

Research and development impact targets:

- Diversified cassava value chains through improved varieties and crop management
- Reduced crop losses from environmental stress
- Increased efficiency and use of cassava in agri-food systems

Adding value to cassava for diverse markets and uses



Cassava the survivor crop

Cassava is a survivor crop. It tolerates high temperatures and can withstand periods of drought. As a rootcrop, it's more resilient to weather extremes in Asia like typhoons, making it a potentially important food security source in the face of challenges presented by climate change.

Largely overlooked by most researchers and policy makers in favor of improving other cereal staples, cassava is making a come-back. The crop has shaken off much of its stigma as a last-resort option for the chronically poor and is now grown extensively throughout the region as a cash crop with a global export value of over US\$3.6 billion in cassava starch, fresh and dried roots. An estimated 8 million rural households - about 40 million people - across Southeast Asia depend on cassava as an income earner and "stepping stone" out of poverty. That's thanks in part to its wide genetic diversity which offers multiple options for improving cassava germplasm; its versatility and wide range of uses in local and global markets, and its eco-efficient potential for improved agronomic practices.

As a CIAT Asia priority theme, Adding value to cassava for diverse markets and uses identifies and develops value-addition innovations for the crop to better contribute to the livelihoods of smallholder farmers. Driven by value-chain opportunities, these innovations could draw upon technologies for enhancing farm productivity, strategies for crop resilience against climate risks and environmental threats, and institutional arrangements for enhanced market access.



higher for uniform, reliable and high-quality stock. Input costs are rising - all amid dynamic policy, infrastructure, wages, pest and disease and climate changes. Cassava farmers have their work cut out. The stakes are high for governments, the private sector and processing industries. But they are especially high for smallholder farmers: they can't afford to risk their livelihoods on volatile markets.



Cassava and its upland niche

In Southeast Asia, cassava is primarily grown as a cash crop by smallholder farmers and sold into a range of complex value chains. The crop generates a reliable source of income accessible throughout the year, which can be used to buy household necessities including other staple foods such as rice. Cultivated in the hilly and mountainous upland areas where it can grow under low external-input and resource-limited conditions, cassava is often a key component in integrated cropping, farming and landuse systems. Cassava growers in Asia typically farm one hectare or less on degraded land, with weak links to value chains which demand quantity and quality. At the same time, cassava serves as a key feed resource for livestock-producing rural households while among indigenous communities and ethnic groups, for example in Indonesia, Philippines and India, it remains an important staple food.

Regional trends: understanding opportunity and threats

A far deeper understanding of threats and opportunities throughout the cassava value chain is needed to inform decision making - by producers, processors and traders - about potential returns on their investment. Grounded in eco-efficient principles, our aim is to increase the profitability and sustainability of smallholder cassava production and use through a mix of innovations for enhancing overall competitiveness of value chains.

Diverse market prospects in Southeast Asia

Today, Thailand and Vietnam are Asia's leading cassava exporters, with Thailand and Indonesia the region's biggest producers. Limited expansion areas in these countries has led to intensified cassava production in Myanmar, Lao PDR and Cambodia for example, to meet burgeoning demand outstripping supply. In the context of rapid population growth and urban expansion, markets are also expanding in a range of products from livestock feed, pharmaceuticals, paper and bioplastics to biofuel, sweeteners and noodles. Cassava starch and flour are increasingly used in pre-processed food, low fat and gluten-free products.

Our team is investigating regional trends in agri-food supply chains, animal feed, industrial and biofuels markets, using spatial analyses and geo-referencing techniques to assess production capacity, to track current and future cassava demand and to identify bottlenecks. We are also analysing regional policy, infrastructure and logistical regulations to evaluate supportive networks and value chain-wide services that foster vital conducive environments for smallholder development.

We consciously take a gender transformative lens to better understand and support the roles that women and men play in cassava livelihoods. From labor-saving devices to agribusiness entrepreneurship, we seek innovations that help unleash the full potential of women as workers, decision makers and leaders.

