

Local solutions to address global challenges facing farmers and indigenous peoples

Paul BORDONI, Toby HODGKIN

The Platform for Agrobiodiversity Research, c/o Bioversity International, Rome, Italy

Abstract

Agrobiodiversity plays a central role in the coping strategies of rural communities and indigenous peoples. It is an important part of the livelihood strategies of poor farmers, contributing not only to meeting food and shelter requirements, but also providing medicines and fuels, contributing to the provision of ecosystem support and regulating services and meeting cultural needs. Climate change is bringing new challenges to rural communities and indigenous communities who are have to adapt to changing production conditions and environments in addition to the problems they already face.

The Platform for Agrobiodiversity Research (PAR), which aims to enhance the sustainable management and use of agrobiodiversity by improving knowledge of all its different aspects, has undertaken a survey aimed at identifying the extent to which farmers around the world are using agrobiodiversity to cope with climate change. The survey, available as a web-based knowledge sharing resource, provides information on when and where farmers use agrobiodiversity to help cope with climate change, how it is used and what kinds of agrobiodiversity are most important. This paper describes the ways in which the information has been collected, how it can be used by the agricultural and rural development communities and suggests how it might be further improved. Some major findings of the survey are summarized and illustrated and the implications identified.

Introduction

Agrobiodiversity, or agricultural biodiversity, includes all the components of biological diversity of relevance to food and agriculture as well as the components of biological diversity that constitute the agro-ecosystem: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which sustain the functions, structure and processes of the agro-ecosystem. The continued maintenance and use of agrobiodiversity is central to securing sustainable production and to improving the livelihoods and health of poor farmers throughout the world. Traditional rural communities and indigenous peoples are stewards of, and depend on, agrobiodiversity for their livelihoods. The diversity of crops, forages, livestock, agroforestry products, and fish, and the many other plant, animal and microbial species found in and around their production areas, constitute vital resources that the manage and maintain to provide food, fuel, medicine and many other products necessary to their survival.

Climate change is one of many forces that are compelling rural communities and indigenous peoples to adapt and change. Many communities are having to cope not only with specific trends such as increased temperature or decreased rainfall, they are also facing increasingly variable and fluctuating production conditions. Evidence suggests that agrobiodiversity can, and often does, form an essential element in the various coping strategies that are being tested and adopted by affected communities. Agrobiodiversity not only provides adaptation and the diversity necessary to meet changing production conditions, it also confers adaptability and resilience in the face of fluctuating and variable environments.

However, the fact that agrobiodiversity constitutes an important element in the climate change management strategies being developed by indigenous peoples and rural communities is often unrecognized and undervalued. This reflects the dispersed nature of the information, the fact that much of it is “informal” or part of grey literature, and the fact that the agrobiodiversity dimension is often unrecognized in the information that is made available. Bringing together, validating, synthesizing and making available existing information would provide a framework for exploring how and when agrobiodiversity has been found to be important, what different elements can be most useful, and what practices, approaches and experiences exist that can become part of more general coping strategies, based on the realities experienced by rural communities around the world. Using this information it should be possible to encourage development agencies, national planners and others to develop climate change management strategies that take fuller account of the needs and opportunities provided by agrobiodiversity.

The Platform for Agrobiodiversity Research (PAR) (PAR, 2006) has been established to bring together researchers and others to share knowledge and experiences that can improve the maintenance and use of all aspects of agrobiodiversity. Currently hosted by Bioversity International, PAR’s objectives are to collate and synthesize agrobiodiversity data and information and disseminate knowledge; to identify ways in which the use of agrobiodiversity can contribute to addressing major global challenges; and, to identify and facilitate relevant new and innovative research partnerships that strengthen cross component, multidisciplinary and participatory research. The guiding principles for the Platform include a concern with research of potential global significance; a focus on work that complements existing research efforts and addresses more than one component or level of agrobiodiversity; a commitment to working with poor farmers and local communities on agendas of relevance to their needs; and to working in ways that link custodians, managers and beneficiaries of biodiversity.

As part of its work PAR has sought to bring together available information on how local communities around the world are using agrobiodiversity to help cope with climate change. The information has been collated and made available through the Platform’s website. In this paper we focus particularly on how the information was collected and how it is made available to users. We also outline some preliminary findings from our analysis of the information and suggest ways in which the information resource might be further used and developed.

