7.3 Community biodiversity management
Promoting resilience

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Poverty and agrobiodiversity

The state of vulnerability and powerlessness in making meaningful choices about livelihood development defines poverty; this state is complemented by restricted tangible assets for livelihood development and goods for consumption (Fisher et al., 2008). Hereewith, we meet what the World Bank (2001) refers to as three dimension of poverty: (i) powerlessness, (ii) vulnerability, and (iii) lack of assets. In the current chapter we explore the three dimensions of poverty as a means to disentangle the relationship between community biodiversity management (CBM) and community resilience.

Agrobiodiversity – expressed as the diversity at genetic, species, agro-ecosystem and landscape levels – is one of the options for poor farming households and communities to meet their livelihood needs in times of seasonal shortage and in times of crises, such as drought, crop or even market failure (Fisher et al., 2008; Jarvis et al., 2011). As such, farming households or communities integrate the conservation and use of agrobiodiversity in their livelihood development pathways.

In the 1990s and early 2000s, conservation and development organizations used participatory approaches to address both poverty alleviation and (agro) biodiversity conservation. Where initially many interactions between these organizations and farming communities were of a more consultative nature, they gradually developed into the kind of relationships that fostered learning and action among the poor. The organizations began to address awareness, knowledge and action crucial for motivating (poor) rural communities to assume and take control over their options in biodiversity and natural resource management (Borrini-Feyerabend et al., 2007; Fisher et al., 2008; Wilmsen et al., 2008). CBM, by linking conservation and development in the field of agrobiodiversity management, thus builds upon this body of expertise.

CBM: addressing powerlessness and vulnerability

Empowerment is understood as being vital for the CBM methodology to result in CBM as a situation. Empowerment may also be considered a perquisite for CBM to contribute to the realization of on-farm management of agrobiodiversity. The diversity of experiences, such as community seed banks, value addition, community-based seed entrepreneurship and the establishment of conservation units that target sustainable development, illustrate how the CBM methodology and its practices contribute
to community empowerment in terms of both agency and structure (De Boef et al., Chapter 7.2). It can be concluded that the CBM methodology has the potential to address powerlessness (i.e. the first dimension of poverty).

Vulnerability, the second dimension of poverty, can be defined as the opposite of resilience. Wilson (2012) describes vulnerability as the exposure and sensitivity of an individual or a group of individuals who are unable to cope with risks, hazards or catastrophic changes. We assume that efforts to promote resilience through the CBM methodology and its practices focus on enhancing the capabilities of communities to engage in and follow ‘good’ livelihood pathways, in a collective and purposeful manner. Of course, with this assumption, we realize that ‘good’ is quite subjective and can be perceived differently by individuals or stakeholder groups.

Below, we refer to a number of examples shared in the book where CBM processes and practices contribute to reducing such vulnerability. The process of using diversity kits in Guaraciaba, Brazil, is an illustration of where farming households and communities regain security at an individual and community level in terms of food, crops and varieties (Canci et al., Chapter 1.5). In Central America, development organizations have been supporting farming communities in the establishment of community seed reserves, which have gradually made farmers and communities less vulnerable to losing their varieties during frequent natural disasters. The farmers regain access to seed and varieties through community institutions instead of being dependent on relief or seed markets in which they are unable to access seed of their preferred varieties (Fuentes and Alonzo, Chapter 2.6). Shrestha et al. (Chapter 2.8) show how community seed banks throughout the world and in very different contexts are drivers of the CBM process, promoting agrodiversity conservation and use while building community structures. Several methods of participatory crop improvement enhance farmers’ access to a wider diversity of varieties, reducing farmers’ vulnerability to natural and anthropogenic disturbances (De Boef et al., Chapter 5.1). A striking example is where the introduction of exotic germplasm of taro in Samoa has been vital to sustaining the cropping system (Iosefa et al., Chapter 5.10). The case studies on marketing and value addition of local wheat varieties from the mountainous region of the Lubéron, France (Kastler and Moÿ, Chapter 4.6), is an illustration of where a local livelihood-based food market system reconnects farmers with consumers, while valuing diversity and supporting the establishment of community institutions. These CBM practices not only empower farming communities in their agrobiodiversity management, they also decrease vulnerability.

