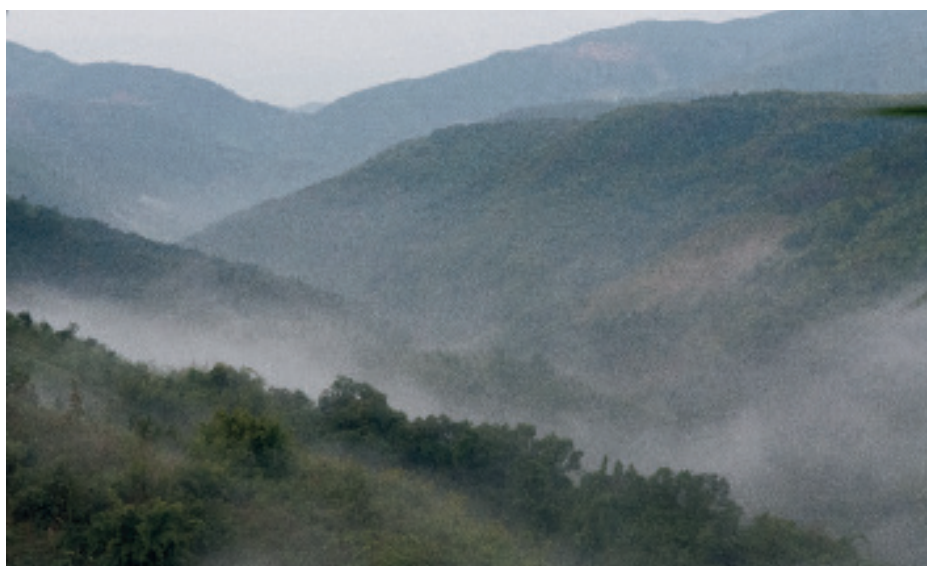


Research and development impact targets:

- Diversified upland farming systems through value-addition for cash and food crops
- Resilient climate-smart agricultural communities: bridging farms and landscapes
- Improved soil health and land management through landscape-scale actions and policies
- Sustainable agri-food systems for poor rural and urban consumers

Integrated farming systems and resilient agricultural landscapes



Managing Asia's farming systems and agricultural landscapes

Asia's rapid change across socio-economic and political spheres, amid population growth and rising demand for food, feed and energy supplies, is unprecedented. To strike a balance between economic growth and environmental sustainability, agricultural decision makers such as smallholder farmers in rural areas, policy makers and businesses need more reliable information and tools to thrive in increasingly complex social and ecological settings.

In the region's more remote and fragile environments, smallholder farmers generally survive by maximizing natural resource use in their surroundings. As they pursue a range of agricultural livelihoods, quickly shifting from one livelihood option to another based on their immediate food and income needs, natural resource sustainability can become compromised. This is a particular challenge in Asia's diverse uplands, where communities are often geographically and socio-economically isolated from wider agri-food systems and mainstream agricultural value chains.

In the uplands and across the whole of Asia's diverse agricultural production environments, the longstanding threats of natural resource degradation are now further compounded by climate change vulnerabilities. And while adaptation and mitigation measures offer promising solutions, these often require joint action and learning among individual farmers and other stakeholders, spanning whole agricultural and natural resource landscapes.

CIAT Asia's priority theme on Integrated farming systems and resilient agricultural landscapes takes a holistic perspective in addressing the diverse crop, livestock, tree and other components that make up smallholder farming systems. At the same time, it adopts a research and development framework that bridges the farm with the landscape, to support the dynamic inter-relationships between these system levels towards more resilient agriculture.

To help guide decisions and actions by research users, CIAT Asia seeks to provide a portfolio of science-driven, evidence-based knowledge products including: information and tools to assess existing conditions and establish long-term scenarios, a relevant mix of technologies and practices for resource-conserving and climate-smart agriculture, strategies for managing environmental threats, and institutional arrangements for linking farmers to inclusive markets.



Integrated farming systems in the uplands

Uplands are predominant agricultural landscapes in tropical regions of Asia. In Lao PDR for example, uplands cover over 70 percent of the country. These rainfed areas - traditionally associated with low-input, subsistence-oriented cultivation - are increasingly threatened by natural resource and crop diversity loss. Upland communities are primarily home to indigenous peoples and ethnic minorities. With limited access to support services and markets, too often they are trapped in a vicious cycle of poverty.

To boost incomes and enhance food security, upland farmers face the challenge of increasing overall productivity and market competitiveness, while maintaining overall eco-efficiency. In helping smallholder upland farmers achieve this goal, CIAT Asia's research focuses on the twin strategies of diversification and integration.

Diversifying varieties, crops and systems contributes to more resilient upland agriculture while offering opportunities for commodities with growing market demand. For example, in northern Vietnam, CIAT Asia's research has demonstrated income benefits, especially among women, in diversifying traditional maize systems by growing new cash crops such as chayote and peanut for large-scale markets.

Cassava and livestock are common features of upland farming systems; integrated whole-farm planning encourages the use of starch-processing waste as animal feed, while forages for livestock also make contour hedgerows for erosion control in sloping land planted to cassava. The strategic importance of integrated farming systems also extends to pest and disease management, to limit the spread of vector-borne plant diseases or the likelihood of establishment and spread of invasive pests. CIAT Asia and multi-stakeholder national partners have rolled out effective biological control options aimed at making natural enemies of invasive pests more abundant, energetic and - ultimately - efficient.

