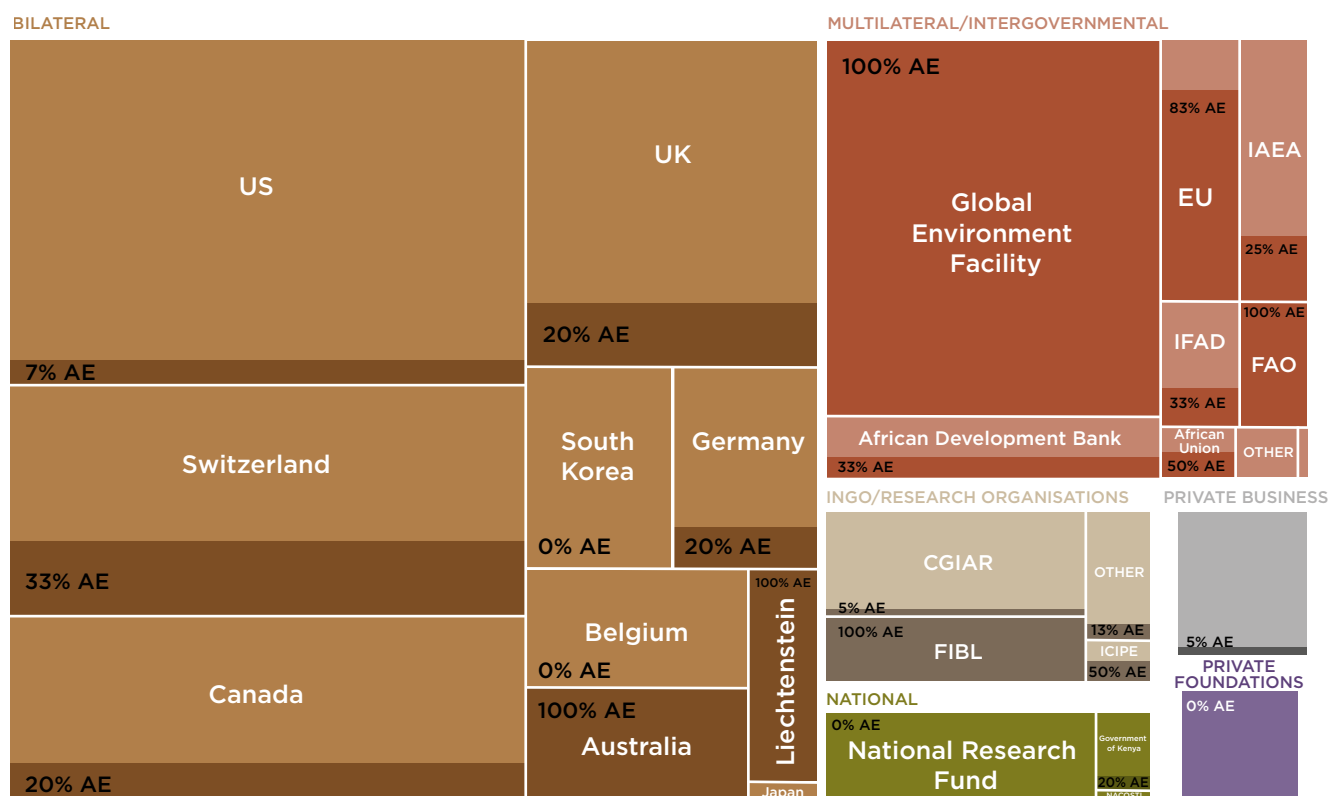
Few of KALRO's many donors emphasise agroecology.

KALRO receives funding from a highly diverse set of donors (see Figure 7.6) whose project portfolios embrace agroecology to varying degrees. Projects funded by the US, Belgium, South Korea, private enterprises or foundations have minimal or zero focus on redesigning agroecosystems (Level 3).

On the other hand, the KALRO projects funded by Australia, Liechtenstein, the GEF and FiBL all integrate at least one indicator at Level 3. The fact that for many stakeholders we were only able to analyse a limited number of projects introduces a considerable bias to the present study and the results should thus not be considered fully representative for each of the institutions.

Figure 7.6:

Overview of KALRO's donors and the degree of agroecological integration in their projects. The size of each box is proportional to the respective donor's share of KALRO's total external funding (US\$23.4 million). The area of each box coloured in darker shade represents the share of a donor's funding which is dedicated to 'agroecological' projects (i.e. projects including at least 1 indicator of Level 3).



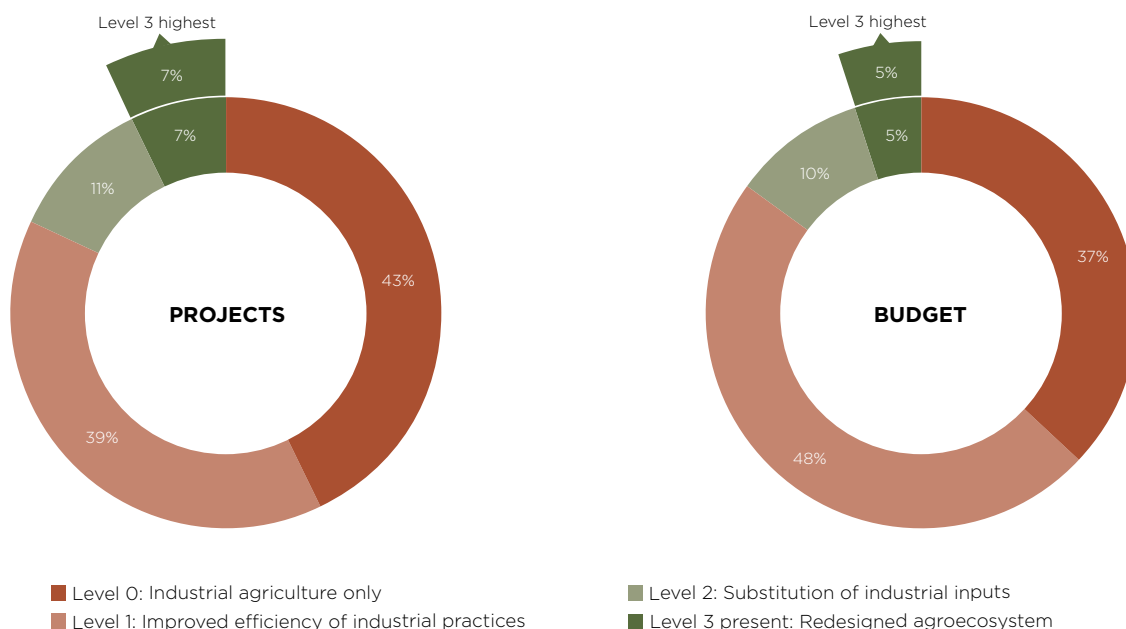
National universities emphasise increasing efficiency of industrial production systems.

Over one-third of the projects implemented by Egerton University, JKUAT and Kenyatta University integrate at least one criterion for Level 1 (efficiency) but no other aspects related to sustainable food systems (see Figure 7.7). These efficiency-focussed projects were concerned with post-harvest loss reduction, breeding for improved varieties, more efficient fertilizer use, alternative feeds for livestock and other topics. Just five modestly budgeted projects met single criteria of Level 3 (intercropping and diversifying production with a nutrition focus), and not a

single project combined farm-level components of agroecology with socioeconomic or political dimensions. One project did have a systemic and interdisciplinary focus – but was not rooted in agroecology. With over US\$4 million in funding from the Belgian Government, the Legume Centre of Excellence for Food and Nutrition Security is a 12-year collaborative programme between JKUAT and two Belgian universities. Its focus is “on different stages along the value chain of legumes, from agricultural production, postharvest storage and food processing to human consumption and its impact on nutrition and health” (JKUAT, 2019). The initiative does not appear to include any aspects of agroecosystem redesign.

