



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
- Cross-cutting themes: eco-efficiency, climate change, policy, gender, decision support, market analysis

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 survive by making the most of natural resources in their surroundings. As they pursue a range of agricultural livelihoods, agricultural intensification could compromise natural resource sustainability. This is a particular challenge in Asia's diverse uplands, where minority communities have limited support to manage sustainable practices.

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. The thematic framework, based on partner priorities, bridges the farm and landscape system levels, supporting dynamic inter-relationships for more resilient systems.

To help guide decisions and actions by research users, CIAT Asia's research, responding to regional demands, will provide science-based information and tools to assess existing conditions and establish long-term technologies and practices



for resource-conserving and climate-smart agriculture. Our researchers will also develop improved 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.

Upland farmers face the challenge of increasing productivity and market competitiveness, while maintaining overall efficiency and environmental sustainability. CIAT Asia's researchers work with local partners to support smallholder upland farmers in achieving this goal, focusing on diversification and integration within the local context, taking policy, market and

socio-economic factors into consideration.

Because diversified crops and agricultural systems contribute to more resilient upland agriculture, prioritizing commodities with growing market demand must be balanced with eco-efficient principles. Cassava and livestock are common features of upland farming systems; integrated whole-farm planning encourages forages for livestock to make contour hedgerows for erosion control in sloping land planted to cassava, while also taking advantage of these markets, for example.

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 increases in temperature and altering precipitation patterns, along with extreme weather events - such as flooding, drought and

impacts like increased salinity in the Greater Mekong sub-region - increasingly threaten tropical agriculture. Short- and medium-term climate variability, such as cold stresses in Southeast Asia's upland areas, undermine crop growth and yield.

Climate risks are better understood and managed through multi-scale adaptation and mitigation. CIAT Asia's research will focus on dynamic interaction between farms and landscapes, mobilizing climate science for national and regional agenda priority-setting. Our portfolio of science-driven tools include climate scenarios to anticipate climate-related vulnerabilities and opportunities, to inform decision makers from national governments to farmers' groups.

These tools are part of broader mapping assessments, prioritization processes, monitoring and early warning systems and climate advisory services - high priorities for our regional partners, together with information provided through ICT-based services - to guide land management planning and policy formulation. These tools help 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's researchers are partners in a regional initiative to test CSA practices in "Climate Smart Villages." These are community-based action learning platforms for climate-smart innovations in a farm-to landscape setting. Across Southeast Asia, CIAT is collaborating with national agencies tasked with climate adaptation and mitigation planning, to foster inter-country networking and knowledge transfer.

Healthy soil, land and ecosystems

Participatory research to assess the underlying causes of soil erosion, through soil mapping and soil fertility assessments - together with awareness-raising efforts in improved soil management - were among top priorities demanded by our regional partners for more effective, integrated farming systems.

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.

This includes training local research teams in the latest scientific frameworks to collect and monitor soil and land health information. A team of researchers are compiling detailed soil maps, which can in future be used to assess soil carbon restoration interventions and guide decisions about land use.

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 negative impacts on ecosystem services.

In collaboration with national partners, our team is investigating regional trends in integrated livestock crop-tree agricultural systems, and associated trade-offs in diversity and efficiency. 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.

Sustainable food for rural and urban consumers: regional priorities

Over half of the planet's population live in Asia, including 2 billion in cities. Producing and providing safe food for urban and rural consumers remains the fundamental responsibility of the agricultural sector, and sustainable food systems play a critical role in combating hunger and ensuring global food supplies.

Yet these are continuously shaped by changing dietary patterns and the limits imposed on agricultural production by emerging threats such as climate change. A better understanding of food value chains, and the systems within which they evolve, will provide key strategic direction for agricultural research and development.

At the same time, there is mounting concern over major



food waste, including postharvest handling and management inefficiencies, and food safety. Our regional partners ranked food safety - and the need to understand consumer demands for safely produced, certified foods - as a key priority for research to assess sustainable food and farming systems.



Our team

Our multidisciplinary regional team spearheads collaborative efforts to develop technologies, tools, and information to make 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:** Postdoctoral researcher/Systems & landscapes specialist
- **Nora Guerten:** Associate researcher/Climate risk management specialist
- **Nozomi Kawarazuka:** Postdoctoral researcher/Social science & gender specialist
- **Louis Parker:** Associate researcher/Geo-spatial analyst
- **Adrian Bolliger:** Specialist in livestock & smallholder systems
- **Kris Wyckhuys:** Cassava entomologist
- **Brice Even:** Associate researcher/Market access specialist
- **Assfaw Tesfamicheal:** Postdoctoral researcher/Impact assessment economist
- **Pham Thi Mai Huong:** Research associate, economics and marketing
- **Le Ngoc Lan:** Research assistant, climate change

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 expertise from global CGIAR research programs such as the Climate Change, Agriculture and Food Security (CCAFS).



Photos:

Georgina Smith / CIAT

The International Center for Tropical Agriculture (CIAT)

a member of the CGIAR Consortium – develops technologies, innovative methods, and new knowledge to better enable farmers, especially smallholders, to enhance eco-efficiency in agriculture. We aim to make agricultural 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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