

# Scaling up Agroecology through Market Systems

*Using Technology Justice in agriculture to leave no one behind*



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To eradicate extreme poverty means focusing on the 500 million smallholders so they can reliably generate more food and income from their agricultural activities. This paper uses the three pillars of Technology Justice (access, local innovation, and sustainable use of technologies) to assess the range of agricultural development pathways available. Agroecology emerges as the strongest pathway for *leaving no one behind* and meeting the triple challenge of productivity, sustainability and poverty eradication, as outlined in the Sustainable Development Goals. This policy briefing presents existing evidence and research in agroecology alongside case studies of successful initiatives with scalable potential, particularly where market systems are at the core of development practices. Considering the barriers to scaling up agroecology, the paper recommends that development actors work together to identify incentives to enable systemic change, through facilitating market systems and private-sector engagement in agroecological production and value chains.



## Executive summary

Agriculture remains a major focus of development efforts. With the global population expected to grow to 9 billion by 2050, coupled with the negative impacts of climate change on agricultural production, a serious strain is being placed on the sector. This is exacerbated by the concentration of extreme poverty among smallholder farmers in the least developed countries.

Meeting this triple challenge is at the heart of the Sustainable Development Goals, which call for 'leaving no one behind'. Yet, intensification-centred approaches to agricultural development have fundamentally failed to be inclusive; they do not address the needs or tap the productive potential of smallholder farmers.

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This paper assesses the range of agricultural development pathways using the Technology Justice framework, looking at the significant issue of access for smallholder farmers, the sustainability of the pathways, and the opportunities for supporting local innovation. Agroecology emerges as the strongest pathway for leaving no one behind and meeting the triple challenge of productivity, sustainability and poverty eradication.

This policy briefing presents existing evidence and research in agroecology alongside case studies of successful initiatives with scalable potential, particularly those where market systems are at the core of development practices.

Several barriers to scaling up agroecology exist, posing a challenge to its use in development programming. To address these barriers, we recommend governments, donors, researchers, and civil society work together to use the existing evidence to promote agroecological research, practice, and incentives to facilitate systemic change.

This paper presents a variety of potential opportunities to adapt market systems and entry points for private-sector investment and engagement in agroecological systems. These can stimulate scalable, profitable and sustainable business models to help reach many millions more smallholder farmers, enabling them to 'step up' within agriculture rather than remain 'hanging in'.

## Introduction

Current approaches to agricultural development have boosted productivity through the application of modern technologies, synthetic inputs, and economies of scale across large farms. But such approaches have fundamentally failed to address the needs and tap the productive potential of smallholder farmers. Moreover, they have created production systems that are environmentally unsustainable and which can trap poor farmers in cycles of debt and poverty. This has led to a serious technology injustice, one that will undermine the very essence of the newly agreed Sustainable Development Goals (SDGs) which call for ‘leaving no one behind’.

This paper calls for governments and donors to build on existing experience to promote agroecological research and provide incentives for agroecological practice in order to facilitate greater private-sector investment and system change.

The challenge is to address the existing ‘catch-22’ situation, whereby there are few existing commercial incentives for investment in agroecological farming, resulting in a lack of experience, learning, and innovation in such farming which, in turn, leads to a paucity of evidence and incentive for further investment (see also Gómez et al., 2012).

Existing applications of agroecological practices show that they can increase productivity (especially in marginal environments), are more resilient to climate shocks, achieve long-term sustainability, and can be readily adopted and adapted by risk-averse and poor smallholder farmers, but are often classified as anecdotal or small scale.

## The need for a practical use of agroecology

A widely used definition of agroecology was developed by Altieri (1995): ‘the application of ecological concepts and principles to the design and management of sustainable agro-ecosystems’. It is recognized as having three facets:

- a scientific discipline involving the holistic study of agro-ecosystems, including human and environmental elements;
- a set of principles and practices to enhance the resilience and ecological, socio-economic, and cultural sustainability of farming systems;
- a movement seeking a new way of considering agriculture and its relationships with society for the environment and future generations (Silici, 2014).