Figure 7.7:

Distribution of projects and their cumulative budgets, implemented by 3 national universities contributing to the various levels of food system change (Total: 70 projects with a cumulative budget of US\$14 million)



KNOWLEDGE POLITICS ANALYSIS

An adapted version of the interview guide developed in [Chapter 3](#) was used in 13 interviews with stakeholders connected to the Kenyan AgR4D sphere. Three sections were maintained in the interview guide relating to, respectively, the individual's career and personal opinions regarding AgR4D; the strategic direction of their organisation and how far this linked to agroecology; and their experience of the Kenyan AgR4D context. Interviews took place remotely, and the survey tool was slightly amended in order to be appropriate to each interviewee. Interviews were held with multilateral and bilateral organisations and NGOs that had funded agricultural research in Kenya, international organisations performing such research in Kenya and national agencies concerned with agricultural research. Interviews were summarised and thematic qualitative analysis performed.

There is limited awareness of alternatives to the green revolution approach to agriculture, and notions of agroecology focus on biophysical aspects.

The New Green Revolution model of agricultural research remains prevalent in Kenya. One of the bilateral funders we interviewed commented that it was the dominant model, and the interview data suggests that this may be down to actors not having encountered alternative paradigms.

“In general, the researchers and the research institutions working on agriculture are still strongly technological, and on the Green Revolution approach. And they have an influence. And we actually support some of that research, on the traditional Green Revolution kind of research (...) and I think that has relegated the debate at the research level on the role of agroecology”

The Green Revolution model emphasises yields, centralised knowledge generation, a commitment to technological solutions and trust in PPPs as a means of delivering productive and profitable agricultural systems. Productivity and food availability are overriding concerns. Among the interviewees, both researchers and funders mentioned that national strategies and priorities – such as Kenya 2030 and the big four mentioned above – reflect and reinforce these motivations.

According to the researchers interviewed, the Green Revolution approach remains prevalent, but is evolving. The past few decades have seen the focus of agricultural research shift from basic, lab-oriented research to more impact-focussed, ‘demand driven’ or participatory work. In particular it is concerned with improving farmers’ livelihood outcomes, reflecting a desire for impact in terms of technology uptake, improved food security, increased productivity and increased income. One international researcher remarked that the BMGF, which they considered a very important donor, remained rooted in Green Revolution approaches and was not convinced by agroecological approaches. This reiterated some of the findings of the quantitative analysis above, and the BMGF case study (see [Chapter 6](#)).

The dominance of a conventional agricultural development discourse was reflected in the terminology interviewees used. The term Green Revolution was in fact only used by the interviewee mentioned above, who presented this as a contrasting model of agriculture to agroecology, a field of research they were sympathetic to. Others did not mention this term, suggesting that they did not perceive there to be any contrasting pathways of agricultural development, only more or less effective ways to modernise agriculture.

The word agroecology was frequently used in reference to the notion of agroecological zones. Several interviewees, including bilateral and non-governmental funders and agriculture ministry staff, defined agroecological agriculture as using appropriate agricultural techniques in each zone of the country. For example, this could refer to developing appropriate crop varieties for each zone, or prioritising beef farming or irrigated agriculture in the arid and semi-arid lands that, as many interviewees were acutely aware, cover the majority of Kenya's land surface. Even the imperatives of agribusiness companies were framed in these terms: In order to maximise profits, they needed to market seeds with certain characteristics such as drought resistance to appropriate agroecological zones.

“The Ministry of Agriculture, with development partners, has been trying to look into solutions and understand the agroecology of the country. Last year we had a famine in the country: We had maize shortage. And because of the maize shortage we declared ourselves that the country is going through a famine. But then the argument was that, but we have potatoes, we have rice, so why are we saying that we have food shortage and we are going through a famine, just because we do not have maize? So one of the things AGRA did in support of the Ministry was to map agroecological zones of the country. And it was shown that Kenya is not a maize growing country, we shouldn't even be growing maize, given that a large part of this country, being 80% ASAL lands, should really be a beef producing country (...). But now we are seeing that the droughts are getting more frequent and the rains are getting delayed. So there is an increasingly need to see how we adapt to climate change and in doing so there is an increasing need to understand the agroecology of the country.”

Just over half the interviewees, from all sectors interviewed but including all researchers, defined

agroecology as roughly synonymous with environmentally sustainable agriculture, the maintenance of ecological functions and the preservation of biodiversity – notions that relate to the production side (Levels 1-3), but not to the socioeconomic and political dimensions of agroecology (Levels 4 and 5).

International researchers also mentioned that they considered agroecology to be synonymous or overlapping with concepts such as climate-smart agriculture and sustainable intensification. Researchers who described farmer practices such as mixed cropping did not necessarily connect these practices to the term agroecology. Only one respondent mentioned social, economic or political aspects of agroecology. This individual, who worked for a bilateral donor, mentioned valorisation of indigenous knowledge in association with agroecology based on time spent in postgraduate training in Spain, rather than communication with colleagues in Kenya.

Many actors did, however, refer to the importance of a systems perspective. Almost all perceptions of valuable research involved considering the context and the food system around an agricultural practice or variety, including the policy context and farmers' needs. This could be seen as connecting to Levels 4 and 5. However, the conceptualisation of a system was usually economic rather than multidimensional: Interviewees from research and funding backgrounds alike cited engagement with markets as a critical and novel component of new models of agriculture, and engagement with the private sector as an important route to achieving impact from agricultural research. Thus, the idea of a food system was usually seen as synonymous with the notion of a value chain or growth corridor. References to livelihoods and resilience were also prominent, and framed in relation to general improvements rather than specific agricultural or socioeconomic models.

Donors and national policy actors co-construct research agendas, while scientists apply pressure from the bottom up.

Interviewees working for non-governmental and multilateral donor organisations described how donors and national actors work together to create a common agenda, constructing and locking in research strategies through the process of allocating funds. Individuals who are responsible for agricultural research portfolios within multilateral donor organisations are keen for national actors to absorb funds allocated to the respective donor's focus area. Yet, they are simultaneously keen for initiatives to be country-led. Specialist advisors from donor organisations are therefore embedded at every stage of the policy and research programme design process to ensure that countries shape their strategies in such a way that funds are allocated to the funder's priorities while also addressing country priorities. Within the fund allocation process, the production of documents such as concept notes serves as an opportunity for such co-construction and lock-in. Simultaneously, personal interaction between government and donor representatives provides an opportunity for suggestions regarding strategic direction.

Bilateral donors are similarly keen to align development policies with Kenyan national priorities, which usually requires the identification of niches where national expertise can be used. Countries with a more industrialised food system are able to export technologically advanced expertise, such as in agro-processing or value addition. Consortium projects are another space where common agendas between multilateral and bilateral donors, as well as governmental bodies and research organisations, may be defined.

Researchers from international organisations mentioned attempts to open up communication with donors, especially during evaluation processes, in order to influence their understanding of agriculture, and in particular to underline the value of integrated, systemic approaches. Taking funders to meet beneficiaries (including local

government stakeholders) of impact-focussed research was seen to be a successful way to achieve such an opening. Reviews and evaluations of research projects were also mentioned, although less commonly, as factors in influencing and opening up research strategies.

Barriers to agroecology: A systems perspective remains largely restricted to market linkages.

Within the mainstream research for development space from which almost all respondents were drawn, agroecology is rarely recognised as an alternative or unique mode of conducting agricultural research. Attention is rather focussed on a dichotomy between basic research and impact-oriented research as part of a conversation on how to achieve maximum development impact. This draws attention away from the question of what *type* of impact is desirable, that is, whether a focus on productivity and income suffices or whether a wider range of indicators should be included relating to concerns such as ecosystem health and farmer empowerment.

A potential opening for agroecology is the gradual movement to systems thinking cited by many interviewees, necessitating the involvement of research traditions beyond the biophysical and agronomic. The quantitative analysis has shown that systems thinking was evident in a small number of projects carried out by public research institutions, although these projects tended to be rooted in market linkages rather than ecological and political dimensions of food systems, thereby reemphasising productivity and farmer income as a measure of success.