We assume that efforts aimed at promoting resilience through the CBM methodology and its practices focus on strengthening community capabilities for using ‘good’ livelihood pathways. Through the collective and purposeful management of agrobiodiversity, community resilience is an emerging property of the CBM processes and practices.

If we want to explore the ways in which CBM contributes to community resilience, we must do so within the larger context of poverty alleviation, livelihood development and empowerment. Here we address ways in which resilience is defined in ecological and social systems, and then analyse whether the CBM methodology and its practices are instrumental in promoting community resilience.
CBM: defining community resilience

In the field of ecology, resilience is defined as the ability of an ecosystem to reorganize itself following perturbations. Resilience is measured by the extent of disturbance a system can tolerate while maintaining its structures and functions. Research on the resilience of ecosystems has shown that when seeking resilience, most disturbances are often linked to changes in social systems (Berkes et al., 1998; Gunderson et al., 1995). While promoting resilience, both natural and anthropogenic disturbances and their interactions need to be addressed. Table 7.3.1 illustrates the diversity of natural and anthropogenic disturbances.

An increasing amount of attention is being placed on understanding how human systems respond to disturbances (i.e. social or community resilience). Wilson (2012, p17) defines community resilience as the ability of a social system to respond to, recover from and reorganize itself following disturbances; he includes those inherent conditions that allow a social system to absorb impacts and cope with an event, as well as a post-event. He includes adaptive processes that facilitate the ability of a social system to reorganize and learn in response to a change. The notion of learning defines community resilience more as a dynamic process that is continuously adapting to changes or disturbances, rather than returning to a previous stage of equilibrium. As such, dynamism and learning are incorporated as ways in which we define but also approach community resilience. Resilience is thus approached both as an outcome and a process that is linked to the capacity of a community to learn, and its willingness to seek out and take responsibility for ‘good’ livelihood pathways. When

| Table 7.3.1 Examples of anthropogenic and natural disturbances affecting community resilience |
|---------------------------------|-----------------|---------------------------------|
| **Natural disturbances**        | **Geological disasters** | **Natural disasters resulting from human mismanagement** |
| Weather-related disasters       | Landslides       | Global climate change           |
| Cold events                     | Volcanic eruptions| Pollution                       |
| Hurricanes                     | Earthquakes      | Human-induced desertification   |
| Drought/desertification         | Meteorite impacts| Pest and disease outbreak affecting agriculture |
| Floods                         | Tsunamis         | Biodiversity loss               |
| **Anthropogenic disturbances** |                               |                                 |
| Socio-political disturbances    | **Disturbances linked to energy availability** | **Economic disturbances** | **Disturbances linked to globalization** |
| War                            | Peak oil         | Shift in global trade           | Loss of socio-cultural values |
| Revolution                     | Energy shortages | Recession                      | Modernization                 |
| Power/ governance shifts        | Food prices fluctuation | Technological change Migration |

Source: Adapted by the authors from Wilson (2012).
communities assume their responsibilities in those pathways, in a collective and purposeful manner, and engage in processes of social learning, the CBM methodology and its practices emerge as potential strategy for fostering community resilience.

**Spatial aspects and community resilience**

In order to define community resilience, we need to first establish clearly what we consider constitutes a community. In this context, community is approached as an open social system with inflows and outflows of people, goods, knowledge, information, skills and resources (Cumming *et al.*, 2006). As illustrated in Figure 7.3.1, we recognize that communities are not homogenous entities, and are comprised of individuals, households and stakeholder groups, each of which has its own resilience pathway. What may be good for a community as a whole may not be beneficial or result in resilience at the level of individuals, households or specific stakeholders groups. Similarly, it can be easily reasoned that what may be good for one household may not necessarily benefit other households, or the community itself (e.g. the accumulation of wealth through creating some exclusive access rights to seed of a certain local variety).