Information collection and organization

An initial search through CABI through CABDirect was performed using the following key words: “*Coping strategies, Climate Change, Agricultural biodiversity or Agrobiodiversity, Adaptation, Mitigation, Indigenous communities and Rural Communities*”.

By screening the abstracts of the 76 records resulting from the above mentioned CABI query we performed a first selection of the results generating a list of 57 most relevant articles. This initial bibliographic research was further extended by checking the most cited titles in the reference list of the different papers and by further follow up searches of key journals and other likely sources.

The resulting list of titles recording Projects, Peer-Reviewed publications, and Development Reports was complemented with news items found over the internet and checked for relevance upon the following keywords "Climate Change, Agriculture, Biodiversity, Rural Strategies and External Strategies"

The UNFCCC database (<http://maindb.unfccc.int/public/adaptation/>) also provided to be a useful source of relevant information and an important place to further expand the search based on the references listed.

Since the original search we have continued to compile information from web surveys and other means. *Agrobiodiversity, Adaptation, Communities, small scale farmers and Indigenous knowledge* are the main key words used to select the information and allow different types of information formats such as

publications (reports, case studies, press releases and peer reviewed publications), events, photos, videos and audio files to be compiled and added to the web site on a regular basis.

Much of the information that has been accessed comes from traditional and indigenous peoples. In making the information more widely available, PAR is attempting in part to respond to Article 8(j) of the Convention on Biological Diversity (CBD): “*Traditional Knowledge, Innovations and Practices*” (www.cbd.int/traditional) which affirms the importance of understanding the value of traditional knowledge and supporting the participation of indigenous and local communities in decision-making; of respecting, preserving and maintaining traditional knowledge relevant to the conservation and sustainable use of biological diversity.

The knowledge base is supported by three different web-environments

The main web site

The information can be accessed through the designated web site developed by PAR for its work on climate change (www.agrobiodiversityplatform.org/climate_change). This is built on Wordpress®, a publishing CMS (Content Management System) that allows to categorize the information posted on line according to a set of keywords and categories specifically set up. The categories are: *News, Announcements, Events, Funding opportunities, Publications and Resources, Research activities* and *Employment opportunities*.

As information becomes available it is added to the publications and resources web space.

Delicious

Social bookmarking was adopted to provide a way for internet users to access, share, organize, and search the identified literature taking advantage of connecting to a wider community. “Delicious” was used and 359 articles, on the basis of their relevance against the main keywords mentioned above (Agrobiodiversity, Adaptation, Communities, small scale farmers and Indigenous knowledge) are currently included in this system (http://delicious.com/par_cc/).

Delicious users can share their links with the network we are fostering by tagging them with “PAR_CC”. Also, the records listed in Delicious give us the opportunity to learn who else has bookmarked the same resources and allows exploring their bookmarks; an interesting feature for further expanding the knowledge base. The Delicious dataset was first created in June 2008 and the most recent entry was made in November 2009.

Mapping adaptation cases

Another way of making the information available in a useful form has been the development of a mapping function for the records collected. The procedure uses a Google map and a web form which collects information from information providers.

The Google map facility currently includes information on about 200 cases where the work is specific to particular locations and there is the information required for mapping. Each georeferenced case is provided with an abstract and the coping strategy (Agroforestry, Cropping Systems, Stress-tolerant Crops, Organic Agriculture, Livestock, Fisheries and Bees, Biodiversity Management, Landscape Restoration, Diet Diversification, Soil and Water Management)



Fig. 1. Adaptation cases mapped on google earth

Items posted on each of the three different web-environments are accompanied by a brief summary of the content and a list of keywords, derived from a selection of Agrovoc along with some add-ons we have created, is used to categorise the information (free tagging).

adaptation, agriculture, africa, agro-ecosystems, agro-ecology, agroforestry, americas, asia-oceania, awareness, biodiversity, breeding, Campaign, capacity-building, climate-data, community, collaboration, competition, conservation, conservation-agriculture, COP, coping, crops, discussion, diversity, ecology, ecosystem-health, ecosystem, ecosystem-approach, ecosystem-services, education, EU, FAO, farmers, farming-systems, food, food security, gender, gene_banks, get-involved, global, governance, health, history, indigenous-people, international-agenda, intensification, interdisciplinary research, intergrated-pest-management, income, jobs, kids, knowledge-gaps, land-use, landscape, landscape-approach, latin-america, livelihoods, livestock, mainstreaming, maps, marketing & trade, media, mitigation, mountainous, natural-resources, nutrition, participatory, pacific, poverty, policy, pests and diseases, research, risks, roots & tubers, rotational farming, seasons, seeds, self-help, soil, soil management, sustainable development, sustainability, Traditional farming methods, Traditional Knowledge, video, vulnerable-communities, water, weather-event, website, Water management, video.