That ‘agroecology’ has therefore been used to describe a science, a practice, and a social movement for reform of the global food system has created much debate, indecision, and controversy.

Agroecology is a scientific discipline enabling an understanding of agriculture within its physical context (see Box 1). Its practice is necessary for sustainable and resilient agriculture – whether for smallholders, emerging commercial farmers, or large-scale production systems (Wezel et al., 2009).

## Why agroecology is relevant and needed

The needs and contributions of many smallholder farmers are not being addressed, as evidenced by stagnating yields, incomes and livelihoods. This group is often referred to as the ‘hanging in’: they usually practise subsistence farming and are often food insecure (Dorward et al., 2009). The reason they are hanging in – unable to ‘step up’ – is because

### Box 1: The principles of agroecology

#### *Holistic planning*

- The health of the whole agroecosystem is necessary for sustainability.
- A farming system must be in harmony with the productive potential and physical limits of the landscape.

#### *Recycle and optimize the use of nutrients and energy on the farm*

- Optimize organic matter decomposition and leguminous nitrogen fixation.
- Minimize losses.
- Avoid chemicals.
- Minimize non-renewable inputs (fossil fuels).

#### *Management*

- Enhance beneficial biological interactions and synergy through on-farm biodiversity, e.g. use natural enemies and antagonists to manage pests and diseases.
- Diversify species and genetic resources in the agroecosystem over time to improve resilience.
- Use local crop varieties and livestock breeds to enhance adaptation to the changing environment.
- Provide the most favourable soil conditions for plant growth by managing organic matter and soil biological activity.

Source: adapted from Silici, 2014

## Policies need to meet the triple challenge of production, sustainability and poverty eradication

conventional agricultural development and growth strategies do not work for them. There are some 500 million smallholder farms worldwide; more than 2 billion people depend on them for their livelihoods (Nwanze, 2011). Improving the productivity and livelihoods of smallholder farmers is crucial to achieving the poverty and food security goals of the SDGs.

The challenge is to generate incentives for innovative investment by farmers and businesses, large and small, in agroecological markets and production systems. This policy brief looks at the choices – innovative pathways for policy and investment – and the barriers to these pathways. We examine learning from existing market-based practice, consider the private-sector opportunities, and propose new research, innovation, and investment by development actors and others.

## Agricultural development pathways

In many parts of the world, particularly in Africa, the production practices of the majority of smallholder farmers are neither sustainable nor productive. Population growth has fragmented landholdings and increased the pressure on land (IFAD and UNEP, 2013). The task recognized by the recently agreed SDGs (goals 1, 2, 8, 12, 13 and 15 in particular – see UN, 2014) is to address the triple challenge of:

- boosting food production to meet growing demands;
- improving the incomes and well-being of smallholder farmers to move them out of extreme poverty;
- working within the boundaries of sustainability to ensure that future generations can continue to provide food for the world, and that the first two aspects are not undermined by climate impacts and shocks.

There are different schools of thought about how to address these challenges, as reflected in the three dominant agricultural development pathways promoted by a range of organizations and institutions. These can be broadly categorized as:





A Bolivian farmer tending to her quinoa crop – a resilient, nutritious and valuable crop for Andean farmers, credit: Samuel Rendon/Manuel Seoane © Practical Action

1. ‘green revolution’ style conventional agriculture, which promotes monocropping and extensive synthetic input use to maximize yields of a single crop;
2. sustainable intensification, which blends aspects of agroecology with modern technological agricultural practices, such as targeted use of synthetic inputs and improved seeds;
3. low external-input systems that use agroecological principles to enhance production and resilience to changing climatic conditions. These systems can require high internal inputs of labour, knowledge and social capital.

The main characteristics of these three approaches are outlined in Table 1. The distinction between the three approaches is not clear-cut and is made here for illustrative purposes only. The scale with which these different pathways are able to meet the triple challenge is illustrated in Figure 1.