There was almost universal prioritisation of the involvement of private sector commercial enterprises (e.g. machinery suppliers, seed dealers, bulkers, etc.) in agriculture. This means our interviewees did not consider potential trade-offs between, on the one hand, the profit-making interests of these companies and, on the other hand, environmental imperatives or farmer livelihoods.

“How enabling are these (different agroecological) areas in terms of attracting private sector... because we also have the whole agenda of improving trade, opening up the space for more private sector participation. Because we believe that they will contribute to the overall sustainable development agenda of the area that we intervene in.”

Strategies for dealing with potential conflicts of interest were also not considered because commercialisation and private sector involvement tended to be equated with increased farmer income and thus improved livelihoods and resilience, i.e. a ‘win-win’ scenario. Only one actor, from an international research organisation, mentioned institutional caution over working with the private sector, not because of trade-offs but rather because they perceived a risk of reputational damage if associated with private sector actors who behaved unethically elsewhere.

Considering unfolding threats such as climate change can help people understand the potential of agroecology.

The rise of systems approaches is an opening for agroecology. Yet, in order for that opportunity to be fully exploited, the role of the private sector must be explicitly addressed, as must potential trade-offs between increased productivity and profit on the one hand and other notions of value such as environmental integrity, social stability and cultural cohesion on the other.

Leveraging the global consensus around critical environmental and developmental issues is a way to raise the profile of non-profit objectives. Climate change mitigation is a pertinent contemporary example of this. Researchers and multilateral funders interviewed mentioned their personal and institutional efforts to address this issue through research on the adoption of sustainable agricultural practices (and particularly climate-smart agriculture, which some saw as synonymous with agroecology). Finding common ground between agroecology and these issues of global concern is an important way to find openings for agroecology. Concern over climate change and

food security were more commonly cited as an incentive for sustainable practices than were the SDGs, which were only mentioned once. Certain publications, notably the HLPE reports, were cited by a few researchers as influential in raising concerns about agricultural sustainability. On a more cynical note, some suggested that a desire to access funds for climate change mitigation or adaptation led to research programmes or proposals being written using the language of environmental sensitivity.

Identifying common objectives such as resilience is important. However, the interview data as a whole suggests that attention must also be paid to the mode of use of the term agroecology itself in this endeavour. There was a cynicism among several interviewees, including those favourably and less favourably disposed towards agroecology, that the term was a new ‘buzzword’ for old concepts, making them less favourable to efforts that used the term. It is also extremely pertinent that, for many interviewees, a geographical meaning was already attached to the word. An example of this was given by a development worker with a business background who considered agroecology to be a geographical, scientific concept, and any introduction of social, economic or political understandings in relation to the word a corruption of its true meaning. Such a predetermined understanding of what agroecology means makes it harder to work with a political definition of agroecology, as opposed to if no understanding of the term existed at all.

Agricultural research organisations such as ICRAF and icipe were more aware of agroecology’s holistic nature than were development funders such as the World Bank. Those credible research organisations with strong track records of impact-oriented research would be in a position to raise awareness of this agenda among other Kenyan and international actors. Interviewees mentioned some examples of ways this could be achieved, including joint funding proposals, conferences and dialogues with governments and multilateral funders on the design of implementation programmes for new funding streams.



8

CONCLUSIONS AND RECOMMENDATIONS

AgR4D is arguably more relevant than ever. The rapidly evolving threats facing food systems – from climate shocks to pest stresses – put a new premium on ensuring a continuous flow of knowledge and innovation, particularly for farmers in sub-Saharan Africa. Addressing these challenges requires collaborations that span the agriculture, research and development communities, making AgR4D, with its focus on the continuum of knowledge from basic research through to adoption, all the more important.

This report is premised on the need for a fundamental transformation of AgR4D to promote systemic agroecological approaches. Agroecological research is highly context-specific, building on local resources and knowledge, as well as relying on transdisciplinary methods that combine the knowledge of experts and practitioners like social actors and peasants. Agroecology considers the food system holistically. It relies as much on social innovations as on technological innovations. It is therefore a paradigm that holds huge potential for addressing the urgent and interrelated challenges in food systems such as the burdens of malnutrition, climate change, biodiversity loss, depletion of natural resources and rural poverty.

Understanding where AgR4D funding in sub-Saharan Africa is currently going, and what is holding back investment in agroecology, is essential in order to advance food system transformation. This report set out to answer these questions.

Through three case studies, we shed light on various aspects of the AgR4D funding landscape: Switzerland as a bilateral public donor, the BMGF as a philanthropic donor and Kenya as a recipient and implementing country in sub-Saharan Africa.

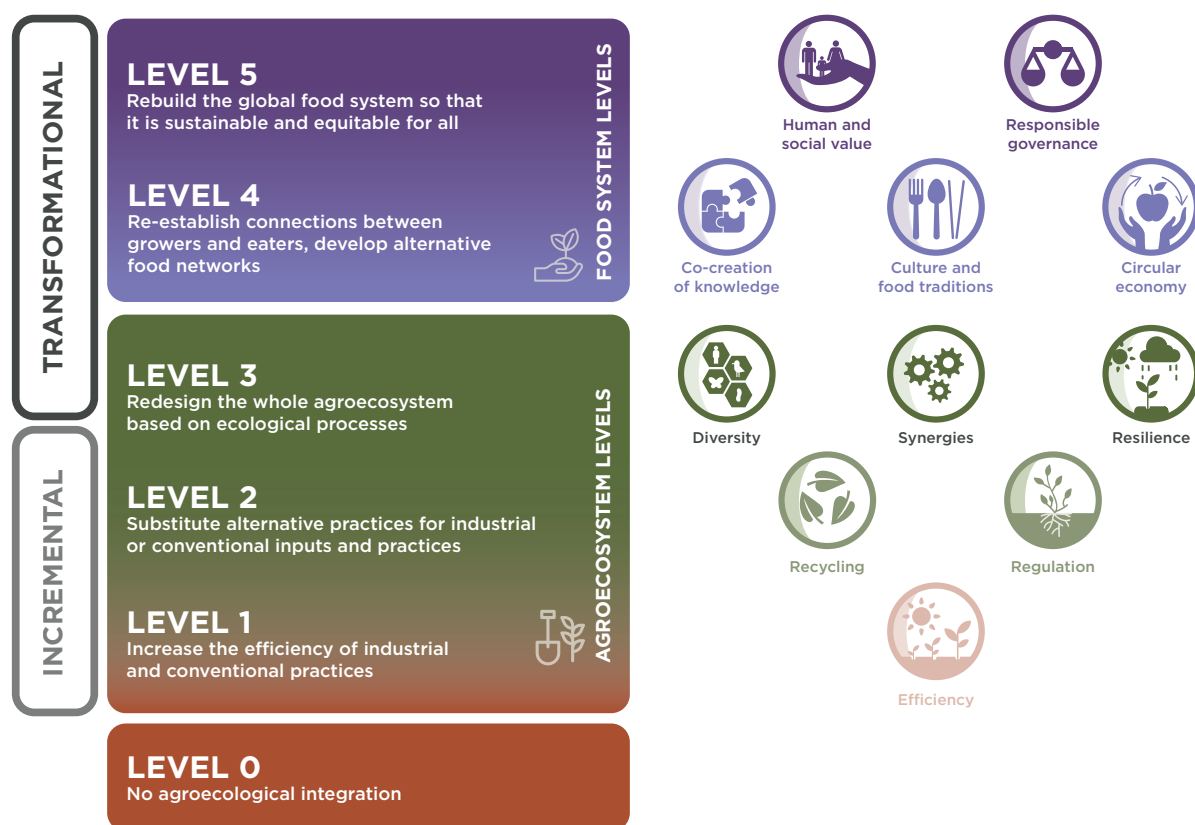
A total of 56 informants from different parts of the AgR4D world were interviewed using a semi-structured interview guide.³⁵ Representing a total budget of US\$2.56 billion, 728 AgR4D projects were analysed using the Agroecology Criteria Tool (ACT), which is conceptually based on FAO's 10+ elements of agroecology and Gliessman's five levels of food system transformation (Chapter 4 and Annex 1).

