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People-Centred Resilience

Working with vulnerable farmers towards climate change adaptation and food security

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Globally, 1.7 billion farmers are highly vulnerable to climate change impacts. The many who are already hungry are particularly vulnerable. Yet scaling up localised 'resilience' successes offers hope for these farmers, while helping to address the climate problem. New thinking to recognise vulnerable farmers as critical partners in delivering solutions is needed to increase their resilience and to enable them to help combat climate change. Bold new public investment to the supporting institutions will be needed.

Summary

Worldwide, 1.7 billion small-scale farmers and pastoralists are highly vulnerable to climate change impacts. They live on marginal rural lands characterised by conditions such as low rainfall, sloping terrain, fragile soils, and poor market access, primarily in Africa and Asia. Such farmers are vulnerable because their farms depend directly on rainfall and temperature, yet they often have little savings and few alternative options if their crops fail or livestock die.

Many are already hungry, making them particularly vulnerable. World hunger currently stands at 1.02 billion people, its highest level ever. Over 60 per cent of hungry people are women, and hunger remains predominantly rural, though cities are catching up.

Given existing hunger and looming climate change, donors and national governments must take immediate action to help vulnerable farmers build their resilience in order to improve their food security despite climate shocks.

Achieving farm resilience requires building up the resilience of vulnerable farmers by developing their skills, expertise and voice while supporting their use of agro-ecological farming practices. A resilient farm can cope effectively with climate shocks while also producing more. Building resilience depends not just on how farmers manage resources, but on how well local, national, and global institutions support farmers.

The clearest evidence that sustainable agriculture remains limited is the widespread degradation affecting agricultural lands, with only localised pockets of environmental restoration. Around 384 million hectares of cropland in the developing world is degrading, affecting 1.4 billion people. In Africa, 65 per cent of agricultural land is degraded. Yet even after farms have 'collapsed' due to soil degradation, they can often be restored, and then resume a sharply higher level of productivity and capacity to cope with shocks.

Agro-ecological practices can empower vulnerable small-scale farmers, offering them both greater control over their lives and an accessible means of improving their food security, while decreasing their risk of crop failure or livestock death due to climate shocks. Vulnerable farmers can use agro-ecological practices to build resilient farms and improve their livelihoods, achieving multiple benefits: 1. improved food security; 2. adaptation to a changing climate; and 3. mitigation of climate change.

This mitigation potential is significant. It is estimated that agriculture could 'fix' gaseous carbon – and hence reduce net greenhouse gas emissions (GHG) – at a rate of 2–3bn metric tonnes of carbon per year for the next 50 years. Measures for doing this would include restoring degraded soils and planting trees. Vulnerable farmers may often live in poverty, but they could be powerful partners in the struggle against

climate change.

While the potential is huge for win-win-win outcomes, farmer adoption of agro-ecological practices is constrained by various barriers coupled with policy frameworks that emphasise external input-based strategies and largely neglect sustainable agriculture.

Vulnerable farmers also face growing threats to their land from big businesses that seek to produce food or biofuels. Increasing land scarcity and anticipated price rises for these products are fuelling a flurry of interest in acquiring developing-country land. Some 120 hedge funds, retirement funds, agribusiness companies, and private equity funds have recently invested in agricultural land in developing countries. The International Food Policy Research Institute (IFPRI) estimates that 15 to 20 million hectares (an area the size of Uruguay) have been under negotiation since 2006.

To secure 'win-win' outcomes instead of adverse outcomes, we must invest in marginal communities in order to build people-centred resilience. People-centred resilience consists of five principles which should guide how investments in vulnerable farming communities are designed and implemented. They are:

1. Restored and diversified natural resources for sustainability.
2. Responsive institutions grounded in local context.
3. Expanded and improved sustainable livelihood options.
4. Sound gender dynamics and gender equality.
5. Farmer-driven decisions.

Following these principles ensures that investments support farmers in their efforts to become food-secure and adapt to climate change. Four institutions central to delivering people-centred resilience are: secure land rights; dynamic farmer associations; responsive agricultural advisory services; and public support for environmental services.

Official development assistance (ODA) to agriculture has fallen by some 75 per cent over the past two decades, from a high of approximately $20bn per year in the mid-1980s to $4bn per year in recent years. Donors currently spend twice as much on emergency response efforts as they do on agriculture. However, preventing crop failure via proactive agricultural investment is estimated to cost about one-fifteenth as much per person as sending food aid to hungry people once farm production collapses. Farmers living on marginal lands have been largely neglected, as have sustainable agriculture strategies.

Vulnerable small-scale farmers are also affected by policy addressing both climate change mitigation and adaptation to climate change. The World Bank estimates that the cost of helping developing countries adapt to climate change will average between $75bn and $100bn per year for the period 2010–2050. In all, Oxfam calculates that at least $150bn per year is needed to address critical adaptation and mitigation needs for developing countries.

Agro-ecological practices can simultaneously deliver food security, adaptation, and mitigation. However, such outcomes are not presently forthcoming from existing institutional mechanisms. For instance, only 14 per cent of the projects supported by the EU's €1bn commitment on food security projects for vulnerable farmers in 2009, included an agro-ecological component, while 51 per cent included agro-chemicals. Meanwhile, current funding for climate change adaptation in vulnerable communities is tiny. Major investments in vulnerable farmers are needed to reverse these trends and ensure that farmers have the tools to build their resilience and contribute to food security in the long-run despite growing climate shocks.

Given these challenges, Oxfam recommends that donor nations and developing-country governments:

- **Invest more and more wisely in agriculture to accomplish multiple goals**. New public investments in agriculture emphasizing agro-ecological approaches are essential to improving food security, helping vulnerable farmers adapt to climate change, and mitigating climate change.
- **Commit to providing $150 bn in mitigation and adaptation funding across sectors** above and beyond the 0.7 per cent of their budgets that donor nations have committed (but not necessarily delivered on) as ODA.
- **Foster 'people-centred resilience' to help vulnerable small-scale farmers achieve food security and adapt to climate change.**
- **Capture the vast potential of developing-country agriculture to deliver mitigation**. Vulnerable farmers and pastoralists – including particularly vulnerable groups such as women – should be treated as key partners in the struggle against climate change.
- **Prioritise investments in small-scale farmers working on marginal and degraded lands**.
- **Scale up proven community-based measures**. Notably, foster agro-ecological practices.
- **Target public investments to fill the gaps left by the private sector**. Investments in food security and adaptation should emphasise marginal areas where investors find few profitable opportunities, yet where vulnerable farmers are concentrated.
- **Address institutional constraints facing female farmers**. Train extension agents to meet the specific needs of female farmers and recruit new female extension workers. Increase tenure security for women through low-cost, rapid, and transparent community land registration. Improve women's access to inputs, technologies and financial services.
- **Gather gender-based statistics,** given the importance of gender to understanding the critical dynamics of reducing food insecurity and adapting to climate change.
- **Harness the large overlaps between adaptation and mitigation measures within agriculture**.

1 Introduction

'Even though we Bolivians aren't contaminating a lot, if we don't start with ourselves, we can't ask others to do things either. We need to look for alternatives so that Mother Earth doesn't get any sicker. We all need to put our hand to our heart, and question what we are doing, for the sake of the future generations.'

Clemente Salazar, community leader and farmer, Raquaypampa, Cochabamba, Bolivia, March 2009.[1]

'There's been hardly any rain for three to four years,' explains Laxmi Devi Sarki, a farmer from Badhauli village, Nepal. 'The planting and harvesting seasons are out of time. The winter wheat crop in particular has been bad. We are totally dependent on rain, we have no irrigation systems, and now our water systems are declining and we are not feeling cold as we should be during winter. If it continues like this there will be a disaster.' Similarly, Kadija Doumbia, from Tangala village, Mali, observes: 'Some years you have to wait a long time for the rain and other years it rains early. Then you plant and it doesn't rain, so you have to plant again. It wasn't like this before, the unpredictable weather happens much more often.' Farmers around the world are well aware of climate change and its impact on their efforts to earn a sustainable livelihood and achieve food security. Yet responding to these changes remains a challenge.

Worldwide, 1.7 billion farmers and pastoralists are highly vulnerable to climate change impacts.[2] They live on marginal rural lands characterised by conditions such as low rainfall, sloping terrain, fragile soils, and poor market access.[3] Of these farmers, 228 million live in Africa and 837 million live in Asia. Land degradation is widespread in these areas, and yields are typically low.[4] Such farmers are vulnerable because their farms depend directly on rainfall and temperature, yet they often have little savings and few alternative options if their crops fail or livestock die. Many are already hungry, making them particularly vulnerable.[5]

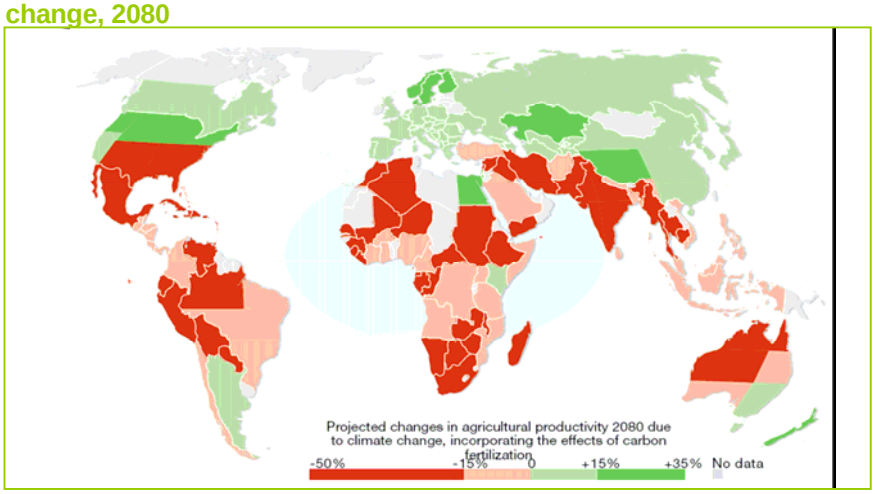
Food security has been defined and accepted as existing when all people at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life.'[6] World hunger currently stands at 1.02 billion, its highest level ever.[7] Although the period from 1970 to 1995 saw steady progress towards achieving global food security, since 1995, hunger has increased. The Millennium Development Goal (MDG) of cutting hunger in half from 1990 levels by 2015 looks increasingly unrealistic.[8] Over 60 per cent of the hungry are women.[9] Five million children die each year from hunger, and many more see their physical and mental development stunted by malnutrition.

Hunger is still predominantly rural, but cities are catching up.[10] Many urban poor are rural migrants who find jobs are scarce and life equally difficult.[11] However, the focus here is on vulnerable farmers and some early priority options to help them achieve food security despite the growing climate change threat.