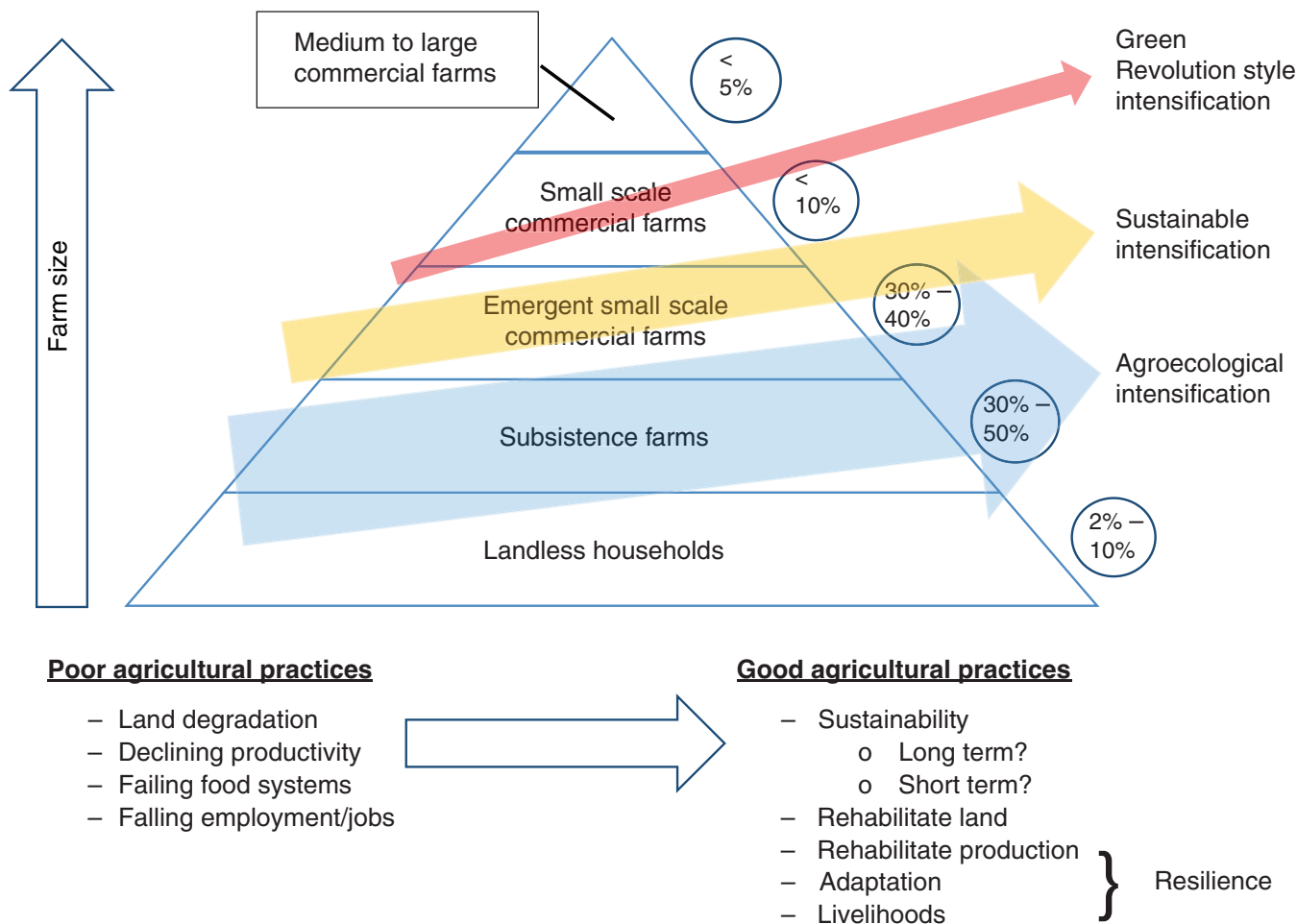
The Technology Justice framework (Meikle and Sugden, 2015), set out in the first paper of this policy briefing series, provides a lens for assessing whether agricultural practices and technologies actually benefit smallholder farmers. It looks at access, local innovation, and sustainable use of technologies.