Through these case studies and our broader review of AgR4D systems, we sought to understand the dynamics of the formal research world. For this reason, interviewees were primarily drawn from formal research and funder settings, and data collection did not aim to capture bottom-up and farmer-led research systems. These are the forms of knowledge generation and exchange that characterise and distinguish agroecology in the eyes of many of its proponents, and have often been undertaken in isolation from and in opposition to mainstream research. They are a crucial piece of the puzzle, and this report therefore includes recommendations for how to bridge the different parts of the research world.

³⁵ For Chapter 3, 24 informants were interviewed, 15 for Chapter 5, 4 for Chapter 6 and 13 for Chapter 7.

Figure 8.1:

Five levels of food system transformation and 10+ elements of agroecology



KEY FINDINGS

TRACKING AgR4D FLOWS IS CHALLENGING

Tracking money flows from AgR4D donors to recipients proved difficult. While a number of agencies have built extensive public databases, they are rarely compatible with one another and data on multilateral development finance and private agribusiness investment is particularly limited. There is no systemic tracking system from governments to international organisations and funds and then on to recipient governments, private contractors and NGOs.

Despite efforts from the Development Assistance Committee of the OECD to track aid, most data on bilateral aid does not include details on project recipients or activities. Research institutions also rarely provide details on the composition of their funding sources. Access to data was one factor to select the case studies of this report. Although they offer valuable insights about major AgR4D players, the findings of the case studies should not be used for generalizing about donor and recipient countries, nor about philanthropic foundations, as a different selection of case studies might have produced drastically different results.

MAJORITY OF FUNDING STILL GOES TO INDUSTRIAL AGRICULTURE

As many as 85% of AgR4D projects funded by the BMGF and more than 70% of projects carried out by Kenyan research institutes were limited to supporting industrial agriculture and/or increasing its efficiency. This was via targeted approaches such as more efficient use of water, pesticides, livestock vaccines, fertilizers or reductions in post-harvest losses. Only 3% of BMGF projects were *agroecological*, meaning they included elements of agroecosystem redesign (Level 3 of food system transformation). For Kenya the figure was 13%, with a further 13% of projects focussing on substitution of synthetic inputs (Level 2). Projects funded through the NRF exceeded the Kenyan average with 21% of projects reaching Level 3.

In contrast, 51% of Swiss-funded AgR4D projects had agroecological components and the majority

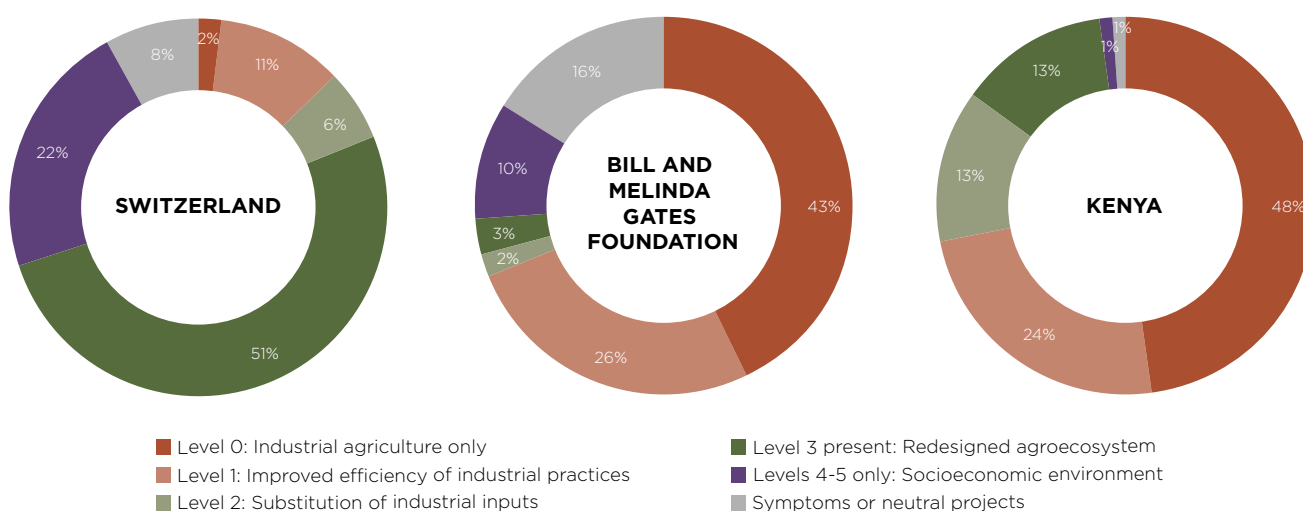
(41% of all projects) can be considered systemic, as they additionally fulfilled criteria for Levels 4 or 5 (but see next section). Just 13% of Swiss-funded projects focussed only on industrial agriculture and efficiency-based approaches.

The case studies revealed that a significant number of Swiss-funded (22%) and BMGF (10%) projects addressed some elements of socioeconomic or political change (i.e. Levels 4 and 5) without addressing any production-related agroecology elements (i.e. Levels 1-3).

Further, in all three case studies, a considerable number of projects only reached Level 1 (efficiency) or Level 2 (substitution). While such projects can be generously interpreted as incremental steps towards sustainability, they also risk locking in existing production systems if they are not undertaken as part of a broader transformation process.

Figure 8.2:

Overview of the degree to which agroecology has been integrated in AgR4D projects in three case studies; Swiss public donors (146 projects with a cumulative budget of US\$563 million), the BMGF (137 projects, worth US\$807 million) and Kenyan research institutes and universities (249 projects, worth US\$37 million).



AGROECOLOGICAL PRACTICES AND CONCEPTS OFTEN ADDRESSED IN ISOLATION

Agroecology is virtually absent from BMGF funding. In the Kenya case study, individual projects included specific components of agroecosystem redesign (Level 3) such as crop rotation, agroforestry and mixed crop-livestock systems, often in the remit of wide-ranging programmes financed by bilateral or multilateral donors. While NRF projects were more agroecological than other Kenyan sources, total funding is comparably low and not very reliable, which may explain why not a single project focussed simultaneously on transforming agroecosystems (Level 3) *and* transforming socioeconomic/political conditions (Levels 4 and 5). Even for the better-performing Swiss programmes, it is worth noting that in the majority of these cases individual criteria at each level were addressed in isolation. Very few projects systemically integrate a variety of practices and concepts corresponding to Levels 2, 3, 4 and 5. When they do so, these projects tend to be characterised by long-term funding and a diverse consortium of partners.

SMALL SHARE OF FUNDING GOES DIRECTLY TO AFRICA

Research institutions based in the Global North continue to lead on the majority of AgR4D projects, and to attract larger sums of funding. African research institutes were the main funding recipient in just 9% of BMGF projects and 10% of Swiss-funded projects. Projects led by African institutions were often those with the most systemic focus.

RANGE OF CONSTRAINTS HOLDING BACK DONORS FROM PUTTING AGROECOLOGY AT THE CENTRE OF STRATEGIES

Only a handful of bilateral donors and international organisations – notably France, Switzerland, Germany, FAO and IFAD – specifically identify agroecology as a sustainable approach for achieving food security. The majority of donors partially endorse some principles of agroecology while simultaneously supporting conventional approaches. Interviews with Swiss AgR4D actors confirmed that agroecology receives considerable support in Switzerland, and underlined widespread support for funding projects that aim at reducing the environmental footprint of agricultural production and contribute to a more equitable and inclusive food system. Yet many actors reduce agroecology to the biophysical dimension, ignoring or deliberately excluding socioeconomic and political dimensions. Consequently, donors like Switzerland pay less attention to questions about the circular economy, local food webs, food cultures and the co-creation of knowledge with farmers and local communities. For others, agroecology does not fit with existing investment modalities. Like many philanthropic givers, the BMGF looks for quick, tangible returns on investment, and thus favours targeted, technological solutions. In Kenya, low awareness of alternatives to the (new) Green Revolution model emerged as the greatest barrier to supporting and implementing more agroecological projects. Concerns about the profitability and scalability of agroecology, and whether it can fit within short project timeframes, are recurrent across the AgR4D community.

