Agricultural biodiversity enhances capacity to adapt to climate change

Farmers are making use of agricultural biodiversity to adapt to climate change
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To cope with climate change, smallholder farmers rely on agricultural biodiversity. This was the key message resulting from a recent survey of almost 2,400 smallholder farmers across Bolivia, India and Nepal. The research was coordinated by Bioversity International, in partnership with MSSRF, LI-BIRD, and PROINPA. The survey aimed to build understanding of smallholder farmer perceptions of climate change and their coping strategies to gain insight into the adaptive capacity of their production systems and opportunities to enhance their resilience.

Most farmers interviewed (89 per cent) have recognised changes in the weather over the last 20 years; they do not all agree on the changes that have taken place but most note higher temperatures and altered precipitation patterns in accordance with scientific records. For instance, farmers in Nepal report that "The sun is hotter making it harder to work in the fields" and that "Water sources are drying up". Farmers in India and Nepal also report that higher temperatures have resulted in increased incidence of drought. In the Bolivian Andes farmers are not so affected by drought but they have observed that rains come later than in the past. Many also find the weather now more unpredictable. As a result of the changing weather patterns, farmers in all three countries are suffering yield declines and food insecurity.

New approaches

To mitigate the impacts of climate change, farmers report taking a number of different actions; interestingly, for the most part, their coping strategies depend on agricultural biodiversity. This resource encompasses the multitude of species and varieties of food plants that thrive under a wide range of growing conditions. The most common strategy is for farmers to plant new crops and varieties which are more resistant to changing climatic conditions. Farmers also make use of their existing materials, modifying planting locations and schedules to build their resilience.

For example, in Bolivia, increasing pests and disease is the primary impact that farmers note from climate change. Warming conditions in the Andean highlands are enabling previously kept under control by cold temperatures. To counter the warmer temperatures and spread in disease, many farmers are now planting disease-resistant varieties. Some are also shifting their production plots further uphill where temperatures are colder and disease is less evident. Farmers report that the frost-resistant native potato variety - Luki - is climate change

In Bolivia many farmers are now planting disease-resistant varieties
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resilient, as well as the blight-resistant modern potato variety Double H, also known as Runa Toralapa. Many farmers also considered quinoa and barley to be climate-hardy crops; quinoa is particularly appreciated for its drought-resistance.

Across the globe in India and Nepal, farmers are similarly making use of agricultural biodiversity to adapt to climate change. Here they plant early-maturing varieties to cope with the intensifying risk of drought. Farmers in the Terai region of Nepal, for example, reported that rice variety 1442 and wheat variety NL297 are particularly resistant to climate change. In India, finger millet, kodo millet and small millet are reported by farmers to be drought-tolerant. Like quinoa, these minor millets grow under low-input conditions, while also producing highly nutritious grains. Increasing reliance on such crops could play an important role in enhancing climate change resilience of their production systems. To harness this potential, however, these minor crops (millets, quinoa, etc.) require more attention by research and development efforts, which primarily focus only on the dominant staples (e.g. rice, wheat, maize, and potatoes).

The benefit of trees

Planting trees is another common strategy farmers use to cope with climate change. Trees can mitigate some of the impacts of rising temperatures by providing shade and maintaining humidity in their immediate surroundings. Trees also offer alternative livelihood options through timber, fruit and nut production, among other products. In the hill regions of Nepal, for instance, farmers identified lychee (litchi) as particularly resistant to climate change. Planting these trees offers a source of food, market income, and shelter from rising temperatures.

Diversification by planting trees fits well with traditional practices in these production systems, where farmers typically maintain a high diversity of crops and varieties to ensure a harvest despite uncertain weather conditions. In Nepal, farmers interviewed planted on average three cereals, three legumes, nine vegetables, four spices, three to four fruit species, and typically more than one variety within each crop. In Bolivia, farmers maintain an average of seven varieties of potato and a few other crops including native tubers such as isaño, oca, and papalisa, and Andean grains quinoa and cañahua. Traditional wisdom confirms the adage not to put all your eggs in one basket!

Planting trees is a common strategy used in Nepal
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Overall, smallholder farmers' targeted use of agricultural biodiversity enhances their capacity to adapt to climate change. Given the prevalence and effectiveness of planting new crops and varieties as a coping mechanism, ensuring access to a diversity of climate-hardy seed will be important to build resilience. An added challenge is that agricultural biodiversity is threatened by increasing homogenisation and industrialisation of production systems worldwide, urbanisation of populations, and shifts in cultural eating habits. Building climate change resilience will therefore also require supporting the conservation of crop diversity through an integrated approach from farmers' fields to the market and then to the table.

This research was coordinated by Bioversity International in partnership with: Local Initiatives for Biodiversity, Research and Development (LI-BIRD), Foundation for Investigation and Promotion of Andean Products (PROPINPA), M. S. Swaminathan Research Foundation (MSSRF), International Fund for Agricultural Development (IFAD), and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

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