Policy brief

What Does Resilience Mean to Food Security and Poverty Alleviation?

Introduction

Food security is under threat from several global processes, including climate change, decreasing supplies of inputs such as phosphorous and fossil fuel, deteriorating soil quality and limits on land and water. Food production interacts with all nine of the planetary boundaries identified by Rockström, et al. (2009) and the eleven social dimensions identified by Raworth (2012), that together are seen as defining a safe and just operating space for humanity.

Because resilience science (Holling, 2001) is the only sustainability science that is based on an overarching theory (Mooney, Duraiappah & Larigauderie, 2013), it could make a key contribution to a practical understanding of what sustainable food production means in a rapidly changing world. This discussion brief presents some key concepts of social-ecological resilience and then briefly discusses them in relation to three cases from Africa.

What kind of resilience are we talking about?

Resilience is a concept that is applied in a range of fields, from psychology to engineering, to natural resource management and disaster management. However, there are really two types of resilience that underpin this wide variety of meanings and use. These are: simple system resilience, based on the assumption of predictability, and complex adaptive system resilience, based on the assumption of unpredictability (Brand & Jax, 2007). This discussion brief is concerned with resilience of the second type; that is, resilience in unpredictable, complex adaptive systems, a concept that applies to all living things, but which in this brief is applied to farmers and their land, crops and livestock in three different parts of Africa.

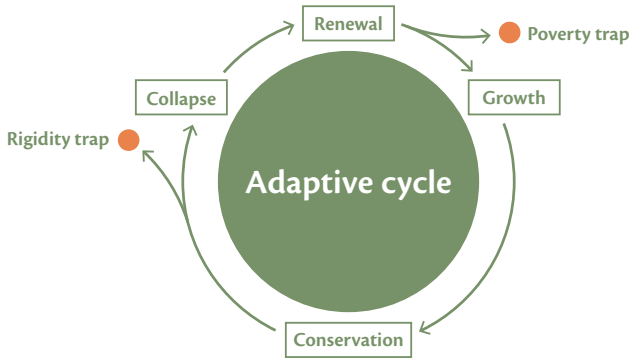

Figure 1. The adaptive cycle illustrates how change occurs over time. It has relatively long growth and conservation phases followed by rapid phases of collapse and renewal. A rigidity trap is in essence an over-resilient system that cannot or will not change when change is necessary. A poverty trap develops when the potential of a system for change has been severely eroded and the connections necessary for internal regulation have been broken.

Resilience is normally viewed as the ability to recover or "bounce-back" from disturbance, but resilience is also part of evolutionary change and sustainability (Holling, 2001). This deeper understanding describes how living entities can change, while remaining more or less the same. It also enables disturbance to be used as an opportunity for transformational change, or "bounce-forward". Learning how systems behave at the threshold between bouncing back and bouncing forward is the key to sustainable development, since thresholds mark the boundary between those system states that support sustainable development and those that do not. It is also essential for creating the kinds of transformation in food systems necessary to cope with climate and other global scale changes.

Resilience models

Resilience science is based on three conceptual models of change (Holling, 2001): the adaptive cycle of change within a given system; "panarchy", which describes interactions between systems at different levels of scale; and the ball and basin model of thresholds between different stable states. These models are designed for hands-on learning and, through a formalised process of trial and error, help managers to decide what is more or less likely to be sustainable.

The adaptive cycle (Fig. 1) is comprised of four phases – growth, conservation, collapse and renewal – which approximate to the manner in which living systems grow and their components recycle to start another phase of growth. In maladapted systems, the cycle is interrupted by poverty and rigidity traps, which represent a loss of healthy function and indicate points where intervention may be required to restore resilience.

Panarchy (Fig. 2) describes interactions between systems operating at different scales. For example, innovations in farming practice are introduced via small systems (e.g. a single farm) that cycle relatively quickly, while large, slow cycling systems (e.g. a ministry of agriculture) resist change and provide long-term stability.