Climate change brings a vast new threat to vulnerable farmers, placing them at risk of food insecurity while further endangering the many farmers who are already hungry. Impacts on vulnerable farming communities include: higher temperatures; lower, more erratic rainfall;

and more frequent and intense droughts, floods, and cyclones. Climate change even alters the nature and timing of seasons.[12] Anticipated consequences include yield reductions,[13] water scarcity, disease, and mass migrations. [14] Tragically, climate change is predicted to cause a situation where calorie availability in 2050 will be below 2000 levels across the developing world.[15] Moreover, hungry households often sell whatever assets they have to buy food, making it likely they will remain hungry after the latest climate shock has passed.

Figure 1. Predicted changes in agricultural productivity due to climate change, 2080



Source: Hugo Ahlenius, UNEP/GRID-Arendal, 2008.[16]

Given existing hunger and looming climate change, immediate action must be taken by donors and national governments to help vulnerable farmers build up their resilience in order to improve their food security.

'We can transform a necessity into virtue; we can pursue new and improved ways to produce, consume, and discard. We can usher in a new era of global partnership, one that helps lift all boats on the rising tide of climate-friendly development.'

UN Secretary General Ban Ki-Moon, at the launch of the Intergovernmental Panel on Climate Change report, November 2007.[17]

Historically, assistance to developing world agriculture from international donors and national governments alike has largely focused on high-potential agricultural areas and conventional farming strategies. Yet ongoing food security concerns coupled with the emerging climate threat demand a shift in focus to prioritise vulnerable farmers and sustainable agriculture farming strategies.

Experience from community-based initiatives across the world suggests that positive outcomes for vulnerable farmers are possible despite climate change. Scaling up these proven measures could catalyse major food security gains while also helping vulnerable farmers adapt to climate change.

Despite this potential, we must also recognise that it is only possible for farmers to adapt to climate change up to a point, no matter how vigorous and well-designed the adaptation measures. Bold climate change mitigation – i.e. addressing the global climate problem – is therefore also imperative, since adaptation alone cannot address the threats facing vulnerable communities.

'Climate change takes away some possibilities and it gives you others,' says Cristian Domínguez, a farmers' association leader from Bolivia. 'Part of our culture has always been to manage climate risks. We don't call it "adaptation" to climate change but "evolution". But it's becoming

more difficult as the climate is becoming more extreme.'

Besides embracing a renewed emphasis on vulnerable farming communities, policy-makers must also reconceptualise public investments in these communities to view vulnerable farmers as key actors in creating solutions to these challenges.

While diverse investments in these communities are needed, a key early focus, given the growing climate change threat and limited resources, should be scaling up proven community-based measures. In this paper, we highlight agro-ecological farming practices as a way to build up the resilience of farms, delivering both food security and climate change adaptation simultaneously. Often, these same practices also help to mitigate climate change, while potentially providing farmers with a major new income stream for their service.

Achieving farm resilience requires building up the resilience of vulnerable farmers by developing their skills, expertise, and voice whilst also supporting their use of agro-ecological farming practices. Investments must support and build responsive local and national institutions; create sustainable livelihood options; address gender inequities; be farmer-driven while building on local knowledge; and be participatory at all stages.

This paper makes the case for investing in building up the resilience of vulnerable farming communities as a critical stepping stone to addressing the global challenges of food security; climate change adaptation; and climate change mitigation. It outlines what is required to put vulnerable farming communities at the centre of solutions to these three challenges. It provides a sense of early options for adaptation investment that address urgent needs while also delivering major co-benefits. Finally, it highlights the need for political will and commitment to address these challenges.

2 Sustainable agriculture and resilience

Just as food security is not mainly about increasing food availability, farming system resilience is not mainly about productivity. Clearly, increasing productivity and its capacity to withstand climate shocks is critical to the food security of vulnerable farmers. Yet resilience is also the capacity of farmers to respond to and learn from shocks. This requires a diverse skill set; supportive institutions; and back-up plans (e.g. social protection) when failures occur. Hence, it depends not just on how farmers manage resources, but also on how well local, national and global institutions support farmers. [18]

Resilience is the ability of a joint social and ecological system – such as a farm – to withstand shocks, coupled with the capacity to learn from them and evolve in response to changing conditions.[19] Building resilience involves creating strength, flexibility, and adaptability.

A resilient farm can cope effectively with climate shocks such as droughts or floods, continuing to produce and sustain its capacity for future responsiveness and production. By contrast, a vulnerable farm hit by climate shocks could see its crops fail or its livestock die, with potentially lasting effects.[20] On degraded lands,[21] building resilience can also sharply raise a farm's baseline productivity.

Building farm resilience depends in part on people changing how they use and manage natural resources, as resilient systems are typically founded on a dynamic, intact natural resource base. For instance, whether farms remain productive despite climate shocks depends partly on the current state of local soil fertility, water resources, and microclimate – things that are influenced by farmers. Simply put, the same farm can be either more resilient or more vulnerable depending on how it is managed. Farmlands where soil, vegetation, and water resources are degraded may be functioning well below their potential.[22]

Around 384 million hectares of cropland in the developing world are degrading, affecting 1.4 billion people.[23] In Africa, 65 per cent of agricultural land is degraded.[24] Cereal yields of 1 tonne per hectare (ha) are common on these lands,[25] compared to global averages of 5 tonnes/ha and 3 tonnes/ha for developed countries and developing countries, respectively.[26]

Yet even after farms have 'collapsed' due to resource degradation, they can often be restored, resuming a sharply higher level of productivity and capacity to cope with shocks. In other words, a 'vicious circle' of resource degradation; agricultural stagnation; and climate vulnerability can often be transformed into a 'virtuous circle' of environmental restoration; renewed farm productivity; and climate resilience.[27]

Building resilience can thus deliver both food security and climate change adaptation. Contemporary approaches to disaster risk reduction similarly emphasise building up resilience to minimise the vulnerability of communities to diverse shocks, notably by restoring degraded

natural resources; diversifying livelihoods; and improving governance.[28]

Agricultural practices and empowerment

'We need forestry to restore the sponge effect to the land. That will help keep the streams alive,' explains Santosh Matthew, a local official in Bihar, India. 'We also need a number of surface water-harvesting structures. In addition to the right kind of forestry, we need horticulture to help fill the gaps.'

Santosh Matthew, Local Official, Bihar, India, 1996.[29]

A key intergovernmental, multi-stakeholder process, the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), recently conducted a comprehensive assessment of world agriculture involving 400 leading scientists working over a period of four years.[30] Its mission was to map out a strategy to achieve sustainable food and agriculture systems. Through this process it was concluded that fundamental changes are needed in world agriculture, notably a decisive shift towards sustainable agriculture as a complement to conventional farming. Agriculture has in many cases degraded the natural resource base on which it depends, with adverse effects on production, water resources, and global climate. Reversing this process is essential, notably by fostering the adoption of agro-ecological practices.[31]

The emerging climate change threat makes this call for agro-ecological farming practices all the more urgent. As farmers are often the first to experience the impacts of climate change, it is important to note that both community-based adaptation projects and indigenous adaptation measures strongly emphasise these practices.[32] These practices can also help mitigate climate change.

'We need water pipes, we need to learn how to look after the land and adapt to the drier conditions; we need to grow more drought-tolerant crops and vegetables; we need to learn more about climate change; and we need training in how we can speak up on these issues.'

Thandi from Hluhluwe, a small town in KwaZulu-Natal province, South Africa, 2009.[33]

Agro-ecological approaches involve the innovative management of natural inputs (e.g. manure, crop residues, rainwater, trees) as opposed to simply exploiting land or relying on external inputs such as agro-chemicals or improved (i.e. hybrid or genetically-modified) seeds. A number of broadly analogous terms are commonly used, namely sustainable agriculture, agro-ecology, conservation agriculture, organic agriculture, LEIT and LEISA (see endnote for details).[34]

Sustainable agriculture views the farm as an integrated system, including both agricultural technologies and the wider socio-cultural and environmental context. Its technological focus is the restoring of degraded lands and the maintenance of a vital natural resource base,[35] notably by harnessing symbioses between field crops, livestock, pastures, and trees. It builds on local knowledge and traditional institutions, yet adapts them to reflect increased scarcity of resources. It diversifies farm production through complementary enterprises such as livestock-keeping, tree planting, and vegetable gardening. It sees farmers as stewards of the land. Practices include using manure as fertiliser, intercropping, water harvesting, planting trees that complement crops or livestock, and integrated pest management. Box 1 highlights the case of organic agriculture.

Box 1: Organic alternatives help build resilience in Tajikistan and Thailand

Organic farming is a sub-set of sustainable agriculture in which strict standards ensure that products are free from agro-chemicals, allowing them to fetch a price premium. An Oxfam project in Khatlon Province, Tajikistan is helping women's groups establish collective organic farms and providing them with subsidised seeds as a means to supplement their incomes and withstand drought. In a region where 50 per cent of rural households are food-insecure and where erratic weather is wreaking havoc with farm livelihoods, this initiative is helping farmers get by. Besides fetching a price premium and avoiding the cost of expensive chemical inputs, organic methods help farms withstand climate change by fostering more fertile soil with better water retention, as well as more diverse crops with differing climate sensitivities.

Yasothorn Province, Thailand provides another example of organic farming helping farmers cope with the twin threats of hunger and climate change. This rice-growing area is poor, and erratic rainfall in recent years has devastated rice yields and threatened food security. In response, Oxfam is working with farmers to foster organic rice production, which copes better with erratic rains. Project activities include training farmers, small-scale water management; diversifying farm production; examining risks to and burdens on women; and farmer-to-farmer learning. Outcomes have been impressive, with participating farmers maintaining their rice yields – compared with 40 per cent falls elsewhere – while also earning income from fruit and vegetables. Clearly, local-level success is possible using simple measures, but scaling up such work will require major new investments.

Source: Oxfam programme work in Tajikistan and Thailand, 2009.[36]

'This area used to be thick forest, now it's been cleared. Almost every piece of land has been settled on and people have cut trees wantonly. The river used to be wet all year round because trees surrounded it. People have cut them, the soil is being eroded, and we can't grow crops in the dry season because we can't get water from the river.'

Julius Nkatachi, Tsite village, Phalula, Balaka, southern Malawi, 2009.[37]

Agro-ecological practices can empower vulnerable farmers, offering them both greater control over their lives and an accessible means of improving their food security while decreasing their risk of crop failure or livestock death due to climate shocks. This is important, as the most vulnerable farmers often cannot afford purchased inputs, and effectively live in biomass-based subsistence economies, relying directly on the continued vitality of local natural resources.[38] Agro-ecological approaches can work particularly well for women, who often have neither the money to afford external farm inputs nor the time or social capital to participate in remunerated work.