With communities as open systems, community resilience is influenced by pathways that are defined at higher scales, such as the outcomes of policies and decisions. Wilson (2012) argues that larger-scale processes or actions that influence decision-making (e.g. national policies, and/or global drivers of change) are ultimately mediated by the household within its community. For example, national genetic resource policies result in actions that have tangible effects in a given locality (e.g. they create options for a farming household or group of households in a community to claim certain exclusive rights in the production and marketing of seed of specific local variety). The accumulated effect of such individual actions can be seen at local community level, where farmers or groups of farmers actually exercise their rights, or engage themselves in a collective effort, such as establishing a community seed bank, and ensuring that farming households in the community and beyond can access the seed

*Figure 7.3.1* The human scales of resilience.

*Source: Adapted by the authors from Wilson (2012).*
of local varieties in a more equalitarian manner. Various genetic resource policies bring global and national policies to the level of communities and farming households as drivers of change (Louwaars et al., Chapter 6.1). However, for delineating and up-scaling resilience, actions are defined by the degree to which individuals or groups of individuals become engaged in those actions that are addressed by such global and national genetic resource policies.

**Resilience, assets and capital endowments**

In the early 2000s, the focus in rural development moved from participatory approaches to livelihood development. Components of improved livelihoods usually include good health, higher income, resilience, empowerment, food security, and a more sustainable use of the natural resource base (Carney, 1998; DFID, 1999). Assets, which are also identified as the third dimension of poverty, are considered to be the basis for livelihood development; they include physical, natural and biological assets; human and social assets; and economic and financial assets. When we build upon the three pillars of sustainability, these assets can be structured into economic, social and environmental capital (Cutter et al., 2008; Ostrom, 2009). Instead of individual livelihood assets, we refer to these assets as capital endowments for defining community resilience.

Economic capital is defined as monetary income and financial assets. Factors such as the levels of community or household income, the development of community infrastructure and the availability of funding are associated with strong economic capital, which many would argue is overemphasized as an indicator of community resilience. Social capital is generally described as the social, political and cultural networks and relationships in a community (Bordieu, 1987). What is relevant to community resilience is the description of social capital as being the ability and willingness of community members to participate in actions directed to community objectives and to processes of engagement (Magis, 2010). Wilson (2012) highlights functions such as bonding (group cohesion), bridging (ties between groups), and linking (vertical relationships). Environmental capital has been immersed in debates on sustainability since the 1980s; today, it is self-evident that a community relies on a healthy environment for its survival. With the complex and strong linkages between social and ecological systems described above, the importance of environmental capital has generally become more accepted as one of three pillars when defining community resilience. Environmental capital addresses physical, natural and biological (agrobiodiversity) assets, which are often highly interdependent on social and economic assets. Environmental capital is influenced by individual and collective actions, but also presents opportunities and constraints to communities for their livelihood development and for promoting community resilience (Magis, 2010).

Based on Wilson (2012), community resilience and vulnerability can be conceptualized as a triangle of economic, social and environmental capital (Figure 7.3.2). The strongest resilience is achieved when all three capitals are well developed; such situations can be found when there are dynamic interactions between strong economic, social and environmental capital, as shown in the overlap of the three circles.
in Figure 7.3.2. Communities with only two capitals are characterized as moderately resilient or moderately vulnerable; while the communities with only one well developed capital can be characterized as of weak resilience and high vulnerability. Community resilience can be seen as the capacity of the community to balance their economic, social and environmental needs in their livelihood pathways in response to disturbances. The relationships between the three capitals are of more relevance than the capitals themselves are individually, thus for reaching community resilience an integrated approach is required.