The thresholds model (Fig. 3) provides a basis for building simple quantitative and qualitative models of systemic change that in turn provide the basis for adaptive management. A lack of such models is a common cause of failure in natural resource management, and where models are used, there is a need to monitor and test the model's assumptions and adjust management accordingly in a process of social learning about the interactions between humans and nature.

Resilience, poverty and food security

Resilient agricultural landscapes would be characterised by high levels of biological and crop diversity in a mosaic of arable and pastoral land, woodlots and wetlands, that produce the full range of ecosystem services. Farmers in such landscapes would regard themselves as an integral part of the land community, recognise their dependence on an ecologically functional landscape, and practice land husbandry that maintained the integrity of the soil, nutrient and water cycles. They would also be flexible, adapting their practices according to changes in their natural environment as well as their socio-economic environment, which includes laws and policies, financial organisations, and markets and development agencies. This ideal may not occur widely in a world dominated by a belief in modern, economically efficient farming to produce food for commodity markets, but two of the cases presented here show some potential to achieve it.

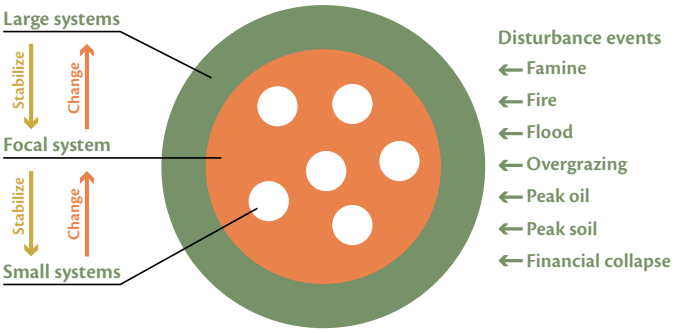

Figure 2. Panarchy explains the interactions that occur between nested systems of different size. The focal system is the system of interest to management: small systems embedded within the focal system change relatively quickly; and large systems within which the focal system is embedded are part of the larger environment. Small systems create change; large systems provide stability. When large systems collapse, the focal system and sub-systems will change in a "cascade of collapse" creating opportunities for transformational change, or "bounce forward".

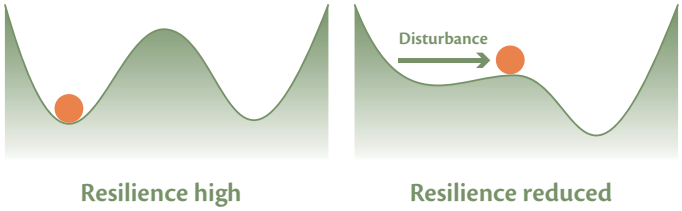

Figure 3. The ball and basin metaphor is a simple way of understanding the manner in which systems (the red ball) can switch from one stable state to another. Management that reduces the resilience of a system increases the likelihood that it will cross the threshold or tipping point from one state to another as a consequence of a disturbance.

Case 1. South-east Lowveld, Zimbabwe

A satellite image from the south-east Lowveld of Zimbabwe (Fig. 4) illustrates the difference between a resilient landscape well covered with savannah vegetation, and an adjacent landscape, degraded by human population pressure and smallholder cultivation. The resilient landscape is occupied by a small number of farmers with property rights and high levels of social, economic and ecological capital. On the other side of the fence the economic and ecological potential necessary for resilience continue to decline: farmers have no property rights, and people are sinking deeper into poverty while the land is increasingly degraded. People supplement their livelihoods by off-farm employment in urban areas and for about four years in every 10 they depend on food relief from humanitarian aid organisations. Dependency is increasing as both the human population and the frequency of drought increases. The panarchy model suggests that this pattern of deepening rural poverty on land adjacent to areas of relative wealth, which began with colonisation in the late 19th century, is an example of how large scale, slow-cycle change like globalised industrialisation can destroy the resilience of traditional village life in rural Africa. Colonisation marginalised indigenous people and confined them to "communal lands", which functioned as a labour pool for mining and industrial development in Southern Africa. The traditional relationship between people and land collapsed into a poverty trap, because the potential for change in traditional systems has been captured by industrial systems. The resilience of the traditional system was transferred through economic activity to maintain the resilience of the new industrial system, affecting both the capacity of the land and its people to maintain human livelihoods.