External inputs such as agro-chemicals and hybrid seeds are potentially complementary to agro-ecological approaches, but on marginal lands agro-ecological practices may need to be the first step, given the challenges such farmers face. For instance, farmers in Adamitullu village in Ethiopia are working with an Oxfam partner to restore their degraded land, which produces little and leaves them vulnerable to increasingly erratic rains. They now use manure as a fertiliser and plant trees. The land has been restored to the point where farmers no longer see chemical fertilisers as a priority. While drought-tolerant seeds are seen as a powerful complement to these agro-ecological practices, only one or two households per village can afford them at present.

Whatever technologies are used, these should fit with local soil,

hydrology, institutions, financial constraints, and culture. If technologies or concepts are developed elsewhere, they should only be used if they fit with the local context. The end result should be an intelligent blending of indigenous and introduced elements that reflects contemporary local opportunities and constraints.

'Win-win-win' outcomes?

With climate change already affecting many farms around the world, vulnerable farmers can use agro-ecological practices to build resilient farms and improve their livelihoods. They use them to achieve three distinct goals (wins): 1. addressing concerns about food security; 2. adapting to a changing climate; 3. mitigating climate change by 'fixing' atmospheric carbon in soil or trees.

Recent studies have shown that agro-ecological practices can deliver these three distinct benefits simultaneously, if carefully designed, in what might be termed 'win-win-win' outcomes.[39] Such outcomes are most associated with adoption of these practices on lands that have become degraded and hence are well below their inherent potential, notably marginal lands farmed by vulnerable farmers.[40]

In different ways, all three 'wins' come back to ensuring the food security of vulnerable farmers. Indeed, building up the resilience of farmers and their farms promotes all three aspects of food security:

Availability of food

With stronger, more equitable land rights and better access to information, especially price information, women and men farmers have more incentive to carefully manage their natural resources and to grow food for market sale, which in turn increases the availability of food in towns and cities, and amongst farmers themselves.

In Mali, Oxfam facilitated a self-assessment that led farmer co-operatives to adopt organic production methods; diversify into sesame and shea butter trees; develop skills to build local processing capacity; and learn advocacy skills. Results included more stable production; a 65 per cent increase in farm income since 2007; farmers' voices being heard in key decision-making processes; strengthened farmer co-operatives committed to gender equality; and more food on local markets.

A recent review of 286 projects in 57 countries found crop productivity rose by 79 per cent where farmers had adopted agro-ecological practices,[41] while another review reported food production rising by 73 per cent for 4.42 million small-scale farmers growing cereals and root crops.[42]

Access to food

Investments in hard infrastructure, soft infrastructure, and market development can all increase rural access to food markets. However,

without improved advocacy skills, organisation, and local political decision-making, vulnerable farmers may be unable to successfully demand such investments, and will remain marginalised.

When markets fail, back-up plans must be ready to ensure every woman, child, and man's right to food, as guaranteed by the United Nations in 1948.[43] These plans will become increasingly important as climate-related disasters begin to inflict more havoc upon vulnerable farmers. National social protection plans such as Ethiopia's Productive Safety Net Programme often offer cash and food transfers that help guarantee access to food and keep poor people from selling their assets during hard times.[44] Ethiopia's programme, while national, involves community-based decision-making.

Utilisation and nutritional value of food

By encouraging extension agents and community-based organisations to build on local knowledge and biodiversity, sustainable agriculture can increase vulnerable farmers' access to a nutritious diet. For example, with encouragement from an NGO, some Dalit (the lowest and most marginalised caste) families of Zaheerabad in Andhra Pradesh, India have returned to harvesting, eating, and selling the nutritious and medicinal leafy greens that grow best on farms practicing sustainable agriculture. In addition to bringing income to poor farmers and field labourers, this practice provides access to foods containing key micronutrients.[45]

Nutrition education alone would not enable food security, but it is an important complement to sustainable agriculture. Women and men must understand basic nutrition in order to remain healthy and alert and develop the skills necessary to build resilience.

Achieving win-win-win outcomes

One of the best examples of a 'win-win-win' action is increasing the soil organic matter levels of farmland.[46] Soil organic matter can be built up via practices such as fertilising fields with animal manure or compost; using crop residues as mulch; and employing conservation tillage methods. Increasing soil organic matter content makes soils more fertile; better able to hold water; and more resistant to erosion. The end result is farms that are both more productive and more resistant to climate shocks.[47] Increasing soil organic matter is also a mitigation strategy with huge potential, on a par with mitigation strategies for industry or transport.[48]

Other actions can also deliver food security, adaptation, and mitigation simultaneously. Rainwater-harvesting strategies help cope with increased rainfall variability, yet can also raise crop productivity and increase soil carbon stocks. Agro-forestry practices can diversify and increase total farm production while also providing emergency cash reserves and sequestering carbon.[49] Avoided deforestation can likewise deliver multiple benefits, though this is a more nuanced case.[50]

Pastoralists from Haraweyu village, Ethiopia illustrate how improved pasture management can also deliver these three goals.[51] Recent droughts have brought water scarcity, while intensive grazing has led to a loss of the area's traditional deep-rooted grasses, which survived from year to year. An Oxfam water project has transformed water availability, but pasture remains a problem, as the remaining grasses have shallow roots that get pulled up when they are grazed. The result is that livestock grow thin and sometimes die, especially during droughts. However, villagers are excited by a project to reintroduce deep-rooted grasses by giving people seeds to plant on their private lands. This has dramatically increased milk production and the capacity of animals to survive drought, while also boosting soil carbon stocks.

'There will be a much greater negative impact on Africa because of its geography. But instead of adapting we are scraping the land, removing the vegetation and losing the soil. We are doing things to make it worse… Our real work is reclamation – bringing back what is essential so we can move forward. Planting trees, speaking our languages, telling our stories are all part of the same act of conservation.'

Nobel laureate Wangari Maathai, May 2009.[52]

Under the third 'win,' how much mitigation potential are we talking about exactly, from both private and public measures? In total, it is estimated that agriculture could 'fix' gaseous carbon – and hence reduce net greenhouse gas (GHG) emissions – at a rate of 2–3 bn metric tonnes of carbon per year for the next 50 years, through measures such as restoring degraded soils and planting trees. [53] This is enough to compensate for half to three-quarters of new emissions annually.[54] Moreover, such mitigation could be relatively cheap[55] – from $2 to $10 per tonne[56] – compared with predictions that carbon credits will have to be trading at between $90 and $180 per tonne by 2030 to avoid disastrous climate change.[57] Vulnerable farmers may often live in poverty, but they could be powerful partners in the struggle against climate change.

Could there be yet one more 'win'?

Beyond the three described above, there may be yet another fundamental 'win' that could follow from widespread adoption of agro-ecological practices by farmers.

To explain changes to the local climate that threaten food security, some farmers point to local environmental degradation and deforestation. In the words of farmers from Ethiopia's Rift Valley, 'trees make rain', while also bringing cool, moist air and improving the local microclimate.

Farmers from Tanzania's Shinyanga Region and elders from Mali's Tangala village say similar things, and their assertions are supported by regional modelling work and field studies.[58] This work finds that farmers' decisions on land use – notably how well trees, grasses, and soil organic matter are maintained – strongly affect local temperatures and rainfall.[59] Indeed, local land use patterns have a comparable impact on local climate to that from global GHG levels.[60]

While important, local changes in land use are no substitute for efforts to address global climate change, since continued global warming could overpower any local climate effects linked to land-use change. However, land use practices can be a powerful tool for modifying the local climate.

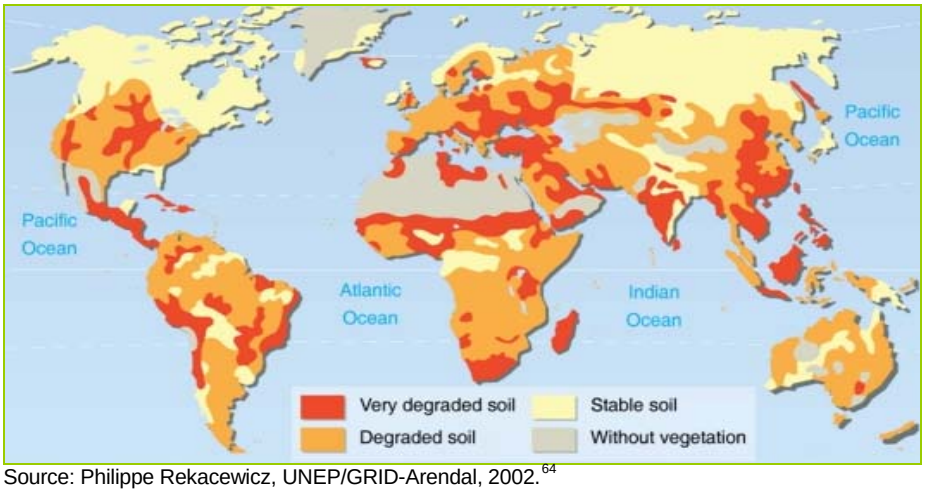
Agro-ecological farming in practice: sporadic adoption, limited support

'In responding to changing climatic conditions in many parts of the world, sustainable agriculture or conservation farming techniques should be employed to conserve water and prevent soil degradation and deforestation.'

Policy recommendation from a 2008 US government research report to inform discussions on a new US food security policy.[61]

Despite the many merits of agro-ecological practices, their adoption by farmers is currently sporadic and limited, especially among vulnerable farmers.[62] The clearest evidence that sustainable agriculture remains limited is the widespread degradation affecting agricultural lands, with only localised pockets of environmental restoration.[63]

Figure 2. Land degradation is widespread



Source: Philippe Rekacewicz, UNEP/GRID-Arendal, 2002.[64]

Degraded soil means less food and greater poverty. It is estimated that 11.9–13.4 per cent of world agricultural production has been lost due to soil degradation in the past five decades.[65] These losses are concentrated amongst poor communities who can least afford them.

While the potential is huge, farmer adoption of agro-ecological practices is constrained by various barriers to adoption coupled with policy frameworks that focus on external input strategies, while largely neglecting sustainable agriculture.[66] In the absence of enabling policies, localised agro-ecological successes usually involve active engagement of supportive outside actors with local farmers' associations[67].