Technology Justice: where people have the ability to choose and use technologies that assist them in leading the kind of life they value, without compromising the ability of others and future generations to do the same (Sugden, 2015: 5).

**Table 1** Generalized characteristics of the three different agricultural pathways

|                              | Pathway 1 – Conventional                                    | Pathway 2 – Sustainable intensification  | Pathway 3 – Agroecological   |
|------------------------------|---|--|--|
| Objective                    | Maximize yields   | Maximize yields  | Optimize yields  |
| Genetic diversity            | Mainly monoculture of genetically uniform crops (or breeds) | Mainly monocropping with crop rotation or some intercropping   | Biodiversity maintained and utilized through diversified crops and farming systems   |
|                              | Germplasm licensed and regulated                            | Germplasm licensed and regulated   | Often unregulated germplasm  |
| Inputs                       | High use of chemical fertilizer, herbicide, and pesticide   | Reduced application of chemical inputs through precision-dosing technology, combined with organic inputs         | Minimal chemical inputs; linked production to utilize waste materials (by-products) as organic inputs  |
| Use of technology            | Extensive use of external inputs, machinery, and technology | Mostly use of researcher-developed technologies; some use of machinery   | Use of both farmers’ knowledge and researcher-developed technology, e.g. resource-efficient technology such as drip-irrigation and cyclical production |
| Climate change impacts       | Contributes to Green House Gas emissions                    | Limited contribution to GHG emissions  | Mitigates GHG emissions through carbon sequestration   |
| Adaptation to climate change | Limited ability to adapt to climate change                  | Adapts to climate change through improved seed activated by chemical inputs; sensor equipment to monitor changes | Resilient to climate change (several strategies including holistic planning, recycling, synergies, and biodiversity) with options for adaptation       |

Note: GHG (greenhouse gas)



**Figure 1** Alternative pathways for intensification and investment

Note: The size and position of coloured arrows represents the type and number of farmers able to adopt the pathway

Source: adapted from OECD, 2006: 11

In agriculture, this means that interventions or practices must, at a minimum:

- improve and support access to productive agricultural practices and technologies for marginalized smallholder farmers in a way that minimizes risk;
- promote local innovation that improves the adaptive capacity of smallholder farming systems;
- facilitate sustainable use of natural resources to ensure the viability of continued production and adaptation.

Agricultural systems that do not meet the three pillars of Technology Justice will ultimately fail to address the triple challenge of productivity, sustainability, and poverty eradication, and will leave smallholders behind, hanging in rather than stepping up.

## Meeting the triple challenge and Technology Justice

The distinction between the three pathways is not clear-cut. They span a continuum of different practices. In a given district, circumstances may favour some farmers with good market access and financial capacity allowing them to follow Pathway 2, while others, with poor access to markets or few resources, may follow Pathway 3.

*Pathway 1* can appear attractive as it provides the highest production output, market opportunities for input and output agribusinesses, and efficiencies associated with

concentrated production and marketing systems. But the cost of inputs, along with the technologies and technical capacities needed to achieve high outputs, make it prohibitive for the vast majority of low-income smallholder farmers.

Single-crop systems have routinely been shown to be less resilient to natural disasters and shocks (Altieri et al., 2015; De Schutter and Vanloqueren, 2011), and so present an inappropriate development pathway for resource-poor smallholder farmers. Furthermore, the application of synthetic chemical inputs to manage such production systems damages and degrades soils, undermining the natural resource base of smallholder farmers. This system not only contributes to greenhouse gas emissions that cause climate change, but promotes a short-term vision of agriculture, shifting the impending food crisis from this generation to the next, and leaving it unable to provide for a global population which it is estimated will be 9.7 billion by 2050 (UN-DESA, 2015: 1). A dependency on technology transfer and external inputs exacerbates risk and limits access, meaning Pathway 1 fails to meet the access, innovation and sustainability criteria of Technology Justice.

*Pathway 2*, sustainable intensification, provides a more nuanced approach to agricultural production, and better meets the challenge of sustainability, through precision application of inputs, minimal tillage, and some diversification (Godfray and Garnett, 2013). Its proponents stress the need to keep all technological options on the table, combining agroecological practices with modern technological solutions which are also effective at improving yields.

