Drivers in the forest and levers in the landscape

By Paul Stapleton

"We rejected our first theory of change even before we started work," "The number of fence poles in the forest is a good indicator of livestock grazing," "Deforestation might not always be bad". These were some of the provocative claims that speakers made at a side event of the 24th Meeting of the International Union of Forest Research Organizations in Salt Lake City on 11 October.

Organized by Peter Minang and Elizabeth Kahurani of the World Agroforestry Centre (ICRAF) in Kenya to mark the 20th anniversary of the Alternatives to Slash and Burn Partnership (ASB), the discussion centered on the evolution of ways to understand what drives deforestation and forest degradation, and propose viable alternatives.

Meine van Noordwijk, Chief Scientist of ICRAF, talked about the way that the theory of change (ToC) of ASB had matured over the last 20 years. A theory of change is a rational, implementable pathway that an organization develops to allow it to achieving its goals. However, the goals have to align with the needs and wants of the local people, and other actors. In addition, the answers that come from applied research do not agree with the original theory, and so the theory needs to be changed. (Semantically them the theory should actually be a hypothesis.) This was certainly the case with ASB. Before 1993, its ToC was based on the idea that shifting cultivation is a major driver of deforestation, so modernizing agriculture would save forests. This developed into the 'Borlaug hypothesis', that intensifying agriculture to obtain higher yields reduces pressure on forests.

Such an approach proved to be somewhat naïve. The forest margins and associated agricultural lands are a large, interconnected mosaic that operates on different scales. Even though farming on highly productive land can be a sustainable land use, continuing to work on low productivity land forces the local people to acquire more land area at the expense of the forest. Agricultural practices can be addressed locally, but watershed functions, for example, can only be assessed at a landscape scale. These landscape mosaics require fair and efficient reward mechanisms and coinvestment, trading off between public and private benefits. Knowing these costs can help to frame policy.

From there the ToC has evolved into the idea that landscape scale co-investment in environmental services supports the concept of REALU – reducing emissions from all land uses – as an alternative to REDD++. Using approach that operates on large and small scales with different paradigms helps us to identify the futures we want and work towards them.

Tropical dry forests across the world are being heavily degraded because they have a large population practicing shifting cultivation within a complex landscape. Because of its negative environmental impacts – soil degradation, loss of biodiversity, deforestation, release of greenhouse gases – shifting or swidden is often labelled as unsustainable.

Margaret Skutsch, from the Centro de Investigaciones en Geografía Ambiental in the University of Mexico, speaking on behalf of Lucia Morales-Barquero, talked about identifying and quantifying the drivers of degradation in shifting cultivation. Morales-Barquero has found that, at least in the areas of Mexico she studied, the system does not cause deforestation, but does degrade the forest and reduces carbon stocks. In fact, the practice is operating successfully and sustainably in the region, with 2 years' cultivation and 5-10 years' fallow time. This leads to a typically mosaic landscape with recovering areas and those being used, making it difficult to analyse carbon stocks accurately. Shifting cultivation over the last 50 years has lowered carbon stocks but there is no net emission of carbon now, as the regrowth rates in the 5-year fallow are so rapid. However, it takes 30 years to regain the full carbon stock of the natural forests.

There are several possible avenues open to control degradation and even promote restoration: banning shifting cultivation, increasing the length of the fallow period and controlling grazing. A ban would mean that payments for environmental services would have to be made to the local people to compensate for the earnings they were foregoing. However, investigations showed this is not really practical. In addition, a ban would be socially undesirable as this type of farming is a safety net for the poorest farmers, who are on average 5 years older than other farmers. A complicating factor is that producing equivalent amounts of maize from permanent systems would in fact produce less carbon stocks.

In a later presentation, Martin Yemefack, a scientist at the International Institute for Tropical Agriculture found similar situations in tropical forest margins in the Amazon basin in Brazil and the Congo basin in Cameroon. Soil productivity declines during the cultivation period and recovers during the fallow time. He found that the swidden method is an acceptable use of the land when conditions are stable, but high demand for food through increasing population or other pressures degrades the systems as shorter fallow periods are adopted and people are driven to encroach further on the forest.

Increasing the length of the fallow period is another option, but that is limited by land availability, tenure and population density, and government subsidies are actually decreasing the fallow period in some areas. An alternative may be to regulate grazing in the forests. Local people fence off areas of their land within the forest to control the movements of their animals. In fact, Morales-Barquero found that counting fence posts was a good indicator of grazing levels.