Potential barriers to farmer adoption of agro-ecological strategies include:

Information: Farmers may be unfamiliar with agro-ecological practices, which historically may not have been needed in the area if land was abundant and the climate was stable. They may also lack access to relevant information and training to harness these knowledge-intensive practices.[68]

Labour: These practices may be labour-intensive, at least when first established, but they can also save labour. Planting trees requires work, but subsequently women no longer have to walk for hours to gather bundles of firewood. Similarly, establishing in-row tillage requires extra labour initially, but thereafter makes weed control easier.[69]

Timing: These practices tend to deliver benefits only gradually, which can be a problem for vulnerable farmers who may be preoccupied with short-term needs.[70]

Land tenure: Farmers need secure land tenure to be confident they will reap the benefits of longer-term investments in land quality.[71]

Co-operation: Some practices require actions by groups of farmers, such as contouring hillsides to control erosion and capture water. This action requires dynamic producer associations as a pre-requisite.[72]

Many of these barriers to adoption could be addressed if national governments and donors invested in relevant enabling institutions such as producer organisations, social protection, and land tenure. Public funding for climate change adaptation and food security both provide major opportunities to do this.

Additional threats to vulnerable farmers

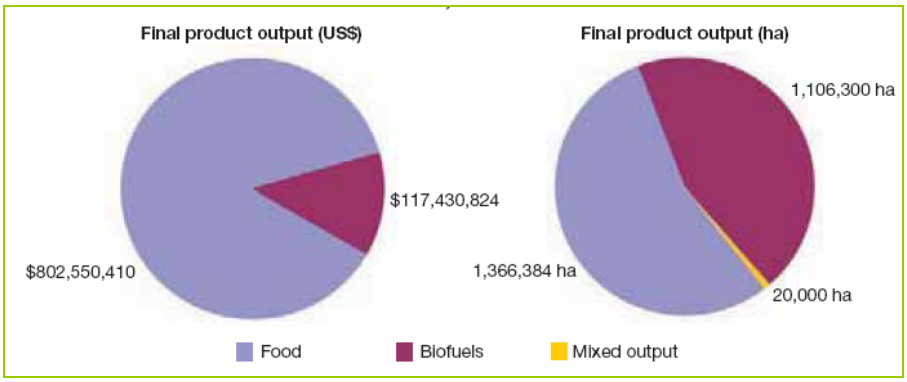
'I'm convinced that farmland is going to be one of the best investments of our time. Eventually, of course, food prices will get high enough that the market probably will be flooded with supply through development of new land or technology or both, and the bull market will end. But that's a long way away yet.'

George Soros, Leading US Corporate Investor, June 2009.[73]

Vulnerable farmers face growing threats to their land from big businesses that seek to produce food, biofuels or mitigation credits known as 'carbon offsets.' Increasing land scarcity and anticipated price rises for these products are fuelling a flurry of interest in acquiring developing-country land.[74] In cases where land rights are insecure or informal, vulnerable farmers may face the threat of 'land grabs'. Of course, land deals are not necessarily involuntary. However, without proper institutional support vulnerable farmers may be susceptible to distress sales. Either way, these women and men could end up losing their assets and livelihoods and endangering their food security.

Since 2004, according to the Food and Agriculture Organization (FAO), the volume of international land deals in Ethiopia, Mali, Ghana, Sudan, and Madagascar have increased rapidly due to high food prices and expectations of increased demand for biofuels and climate change mitigation.[75]

Figure 3. Land acquisitions data for five inventory countries, 2004–2009



Source: FAO, IFAD, and IIED (2009) 'Land Grab or Development Opportunity?' [76]

120 hedge funds, retirement funds, agribusiness companies, and private equity funds have recently invested in agricultural land in developing countries.[77] The International Food Policy and Research Institute (IFPRI) estimates that 15 to 20 million hectares have been under negotiation since 2006,[78] and these land deals are notable for their sheer size.[79] Table 1 shows that $1bn has already been invested in just five African countries to buy 2.5 million hectares, an area the size of Macedonia.

Table 1. Approved Land Sales, 2004 – early 200980

	Ethiopia	Ghana	Madagascar	Mali	Sudan	Total
Total land area allocated (ha)	602,760*	452,000*	803,414*	162,850*	471,660*	2,492,684*
No. of projects approved (over 1000 ha)	157	3*	6*	7*	11*	184*
Largest land allocation (ha)	150,000	400,000	452,500	100,000	109,200	
Total investment commitments ($)	78,563,023 *	30,000,000 *	79,829,524*	291,988,688 *	439,600,000 *	919,981,235

Sou rce: FAO, IFAD, and IIED, Land Grab or Development Opportunity? * Denotes incomplete data. [81]

'The soya farmers have arrived. They began their attack on the land of our relatives in the Xingu National Park. They have caused a lot of destruction there. They have put an end to the forests. They are doing the same elsewhere.

Davi Yanomami, a Yanomami Indian from the Brazilian Amazon.[82]

Meanwhile, due to diverse barriers to entry and economies of scale, vulnerable farmers will be largely unable to access the global food, biofuel, and carbon markets without a transformation in supporting institutions.[83] Given this gap, civil society, national governments, and donors must ensure that the needs of vulnerable farmers are met through public investments while exploring how to deliver pro-poor markets.

Without the implementation of appropriate and functioning institutions, 'win-win' outcomes will be replaced by outcomes in which vulnerable farmers lose out. 'Lose-lose' outcomes are also possible if development spending continues to neglect marginal and degrading lands and if measures to address climate change remain half-hearted.

To secure 'win-win' outcomes instead of adverse outcomes, we must invest in marginal communities using the people-centred resilience framework as a guide. Technologies are a key part of the solution to the food security challenge facing vulnerable farmers. Yet their promise depends critically on supporting institutions, as does empowerment more generally. It also depends on institutions reflecting the fact that communities are diverse, including women and men, youth and the elderly, and disadvantaged ethnicities and religions.

'Drought and famine in Palamau grab the headlines because they are spectacular,' notes Narendra Chaubey, a political activist in Bihar,

India. ‘But they are, still, *events* that flow from a number of less spectacular *processes*. Among those are deforestation, land-grab, and poor water harvesting.’[84]

3 Enabling 'people-centred resilience' for vulnerable farmers

Resilience is about farmers and their resources. People-centred resilience is about working with vulnerable communities to achieve resilience to a variety of shocks. Here we focus, however, on the need to build farmers' resilience to climate shocks, which directly threaten food security. People-centred resilience involves far more than simple adoption of agricultural technologies. Notably, it requires building on the rights of vulnerable farmers to address key institutional issues within the agricultural system, as well as investments in sectors which support agriculture (such as health, education and infrastructure).

People-centred resilience consists of five principles that should guide how investments in vulnerable farming communities are designed and implemented to ensure that they support farmers in their efforts to adapt to climate change and become food-secure. [85] Its impact is greatest where aspects of people-centred resilience are currently missing, i.e. where land is degraded; people have little education or voice; and institutions and markets provide few opportunities.

Principle 1: Restoring and diversifying natural resources for sustainability

The underlying physical component of people-centred resilience is a restored, diversified natural resource base. This can be achieved by fostering widespread adoption of agro-ecological practices, which enhance food security and climate resilience by building up natural assets. At a time of rising input costs, greater scarcity of resources, and growing climate threats, these practices offer powerful options to help farmers meet their multiple goals. However, achieving widespread adoption of these practices depends on having relevant institutional support, as the remaining four principles indicate.

Principle 2. Responsive institutions grounded in the local context

To effectively confront daunting livelihood challenges, vulnerable farmers must have access to functioning institutions responsive to their priorities and constraints across local, national, and global levels. Critical institutions needed to support farmers include; markets with regulatory systems that are responsive to the needs of vulnerable farmers; agricultural advisory services; secure property rights; and social protection.[86] Institutions must be designed to address gender

disparities that could derail effective development outcomes. They must enhance critical household assets through access to information, training, incentive schemes, and credit.

Programmes, services, and policies focused on vulnerable farmers should be locally grounded and appropriate to the local context. Community ownership of institutional actions is critical. Farming communities must both voice their priorities and help design actions, if they are to support them and seize the opportunities they bring. For institutions to be responsive in these ways, their initiatives must be based on participatory consultations that solicit active involvement of marginalised farming communities in programme and policy design. The process by which institutions engage with vulnerable women and men is critical, and must be based on full partnership and mutual respect.

Principle 3. Expanded and improved sustainable livelihood options

One key way to expand the livelihood options of vulnerable farmers is via markets, notably those offering diversified options and improved terms. Markets can provide farmers with new sources of income; key farm inputs; and diverse consumer products. Market-based factors of particular relevance to empowering marginalised farmers include: (1) new production technologies such as drought-tolerant or pest-resistant seed varieties; 2. new market types, notably high-value product markets (e.g. organic, Fair Trade) and innovative products; and 3. new facilitating structures such as financial instruments (e.g. micro-credit, crop insurance, and community savings schemes) and infrastructure (e.g. crop processing facilities and roads).

Besides markets, the livelihood options of vulnerable farmers may also be expanded via public-sector schemes that provide payments to people in exchange for certain types of work. For instance, some governments provide a daily wage for work on local infrastructure projects as part of safety net schemes in food-insecure areas. Governments or donors could also provide payments for environmental services to farmers whose management practices benefit society. For example, farmers who mitigate climate change by 'fixing' atmospheric carbon in soil or vegetation.

Principle 4. Sound gender dynamics and gender equality

Women typically play critical roles in vulnerable small-scale farming communities. They tend to be the principal care-givers to children, the

old, and the sick. They are often the primary producers of food crops, and they tend to collect water and fuel for their households. At the same time, women are also particularly threatened by both hunger and climate change. They often remain disadvantaged at various levels – within households, communities, and in interactions with the state, the private sector, and civil society organisations (CSOs). They tend to have limited access to and control over key household assets and a marginal role in household decision-making.

In addition, many rural societies have gender roles that leave women more exposed than men to climate change impacts. For instance, gathering firewood and water for the household is becoming more difficult due to climate change. If food supplies are inadequate, women and girls are usually the first to eat less and worse. And if households are struggling and need more help from their children, girls are the first to be pulled out of school.

Women must actively participate in project and programme design to ensure that the resulting measures are not biased against them. For instance, programmes must be designed so that women are not excluded from access to extension agents, credit, agricultural inputs, storage facilities, and land tenure. Women must also have full access to emerging opportunities such as new markets or government-led schemes of community-based financial incentives. Generally, the empowerment of women must remain a priority, since successfully achieving resilience outcomes will depend on ensuring that their needs and concerns are addressed (see Box 3).[87] Notably, investments in marginal farming communities should empower women to actively participate in household and community decision-making and to make their voices heard in national policy debates. Ultimately, addressing the gender relations that contribute to hunger and climate vulnerability could unlock key drivers of deprivation and transform communities.

Principle 5. Farmer-driven decisions

Ensuring that vulnerable farmers can improve their livelihood outcomes depends critically on their own decisions. A fundamental shift and increase in their influence on decision-making about the programmes and policies that affect them requires enhancing farmers' capacity to voice needs, demands, and choices.