Many of the contributing authors of this book share experiences with CBM processes and practices that address the three capitals. The common and global reference in the development of the CBM methodology is Local Initiatives of Biodiversity, Research and Development (LI-BIRD) and partner organizations in Nepal (Subedi et al., Chapter 1.2; Shrestha et al., Chapter 1.3). Experiences with more than nine CBM practices implemented by LI-BIRD are shared in this book. For example, the community seed bank and community biodiversity register constitute local institutions for strengthening agrobiodiversity management (natural and social capital). Above all, these practices motivate communities to engage themselves in collective and purposeful action, which results in what Wilson (2012) describes as bonding, bridging and linking, as features of social capital. The community seed bank, coupled with the CBM trust fund, enables poor farming households to obtain access to credit (social and economic capital), and get involved in value addition and the marketing of specific crops and varieties (natural and economic capital), while at the same time providing services in the conservation of unpopular varieties (natural capital) (Shrestha et al., Chapter 2.9). A diversity of participatory crop improvement methods, as used by LI-BIRD, contributes to the availability of local and improved varieties (natural
capital). The methods include the participatory genetic enhancement of local varieties of a major food crop, such as rice (Silwal et al., Chapter 5.5) and grassroots breeding, which targets neglected and underutilized fruit and vegetable species in particular (Sthapit et al., Chapter 5.2).

The other global reference for CBM processes is the M.S. Swaminathan Research Foundation (MSSRF) in India. It has taken an integrated approach in supporting tribal communities in the Kolli Hills, through raising awareness and enhancing the capabilities of farming communities to maintain and use a diversity of small grain species. In using this approach, the foundation aimed to ensure food and nutritional security in harsh climatic conditions (natural and social capital), and address changes in food and agricultural systems. MSSRF has promoted the establishment of community seed banks (natural and social capital) and supports value addition processes (economic capital) in promoting small grain products in rural and urban markets (King et al., Chapter 4.3).

Similarly to the examples from India and Nepal, the Seeds of Passion network, facilitated by the Semiarid Network in Paraíba, Brazil (ASA/PB), enhances the use of farmer-produced seed of local varieties (natural capital) (Dias, Chapter 2.7). In terms of social capital, the Seeds of Passion Network bonds farmers, fostering cohesion within communities; builds bridges between communities, facilitating varietal and seed flow; and establishes linkages in terms of vertical relationships with, for example, policy bodies. With regards to economic capital, farmers’ autonomy increases so they do not have to access seed and varieties from governmental distribution programmes. Through the vertical integration, even the use of their assets in natural and social capital can be fostered for engaging in income generation as an expression of their economic capital. As such, the Seeds of Passion network does not only contribute to on-farm management of agrobiodiversity, it also enhances the autonomy of farmers and communities in semi-arid areas in seed, varietal and food security. By addressing the three capitals in an integrated approach, the network promotes community resilience. The example is powerful since it clearly expresses how several scales of resilience are interrelated.