BEHIND THE FRAGMENTATION OF THE AgR4D LANDSCAPE LIE A HANDFUL OF POWERFUL BROKERS

The AgR4D system for sub-Saharan Africa is characterised by a complex and fragmented landscape of actors. However, this masks the reality of a handful of dominant organisations acting as brokers and setting the terms of agricultural research by dominating funding flows or by influencing others through partnerships and coalitions. World Bank loans and grants are by far the most important source of funds for national research systems in most sub-Saharan African countries. Likewise, the BMGF has come to dominate the philanthropic AgR4D landscape. Meanwhile, private sector contributions to AgR4D are controlled by a handful of agribusiness firms, with three companies dominating the agribusiness input market and R&D activities, often resulting in narrow research pathways. Commercial, philanthropic and multilateral organisations are allied within this landscape, coalescing around a productivist ideology. Actors with a different vision of AgR4D are providing some counterpoints and alternative funding opportunities, although, as the Swiss case study shows, a large share of funding is still distributed through multi-donor programmes (e.g. the CGIAR) over which they have little influence. Indeed, aligning priorities or pooling funding with the prevalent actors remains the obvious 'low-cost' option for many donors.

CURRENT RESEARCH TRAJECTORIES ARE 'LOCKED IN' ON MULTIPLE FRONTS, BUT THERE ARE SEVERAL OPENINGS – PARTICULARLY THE CLIMATE CRISIS

A series of key drivers of agricultural research emerged from interviews with actors from across the global AgR4D community, principally: commercial interests, ideologies, and alignment with national and global political priorities. The Swiss and Kenyan case studies confirmed that alignment with political priorities is a key driver of their research funding priorities. In the BMGF case, ideology appeared to be the leading driver of funding decisions, i.e. achieving quick tangible results through technological solutions.

Through analysis of the global-level interviews and the political economy of AgR4D, it also became clear that research trajectories are highly resistant to change. Institutional and individual motivations, self-validating scientific methods and partnerships, and discourse coalitions all serve to lock in current trajectories.

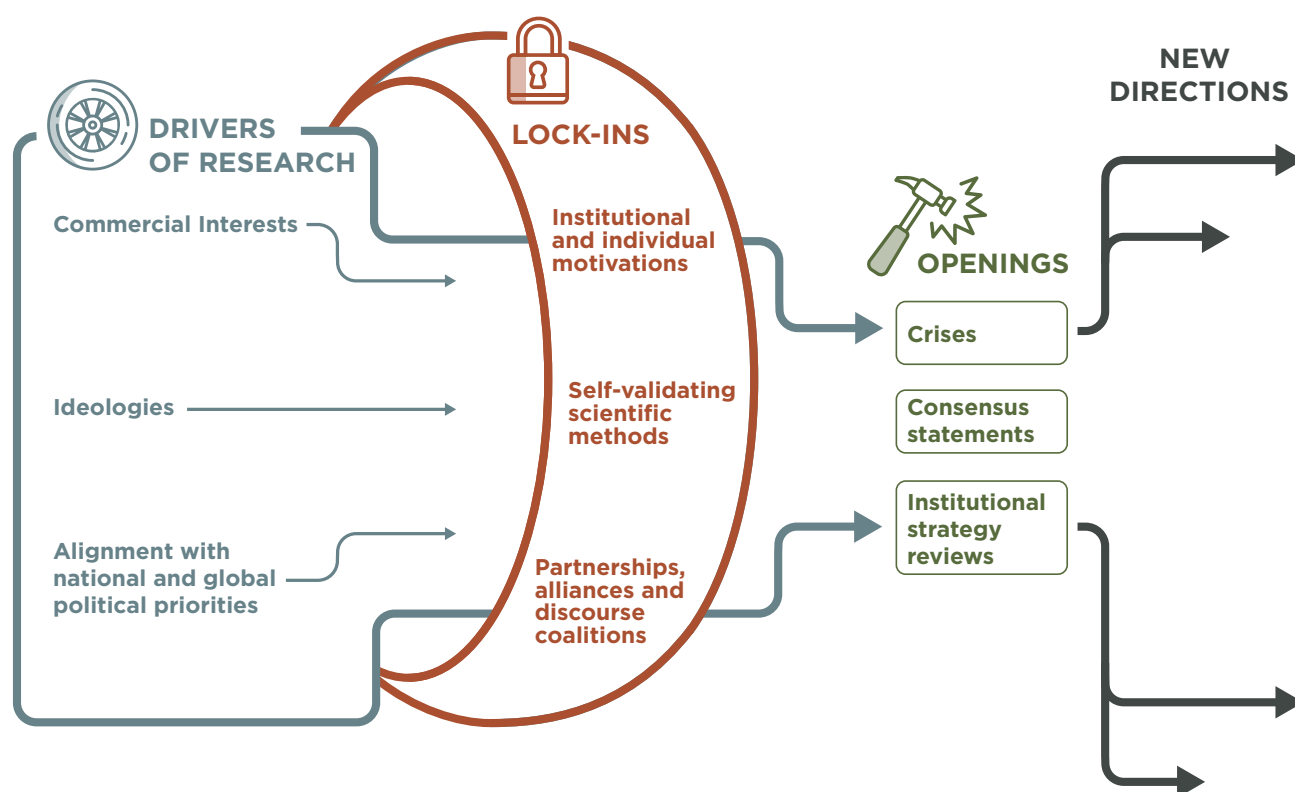
The three case studies reinforced these findings, and underlined the fact that in all organisations the knowledge and worldview of key decisionmakers is paramount in setting research priorities. Convincing these individuals and amplifying the voices of agroecological champions is crucial for changing institutional strategies. The case studies also demonstrated the importance of partnerships and networks in locking in research trajectories, with the CGIAR system emerging as a key focal point. However, in both the Swiss and BMGF cases, the greatest barriers to wholesale adoption of agroecology were the underlying concerns about its profitability and scalability, and the perception that agroecology is too complex and too time- and work-intensive to be implemented in the rather short timeframes of AgR4D projects.

Interviewees also identified moments when research trajectories could potentially change course, if individuals or groups are able to harness the windows of opportunity presented by crises, consensus statements and institutional strategy reviews. Swiss AgR4D actors confirmed the opportunities inherent in institutional strategy reviews, while highlighting that these are strongly influenced by crises, in particular around climate and biodiversity.

Indeed, the climate crisis was identified as a particularly promising entry point for agroecology by stakeholders from diverse institutions. This may apply to the BMGF: While technological solutions tend to be prevalent in framing all such issues, Bill Gates was involved in launching the Global Commission on Adaptation and has called for investment of US\$1.8 trillion over the next decade in climate adaptation. Providing evidence of improved resilience to climate change through agroecology can therefore provide a promising leverage to raise the awareness and interest of actors involved in the climate debate.

Figure 8.3:

How research trajectories are formed, reinforced and opened up



PEOPLE CONTINUE TO UNDERSTAND AGROECOLOGY IN DIFFERENT WAYS – BUT THERE ARE COMMON ENTRY POINTS

There is growing support for agroecological research among the international stakeholders interviewed for this report, and particularly in the Swiss AgR4D community, but the range of research considered agroecological is diverse.

Some actors focus exclusively on technological aspects, while others situate agroecology within a politically transformative peasant movement for food sovereignty. For many Kenyan AgR4D actors, agroecology refers to a geographical zoning concept.

Those who are aware of agroecology as a series of farming practices often equate it with climate-smart agriculture. Issues of gender equity, biodiversity conservation, climate resilience and soil health tend to transcend the boundary between supporters of agroecology and those either hostile to or unaware of it. The majority of actors can align more with the scientific and technological components of agroecology. For others, equity, gender and social inclusion or resilience to climate change are viable entry points. In times of increasing awareness of complex and interrelated challenges and crises, the systemic and holistic nature of agroecology provides multiple entry points. Hence, the fluidity of agroecology is an opportunity and a challenge to further adoption (see below).