Box 2: Coping with climate change by reviving indigenous knowledge, Bolivia

Beni Department in Bolivia is prone to droughts and flooding, with both becoming more frequent and intense due to climate change. Indigenous farmers are especially vulnerable to such shocks, as are women who are the area's principle food producers. Fortunately, archaeological work and development research has revealed an ancient farming system used by the area's pre-Inca civilisation that is now being revived to great effect with help

from Oxfam.

The 'camellones' system involves establishing raised seedbeds to protect crops from flooding. The seedbeds are bordered by water channels that capture and store water. The channels provide natural irrigation to guard against drought while creating a habitat for fish and aquatic plants. These plants are either used as livestock fodder or laid on the ridges to increase soil fertility. Results include higher farm production; greater climate resilience; and provision of an alternative to clearing rainforest for agriculture by restoring degraded lands.

Given its promise to ensure food security despite an increasingly erratic climate, many women have enlisted in the scheme, which operates at the household level in some areas and collectively in others. Early successes have convinced the municipal authorities in Trinidad to incorporate camellones into the local climate risk mitigation strategy.

Initially the local community was sceptical, since everyone knew that the soil was very poor and no good for agriculture. But the system's success has won them over, while also giving them a sense of pride in their heritage. One farmer explained: 'When we saw it for the first time we became curious… and when we saw how it worked we saw it was very good.... and because it was developed by our ancestors we felt proud.'

Source: Oxfam programme work in Bolivia, 2009.

Access to relevant information enables farmers to make informed decisions and to voice them effectively. Information is especially needed to help farmers adapt to the unprecedented challenges now facing them, notably regarding innovative production technologies and diversification options. Responsive agricultural advisory services; dynamic farmers' associations; and women's empowerment initiatives are critical to securing farmers' access to information. Such institutions strengthen farmers' voice in setting priorities and influencing the design of rules and regulatory regimes affecting them.

With a shift in the influence of vulnerable farmers, resilience measures can build on local knowledge and traditional practices. Such innovations are likely to be better suited to the local environment and culture; less reliant on costly inputs; and more acceptable to communities. Initiatives to foster innovations in resilience can fruitfully build on indigenous resilience strategies, but should avoid indigenous coping strategies based on asset-stripping or increased hardship, e.g. selling livestock to buy food, or walking further to find water or fuel. Finding the best blend of local and outside knowledge to address key livelihood challenges requires full participation by vulnerable women and men and advisory services that are accountable to these clients.

4 Principles in practice

People-centred resilience involves shifting a common yet narrow focus within agricultural development – on external-input based technologies – to a focus on agro-ecological technologies and the institutions needed for these to be adopted widely. This shift offers hope for positive outcomes for vulnerable small-scale farmers despite the daunting threat of climate change. Yet success depends on a strong political commitment to support vulnerable farmers and heed their voices about how best to do so. That is, the success of technological change hinges on how it is delivered and received, and hence on political will, institutions, and farmers themselves.[88]

Of the diverse forms of institutional support needed to deliver people-centred resilience, four types deserve special mention. So too does one overarching bias.

Development policy is biased towards men. For instance, data on access to credit and formal land rights in Kenya, show that institutional supports go overwhelmingly to men, despite the fact that women are estimated to produce 80 per cent of Kenya's food.[89] Insecure tenure and lack of credit hamper investments in land, undermining both farm productivity and adaptation to climate change. Such trends are disturbing as well as counter-productive. Where roles and access to assets and services are strongly gendered, recognising these patterns will be a key determinant of whether community-based initiatives succeed. In many cases, however, gender-based data are simply unavailable at present, making it difficult to understand critical dynamics and respond effectively to constraints.

Providing a firm foundation via secure property rights

Agro-ecological farming may promise multiple benefits, but securing the property rights of vulnerable farmers is a critical pre-condition.

In the developing world, land tenure arrangements are often complex. In Africa, over 90 per cent of land is formally owned by national governments, while rural people possess only customary tenure or informal use rights. Millions of hectares in Asia and Latin America have a similar status. Some areas fall under co-existing informal tenure systems that are not recognised in formal statutory law but are accepted and enforced by local communities. [90] Small-scale farmers who have only *de facto* rights to land may face a greater threat to land grabs and extortive land deals.

Box 3: Women, land tenure, and information sharing in Niger

In the late 1970s and early 1980s, farm households in Kollama Baba, Niger, in the Sahel region of Africa, suffered from food security linked to extreme drought and land degradation. By the late 1980s, farm productivity had plummeted by 90 per cent.

With the help of the German development agency's (GTZ) Tahoua Rural Development Project, village chiefs and local government officials granted 250 widows and divorcees from Kolloma Baba rights to degraded plots of land.

The women formed the Kolloma Baba Women's Association and began sharing information and resources, helping one another to develop their plots of desert through soil and water conservation and tree regeneration. Many members diversified into okra, cowpeas, and groundnut – something that might not have happened if they had not been organised, as women's time is especially limited due to child care, water gathering, and other household responsibilities. Nowadays, many of the women are active on a village committee that deals with protecting trees. Their confidence and status have also increased and some even hire male labour.[91]

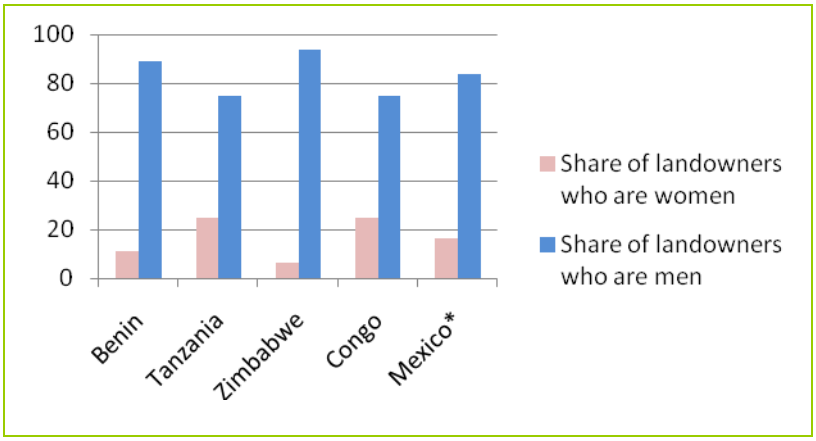
The formal nature of their land rights created incentives for the women to work their land with the assurance that they could keep it. Natural resource rights were also key. Before a radical change in Niger's Rural Code, gave people rights to the trees on their land, a project like this would have been impossible. For years, the state owned villagers' trees and patrolled markets to make sure that no one sold tree products. The change in the rural code has enabled the widespread adoption of agro-ecological practices. These changes have resulted in the 're-greening' of 5 million hectares of desert and enough additional food to feed 2.5 million more people per year.[92]

Clearly, robust safeguards are needed to protect small-scale farmers in the face of growing demands for their land. These must include educating farmers about their rights to land as well as explicit procedures for local consultation and mechanisms for appeals and arbitration.

Tenure arrangements are important to farmers' management decisions, independent of broader concerns over market participation and struggles over land. Research has found that secure property and natural resource rights encourage farmers to prioritise the restoration and maintenance of land quality through actions such as tree planting and erosion control, while lack of secure tenure can act as a deterrent to such actions. One simple solution applied in some areas is to provide formal recognition of customary property rights.[93]

The land question is especially acute for women, who are less likely to own land and who commonly only have 'use rights' mediated through a male relative. Also, men's landholdings are almost three times larger than women's holdings on average.[94] Such realities argue against simply recognising customary rights as a solution to the land question. After all, insecure land tenure profoundly constrains farmers' capacity to invest in land, causing both lower yields and increased vulnerability to climate shocks. To be effective in the longer term, land reform must address inequities based on gender.

Figure 4. Landholdings by Gender



Source: Oxfam chart, based on data from FAO, 'Gender and Law: Women's rights in agriculture'.[95]

*Mexico data is based on membership levels in eijidos, local organisations formed around land ownership

Empowering vulnerable farmers through collective action

Farmer associations increase the political, economic, and social influence vulnerable farmers have on programmes and policies affecting their communities. By enabling members to pool resources, they increase farmers' access to information and markets; reduce the transaction costs of market engagement; secure more opportunities to improve skills; foster continual learning; and improve bargaining power.[96]

Farmer organisations offer a wide range of services and benefits to their members. For example, those in Kenya, Malawi, and Ethiopia offer access to extension (57 per cent of organisations), markets (39 per cent), inputs (33 per cent), policy and advocacy platforms (33 per cent), and financial services (28 per cent).[97]

Women often face obstacles to participating in and benefiting from formal producer organisations.[98] Women are under-represented in formal, large-scale producer organisations such as co-operatives and their unions, which often limit membership to heads of household[99] or to those owning land.[100] For instance, in Uganda and Kenya agricultural co-operative members are mostly male (76 per cent and 75 per cent, respectively).[101] Other barriers to membership include the time and social capital required to participate in meetings and decision-making processes. In order for farmers' associations to serve women, they must have full access to membership; engage in key discussions; and voice their interests which must in turn be taken into account in key decisions.

Box 4: Restoring production and adapting to climate threats in Andhra Pradesh, India

Water was once readily available in drought-prone Anantapur district in Andhra Pradesh, but in recent years the land has become dry, unproductive, and poor. A stream from the nearby hills used to irrigate fields. Farmers grew rice, vegetables, and dates, and had ample fodder for their cattle. Food was available throughout the year. But in recent years, summer temperatures have increased and the rains have been poor and erratic. The stream has dried up. From drought coming once in 2–3 years, successive droughts have led to desertification of farmlands. Farm production has dropped sharply while cattle numbers have fallen, and farmers' co-operatives have dissolved. Many people have left to look for work in the city.

What happened? Seasons are changing, rains are late, and infrequent downpours are becoming common. The temperatures and the rainfall are no longer conducive to agriculture cycles. Further, the local hills have been deforested and traditional water storage and conservation structures have largely disappeared over the past century, after the colonial authorities removed local control. These factors have brought soil erosion and altered the regional microclimate.

Yet agricultural livelihoods in some 200 local villages are making a bold comeback. Recently, Oxfam helped farmers to use natural fertilisers and pesticides, instead of chemical inputs, to fix nutrients in the soil. Sustainable farm practices have led to better crop production and more fodder. Oxfam has also helped women and men farmers to organise and create linkages with local NGOs and local government. The community now enforces its decision to forbid residents from cutting down trees, while also planting trees and implementing soil and water conservation measures.

Results have been dramatic. The area's groundwater has been recharged, and thanks to the rising water table small oases of date palms have sprouted naturally. Women's groups now grow, harvest, and market custard apple, neem, moduga leaf, soapnut, and regu fruit. From date palms, residents market dates, mats, baskets, and thatching, and the resulting income streams are resistant to climate shocks.