Fig. 2. PAR-CC keywords

The top ten tags from Delicious provide indications on the nature of the information collected and the fact that many cases are of global significance or geographically geared towards Africa.

Table 1. Top ten tags from Delicious

TEN MOST USED KEYWORDS	n. postings
climate_change	254
Adaptability	141
World	106
Africa	99
par:peer_reviewed	90
Biodiversity	81
Agriculture	67
par:project	67
Policy	67
food_security	64

An interesting feature Delicious offers is the opportunity to group keywords in major headings. For example 14 of the keywords have been classified under the heading “Environment” (http://delicious.com/par_cc/bundle:Environment) and 8 under the “Regions-Continent” (http://delicious.com/par_cc/bundle:Regions-Continent)

The knowledge base provides the opportunity for users to add information on additional cases and PAR encourages users to forward documents for the web site and to provide possible sources of new information. However, the majority of the titles listed have been gathered by the PAR’s secretariat members.

Some first results from analysis of the information

The information available reflects the wide variety of sources from which it came and often it is presented in very different ways. There are great differences in the way information is presented for scientific papers prepared for world renowned journals and the way in which specific groups may choose to make available case studies on their own websites or in their own informal publications. It has been useful in undertaking analyses of the information to distinguish 3 categories: (i) those which come from research studies of particular aspects that have relevance to agrobiodiversity and climate change (e.g. Morton, 2007, Bezancon et al., 2008); (ii) those which come more or less directly from experiences of indigenous communities themselves. In Honduras, farmers organized community-based agricultural research teams (CIALs), to diversify their plant genetic resources and to develop hardier plant varieties that grow well on their soils and hurricane hit environments (<http://usc-canada.org/UserFiles/File/Pathways-Case01-Honduras.pdf?PHPSESSID=cdd31020d18395656e32413090eac2bc>); and, (iii) those that describe use of agrobiodiversity as part of project interventions such as (e.g. Practical Action and IFAD’s project on spate irrigation – <http://www.ifad.org/english/water/innwat/topic/irrigation.htm>). The last group may reflect a local or community identified response to climate change but they may also reflect specific project ideas that come from external sources.

As described above, it is possible to classify the information in a number of different ways. Thus, grouping the information by climatic envelope, biome, region and component of agrobiodiversity of concern has proved to provide useful insights on the nature of farmer and community response. This kind of analysis has also been useful in helping to identify where there is still very limited information such as from specific regions (Central and West Asia and North Africa – 5 examples) or on specific components of agrobiodiversity such as the impact on and ways of maintaining and using pollinator diversity.

The cases present a wide range of climate adaptation measures and coping strategies of rural and indigenous communities including landscape restoration, changes in cropping systems, cultivation of stress-tolerant crops, organic agriculture, changes in livestock and fisheries management, indigenous beekeeping, biodiversity management, diet diversification, and soil and water management. Often, these strategies are the elements of integrated and site-specific approaches based on the indigenous and local knowledge and innovation.

Important elements in response of communities to climate change within agricultural ecosystems include:

- Water and soil management practices such as improved water retention practices in dry environments (Barro, A. et al., 2005) or improved management of mangrove systems in coast areas (http://www.mssrf.org/tsunami/eco_rehab.htm).
- Introduction of new crops, livestock species and new cultivars of existing materials especially the increased use of agroforestry species. This includes the use of varieties and crops with greater stress tolerance ([http://www.leisa.info/index.php?url=show-blob-html.tpl&p\[o_id\]=2x93x8&p\[a_id\]=2xx&p\[a_seq\]=2](http://www.leisa.info/index.php?url=show-blob-html.tpl&p[o_id]=2x93x8&p[a_id]=2xx&p[a_seq]=2)) and a wide range of diversification practices such as the introduction of fish farming or floating gardens in Bangladesh (Practical Action, 2009);
- Changes in cropping systems, timing, rotations and other crop management practices and altered management practices with respect to key production components such as pollinators (<http://www.ddsindia.com/www/enviindia.html>);
- Adoption of agricultural management practices believed to increase adaptability and resilience such as organic agriculture and conservation agriculture (<http://www.utviklingsfondet.no/filestore/Nicanet.pdf>);
- Institution strengthening particularly through the development of mutual support systems such as is occurring among many pastoral communities (<http://www.cenesta.org/projects/Pastoralism.htm>)
- Diet diversification as a result of changed availability of foodstuffs (<http://practicalactionpublishing.org/food-production/ricefishculture>)