As with Pathway 1, sustainable intensification will typically promote contract farming to achieve economies of scale and may focus on the production of particular crops with some chemical inputs and improved seeds. The danger with this pathway is that productivity will be prioritized over access for smallholders. Many smallholders are in locations too remote or inaccessible for this approach to be financially viable for them: limited market linkages, and the credit needed for inputs, seeds, and technology erodes the income they can generate. The investment and focus on specific crops increases financial, environmental, and food security risks, in particular by limiting adaptation choices in future years, and does not foster local innovation efforts.

*Pathway 3* is closely associated with agroecology and most effectively meets the triple challenge of increased food production, higher incomes, and sustainability. Working within the natural ecological systems of the locality, Pathway 3 places sustainability and land management at the heart of the approach and has a clear focus on resilience to climate changes and shocks. Diversified growing practices result in crops being available for a greater part of the year, providing more stable income-earning opportunities and food availability across growing seasons. The diversity of produce also encourages a more varied diet, helping to address nutritional issues (Alloway, 2008; DeClerck et al., 2011).

Pathway 3 is likely to be more appropriate for the majority of marginalized smallholder farmers who could develop commercial viable enterprises by reducing costs, managing risks, and achieving a greater return on investment. Agroecology fits the key criteria of Technology Justice and presents an opportunity to support the majority of poor smallholder farmers in low-income countries, a group that is currently excluded from opportunities presented by other agricultural pathways and faces insurmountable constraints in 'stepping out' of agriculture into alternative rural or urban livelihoods. One of the major challenges facing smallholders, however, is how to meet the higher labour requirements of agroecological farming.



Rice-duck farming provides environmental and productivity benefits and new and diverse market opportunities, credit: Menila Kharel © Practical Action

It is vitally important to find common ground between private-sector interests and development objectives

While innovation and investments in agriculture are dominated by commercial interests, it is possible and vitally important to find common ground between private interests and development objectives so that innovation and investment deliver improved agricultural practices that are inclusive and benefit the poor (Sugden, 2015).

To ensure the *access* element of Technology Justice is met, a paradigm change is required in the policies, investments, and structure of agriculture. That change needs to create incentives and an enabling environment for the private sector to invest in, engage in, and deliver technologies, services, and knowledge that enable agroecological farming by remote smallholder farmers.

Although the productivity potential of agroecology is often challenged by proponents of other agricultural development pathways, there is a growing body of evidence which demonstrates the capacity of such systems to significantly and sufficiently increase yields (see Box 2). Table 2 summarizes the major research findings on the productivity of agroecology.

**Table 2** Major research findings on the productivity of agroecology

| Source                          | Findings on yield   |
|---------------------------------|---|
| Pretty and Hine, 2001           | Data on yield changes in 89 projects for various crops (sorghum, maize, beans, rice, wheat, potato, cotton) showed 50–100% increases in rain-fed crops and 5–10% in irrigated crops |
| Pretty et al., 2006             | Study of 286 projects, representing 12.6 million farmers on 37 million hectares. Mean relative yield increase was 79%   |
| Sileshi et al., 2012            | 1.3–1.6 t/ha maize yield increase using agroecology in sub-Saharan Africa   |
| De Schutter, 2010               | Average crop yield increase of 80% in 57 developing countries, with an average increase of 116% in Africa   |
| Pretty et al., 2011             | 113% yield increase across 40 projects in Africa  |
| Altieri and Funes-Monzote, 2012 | 145–351% yield increases over 13-year period in Cuba  |



## Box 2: Scaling up agroecology through the private sector: coffee production in Peru

Small-scale coffee producers in Peru often struggle to carve out a living and work in supply chains which are biased in favour of coffee exporters and processing companies. Limited technical expertise contributes to unsustainable practices among farmers. Large-scale deforestation is leading to land degradation and reduced soil fertility. Farmers suffer from low levels of competitiveness, low prices for coffee, and few opportunities for wage labour.