Lack of suitable land is the main driver pushing people into adopting semi-permanent food cropping of perennial plantations and pasture, even though it demands high inputs. Any sustainable system would need to be multidisciplinary, taking into account production, ecological, social, cultural, economic and temporal factors, with strong policies and an incentive framework.

Sonya Dewi, from ICRAF's Indonesia office, has been working to identify the levers of deforestation and recovery of tree cover. There are many and they are very complex. For example, total regrowth can be the result of three factors: recovery through reforestation, tree cropping and agroforestry. The mix varies depending on area. "A very specific understanding of the drivers is needed," said Dewi. "We need a link between the descriptive and quantitative patterns."

There are very complex interactions between the main reasons for tree loss and the dominant methods of recovery. This is why it is essential to involve the local people in a participatory process to discuss the factors of land use and cover change, and identify underlying mechanisms. "And deforestation might not always be bad," said Dewi. "We need to acknowledge cultural norms as well.

Drivers can also be very different in different regions. "We found in South Sumatra that the government's food self-sufficiency programme is the main driver of deforestation," said Dewi. "But in Papua New Guinea it was subsistence farming."

Locally specific leverage points can be identified by understanding this interconnectedness and variation amongst the drivers. Comparing areas, as well as the process of analysis itself is useful because it stimulates stakeholders to consider and discuss the drivers. The analysis can then be used to create simulations that allow the potential of any actions to be assessed.

Sara Namirembe, an ICRAF scientist based in Nairobi, proposed the business case for deliberate land sparing in African smallholder landscapes. Land sparing, or the protection of land from conversion to agriculture, allows the landscape to continue to provide ecosystem services like watershed effects. The Borlaug hypothesis predicts that increasing the productivity of agricultural land will conserve or 'spare' ecosystems because enough food will be produced to feed a growing population. However, experience shows that this sparing is not automatic. In areas of Uganda,

Namirembe used government maize-production targets and above-ground carbon as proxies to see how much land could be spared if policy targets were met. Land cover maps showed that large areas of the forest margins had been converted to inefficient subsistence agriculture with an 85 percent loss of above-ground carbon.

The intensification programmes had been undertaken without any consideration of ecosystem services, so that a rapidly growing population, low fertilizer use and insufficient food production continued to threaten the forest margins. Increased investment could enhance food security, household income and environmental services. But that will only happen with integrated policies. Rural populations need to be shown how to intensify their agriculture to make a profit. Accessing the local and international environmental services market will strengthen efforts, as will providing incentives and increasing enforcement.

There is a clear business case for the approach. Data on the value of natural capital and potential markets will motivate policy decisions, However, 100 percent intensification and full per capita satisfaction are completely impossible growing just maize on the land area available.

Other crops that are more valuable are needed. Critical issues like population growth and urbanization will have to be considered if Uganda wants to feed its rapidly growing populations and conserve its forests.

Beria Leimona, an ICRAF scientist in Indonesia, looked at ecosystems services from another angle by asking the question, "Does expected profit predict compliance in auctions of payments for environmental services?"

When farmers try to maximize their profits by increasing land use, it can cause other costs. In a case in Sumberjaya in South Sumatra, farmers were intensifying their coffee production, but this was increasing sedimentation in the river, causing problems to a hydropower operation downstream. Because of this, the company was prepared to pay farmers to reduce the area of land they were cultivating, through a land-sparing programme.

Leimona worked with partners to test conservation auctions as way to mimic market-based mechanisms to value ecosystem services. Farmers would bid for contracts to conserve certain areas of the landscape. It quickly became apparent that while most farmers understood their land, but they did not understand the costs associated with producing crops, so they could not accurately predict the value of environmental services. Some also did not understand market competitiveness. However, in a survey, 88 percent understood the auction mechanism, perceiving it as fair and not causing conflicts amongst other community members. Many quickly learned the mechanism of bidding and the way that prices varied depending on the opportunity and implementation costs. Their bidding behaviour depended on several factors, especially the quality of information that was available.

Power imbalances, such as village leaders and elites, tried to influence where the payments went. Nevertheless, "this process could lead to fair and socially acceptable contracts for payments for environmental services," said Beira, "Success in bidding did not indicate eventual compliance, but it was successful enough for the hydropower company to begin upscaling the mechanism in other areas."

Auctions could be an efficient alternative way to identify opportunity costs, but not a predictor of compliance. Beyond the value of the financial contract, several factors influenced successful implementation, including the information available to the farmers, an understanding of the constraints to complying with the contract, and an adequate balance between sanctions and incentive.