Source: Oxfam India programme work, 2009.[102]

Inequities between farmers' associations also exist. Better organised and resourced associations can hold advantages over those made up of more vulnerable farmers, particularly in national policy arenas and national or global markets.[103] Associations of vulnerable farmers must therefore receive institutional support to ensure they have adequate tools for effective organisation.

Farmer associations can help communities build resilience. Between 1982 and 2002, spurred by the human and environmental crises caused by serial drought, the number of villages with producer associations rose from 21 per cent to 91 per cent in Burkina Faso.[104] Given their multiple functions, farmers' associations can help promote the uptake of sustainable agricultural practices and can facilitate farmer participation in the design of payments for environmental services to ensure their accessibility even to vulnerable farmers.

Addressing information gaps with agricultural advisory services

Information is a key element in supporting farmers' responses to both hunger and climate change. Farmers may not be aware of the best means of adapting to climate change or seizing mitigation opportunities, given the newness of these challenges. In order to respond effectively, they may need information on climate forecasts, locally appropriate technology innovations, or shifting market signals. Agricultural advisory services play this role. Traditionally, governments have provided information to farmers via 'extension agents', but many countries also now have alternative providers such as community-based organisations, farmers' associations and private companies. Pluralistic systems can potentially lead to more locally appropriate and cost-effective provision better geared to farmers' needs.[105]

One promising approach involves village-based 'farmer field schools', which offer hands-on learning about innovative farm management practices coupled with discussions about the ecological principles underlying these practices. Another is screening educational films in villages, followed by discussions with extension agents regarding locally relevant applications.

Agricultural advisory services can play a wider role beyond information provision. They can foster the formation of farmers' groups; link communities to markets; or engage in participatory technology development. Agents could also act as honest brokers for relations between farmers and partners such as buyers of carbon credits or institutions charged with distributing adaptation investments.[106]

Despite government initiatives to promote equal access to advisory services, these services remain biased towards men for diverse and complex reasons. A recent study found four major barriers to achieving equitable provision of advisory services. One was the strong cultural norm that 'women do not farm,' whereby women are often not considered farmers, despite being heavily engaged in agriculture, due to the fact that they do not typically plough with oxen or sow fields. A second was that male advisors have difficulty working with women farmers due to cultural resistance to contact with 'other mens' wives', though this barrier is increasingly addressed by rising numbers of female agents and the growth of womens' associations. A third is that the training of advisors tends to be technically focused, with little attention to community organising or gender. A fourth is the incentive systems under which advisors work, which tend to reward them for signing up farmers to external input-based technology packages instead of engaging in demand-driven service provision.[107] These findings from India, Ghana, and Ethiopia are indicative, but clearly gender dynamics vary greatly from place to place.

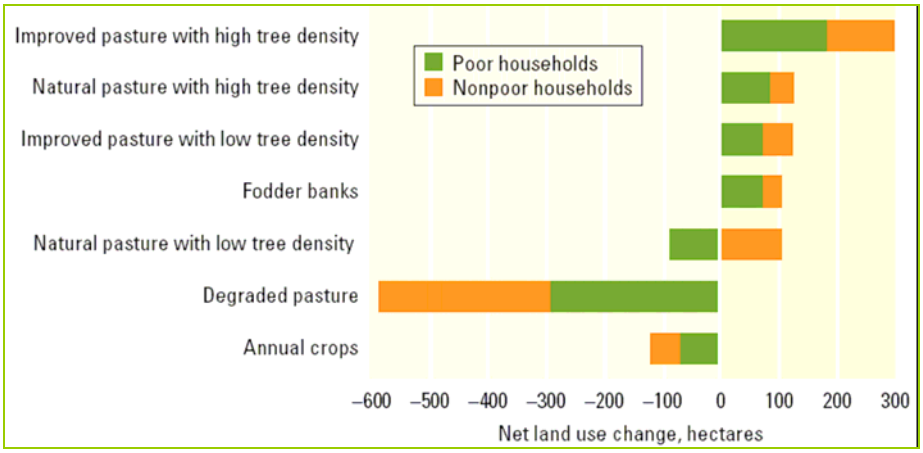
Creating incentives via payments for environmental services

'Woodlots are cut down because that's the only time people can get a benefit. If there's no fund to keep the trees alive you have to cut them down to get the benefit. I don't know how it would work but maybe the government could say, if you grow some acreage of certain trees the government will pay you.'

Balaku Yofesi, a farmer and leader of a producers' association in western Uganda.[108]

One way to incentivise adoption of agro-ecological practices is via schemes offering payments for environmental services, which provide land users with cash in exchange for taking certain actions. Such schemes have generated growing interest, yet remain in their infancy.[109] Potential reasons for payments vary, but could include delivering services such as 'fixing' atmospheric carbon, watershed management, or biodiversity conservation. These payments could provide the means to overcome diverse barriers to adoption, notably costs associated with the initial period before practices begin delivering benefits.[110] Early experience suggests that they are highly effective (see Figure 5).

Figure 5. Restoring degraded pasture in Nicaragua using payments for environmental services



Source: International Bank for Reconstruction and Development, World Bank.[111]

Payments for environmental services could be delivered via either the public or private sector. Public-sector schemes could involve payments for the adoption of certain practices, such as for each hectare kept under conservation tillage or for each tree planted. Private-sector payments would involve linking farmers with the carbon market, where providers receive a certain sum for each tonne of carbon delivered.

Public-sector schemes will be especially useful for creating incentives in poorer or more remote areas. Such schemes would be an appropriate use of climate change adaptation funding for developing countries as they would encourage the use of agro-ecological practices to build resilience.

An early incarnation of such a scheme was an extensive food-for-work programme in Burkina Faso from 1984 to 1985. It was created in response to a crippling famine and scaled up a successful Oxfam agro-forestry project. Although the majority of the farmers who adopted the small-scale soil and water conservation techniques under the scheme abruptly stopped when the programme ended, some continued, and

those who stopped eventually began using the techniques again when they saw the longer term food security and resilience benefits that resulted from these practices.[112] Such payment programmes can thus be an important catalyst to fostering wider use of these techniques while also potentially serving as a social protection 'back-up plan' to ensure access to food for all during crisis periods.

However, despite these ideas, small-scale farmers in marginalised areas currently suffer most from climate change but largely fail to benefit from institutional responses to it. This is profoundly unjust.

5 Will growing political interest deliver greater public investment?

Food security policy

'We must seize the opportunity to build on synergies between actions to combat climate change and economic recovery initiatives, and encourage growth and sustainable development worldwide.'

Final communiqué, G8 Summit, July 2009.[113]

Investment in developing-country agriculture has fallen steeply during the past several decades, for diverse reasons. Official development assistance (ODA) to agriculture has fallen by some 75 per cent over the past two decades, from a high of approximately $20bn per year in the mid-1980s to $4bn per year in recent years. Donors currently spend twice as much on emergency response efforts as they do on agriculture, even though bolstering farm production and hence preventing crises can be much cheaper than responding to crises once they occur. For instance, preventing crop failure via proactive agricultural investment is estimated to cost about one-fifteenth as much per person as sending food aid to hungry people once farm production collapses.[114]

What investment there has been has often targeted external input and large-scale irrigation strategies and higher potential lands as a means to boost food production and export earnings while creating jobs. Meanwhile, farmers living on marginal lands have been largely neglected, as have sustainable agriculture strategies. Private-sector investment in marginal farming areas is likewise low, given the difficulty of finding profitable investments in these areas.[115]

With more than one billion hungry people in the world and disasters increasing steadily, it is no surprise that strong international statements have been made about the need to eradicate hunger. Most notably, the 1996 Rome Declaration on World Food Security saw national governments reaffirm the universal right of access to safe and nutritious food, and pledge their political will to achieve food security for all. In 2000, the international community adopted the MDGs, which pledged to 'spare no effort to free our fellow men, women and children from the abject and dehumanising conditions of extreme poverty'.

Yet once again there is a large gap between rhetoric and reality. For instance, we are now more than halfway towards the target date – 2015 – by which the MDGs are to be achieved, yet key goals such as eradicating poverty remain as elusive as ever.

Most recently, at their July 2009 summit, the G8 leaders declared that agriculture and food security should be placed at the core of the international agenda. They pledged $20bn over the next three years to support these goals, in particular by investing in small-scale farmers in the developing world. While this sounds encouraging, G8 summits have a history of unkept aid promises, and nothing in the declaration specified that the funds in question must be new.[116]

G8 leaders have also pledged to begin implementing a new multilateral Global Partnership for Agriculture and Food Security (GPAFS) by the end of 2009. GPAFS would enhance international co-operation in favour of food security and agricultural development. To make a dent in world hunger, it must favour adequate funding, policies, and measures to help farmers adapt to climate change.

Climate change policy

'Substantially increasing investment in agriculture is the best way to increase its resilience to climate change; fully integrating agriculture in the future Copenhagen agreement… is an absolute necessity; financial mechanisms to reward farmers for…. ecosystem services… are imperative to demonstrate tangible results on the ground.'

Ajay Vashee, President of the International Federation of Agricultural Producers, which unites 120 national farmers' organisations from 80 countries, Sept 2009.[117]

Vulnerable small-scale farmers are affected by policy addressing both climate change mitigation and adaptation to climate change.

The World Bank's new estimate of the cost of helping developing countries adapt to climate change – between $75bn and $100bn per year – is greater than past estimates by the United Nations Development Programme (UNDP) and others. However, it only looks at 'hard' physical factors such as infrastructure costs. It neglects institutional capacity-building, such as educating farmers on water management. It does not consider the cost of catastrophic climate impacts, such as sudden shocks or faster warming than is currently anticipated, or the potentially larger adaptation implications of unexpectedly rapid change. Nor does it take into account the impacts to economic sectors such as tourism.

Yet $75–$100bn is a small amount when compared with world defence spending, which in 2008 totalled $1.2 trillion.[118] However funding to date for climate change adaptation has been paltry, with a mere $843.5m pledged and $123.8m disbursed as of September 2009.[119]

'When Africans arrive in Copenhagen later this year, they will have one important message to deliver to their peers: a climate change deal without agriculture is no deal for Africa.'

Lindiwe Mejele Sibanda, CEO of Food, Agriculture, Natural Resources Policy Analysis Network.[120]

One early adaptation initiative is the National Adaptation Programme of Action (NAPA) scheme, which identifies high-priority adaptation projects in least-developed countries. While project documents have been prepared for 48 countries, only three projects of the many hundreds proposed have been endorsed for funding, showing that funding has been elusive. Early implementation now looks likely though, since funding NAPAs has become a priority in the international climate negotiations.[121] Yet these schemes are just the tip of the iceberg of what needs to be done.[122]

More generally, developed countries need to step up and deliver major adaptation finance so that developing countries can begin taking action; testing pilot projects; and developing long-term adaptation plans. Developing countries other than the least-developed must take action as well.