In 2008, Practical Action launched a project to address these problems. One component of the project focused on increasing productivity through agroecological practices; the other built farmer capacity to participate in markets through organizing producer groups, carrying out capacity training, such as market analysis and business management, and strengthening relations with other actors in the value chain.

Following the completion of the project, farmers reported a decrease in disease (yellow rust) from 73% to 18%. Coffee production increased by 33% across the board from 2013 to 2014. Through sustainable land management, quality increased from 78 to 82 points resulting in a higher coffee grade, and farmers were able to negotiate quality-related premium prices. The average income of the farmers increased by 252% in 2014.

The agroecological market system approach is estimated to have the potential to quintuple coffee exports from Peru. About 30 million tonnes of carbon dioxide per year could be captured by decreasing deforestation and water treatment. Practical Action is working with regional governments and national ministries to adapt policies and legislation to enable this production system to be scaled up across the country.



A skilled Peruvian coffee farmer raising coffee seedlings for his shaded and biodiverse farm in the cloud forests of San Martin, credit: Practical Action Peru © Practical Action

What is often not systematically captured in studies of the three pathways is evidence of the benefits beyond yields and income – resilience, sustainability, nutrition, livelihood security, land and soil quality, and water-use efficiency. Without such comparable evidence of these equally important factors, yield and income comparisons are a shallow and misleading representation of the benefits, qualities, and appropriateness of different systems.

Governments, donors, NGOs, and researchers need to ensure that measures of well-being, income, sustainability, resilience, and nutrition are included in the planning and evaluation of development programmes. In this way a true comparison can be made to measure the multifunctional benefits of agriculture that are vital to achieving multiple SDGs.

## Constraints and opportunities in scaling up agroecology

### Challenges

Barriers to the supply of agroecological technologies and approaches when developing successful agricultural market systems are many and varied (HLPE, 2013). Many NGO- and farmer-led initiatives have not continued once the project funding that supported them ended (Altieri et al., 2011).

Table 3 outlines some of the key challenges for policy makers creating enabling environments for the widespread promotion of agroecological production systems, particularly among smallholder farmers.

**Table 3** Barriers to private-sector involvement in agroecological practices

|                                 |  |
|---------------------------------|--|
| Timeframes                      | Requires a long-term view of production, risk, and value. It takes time to reap the benefits from adopting agroecological practices. This stands in sharp contrast to shorter term business priorities of farmers and agribusiness (large and small), as well as the immediate needs of farmers for food and income.   |
| Perceptions and marketing       | There is no existing certification system for agroecologically produced goods and thus limited price premium potential.  |
| Labour intensity                | Although some technologies and aspects of agroecology reduce farm labour in the long term, on the whole agroecological practices are often more labour-intensive than mechanized agriculture.  |
| Complexity and diversity        | Agroecological farming systems require sound knowledge of how to manage and balance the farm. This necessitates strong knowledge systems to be accessible to farmers, as opposed to companies providing goods and inputs often with limited extension services.  |
| Diversity                       | Agroecology practices promote biodiverse farming to balance and maintain nutrients and water and to manage pests and diseases. This then requires companies to retail different types of goods and services for different crops. It also poses challenges of scale for market buyers, who conventionally purchase single crops in larger quantities to minimize transaction costs. |
| Scale                           | The vast majority (around 85%) of smallholder farmers work on less than 2 ha of land (HLPE, 2013). This means that economies of scale achieved on larger commercial farms using monocropping cannot be realized.   |
| Externalities                   | Agroecology incorporates the dimensions and costs of externalities – such as pollution, water usage, and GHG emissions – into its practices. But when there is no existing market value such as carbon credits, for these externalities at a national, regional, or global level, then agroecological production is less competitive.  |
| Existing policies and subsidies | In many cases, existing policies and subsidies promote development pathways other than agroecology, so there is not a level field of production system options available to farmers. This can be seen in many countries, such as Bangladesh, where chemical inputs are heavily subsidized but no such subsidies exist for organic inputs.  |

## Entry points

Despite these barriers, there are many opportunities for both small and medium-sized enterprises (SMEs), along with more established, larger companies, to craft new value chains or to exploit value chains that are embedded in existing market systems. Scale can be achieved if these value chains involve many of the 500 million smallholder farms worldwide.