SIX RECOMMENDATIONS FOR ADVANCING AGROECOLOGICAL AgR4D

Below we outline a series of recommendations for advancing agroecological research in sub-Saharan Africa and beyond. The recommendations go beyond simply advocating for more resources for agroecological research for development. Instead, they are based on addressing the lock-ins of current research pathways. As highlighted by IPES-Food (2016), the reliance on indicators such as productivity of single crops per hectare or per worker is one of the factors locking in the industrial food system model, despite its many negative impacts or externalities. This report identified “self-validating scientific methods” as a further lock-in of research trajectories: The selection of research methods is a routine way to determine which kinds of knowledge, and whose knowledge, are deemed relevant and important. Conventional agronomic research tends to cement and prioritise certain scientific methods and hamper the development of participatory, inter- and transdisciplinary methods used in agroecological research. The recommendations below are therefore aimed at changing the fundamental incentives in AgR4D by promoting new funding structures, new research modalities, new types of partnerships and new ways of measuring and valuing research.

In identifying these solutions, we seek to build on the openings and opportunities already outlined in this report. The recommendations are addressed to those seeking to promote agroecology within their own institutions — notably bilateral donors, philanthropic funders and scientific research institutes — and more broadly in the AgR4D world. While these recommendations draw on the findings of the present case studies, they are intended to be relevant to a wide range of AgR4D actors.



RECOMMENDATION #1**FOCUS ON OPERATIONAL ELEMENTS OF AGROECOLOGY AS FIRST STEPS
IN A WELL-SEQUENCED TRANSFORMATION STRATEGY**

The risks of agroecology being co-opted (i.e. reduced to a menu of standalone practices and conflated with approaches like climate-smart agriculture) are real. However, it is crucial to encourage broader uptake, and to exploit windows of opportunity for spreading agroecology in different institutions and different settings. To do so, a variety of entry points can and should be emphasised, drawing on the context-specific nature of agroecology. It is particularly important to keep doors open given the potential for rapid shifts in strategy at top-down donor organisations like BMGF. Building some element of system redesign – including the socioeconomic and political components of agroecology – into projects, at least in subsequent phases, can provide a guarantee of meaningful engagement with food system transformation. Multi-stakeholder dialogues built on evidence-based arguments can help to bring together different perspectives, as long as they are developed in an inclusive manner. In order for research to have a real-world impact, implementing agencies, civil society organisations, farmer organisations and private sector actors need to be involved at various stages. However, the role of the private sector, including potential vested interests, should be openly discussed and scrutinised, particularly in relation to blended finance models.

SPECIFIC STEPS TO ADVANCE RECOMMENDATION #1:

- Use entry points such as climate change adaptation, human and environmental health, biodiversity conservation, natural resource management, equity and social inclusion to establish dialogues with wide-ranging stakeholders around the multidimensional benefits of agroecological research for development.
- Focus on core practices and principles (e.g. closing natural resource cycles, agroforestry, diversification of crops and livelihoods, inter-cropping and crop rotation, push-pull technology, system of rice intensification, circular economy, co-creation of knowledge, localised food web, gender equity, inclusive decision-making) in order to introduce agroecology to new actors in a way that emphasises its practical applicability and compatibility with existing organisational goals and strategies.
- Emphasize agroecology's contribution to normative commitments like the SDGs and the Paris Agreement as well as to protecting biodiversity through phasing out synthetic agrochemicals.
- Organise equitable and inclusive multi-stakeholder dialogues based on evidence from agroecological research; enrol champions or figureheads who can help to enhance credibility and build alliances.
- Support organisations in their journey towards agroecology by assisting them to build increasingly systemic approaches into subsequent phases of their programming.

RECOMMENDATION #2**CAPTURE THE BENEFITS OF AGROECOLOGY BY MEASURING FOOD SYSTEM OUTCOMES HOLISTICALLY**

The case studies revealed some residual scepticism in the AgR4D world in terms of whether agroecology can deliver the kinds of results typically required by donors. It is therefore crucial to equip donors and research institutes with the tools to identify agroecological AgR4D and measure its outcomes. It is also imperative to showcase agroecological success stories in a way that highlights the economic viability and scalability of agroecology, as well as the feasibility of carrying out systemic agroecological research projects. Indeed, this should be used as an opportunity to advance a more nuanced understanding of scalability, based on scaling out as well as scaling up (see for example IPES-Food, 2018).

SPECIFIC STEPS TO ADVANCE RECOMMENDATION #2:

- Develop a suite of indicators that can be used by donors and research institutes to understand whether existing projects are ‘agroecological’, building on the Agroecology Criteria Tool (ACT) used in this report.
- Extend the analysis of AgR4D money flows to other regions and institutions, including the CGIAR system, and undertake peer reviews to ensure coherent approaches throughout funding portfolios.
- Support the development of holistic performance measurements for agroecology and metrics for capturing project alignment with the SDGs, building on (inter alia): the ACT, FAO’s Tool for Agroecology Performance Evaluation (TAPE), the growing body of work on ‘true cost accounting’ and specific metrics like the land equivalent ratio.
- Improve transparency and accountability as to how AgR4D projects are funded, how they are monitored and how their impacts are measured, e.g. through an extended common reporting system.
- Invite policymakers and funders to visit projects and get first-hand information about the added value of agroecological research projects; engage policymakers in sustained dialogue to challenge and counter the other perspectives influencing their thinking.
- Initiate an alliance to formulate principles and guidelines for agroecological research and to monitor practices.
- Increase the visibility and credibility of agroecological success stories by publishing in peer-reviewed journals and highlighting successful outcomes related to conventional measures and concerns (e.g. productivity, livelihoods) as well as the broader suite of impacts.
- Organise awards for particularly innovative agroecological research collaborations rather than for individual scientists.

RECOMMENDATION #3**BUILD BRIDGES BETWEEN DIFFERENT PARTS OF THE RESEARCH WORLD**

Stronger incentives are needed to involve different stakeholders and different forms of knowledge in research design beyond traditional discipline-specific incentives (journal publication and career opportunity). Agricultural innovation systems need to integrate local knowledge and practices to ensure that innovations are context-specific and adapted to socioeconomic, cultural, institutional and ecological contexts. Within formal research systems, more emphasis is needed on co-creating knowledge, building on the work already being done by farmer groups, CSOs and indigenous peoples to promote farmer-led research and other forms of participatory research where the role of farmers as innovators is appreciated and traditional knowledge is valued. These agents of change for agroecology are rarely among the recipients of AgR4D funding. It is crucial to build bridges between the different parts of the research world in a way that respects and values the autonomy of bottom-up approaches rather than seeking purely to extract, formalise or commodify their knowledge. Besides funding research projects based on co-creation, these agents of change can be supported by creating space to exchange and connect through platforms and networks, thereby increasing their power, visibility and influence.

SPECIFIC STEPS TO ADVANCE RECOMMENDATION #3:

- Facilitate learning exchanges or 'transdisciplinary labs' with different knowledge-holders based on horizontal and peer-to-peer formats to enhance collaboration between farmer groups, CSOs and researchers.
- Provide grants for project development phases, drawing on best practices such as the GEF Project Preparation Grants, which allow for participatory project design and the exploration of farmer-researcher partnerships.
- Include requirements in funding calls on research modalities, including dissemination and research uptake phases, criteria on inclusive research and incentives for highly participatory approaches.
- Identify and showcase champions of transdisciplinarity, i.e. promote role model projects and individuals that combine success in academia with inclusive approaches and applied research components that provide a benefit to society.