Figure 4. Google Earth image of part of the south-east lowveld region of Zimbabwe showing relatively resilient agricultural land to the south and degraded communal lands to the north. The green parts in communal areas are rocky hill outcrops that cannot be cultivated.

The development of conservancies in Zimbabwe was an initiative that aimed to conserve biodiversity and address the equity gap between resilient, privately owned ranches and poverty-stricken smallholder farmers on neighbouring land. The aim was to use the natural resources of conservancies as a source of renewable natural capital that could be used to restore communal land. This process was based on agro-ecological approaches that included the use of a range of wildlife species. The initiative was brought to an end by the political and economic activities of Zimbabwe's ruling elite, which used its power to capture most of the resources needed for restoration. Large-scale change at the national level had consequences for smallholder farmers that were similar to those of colonisation. Interaction across scales (panarchy) over which the farmer has no influence is one of the primary reasons for loss of resilience and failed management in agricultural landscapes. In the longer term, the loss of soil, soil nutrients, and soil water capacity in Zimbabwe's communal lands threaten collapse of the entire system. Soil formation and the hydrological cycle are slow variables that once degraded may take centuries to recover. This pattern of deepening human and ecological poverty is common across Africa.

Case 2. Shinyanga, Tanzania

In the Shinyanga region of Tanzania (Barrow et al., 2003) development efforts have aimed to reduce poverty by clearing woodland and eradicating the tsetse fly; a vector for trypanosomiasis, a debilitating parasite of people and livestock. The project aimed to improve the health of humans and livestock and to create opportunities for households to increase their income through small-scale commercial agriculture. Woodland began to be removed from Shinyanga with the aim of eradicating the tsetse fly in the 1940s. Consequently the human population began to grow as land was opened up for farming, and the imposition of Ujamaa – a central government policy of enforced village development – changed the traditional institutions for land management. By 1985, the Shinyanga region was so degraded that it was declared a desert by the president of Tanzania (Fig. 5). Deforestation and the impacts of the Ujamaa had combined with market-oriented agriculture to destroy the resilience of the Shinyanga landscape, leaving its people in a deepening poverty trap. Because the relationships between people, livestock, land and tsetse were largely unknown and not considered, the well-intentioned programme to eradicate tsetse played a big role in systemic collapse.

Figure 5. Aerial view of the Shinyanga region Tanzania in 1985. Photo by Ed Barrow, IUCN

The declaration and the desire of the region's inhabitants to bring back what had been lost led to a long-term restoration project supported with Norwegian aid. Over 300,000 hectares of land were restored around 800 villages, and the economic value of restored ecosystem services to villagers was estimated at US$ 168 per person per annum – about 1.4 times more than agricultural production. One key success factor was a policy environment that returned rights and responsibilities to the villages, enabling people to apply traditional knowledge and develop local rules. As in the south-east Lowveld in Zimbabwe, the case of Shinyanga illustrates how large-scale changes like colonisation can have profound impacts on resilience at the local level: the drive to use land for agricultural production more and more efficiently precipitated a systemic collapse of the local social fabric and landscape. However, in contrast to the Zimbabwe case, where continued political and economic upheaval were additional drivers towards poverty, in Shinyanga the original structure and function of the system is being slowly restored. An enabling policy environment has been critical to the success of this restoration effort. Although resilience can be built from the bottom up, it nevertheless requires policy that supports the conditions necessary for the emergence of new connections between people and between people and land (Ruitenbeek and Cartier, 2001).