The application of agroecological principles results in more diverse and complex production systems. Inevitably it leads to the production of a much wider range of commodities from smaller plots or units. From a market perspective it means more variety and variability, which can be challenging when there are multiple actors and channels. The link between the provision of physical inputs and commodity markets is not as strong, but there may be many more opportunities at other points in numerous value chains.

**Agroecology  
leads to more  
market variety  
and variability**

Agroecological practices are knowledge-intensive. Therefore, the range of entry points entails a shift away from conventional agribusiness practices of goods-based businesses (retailing state-subsidized chemical inputs) to service-based business models, and retailing locally produced organic inputs. Table 4 gives some examples.

## Creating enabling environments

While these examples represent significant opportunities for private-sector engagement and investment in agroecological practices, there also needs to be an enabling environment to make these opportunities viable and effective so they reach the millions of farmers left behind by existing development pathways. There needs to be a level playing field when it comes to input prices (e.g. input subsidies) and policies need to reward farming that addresses the triple challenge of productivity, sustainability and poverty reduction.



A smallholder farmer sells her milk to a local collection point in Nepal, credit: Practical Action Nepal © Practical Action

**Table 4** Examples of agroecological market entry points

|                   |   |
|-------------------|---|
| Knowledge systems | Brokering appropriate scientific knowledge, while supporting farmer innovation and adaptation<br>Creating knowledge networks between companies, farmers, meso-level institutions, and extension services with robust feedback loops |
| Technologies      | Drip and spray irrigation systems<br>Precision-dosing applicators<br>Remote-sensing systems<br>Biogas digesters   |
| Data/information  | Meteorological data<br>Networked remote-sensing systems<br>Brokering crowd-sourced data   |
| Organic inputs    | Bio-fertilizer/industrial production of organic fertilizers<br>Natural pesticides<br>Complementary plants (e.g. nitrogen-fixing legumes)  |
| New value chains  | Retailing by-products, such as crops from complementary plants<br>Fish, meat and animal products from livestock–crop farming systems<br>Price premiums for ecologically produced goods in expanding urban markets                   |

Practical Action’s experience in facilitating pro-poor changes in agricultural market systems through Participatory Market System Development (PMSD) has shown that if smallholders and companies are jointly involved in processes that shape market systems, those markets are more likely to innovate and deliver affordable and appropriate technology that meets their needs (Practical Action, 2015). The PMSD process works to build trust and a joint vision of change between multiple market actors, and helps them to collectively identify obstacles and opportunities. Enabling actors to coordinate is an essential aspect of creating inclusive market systems, particularly in new or nascent value chains (Hellin et al., 2012). Box 3 describes Practical Action’s PMSD work in Bangladesh.



Participatory markets are more likely to be innovative and deliver affordable and appropriate technology



High-quality organic compost produced in Bangladesh from urban waste, credit: Mahobul Islam © Practical Action

**Policies and subsidies.** Existing policies in many countries actively support and promote development pathways associated with Pathway 1. This includes subsidized chemical inputs and pesticides, tax breaks for the largest commercial farms linked to export markets, subsidized water use which promotes resource-intensive practices, and the failure to monetize the externalities of farming, including Green House Gas emissions, land degradation, forest loss, and water pollution and overuse (Amboueleish, 2011). Solutions which address market failures to value biodiversity and land management have been at best slow and piecemeal (Lockie and Carpenter, 2012).

In Bangladesh, Practical Action is working with the national government, agribusinesses, and research organizations to change this situation and create an enabling environment for bio-fertilizer. Produced from treated and processed faecal sludge, the approach is also creating new value chains from material which previously had little to no value.