Similar considerations relating to CBM processes and practices, and capital endowments, can be made for many other experiences shared in this book. Several chapters address araucaria landscape management in Brazil (Assis et al., Chapter 3.2; Peroni et al., Chapter 3.4; Reis et al., Chapter 3.5), in which traditional peoples’ rights are fostered, management systems are supported, and market access and value addition is promoted. Several authors share experiences in promoting farmers’ involvement in crop improvement coupled with community-based strategies of seed production. Experiences are shared from Ethiopia (Mohammed et al., Chapter 5.9), Thailand and Vietnam (Doctor, Chapter 1.6; Thomas and Anh, Chapter 4.5) and Central America (Alonzo et al., Chapter 5.8). Plant genetic resource programmes support the establishment of agrobiodiversity-oriented cooperatives in Ecuador (Tapia and Carrera, Chapter 2.3) and Ethiopia (Feyissa et al., Chapter 1.4). In France, a community seed bank and various methods of participatory crop improvement support the farmers’ dynamic management of local varieties (Kendall and Gras, Chapter 1.7; Lassaigne and Kendall, Chapter 5.4). Basically, most experiences link livelihood development and agrobiodiversity management in one way or another.
Following the argumentation built upon the cases from Nepal, India and Brazil, and complemented by several others, the CBM methodology motivates conservation and development organizations to take an integrated approach. With the focus on agrobiodiversity, the organizations strengthen the capacities of communities to manage their biological assets in a more purposeful manner as part of their environmental capital. They target both individual and collective capabilities, and strengthen community institutions and structures, i.e. enhance human and social assets as part of social capital. Many experiences shared in the book promote livelihood-based food market systems (De Boef et al., Chapter 5.1). They show how communities are positioned in the overlap between the three circles of capital endowments, as illustrated in Figure 7.3.2. We can therefore conclude that through the diversity of approaches that constitute the CBM methodology and practices, these experiences contribute to community resilience.

Community resilience, the CBM methodology and its practices

In the conclusion of this chapter and the book, the experiences and emerging insights on poverty alleviation, livelihood development, empowerment and conservation of agrobiodiversity shape CBM as a methodology that promotes community resilience. CBM is introduced by Shrestha et al. (Chapter 1.3) as a methodology for contributing to the conservation and sustainable utilization of biodiversity at local level, with an emphasis on agrobiodiversity or plant genetic resources, where it focuses on enhancing the capacity of communities to make collective decisions and purposefully implement the practices that contribute to securing access to and control over their agrobiodiversity for sustainable livelihood development. Moreover, De Boef and Thijssen (Chapter 1.8) describe CBM as a situation in which on-farm management of agrobiodiversity is achieved.

Here, in this chapter, we can formulate a similar argumentation where CBM as a situation promotes community resilience. Again, CBM can be approached as a methodology and a situation that describes what people or communities do. CBM is thus a process but also an end-point, where CBM results in a resilient community. The practices that are elements of the CBM methodology can be single actions that are geared towards raising awareness of conservation and diversity, enhancing understanding, building capabilities within community-based organizations, and encouraging communities to make informed decisions over their agrobiodiversity in times of change. CBM incorporates such multi-year processes for value addition and market development, and participatory crop improvement. Following this logic, new features can be incorporated in Figure 7.2.1 that illustrate the relationship between CBM as a methodology and a situation with empowerment and in situ conservation. In Figure 7.3.3 we incorporate community resilience in this conceptual framework.

A critical assumption remains that for CBM as a methodology to reach CBM as a situation it should target empowerment. However, when such a situation is reached, community resilience and on-farm management emerge as properties of that situation. Linking these outcomes with the discussion on genetic resource policies and rights (Louwaars et al., Chapter 6.1), farmers’ rights also emerge as a property of
CBM as a situation. In this way, we meet the three objectives of both the Convention on Biological Diversity (CBD) and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

When we first decided to compile this book with case studies and insights, our objective was that of assessing to what degree we, as conservation and development professionals and our organizations, have advanced in achieving those three objectives related to the conservation and use of agrobiodiversity, and the fair and equitable sharing of benefits arising from the use of agrobiodiversity. By incorporating farmers’ rights in this conceptual framework, and linking them to a situation where community resilience and on-farm management are promoted, we have been able to link the three objectives of the CBD and the ITPGRFA to the current challenges of climate and social–environmental changes.

A comparative advantage of adding community resilience to this conceptual framework is that we can benefit from advances that have been made over the past two decades in the field of agrobiodiversity management and livelihood development in support of farming communities. As we have learned from contributing to on-farm management and promoting farmers’ rights, we do not need to start from scratch when approaching the subject of community resilience. We can build upon a body of knowledge and experiences, as well as insights, for strengthening farming communities in their livelihood pathways to be more resilient to the unpredictable challenges they, and we as a global community, face.