Opportunity is abundant - yet cassava's market outlook is coupled with global starch, grain and energy markets. Rising demand and growing investment in commercialization is driving the bar



Soil, land and environmental management

Connecting smallholder farmers with cassava markets is not, however, a silver bullet to ensure empowerment and profit. Many farmers depend on locally available cassava varieties and traditional methods of cultivation with typically low yield. They depend on traders for their market information, so receive lower prices for their harvest and generally farm the most degraded land.

Our expertise can be tapped to achieve sustainable and climate-smart rural land management, unlocking its potential for delivering greater economic, ecological and social benefits. In Asia's diverse upland areas, this means researching complex landscapes to identify different soil types and complementary management practices. For example, cassava is reputed to cause soil erosion - but this is largely because it is grown on already degraded land and recommended management practices have not been adopted.

Simple practices like intercropping cassava with peanuts to protect the soil from rainfall impact, or planting forage grass strips to impede run-off, can make cultivating cassava on sloping land not only possible, but environmentally and financially sustainable. Together with national partners, our researchers co-develop and evaluate cassava varieties attuned to the requirements of target markets and users, site-specific agronomic and soil conservation practices, and decision-support tools to guide where and how to grow cassava, and under particular conditions.

If not managed properly, expansion and growth in cassava processing is not without wider environmental costs. Our research seeks to mobilize relevant stakeholders toward practices and policies for environmentally responsible waste management, for example in reducing and better managing solid

and liquid residues generated from starch production.

Emerging threats and biological control

CIAT's researchers have joined forces with local partners to contain and control a range of emerging pests and diseases throughout the region. These include destructive invasive mealybug species and cassava witches' broom - a systemic disease resulting in yield and starch content loss, spelling lower prices and income for farmers.

State-of-the-art technology is being used to pinpoint insect vectors and to fine-tune cassava tissue culture and rapid propagation protocols as a step to ensure that disease-free cassava materials are widely available and readily accessible. A multi-country network to combat cassava witches' broom disease has been established, while novel outreach methods using video, cartoons and mass media aim to build local capacity and raise awareness about serious pest and disease threats.

Biological control efforts include the release of the two-millimeter *Anagyrus lopezi* wasp, which kill the cassava mealybug. This research effort in Asia facilitates inter-regional knowledge sharing on biological control such as from sub-Saharan Africa, where the wasps saved a massive US\$20 billion in damages to the cassava industry and restored food security for millions.



CIAT as a partner for an eco-efficient future in Asia's cassava sector

CIAT develops technologies, tools, and information that better enable smallholder farmers to make agriculture more eco-efficient: competitive and profitable, sustainable and resilient. Our genebank safeguards the world's largest collection of cassava and its wild relatives. Collaborative efforts between the Center and national researchers in Asia over

the last 30 years have improved germplasm, using advanced breeding techniques suited to local opportunities and constraints. Today, 48 CIAT-related cassava varieties in national breeding programs are planted in Southeast Asia - around 40 percent of the region's total cassava-growing area.



Our team

The growing multidisciplinary regional team is spearheading strategic value chain and biological control intentions aimed at benefitting the poor, while furthering collaboration between CIAT, national breeding and crop management programs. CIAT Asia's cassava and cross-theme researchers include:

Keith Fahrney: Senior agronomist

Tin Maung Aye: Senior agronomist/soil scientist

Jonathan Newby: Rural resource economist

Kris Wyckhuys: Entomologist

Stef de Haan: Breeding network coordinator

Brice Even: Market access specialist

Cu Thi Le Thuy: Associate researcher, cassava value chains

Lao Thao: Research assistant, Lao PDR

Sok Sophearith: Research assistant, Cambodia

Ou Wenjun: Liaison scientist, China

Le Ngoc Lan: Research assistant - farmer extension schemes

CIAT Asia works hand in hand with the Center's global cassava team and draws expertise support from the broader research partnership under the CGIAR program for Roots, Tubers and Bananas (RTB).

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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