### **Box 3: Using PMSD to create an enabling environment for sustainable agriculture**

To combat systemic market constraints facing both smallholder farmers and supplier companies in Bangladesh, Practical Action instigated the Making Agriculture and Market Systems Work for the Poor project. This project sought to boost agricultural production and food security by improving knowledge and skills, encouraging the adoption of modern technologies, and establishing a sustainable, high-quality organic inputs supply system.

Using the PMSD approach, Practical Action helped service providers to establish links with producers, certified seed sources, and traders. Rural sales and service centres were set up to create a meeting place where rural produce could be sold to buyers, and agricultural inputs and services distributed. In addition, Practical Action facilitated the formation of service-provider associations. This allowed the service providers to establish relations with large input suppliers and facilitated engagement with government departments.

As a result, 89% of crop, livestock, and fish farmers noted great improvements in their production through use of better crop varieties and bio-fertilizer. Awareness-raising campaigns on the benefits of using green manure to increase soil organic matter resulted in significant decreases in chemical fertilizer use and associated costs among participants.

Training and capacity building of service providers resulted in an overall business growth of 63%, while paravets' business growth averaged 144%. Service providers reported that, as a result of training, they could more readily identify market opportunities and could quickly respond to the growing demand from producers for higher quality organic products.



Rigorous studies have demonstrated that investments in rural public goods, infrastructure for transport, energy, and communications, creates significantly greater returns on investment for governments and farmers than investing in subsidizing chemical inputs (De Schutter and Vanloqueren, 2011; Fan et al., 2009: 2; HLPE, 2013).

Private retail standards (PRS) are often seen to be disadvantageous for smallholder farmers, as they present a new set of challenges and restrictions (Rossignoli and Moruzzo, 2014). However, where PRS can be aligned with agroecological practices, there will be market mechanisms to support and incentivize such production systems, bringing many more smallholders into lucrative international and emergent domestic markets.

**Credit systems.** Functioning credit systems are fundamental for achieving an enabling environment for scaling up agroecology. Many farmers currently purchase inputs on the basis of formal and informal credit systems with agro-dealers. But in limited external-input systems such as agroecology, credit systems which are accessible and appropriate for smallholder farmers will need to be supported and their reach extended to ensure that farmers can access the necessary financial resources to invest in knowledge, data, inputs, and technologies (Pretty and Hine, 2001).

Financial products and systems across the finance sector must be adapted to encourage sustainable agricultural practices. Tools such as the Soft Commodity Forest Risk Tool, devised by the United Nations Environment Program (UNEP) and Natural Capital (2015), provide effective mechanisms for integrating robust sustainability criteria into a range of financial products for medium-sized to large enterprises.

## Recommendations to help ensure no one is left behind

Eradicating extreme poverty means focusing on those that are hanging in with subsistence agriculture, so they can reliably generate more food and income from their agricultural activities and be part of the solution to food security and poverty reduction. Agroecological farming that uses the existing assets, knowledge, and resources of smallholder farmers is the most effective way to do that.

Companies, governments, and investors need to take long-term approaches to development and food production, and better incorporate risk management into their practices to ensure the impacts of climate change and land degradation do not simply shift to the next generation of smallholder farmers.

Taking a strategic perspective, governments and donors need to address the current 'evidence catch-22'. They need to build on the existing evidence to promote further agroecological research, practice, and incentives to enable systemic change and foster an enabling environment for private-sector investment. We call for large-scale action research to address the following key questions:

- What role does the private sector play now in agroecological practices and what role could it play?
- What are the most effective technologies for stimulating agroecological production and emergent value chains?
- What blend of push-and-pull policies and legislation is required to increase investment in sustainable smallholder agriculture systems?

If the needs, risks and resources of the diverse types of smallholder farmers are not placed at the very heart of rural development strategies, alongside environmental considerations, then governments and donors will fail to address the triple challenge facing world agriculture and the targets set by international agreements, such as the SDGs. If eradicating extreme poverty and achieving food security in sustainable ways are to be thoroughly addressed, governments and donors must act now to create and stimulate agroecological value chains for smallholder farmers.

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Front page photo: A woman sorting coffee in a shed

*Credit:* Francis Salas © Practical Action

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