Climate-smart farms within landscapes

Long-term changes in temperature and precipitation, along with extreme weather events - such as flooding, drought and increased salinity in the Greater Mekong sub-region - increasingly threaten tropical agriculture. Cold stresses in Southeast Asia's upland areas cause havoc for crop growth and yield, and alter longstanding seasonal cropping calendars.

Climate risks are better understood and managed through multi-scale adaptation and mitigation. CIAT Asia's research focuses on dynamic interaction between farms and landscapes, and mobilizes climate science for institutional, national and regional agenda priority-setting - crucial in fostering enabling environments for local communities.

Our portfolio of science-driven tools include climate scenarios to anticipate and cope with climate-related vulnerabilities, to inform decision makers from national governments to farmers' groups. These tools are part of broader mapping, prioritization and monitoring methods to set up early warning systems and climate advisory services; to guide land management planning and policy formulation; and to identify best-bet climate smart agriculture (CSA) portfolios of location-specific tradeoffs between food security, mitigation and adaptation.

In Vietnam, Cambodia and Lao PDR, CIAT Asia is leading a CGIAR-wide initiative for testing CSA

technologies and practices in “Climate Smart Villages,” as community-based action learning platforms for climate-smart innovations in a farm-to-landscape setting. Across Southeast Asia, CIAT has initiated collaboration with national agencies tasked with climate adaptation and mitigation planning, including to foster inter-country networking.



Healthy soil, land and ecosystems

The year 2015 has been declared the International Year of Soils by the 68th United Nations General Assembly, to increase awareness and understanding of the importance of soil for food security and essential ecosystem functions. CIAT’s research in Asia on soil fertility decline and land degradation has historically focused on crop management to sustain soils that support cassava cultivation; and integrating forages for soil conservation in crop-livestock systems. Towards a broader agenda, research in tropical soils is expanding in different farming systems and agricultural landscapes for example through cutting-edge soil mapping.

In fragile agricultural lands, intensive crop cultivation has exacerbated soil erosion and fertility decline. Restoring and maintaining soil health are critical steps towards sustainable farming systems. This involves working with local communities and stakeholders in soil characterization and monitoring, alongside broader land management efforts. Science-informed regulatory policies and field-level strategies can help rationalize and coordinate landscape-level collective action.

Ecosystems services

Closely linked to soil and land management are the provisioning and regulating ecosystem services through which farming communities derive multiple benefits from landscapes. Agriculture is especially

reliant on ecosystem services – including plant genetic resources, soil fertility, and fresh water for food production. But at the same time, agriculture exerts greater negative impacts on ecosystem services than any other land use, especially in the tropics.

In collaboration with national partners, our team is investigating regional trends in integrated livestock-crop-tree agricultural systems, believed to be most resource efficient due to their inherent diversity. CIAT Asia is likewise exploring new research partnerships to bring an ecosystem perspective to specific agricultural technologies, with the aim of increasing productivity and environmental benefits to farming systems and agricultural landscapes.



Securing food for poor and rural consumers

Besides the biophysical connotation, agricultural landscapes have a critical social dimension. Ultimately, what matters to poor rural consumers is the benefits they can derive from their natural environment. Providing an additional lens to agricultural landscape research, “lifescapes” highlight the linkages between producers and intermediaries, users and consumers.

Over half of the planet’s population live in Asia. Producing and securing enough food for poor and rural consumers remains the fundamental responsibility of the agricultural sector, and diverse food systems play a critical role in combating hunger and protecting global food supplies. Yet these are continuously shaped by changing dietary patterns, consumer preferences and the limits imposed on agricultural production by emerging threats such as climate change. Future scenario analyses of food consumption and production provide key strategic direction for agricultural research and development.

Beyond the challenge of food production per se, there is mounting concern over major food waste, including postharvest handling and management inefficiencies. Thus CIAT Asia's researchers also aim to understand the dynamics of agri-food systems and value chains connecting poor consumers - both rural and urban - through a consumer and user lens.



Our team

Our multidisciplinary regional team spearheads collaborative efforts to develop technologies, tools, and information to make agriculture more eco-efficient: competitive and profitable, sustainable and resilient. This includes making agri-food and livelihood systems more productive while reducing their environmental footprint through prudent

resource use. CIAT Asia's researchers for integrated farming systems and resilient agricultural landscapes include:

Bui Le Vinh: Systems and landscapes specialist

Nora Guerten: Decision and policy analysis specialist

Louis Parker: Geospatial analyst

Adrian Bolliger: Smallholder livestock and agricultural systems specialist

Kris Wyckhuys: Entomologist

Brice Even: Market access specialist

Tesfamicheal Assfaw: Impact assessment economist

Pham Huong: Associate researcher, economics and marketing

Together with the global research team on Soils and Decision and Policy Analysis (DAPA), and in line with strategic initiatives on Sustainable Food Systems and Ecosystem Services, the team works with local partners and draws global expertise from CGIAR research programs such as the Climate Change, Agriculture and Food Security (CCAFS); Humidtropics and Policies, Institutions and Markets (PIM).

The International Center for Tropical Agriculture (CIAT) – a member of the CGIAR Consortium – develops technologies, innovative methods, and new knowledge that better enable farmers, especially smallholders, to enhance eco-efficiency in agriculture. This means we make production more competitive and profitable as well as sustainable and resilient through economically and ecologically sound use of natural resources and purchased inputs. Headquartered near Cali, Colombia, CIAT conducts research for development in tropical regions of Latin America and the Caribbean, Africa, and Asia.

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