RECOMMENDATION #4**YOU CAN'T TEACH AN OLD DOG NEW TRICKS: CHANGE MUST BEGIN
IN TRAINING AND EDUCATION**

Educational structures and programmes are seeing some evolution towards systems analysis and higher-order thinking, with several universities recently opening food system centres or units that tend to break down the traditional silo structures of research. Collaborative research programmes are also forming around agroecology and high-diversity farming systems (IPES-Food, 2016). But change is not going far or fast enough: In order to enable more systemic research in the future, academic curricula need to become more flexible now. Further, there is a need for young researchers to develop more critical thinking and to question certain research paradigms in order for participatory and transdisciplinary approaches to be amplified.

SPECIFIC STEPS TO ADVANCE RECOMMENDATION #4:

- Break down institutional silos in order to embed transdisciplinarity in the DNA of research and training institutes, starting with interdisciplinary courses at the graduate and undergraduate level that include non-academic actors.
- Provide training that includes practitioner-led learning; build a culture of accountability where research is undertaken with and for farmers as the ultimate beneficiaries.
- Develop agroecological curricula at colleges and universities in sub-Saharan Africa by facilitating exchanges between experienced and interested stakeholders (from research, civil society and donor organisations).
- Develop a network of decentralised centres of excellence in agroecology ('agroecology academies') based in sub-Saharan Africa.

RECOMMENDATION #5**SHIFT TOWARDS LONG-TERM FUNDING MODELS**

Research proposals are often adapted to the priorities of funding agencies. It is therefore paramount for donors to use their influence over the research agenda in a way that provides favourable conditions and favourable *timeframes* for agroecology. Systemic research, involving different stakeholders and disciplines, is inherently complex and time-consuming. Standard project-based research funding usually comes with considerable pressure to deliver results (mostly peer-reviewed publications) within a few years. Such conditions work against multidisciplinary research partnerships and the inclusion of non-research stakeholders. Consequently, the imperative for more systemic and transdisciplinary research goes hand in hand with a need for stable, long-term funding. Researchers also need to be creative in establishing partnerships, whether formal or informal. Systemic research is also possible when individually funded research projects from different institutes, departments and disciplines are carried out under a common workflow.

SPECIFIC STEPS TO ADVANCE RECOMMENDATION #5:

- Promote institutional rules for donors that provide enhanced flexibility in programme planning and funding, including the removal of obstacles to funding subsequent phases of the same project or programme.
- Facilitate donor alliances with overlapping funding/financial periods, contributing to and supporting long-term research programmes.
- Harness large finance mechanisms for agroecology, such as Global Environment Facility funds, the Green Climate Fund and the Adaptation Fund.
- Include the delivery of public goods as well as the integration of different disciplines, perspectives and forms of knowledge in standard public funding criteria.

RECOMMENDATION #6**GIVE PRIMACY TO AFRICAN RESEARCH INSTITUTIONS AND SUPPORT BOTTOM-UP ALLIANCES**

Too often AgR4D projects and partnerships remain focussed on one-way knowledge transfer via institutes based in the Global North (as evidenced by the BMGF and Swiss cases). Non-African research institutes influence the agenda through their capacity to attract both large development and research funding flows. As a result, African institutions rarely manage or coordinate projects, meaning that they miss out on the spin-off benefits and continue to face capacity issues that hold back effective delivery of research. It is therefore crucial not only to promote a shift towards *agroecological* AgR4D, but also to rebalance North-South power relations through equal research partnerships and direct access to research funding. Additionally, there is a need for increased funding to build lasting bridges for South-South collaboration. It is also crucial to support the emergence of long-term partnerships and coalitions with a focus on agroecology, local ownership and the meaningful involvement of social movements and farmers' organisations. In parallel, the PPP model that is so central to current AgR4D needs to be continually scrutinised with regard to the delivery of benefits vis-à-vis the SDGs.

SPECIFIC STEPS TO ADVANCE RECOMMENDATION #6:

- Set targets for i) the share of AgR4D going to Africa-based organisations and ii) the share of Africa-based organisations that are project leads.
- Support the development and functioning of bottom-up alliances with the involvement and ownership of farmer groups, researchers, NGOs and social movements, and use these alliances as a key partner in knowledge generation and sharing.
- Invest in management capacity-building of African institutions as well as in research facilities and equipment.
- Facilitate the establishment of South-South exchanges and collaboration on systemic agroecological research.
- Promote the adoption of clear rules by African institutions to govern their involvement in PPPs and undertake a high-level review of the effectiveness of the PPP model for AgR4D.
- For donors funding a relatively high share of AgR4D versus traditional agricultural aid, communicate the impacts to other donors regarding effectiveness and relevance vis-à-vis the SDGs.

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ANNEX 1: AGROECOLOGY CRITERIA TOOL

**LIST OF CRITERIA
OF TRANSITION**

LEVEL OF TRANSITION	ELEMENT OF TRANSITION	CRITERIA OF TRANSITION
Level 1: Increase efficiency of industrial and conventional practices	1.1. Efficiency	Reduced water consumption: reduction of water use while maintaining/ increasing yields through improved practices
		Reduced application of pesticides and veterinary drugs: reduced application of herbicides, fungicides, insecticides, fumigants or use of veterinary drugs. This subcategory includes general integrated pest management programmes or references to general pest/livestock disease research in case no other specific practices are mentioned (including research aiming to reduce pesticide use or plant incorporated protectants)
		Reduced synthetic fertilizer application and use of animal fed: reduced application of synthetic fertilizer or nitrogen leakage, more efficient use of animal feed
		Reduced energy use: reducing fuel consumption in farming by improved technology, equipment or through renewable, low-carbon energy sources that can be used on farms (biofuels are rated separately)
		Reduced seed use: improved or efficient storage and use of planting materials that result in better crop growth and reduced early mortality
		Reduced waste: reduction of losses at harvesting, processing, storage or post-harvest through improved technologies and equipment
		Improved plant variety and animal breed: improved variety or breed that reduces the use of external inputs of at least two of the following categories: water, pesticide, fertilizer, seed and/or drug
Level 2: Substitute alternative practices for industrial or conventional inputs and practices	2.1. Recycling	Alternative soil inputs: substituting synthetic fertilizers through alternate amendments
		Green manure: cover crops or other plants that are left in the field to decompose, reducing dependence on synthetic fertilizers and increasing nitrogen fixation, or improving nutrient availability
		Recycling of waste water: recycling of waste water for agricultural use, agricultural water reuse
		Use of biomass residues for energy generation: energy derived from biomass residues: primary waste from harvesting residues, secondary waste from processing industries (e.g. using agroforestry products) or from post-consumer residues and waste. This category includes energy generation from organic waste and residues only
		Climate mitigation through alternative practices: adoption of practices that mitigate climate emissions by sequestering soil carbon or reducing GHG emissions. This category includes only Gliessman Level 2-type practices where the agroecosystem is not altered from its more simplified form
		Other practices that enhance recycling of biomass and organic matter: other recycling of biomass residues and waste

LEVEL OF TRANSITION	ELEMENT OF TRANSITION	CRITERIA OF TRANSITION
Level 2: Substitute alternative practices for industrial or conventional inputs and practices	2.2. Regulation/ balance	Biological pest management: pest management through biological control methods that import, enhance or conserve pest enemies/ antagonists (including predators, parasitoids, pathogens and competitors)
		Cover crops for pest management: planting cover crops specifically for weed control or pest reduction. This category includes cover crops grown primarily for pest management
		Other pest management: non-chemical pest management practices that treat pest problems rather than preventing their occurrence, or biochemical pesticides that control pests by non-toxic mechanisms (naturally occurring substance). This category excludes biological pest management and crop cover
		Cover crops for improved soil conditions: planting cover crops specifically to reduce erosion, run-off, increase soil organic matter, improve soil drainage, soil structure, alleviate soil compaction, improve overall soil condition
		Perennial crops: adoption of perennial plant species in place of annual crops
		Reduced tillage: adoption of conservation tillage or no-till practices. This category includes general or other reduced tillage practices that are not considered in previous categories already
		Adoption of organic and low-input farming: general organic or low-input systems if not considered in other categories already
		Domesticated pollinators: improved pollination through the temporary introduction of domesticated pollinators or introduction of exotic domesticated species
		Improved animal welfare and health: improved livestock health, and further efforts to support livestock well-being
		Other Gliessman Level 2 systems: systems that integrate less toxic/ harmful inputs through practices to reduce negative impacts which are not yet captured by any other subcategory