As part of broader efforts to promote climate change mitigation in specific sectors, support could also be provided for mitigation actions in developing countries' agriculture sector, with an emphasis on vulnerable small-scale farmers. Any such efforts should seek to simultaneously deliver climate change adaptation via building up the resilience of vulnerable farmers.

To date, agriculture projects represent only a small fraction of global GHG mitigation efforts, yet the scope for growth is huge. Questions remain, however, including the extent to which communities will be able to benefit, and fears that mitigation projects could lead to vulnerable farmers losing their land. The challenge is to ensure that the policies governing such efforts are intelligent and pro-poor, and that the necessary protective institutions are in place and functioning equitably. Leaders in Copenhagen must address these challenges.

In all, Oxfam calculates that $150bn per year is needed to address critical adaptation and mitigation needs for developing countries. Yet nations continue to squabble in international climate change negotiations, and a positive outcome is far from certain.[123] Compare this with the speed with which rich governments recently found massive funds for bank bailouts, such as the $170bn the US government gave to the stricken insurance giant AIG in late 2008.[124] Clearly, where there's a will, there's a way.

Linking food security and climate change

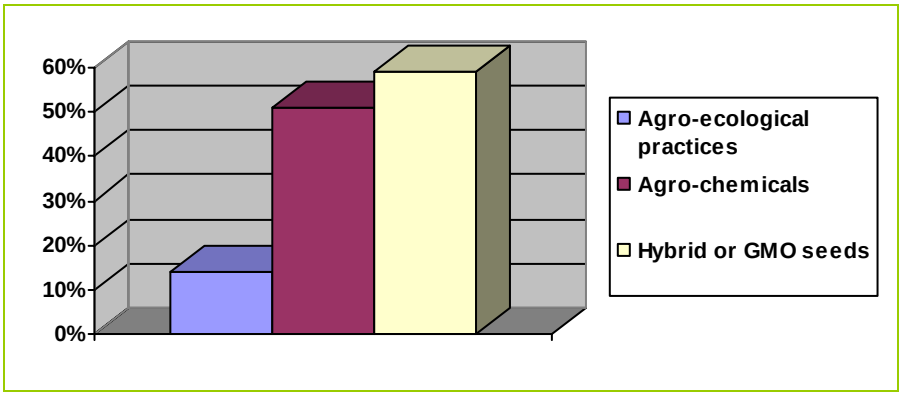
'Copenhagen is the time to make sure win-win effects become reality across the world,' asserted Yvo de Boer, Executive Secretary of the UN Framework Convention on Climate Change at a high-level meeting in June 2009. He especially noted the linkages between food security, adaptation, and mitigation in small-scale farming communities. Such statements are compelling, but now it is time to move from words to action. Leaders of developing and developed countries alike must address the precarious food security situation and looming climate change impacts facing the most vulnerable farmers.

One key question in the ongoing international climate change negotiations is whether 'additional' funds are needed to help vulnerable communities adapt to climate change?

Sceptics suggest that adaptation needs will be addressed via existing channels and that additional funding for adaptation is unnecessary. This argument is plain wrong, as the example of agro-ecological practices shows.

Agro-ecological practices can simultaneously deliver food security, adaptation, and mitigation. However, such outcomes are not presently forthcoming from the current institutional mechanisms of development assistance. For instance, the EU funded €1bn in food security projects for vulnerable farmers in 2009, yet only 14 per cent of these projects included an agro-ecological component, while 59 per cent included improved seed varieties and 51 per cent included agro-chemicals (see Figure 6). Worldwide, donors have allocated very little of ODA to agriculture to combating the impacts of climate change.[125]

Figure 6. Current EU food security projects in vulnerable farming communities, Showing a de-emphasis of sustainable agriculture[126]



Source: Oxfam diagram based on data from EU 'Food Facility' grant documents from 2009 to 2011.[127]

Current support for other adaptation measures is similarly low.[128] Meanwhile, the adaptation challenge is massive. Given this state of affairs, any fresh adaptation funding for vulnerable communities will clearly deliver additional gains.

Public financing of climate change adaptation or food security projects does not represent handouts, but rather investments in people who have the capacity to deliver solutions, paid for by the countries that are both responsible for emissions and most capable of paying.

6 Conclusions and policy recommendations

'A successful outcome [at the Copenhagen climate summit] will include incentives for the agricultural and forestry sectors to adopt decisive mitigation measures.'

Yvo de Boer, Executive Secretary of the UN Framework Convention on Climate Change, June 2009.[129]

Climate change poses a great threat to women and men in developing countries, who in many cases already face food insecurity. Small-scale farmers on marginalised and degraded lands are particularly vulnerable. Diverse innovations will be needed for such people to achieve food security and adapt to climate change, including weather forecasting; access to improved seeds; and social protection measures in case of crop failure. Yet agro-ecological farming practices offer particular promise, as they can provide food security; adaptation to climatic changes; and mitigation of climate change simultaneously. Perhaps most importantly, the inputs needed are under the control of farmers themselves. For such outcomes to become widespread, however, farmers must be supported, protected, and enabled by relevant institutions that reflect their voice. People-centred resilience offers principles to achieve this.

Given its focus on small-scale farmers and agro-ecological practices, this paper represents only one part of the broader food security and adaptation challenges. It nonetheless highlights key early priorities for achieving food security despite increasing climate risk.

Given the existing level of food insecurity and the growing climate change threat, bold new investments are needed to build resilience of vulnerable farming communities. To ensure they deliver widespread institutional change and real empowerment, these investments must follow the principles of people-centred resilience. Donor nations and developing-country governments alike must therefore find a way to strongly support such measures. Fortunately, such investments offer much in return, combining hopeful outcomes for threatened farmers with major benefits to the wider world.

Oxfam recommends that donor nations and developing-country governments:

- **Invest more and more wisely in agriculture to accomplish multiple goals**. New public investments in agriculture emphasising agro-ecological approaches are essential to improving food security; helping vulnerable farmers adapt to climate change; and mitigating climate change.

- **Commit to providing $150 bn in mitigation and adaptation funding across sectors** above and beyond the 0.7 per cent of their budgets that donor nations have committed (but not necessarily delivered on) as ODA.

- **Foster 'people-centred resilience' to help vulnerable small-scale farmers achieve food security and adapt to climate change.**

- **Capture the vast potential of developing-country agriculture to deliver mitigation**. Vulnerable farmers and pastoralists – including particularly vulnerable groups such as women – should be treated as key partners in the struggle against climate change.

- **Prioritise investments in small-scale farmers working on marginal and degraded lands**.

- **Scale up proven community-based measures**. Notably, foster agro-ecological practices.

- **Target public investments to fill the gaps left by the private sector**. Investments in food security and adaptation should emphasise marginal areas where investors find few profitable opportunities, yet where vulnerable farmers are concentrated.

- **Address institutional constraints facing female farmers**. Train extension agents to meet the specific needs of female farmers and recruit new female extension workers. Increase tenure security for women through low-cost, rapid, and transparent community land registration. Improve women's access to inputs, technologies, and financial services.

- **Gather gender-based statistics,** given the importance of gender to understanding the critical dynamics of reducing food insecurity and adapting to climate change.

- **Harness the large overlaps between adaptation and mitigation measures within agriculture**.

Notes

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[2] Oxfam calculations based on data provided by Kate Sebastian, 2009.

[3] P.Hazell, R. Ruben, A. Kuyvenhoven, and H. Jansen (2007) 'Development Strategies for Less-Favored Areas', in E. Bult and R. Ruben (eds.) *Development Economics between Markets and Institutions: Incentives for Growth, Food Security and Sustainable Use of the Environment*, Mansholt Publication Series, Volume 4, The Netherlands: Wageningen Academic Publishers.

[4] J. Pender and P. Hazell (2000) 'Promoting Sustainable Develoment in Less-Favored Areas', 2020 Vision Paper for International Food Policy Research Institute. Washington DC: IFPRI.

[5] Many of these vulnerable farmers are already poor and hungry. Of the 1.4 billion people who currently live in extreme poverty, surviving on $1.25 per day or less, 1.05 billion live in rural areas and depend mostly on agriculture for their livelihoods (International Fund for Agriculture and Development website), largely on marginal lands (see Pender and Hazell 2000). Most reside in sub-Saharan Africa and South Asia, where extreme poverty is usually accompanied by hunger (see World Food Programme Hunger Stats at www.wfp.org/hunger/stats and Bread for the World Institute (2009), 'Global Hunger Report 2009 – Global Development: Charting a new course' (19th annual report on the state of the world's hunger), data table on 'Hunger and Malnutrition', Washington DC: Bread for the Word Institute. http://www.hungerreport.org/2009/assets/HRDATA/Datatable1.pdf.

[6] This definition was originally adopted at the World Food Summit in 1996, and has been endorsed by most of the world's governments. http://www.who.int/trade/glossary/story028/en/. See FAO (1996) 'World Food Summit Plan of Action 1996', Rome: FAO. http://www.fao.org/docrep/003/w3613e/w3613e00.HTM.

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[11] Bread for the World Institute (2009) 'Global Hunger Report' *op cit*.

[12] S. Jennings and J. Magrath (2009) 'What Happened to the Seasons?', Oxfam Research Report, Oxford: Oxfam GB, see http://www.oxfam.org.uk/resources/policy/climate_change/research-where-are-the-seasons.html

[13] For instance, in South Asia, crop yield declines of 30 per cent are predicted by 2050. See R.V. Cruz et al., 'Asia', in IPCC (2007) 'Climate Change 2007: Impacts, Adaptation, and Vulnerability', Contribution of Working Group II to the Fourth Assessment Report of the IPCC, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge: Cambridge University Press, pp469–506.

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[15] G. C. Nelson, M.W. Rosegrant, M.W, J. Koo, R. Robertson, T. Sulser, T. Zhu, C. Ringler, S. Msangi, A. Palazzo, M. Batka, M. Magalhaes, R. Valmonte-Santos, M. Ewing, D. Lee, (2009) 'Climate Change: Impact on Agriculture and Costs of Adaptation', IFPRI Food Policy Report, Washington DC: IFPRI, http://www.ifpri.org/publication/climate-change-impact-agriculture-and-costs-adaptation

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Institute.