Case 3. Kamburu, Kenya

In the Kamburu region of Kenya, efforts to restore resilience were sparked off by a combination of drought, a fall in the price of tea on global commodity markets and falling household purchasing power. The Kamburu story is a simple tale of leadership and the vision of an alternative future that re-affirmed traditional values and knowledge about the relationship between people, and helped to restore the ecological and social potential for change. It is an inspiring story of the manner in which small-scale, bottom up development intervention can restore people's self-respect and self-sufficiency. Conventional large-scale development assistance is top-down and incapable of achieving this kind of outcome because of power relations between development agent and aid recipient that maintain dependency. The leadership and vision expressed by the Kamburu community are based on an implicit understanding that dependence on the efficient production of tea for the world's markets represented a rigidity trap, and would not lead to resilience or sustainable livelihoods. The community also recognise that turning the natural assets of land and biodiversity into cash would not lead to sustainable development. The Kamburu case also illustrates the pivotal role of people in transformational change.

Conclusion

The cases of Shinyanga and Kamburu both illustrate the point that a resilience perspective on food security takes account of inherent differences in the social and ecological contexts of any production landscape, as well as the need to develop strategies consistent with those differences. One size fits all policies for food security and poverty alleviation cannot work amid such diversity of people and landscapes. Viable resilience building strategies require the knowledge of biophysical and social scientists, farmers and policy-makers, and a willingness among all those actors to change when change is necessary. At its most fundamental level, building resilience in agricultural landscapes in the developing south is about restoring human dignity and self-respect. These qualities underpin the emergence of more self-sufficient livelihoods and escape from poverty caused by institutionalised dependency. In contrast, the Zimbabwe case illustrates the manner in which rigidity among a ruling elite can capture the social and ecological potential of agricultural landscapes and drive an entire system towards deeper

poverty. It is clear that the patronage systems of African politics maintain dependency: are conventional top down approaches to food security and poverty alleviation so very different from such patronage politics?

The three cases outlined above illustrate the manner in which human vision influences the interactions between people and nature, and the resilience of food systems. In Zimbabwe, the vision of colonial industrialists reduced parts of the south-east Lowveld to poverty and dependency on food relief. The vision of leaders in the conservancy movement, which sought to alleviate poverty by developing alternative approaches to agriculture, was undone by the vision of the ruling elite, whose members saw themselves as the new custodians of land and people. In Shinyaga, development agents reduced the land to near desert and people to poverty with a vision that was based on limited knowledge of how people and land interacted. Now, resilience is being restored and a new landscape is emerging out of the shared vision of local people and development agents, with appropriate policy support from national government. In Kenya, awareness of the risks of monoculture crops for commodity markets, declining financial returns and increased effects of climate change prompted the emergence of a local vision of resilient livelihoods.

In each of the cases, levels of resilience, poverty and food security are determined by the interaction between human vision, political power, and ecosystem regulatory functions such as climate, water cycles and disease. Human vision for landscapes and sustainable livelihoods are a product of culture and the historical outcome of the interaction between humans and nature. A resilience-based approach to food security and poverty alleviation requires a paradigm shift in the way that people think about how they interrelate with the land. This is especially so at the policy level, where decisions that affect land are taken by people who have no direct connection to it.

In order to build resilient systems that alleviate poverty and increase food security, it is necessary to:

- Understand change processes in complex evolving systems of humans and nature
- Embrace the uncertainty of any management intervention, and accept that these may have unintended as well as intended consequences
- Apply the learning-by-doing tools of resilience science that provide a formal trial-and-error process to discover what does and does not work within a particular landscape
- Develop an adaptive policy environment that protects the conditions necessary for the emergence of local self-sufficiency and adaptive capacity
- Take an integrated approach to development, which recognises that in many cases both the social and the ecological components of the system are caught in linked poverty traps, and
- Recognise that restoring impoverished landscapes and people is a slow process that may take decades, or longer, depending on the degree of degradation.

It is also crucial that development agents work with and support local innovation, rather than impose "solutions" developed in far distant and different places.

In the under-developed south where extractive colonial and post-colonial governments have degraded or continue to degrade land and people, restoration based on an understanding of resilience in complex adaptive systems is one of the most urgently required measures for dealing with climate change.

This brief was authored by Mike Jones, an independent environmental management consultant and an advisor to the Swedish Biodiversity Centre. Mike worked as an ecologist and conservationist with farmers in Africa for 40 years.

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