LEVEL OF TRANSITION	ELEMENT OF TRANSITION	CRITERIA OF TRANSITION
Level 3: Redesign the whole agroecosystem based on ecological processes	3.1. Synergies	Non-crop plants: incorporating non-crop plants in agroecological systems for ecological functions such as conservation, water quality or pest management. This category does not include integration of trees
		Agroforestry: diversified farming system integrating crop production and trees
		Rotational/regenerative grazing: improved grazing methods/management to improve soil quality and forage yield
		Integrated crop-livestock systems: diversified farming system including both crops and livestock
		Other selective combinations/integrations at the farm level to optimise (ecological) synergies: between and among plants, livestock, aquatic animals, trees, soils, water and other components on farms that optimise ecological functions and ecosystem service delivery
		Integrated pest management by habitat manipulation: landscape planning (focussed on habitat) or habitat management as systemic precondition for biological pest control
		Other landscape planning and synchronised landscape activity leading to improved agricultural ecosystem services: consideration and coordination of activities (including land use, land cover or other components) at the landscape level that optimise ecosystem services that benefits agricultural production. Habitat conservation around agricultural lands, landscape-scale management interventions
		Climate mitigation through redesigned system (increasing carbon stocks, reducing GHG emissions): identifying or adopting practices that can mitigate climate change by sequestering soil carbon or reducing GHG emissions. This category includes only Level 3 types of systems where the agroecosystem is fundamentally redesigned
	3.2. Diversity	Improving local seed/breed diversity: supporting the development and promotion of local, regional, organic seeds/breeds, including classical breeding
		Integrating locally adapted crops/races: incorporating native or locally/regionally adapted crops and animals
		Two-crop rotation: supporting a simple crop rotation with just two crops or where the number of crops included is unclear, but excluding cases where the second crop is specified to be a cover crop
		Three+ crop rotation: supporting a more complex crop rotation system with at least three crops
		Spatially diversified farms: introducing diversity over space by multi-, poly- or inter-cropping
		Biodiversity: specific attention to protect or enhance functional agro-biodiversity
		Natural pollinators: specific attention to protect or enhance local and natural pollinators (and their habitats)
		Multi-habitat approach: increase land-use diversity or diversity at the landscape scale
		Diversification of diets and consumption: promotion of diversified locally produced healthy diets through a diversified food production system (at the landscape/territorial level), macro-and micronutrients, other bioactive components

LEVEL OF TRANSITION	ELEMENT OF TRANSITION	CRITERIA OF TRANSITION
Level 3: Redesign the whole agroecosystem based on ecological processes	3.3. Resilience	Systemic resilience of agroecosystems to extreme weather events and other disturbances: promotion of the resilience of agroecosystems to specific disturbances (windfall, storm, heavy rain, winter freeze, floods, draught, wildfire), including developing frameworks to assess resilience of food systems and measuring the impact of management on the recovery of one or more ecosystem services in response to that disturbance
		Systemic resilience and adaptive capacity to changing environmental conditions due to climate change: research promoting resilience of agroecosystems to future conditions (salinity, average temperatures, new emerging pests and diseases), development of adapted system to future conditions
		Livelihood resilience: diversified income, production and access to market to be resilient against stress and shocks (economic, weather...). The project should measure the impact of livelihood strategies (based on the agricultural sector) on the capacity of farmers to respond to a disturbance and recover from it
Level 4: Re-establish connections between growers and eaters, develop alternative food networks	4.1. Circular and solidarity economy	Business support for re-establishing the connection between producers and consumers: assisting in the development of local food systems, short value chains and webs, developing trading relationships with local growers
		Supporting regional value generation: embedding food systems into local economies, connecting local producers with other value-adding activities at the local or regional level, including post-harvesting, processing, packaging
		Encourage and sensitise for seasonal and regional demand: action supporting a stronger seasonal and regional demand
	4.2. Culture and food traditions	Support healthy, diversified and culturally appropriate food traditions and diets: build food systems based on the culture, identity, tradition, social and gender equity of local communities that provide healthy, diversified, seasonally and culturally appropriate diets, support and protect cultural identity and values tied to food systems
		Support the right to adequate and culturally appropriate food: support the ability of people to make decisions about the quality and type of food they hunt, fish, gather, grow and eat
	4.3. Co-creation and sharing of knowledge	Connecting farmers to share knowledge: engage farmers in co-creation and sharing of knowledge, integrate producer's knowledge and management experience to research (through specific participatory research design), support for farmer-researcher networks
		Promote participatory and multi-stakeholder approaches in knowledge generation: integrate farmers and other actors' views in all stage of decision-making, increase participation and exchange between different types of actors
		Promote formal and non-formal "production and food" education: support for farmer-education networks, formal and non-formal education

LEVEL OF TRANSITION	ELEMENT OF TRANSITION	CRITERIA OF TRANSITION
Level 5: Rebuild the global food system so that it is sustainable and equitable for all	5.1. Human and social value	Gender and vulnerable group approach: developing and informing policies and approaches that empower women or other vulnerable groups (including youth)
		Strengthen organisational capacities: increasing organisational capacities of farmers' communities and other local food system actors
		Equity, dignity, inclusion: support fair, dignified and inclusive livelihoods for all actors engaged in food systems, especially small-scale food producers
		Support right to food (sufficient, access, adequate): developing and informing policies and approaches that ensure the right for people to feed themselves in dignity, implying that sufficient food is available, that people have the means to access it, and that it adequately meets the individual's dietary needs
		Promote food sovereignty: developing and informing policies and approaches that allow communities to decide the way food is produced, traded and consumed
		Creating decent jobs for rural youth based on agriculture: developing policies and incentives for decent job creation for rural youth
	5.2. Responsible governance	Policy development on producer-consumer links: developing or informing policies to help re-establish the connection between producers and consumers, market regulations allowing for branding of differentiated agroecological products
		Inclusive policymaking: developing or encouraging inclusive policy making that aim for sustainable and equitable food system
		Establishment of equitable governance and rights over natural resources: developing, informing or encouraging traditional and customary governance models, policies that ensure and protect equitable land tenure systems and secured access to natural resources
		Policy development on the links between agroecology and global changes: developing or informing policies on the integration of agroecology and other policy processes tackling global changes, such as climate change
		Policy development that rewards agricultural management that enhances biodiversity and the provision of ecosystem services: developing, informing and encouraging national level legislation, policies and programmes that protect biodiversity and multifunctional agriculture, subsidies and incentives for ecosystem services

ABOUT BIOVISION



Biovision Foundation for Ecological Development is a not-for-profit, non-denominational, politically independent foundation based in Zürich, Switzerland. The foundation supports the dissemination and application of sustainable ecological approaches to alleviate poverty and improve food security in sub-Saharan Africa. In addition to field projects with African partner organisations, Biovision is fostering policy dialogue and science-based, integrated policy planning for the sustainability of food systems at national (i.e., in Senegal and Kenya) and international levels (i.e., Agenda 2030 [SDG 2], UN Framework Convention on Climate Change, and Committee on World Food Security). Biovision is also the co-host of the Sustainable Development Solutions Network (SDSN) Switzerland.

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ABOUT IPES-FOOD



The International Panel of Experts on Sustainable Food Systems (IPES-Food) seeks to inform debates on food systems reform through policy-oriented research and direct engagement with policy processes around the world. The expert panel brings together environmental scientists, development economists, nutritionists, agronomists, and sociologists, as well as experienced practitioners from civil society and social movements. The panel is co-chaired by Olivier De Schutter, former UN Special Rapporteur on the Right to Food, and Olivia Yambi, nutritionist and former UNICEF representative to Kenya.

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