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[21] Environmental degradation involves depleting natural resource stocks such as soil nutrients, trees and aquifers, thus reducing the productive capacity of land as well as its resilience to shocks. See S. Scherr and S. Yadav (2001) 'Land Degradation in the Developing World: Implications and Policy Options for 2020', in *The Unfinished Agenda: Perspectives on Overcoming Hunger, Poverty and Environmental Degradation,* Washington, DC: International Food Policy Research Institute.

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[32] Two recent reviews of early climate change adaptation initiatives revealed a strong emphasis on agro-ecological practices. 'Sustainable management of natural resources' and 'building human capacity' were found to be the two cross-cutting themes in a UNFCCC survey of adaptation pilot projects in Africa. See 'Report on the African Regional Workshop on Adaptation', 2006, United Nations Framework Convention on Climate Change, http://unfccc.int/resource/docs/2007/sbi/eng/02.pdf

Similarly, a survey of early project experience conducted by the World Resources Institute found that 'changing natural resource management practices' was the single most widely used adaptation strategy. See 'Weathering the Storm: Options for Framing Adaptation and Development', November 2007, http://www.wri.org/publication/weathering-the-storm

Oxfam's own review of published adaptation datasets (UNFCCC, NAPA) likewise showed a strong emphasis on agro-ecological practices. See UNFCCC 'Local Coping Strategies Database' and 'National Adaptation Programme of Action' database, both at http://unfccc.int/adaptation/items/4159.php

[33] 'South Africa: Where Has All the Water Gone?", Oxfam International field report, July 2007. http://www.oxfam.org/en/programs/development/safrica/southafrica_water

[34] Sustainable agriculture: Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. Stewardship of both natural and human resources is therefore of prime importance. Stewardship of human resources includes consideration of social responsibilities such as working and living conditions of labourers, the needs of rural communities, and consumer

health and safety. Stewardship of land and natural resources involves maintaining or enhancing this vital resource base for the long term. Sustainable agriculture requires a 'systems perspective' that emphasises both the farm and its interactions with the local ecosystem and communities. Key components of sustainable agriculture solutions include efficient use of water, reduced reliance on non-renewable energy sources, selection of locally-appropriate species and varieties; diversified farming systems; careful soil management; responsiveness to farmers' priorities and lifestyle goals. (University of California at Davis, U.C. Sustainable Agriculture Research and Extension Program, 'What is Sustainable Agriculture?', http://www.sarep.ucdavis.edu/Concept.htm)

Organic agriculture: This production system relies on ecosystem management rather than the flow of external agricultural inputs. It is distinct from the other terms defined here in that in order to qualify as organic, farming must eliminate the use of synthetic inputs outright, replacing these with site-specific alternatives to harness ecological linkages. Typically, organic production commands a market premium, yet to achieve this farms must be certified to meet certain minimum standards. While most organic markets are found in developed countries, developing countries are becoming increasingly important suppliers, in part because organic practices are especially well suited to the conditions under which they work, especially small-scale farmers in rain-fed areas, who traditionally use few external farm inputs. (Organic Research Centres Alliance, FAO webpage May 2009, http://www.fao.org/fileadmin/templates/organicag/files/ORCA-9july2009.pdf)

Agro-ecological practices: These involve applying ecological concepts in the design and management farming systems as a means to ensure they are sustainable. They reflect a holistic approach to farming that includes both wider human and environmental elements. They seek to intensify production while conserving the natural resource base and building on local knowledge. Agro-ecology incorporates the benefits of modern technologies with the ecological and social dimensions of traditional farming systems as a means to reach small and poor farmers more effectively. See Food and Agriculture Organization of the United Nations website, ftp://ftp.fao.org/SD/SDA/SDAR/sard/SARD-agroecology%20-%20english.pdf

Conservation agriculture: A strategy for achieving sustainable agriculture and improving farmers' livelihoods through the application of three principles: (1) using conservation tillage practices to minimise soil disturbance, thus maintaining soil minerals and soil organic matter while also controlling erosion, (2) ensuring permanent organic soil cover, which builds a layer of mulch and fosters crucial soil micro-fauna, increasing penetration and retention of rainfall, (3) crop rotations as a means to foster symbioses, notably to control crop pests and diseases. It is a strategy for delivering sustainable agriculture that is promoted by the Food and Agriculture Organization of the UN, among other organizations (UN Food and Agriculture Organization website, Conservation Agriculture homepage; http://www.fao.org/ag/ca/).

Low-external input technologies (LEIT): Tripp (2007) suggests that there is no clear definition of LEIT, but instead lists the range of practices commonly discussed under this heading. He cites soil and water management practices (e.g. terracing, contour planting, live fencing, mulching, cover crops), soil fertility enhancement (e.g. manuring, composting, green manure), crop establishment (e.g. planting pits, system of rice intensification); controlling weeds and pests (e.g. intercropping and crop rotations, integrated pest management). See R. Tripp (2007) 'Is low external input technology contributing to sustainable agricultural development?', Rural Development News 2/2007. Based on research from Overseas Development Institute.

Low-external input sustainable agriculture (LEISA): This term covers practices that deliver sustainable agriculture outcomes for small-scale farmers. Given its use of the words 'low-external input', however, there is a clear assumption that for such farmers sustainable solutions depend critically on LEIT practices or other related practices (LEISA Magazine homepage; http://www.leisa.info/index.php?url=index.tpl).

[35] P. Hazell, R. Ruben, A. Kuyvenhoven and H. Jansen (2007) 'Development Strategies for Less-Favored Areas', in E. Bult and R. Ruben (eds.) *Development Economics between Markets and Institutions: Incentives for Growth, Food Security and Sustainable Use of the Environment*, Mansholt Publication Series, Volume 4, The Netherlands: Wageningen Academic Publishers.

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[45] H. Kuhnlein, B. Erasmus and D. Spigelski (2009), 'Indigenous Peoples' Food Systems: the Many Dimensions of Culture, Diversity, and Environment for Nutrition and Health', Rome: UN Food and Agriculture Organzation.

[46] P. Smith (2009) 'Agriculture and Climate Change', *op. cit.*

[47] R. Lal (2009) 'Agriculture and Climate Change', *op. cit*.

[48] T. Barker, I. Bashmakov, L. Bernstein, J. E. Bogner, P. R. Bosch, R. Dave, O. R. Davidson, B. S. Fisher, S. Gupta, K. Halsnæs, G.J. Heij, S. Kahn Ribeiro, S. Kobayashi, M. D. Levine, D. L. Martino, O. Masera, B. Metz, L. A. Meyer, G.-J. Nabuurs, A. Najam, N. Nakicenovic, H. -H. Rogner, J. Roy, J. Sathaye, R. Schock, P. Shukla, R. E. H. Sims, P. Smith, D. A. Tirpak, D. Urge-Vorsatz and D. Zhou (2007) Technical Summary in: B. Metz, O. R. Davidson, P. R. Bosch, R. Dave, L. A. Meyer (eds) *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* Cambridge: Cambridge University Press, United Kingdom and New York, NY, USA.

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[50] Conserving forests is clearly good for mitigation. It also helps local people cope with climate change by providing diverse forest foods and potentially marketable products. However, recent evidence from Cameroon, Indonesia, Peru, and the Philippines suggests that local people face some economic losses from leaving forests intact, so some form of environmental service payments to farmers in exchange for the mitigation services provided would be needed for avoided deforestation to be a 'win–win–win' opportunity for local communities, B. Swallow and M. Van Noordwijk (2009) 'Agriculture and Climate Change: Direct and Indirect Mitigation Through Tree and Soil Management', 2020 Vision Brief for Food, Agriculture and the Environment, Focus 16, Brief 4. Washington DC: International Food Policy Research Institute.

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[54] The annual rate of atmospheric carbon increases causing climate change is 4bn megatons per year. (One megaton equals one million tons.)

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[59] Land use affects local climate outcomes via several mechanisms. Vegetation can induce rain, since the water vapour surrounding it can combine with humidity in passing air masses to trigger rainfall. Land use also affects what happens to rain once it falls, notably whether it is readily absorbed or runs off, carrying away precious water and topsoil, and how well soil retains water it has absorbed. Vegetation also moderates temperature swings and extremes.

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[79] *Ibid*.

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[81] *Ibid*.

[82] Interview with Davi Yanomami, GRAIN (2009) 'Seedling: Climate Crisis special issue', October 2009, http://www.grain.org/seedling_files/seed-09-10.pdf (accessed October 15, 2009).

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offset projects in Costa Rica would have to cover over 1000 hectares to make economic sense.

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[85] These five principles build on recognised basic rights required for empowering people, namely accountability, transparency, participation, equity, accessibility, and livelihood sustainability.

[86] This work acknowledges the critical importance of investment in education and health institutions that prioritise the needs and demands of various groups in vulnerable farming communities for contributing to the success of achieving sustainable livelihoods, empowering farmer voices, and reducing poverty. However, these institutions are beyond the scope of this paper.

[87] Women's empowerment refers to the process in which women reflect upon their reality and question the reasons for their situation in society. It includes developing alternative options and taking opportunities to address existing inequalities. It enables them to live their lives in the fullness of their capabilities and their own choices in respect of their rights as human beings. In the Beijing Declaration, it was agreed that 'women's empowerment and their full participation on the basis of equality in all spheres of society, including participation in the decision-making process and access to power, are fundamental for the achievement of equality, development and peace'. See UNDP (2007) 'Gender Mainstreaming: A Key Driver of Development in Environment and Energy', Beijing Declaration, paragraph 13.

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[123] In terms of specific adaptation projects, donors have pledged a mere $843.5m to multilateral adaptation funds administered by the Global Environment Facility of the World Bank and the Adaptation Fund of the UNFCCC. Of this, only $399.8m had been legally obligated as of September 2009 and only $128.3m disbursed. The sum of $843.5m should be an easy commitment of public funds to make, considering that between September 2008 and March 2009 the world found $18 trillion to pay for bank bailouts, or 30 per cent of Gross World Product. See 'Beyond Aid: Ensuring Climate Change Adaptation Works for the Poor', Oxfam International, *op. cit*.

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[126] These data reflect the project breakdown of spending for food security by the European Union's Food Facility for the period 2009–11. Each project can include multiple components. Despite this, only 14 per cent of these food security projects included any sort of agro-ecological component. Almost all of the agro-ecological practices identified were soil conservation or erosion control measures, while none included tree planting.

[127] See 'Food Facility' documentation of EU food security grants for the period 2009–11. Specifically, see Commission Decision of 30 March 2009 and Commission Decision of 29 April 2009.

[128] National government data on public agricultural investments is not readily available.

[129] Address by Yvo de Boer, Executive Secretary of the United Nations Framework Convention on Climate Change, at the 'Land Day' event at the Bonn Climate Change Talks held in June 2009: http://unfccc.int/files/press/news_room/statements/application/pdf/090606_speech_bonn.pdf

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