Analyses are still ongoing but some trends are beginning to appear which suggest that there are some general features which are important to communities seeking to cope with climate change and which it may be important to try to support. These are summarized below with references to examples of each. They include:

- Maintaining high levels of agrobiodiversity in agro-ecosystems seems to provide adaptability and increase stability and resilience in the face of change.
- Traditional agricultural varieties remain essential to small-scale farmers and indigenous peoples. The continuing management and selection of these materials remains an important strategy for helping to cope with change
- In many situations new crops, varieties and livestock materials are needed to meet changed production conditions and access to new materials to complement traditional materials (not necessarily replacing them) can be important.
- Indicators of change and of the nature and extent of change are clearly important to rural communities. In addition, often the traditional indicators used for determining sowing, harvesting and other cultural practices have changed characteristics and may not be relevant.

- Farmers, pastoralists, forest dwellers and fisher folk are adopting alternative livelihood strategies. This involves developing new skills and the need to exchange information and knowledge. Ways of supporting these transitions are important and often involve institution building (e.g. Ensor and Berger, 2009).
- Combining traditional knowledge with new scientific information is an important part of improving resilience and ensuring adaptability. New information may often be needed but it needs to be placed in the context of a framework of traditional knowledge which itself is dynamic and continually developing.

Conclusions

PAR's work on agrobiodiversity and climate change offers a web-based knowledge sharing resource that allows interested parties to provide, access, and share information on line. It provides a web based resource for collating, synthesizing and disseminating agrobiodiversity knowledge relevant to climate change. It makes available information on useful tools and practices that support improved use of agrobiodiversity and identifies areas where information is lacking and new knowledge is needed.

Of course, an information resource of this kind needs to be continually expanded and to receive information from interested participants from around the world. The experience suggests that even regular information searches need to be complemented by active provision of new information from interested partners around the world. Continuing to nurture and expand the growing community of practice must be an important aim for the future.

Making available the information collected provides one contribution to improving the use of agrobiodiversity as part of adaptation to climate change. Approaches are described which have helped different communities and tools, practices and management strategies are made available which grounds can use or adapt to suit their specific circumstances. Further analyses are ongoing which should provide new information on how agrobiodiversity can help build resilience, strengthen adaptive capacity and help indigenous peoples and rural communities to cope with climate change. The contributions and information made available by farmers, rural communities, indigenous peoples as well as by researchers and those involved in development provides the an improved knowledge framework both to use agrobiodiversity and to maintain it for future generations.

References

- BARRO, A., ZOUGMORE, R., TAONDA, J.B.S. *Mechanizing the manual zai technique in semiarid areas*. - Cahiers agricultures, 2005 No.6
- BEZANÇON, G. et al 2008. *Changes in the diversity and geographic distribution of cultivated millet (Pennisetum glaucum (L.) R. Br.) and sorghum (Sorghum bicolor (L.) Moench) varieties in Niger between 1976 and 2003* <http://www.springerlink.com/content/723ug31141746173/fulltext.pdf> - accessed 11 June 2009
- ENSOR, J. and BERGER, R. 2009. *Understanding Climate Change Adaptation, lessons from community based approaches*. Practical Action Publishing. 192 p. DOI: 10.1038/climate.2009.58
- Morton J.F., 2007. The impact of climate change on smallholder and subsistence agriculture. Proc Natl. Acad. Sci. USA, 104 19680-19685. <http://www.pnas.org/content/104/50/19680.full.pdf+html> - accessed 11 June 2009
- PAR, 2006. *Summary Report of the Platform for Agrobiodiversity Research First International Stakeholder Meeting*, Rome, Italy, 16 pp.

http://www.agrobiodiversityplatform.org/wp_main/wp-content/uploads/2009/02/PAR-report.pdf - accessed 15 February 2010

Practical Action Technical Brief 2009 *Floating Gardens in Bangladesh*,
http://practicalaction.org/practicalanswers/pdf_thumb.php?s=l&im=floating_gardens.pdf - accessed 15 February 2010