Cassava in the world

Cassava’s role in development and industry

Cassava basics
Global production
Cassava in LAC
Cassava in SEA
Cassava in Africa
Cassava: The crop

- A sustenance crop requiring relatively low management, but also a highly productive crop with no strict harvest season.
- It holds the key to improving the livelihoods of subsistence and smallholders in several developing countries.
- Essentially climate-change ready.
- Offers entry point for employment and income generation for smallholders and landless farmers.

Leaves are a high-protein nutritious vegetable and livestock feed.

A staple for >500M people in Africa

Dry roots are >80% starch.

A valuable industrial starch source in SEA.
Currently about **270 MMT** is produced globally per annum, or **8%** of global starch production.

The most traded starch with a **$4b USD export industry** for chips, pellets and starch.
Cassava in Latin America and the Caribbean

Originating in LAC, cassava has a traditional standing that challenges production and technology adoption.

In 2018, LAC produced about 10% of world’s cassava production.

In industrialised and productive regions of Brazil, yields of 30-35 t/ha are usual.

In other areas, average yields are 10-15 t/ha.

Outside of Brazil and Paraguay, there has been little yield improvement over the last 60 years.

Mainly used for starch, cassava flour and fresh cassava.
Cassava in Southeast Asia

SEA produces about **25% of the world’s production** (with Thailand producing about 45% of the region’s output).

**8 million farmers** in Southeast Asia grow cassava across **4.2 million hectares**

SEA has the **highest average yields in the world**

**250,000 farmers** in the least developed countries of Cambodia, Laos and Vietnam with **average holdings of 4 hectares**

Economically achievable yield has almost **doubled** in 20 years

Cassava is grown in remote, rural and mountainous communities where alternative crops are scarce and some of the most disenfranchised poor live.
Cassava in Africa

Now widely **grown and consumed food in 40 countries**

Africa produces **61% of the world’s cassava**, with **90% of this grown by smallholders**.

Most production is **consumed domestically**.

Production has increased due to increased production area, with **yields remaining low at 5-10 t/ha**.

Leaves and roots are eaten, with roots and tubers contributing **20% of the daily dietary energy supply**.
Trends

Trajectories impacting the future of cassava

Climate change
Demographics and productivity challenges
Cassava use diversification
Climate change

Compared to other crops, cassava is climate ready. Yields are overall predicted to increase or remain stable. However, predictions depend on the extent of climate change. In a high-emissions scenario, modelling for Thailand shows a yield reduction up to 21%, impacting half a million smallholders and the supply chain.

Climate change will impact the sustainable production, with more intense rainfall events increasing flooding and erosion risk and heat reducing the number of days available for outdoor work.

Forecast cassava production:
Demographics and production

Increasing incomes and urbanisation are reducing the role of cassava as a dietary carbohydrate.

At a global scale consumption is expected to fall, but at local levels it will remain important for those on very low incomes or with subsistence livelihoods.

Increasing demand for lifestyle foods that are quick to prepare and nutritious.

Growing demand for gluten-free foods.

Yields decreasing in many places due to decreasing soil fertility caused by continual soil nutrient removal in the harvested products.

Brazil and Paraguay have some of the best average yields in LAC, but these are still significantly lower than in SEA.

In Africa the annual production growth rate has outpaced population growth.
Cassava use diversification

Two-thirds of the cassava starch market goes into food and beverages.

The remaining third is used by paper and board industries and other industrial uses.

Cassava starch market projected to increase to $66.8b USD by 2026.

Opportunity for leaf to be used in pelleted animal feed.

Development of niche and lifestyle foods and replacement of wheat in bakery products.
Cassava futures summary

**Cassava can tolerate high temperatures and low rainfall** and is expected to perform better than the other main starchy food crops in future climate scenarios.

Cassava has the potential to generate **income and food security for poor smallholders in future climate scenarios** while making producing countries independent from starch imports.

Some Southeast Asian countries are including more fresh cassava and less rice into their diets, but globally, cassava consumption is declining and cassava processing is increasing. **Cassava starch is present in many processed foods.**

The cassava starch market was worth about $40bn USD in 2018 and is projected to increase to **$67bn USD by 2026.**

Cassava prices are affected by China imports and the **global prices of maize and other starch sources.**
Cassava Program

Impacts: Past and Future

ABC’s investment and focus
Impact of past investments
Varietal adoption
ABC’s investment and focus

Former **CIAT** began working with **Thailand in the 1970s** resulting in a strong national capacity.

Current focus is on Vietnam, Laos, and Cambodia, which have seen **two-digit growth of the industry in the last 10 years**.

Initial focus on **high-yielding varieties with resistance to major pests and diseases**

Current **program looks at the farming system**, including biological control, agronomic and integrated pest management.

Growth of cassava processing industries (primarily in SEA) has increased the **need for quality traits** to increase the value of the crop, including increased starch extraction and specialist starch products like high-amylose types.

Work spans the farming system with **crop protection, agronomy, harvesting and value chains** linking back to the delivery of enhanced cassava genetics and working directly to improve sustainable production of cassava by smallholders, maximizing social and economic impacts.
The Cassava Program’s Research Service Areas

- RSA-1: Enhancement of Genetic Resources
- RSA-2: Agronomy & Soil Management
- RSA-3: Crop Protection
- RSA-4: Seed systems & Harvesting
- RSA-5: Post Harvest & Enhanced Nutrition
- RSA-6: Value Chain Markets & Policy

Integrated team of Research Service Areas (RSAs) across the whole value chain.

Dedicated, experienced in-country scientists working towards common goals.

Established and tested relationships with delivery partners and National programs.
Impact of past investments

The Alliance has invested $380m USD and partners have invested a further $3.7bn in cassava research since the 1970s.

Every US$1 invested in cassava has generated US$2.28 globally and US$5.27 in SE Asia.

ABC has distributed 6,492 varieties (43,458 accessions) of cassava of LAC origin to 84 countries since 1979.

35 improved varieties released in LAC and 25 in SEA

Alliance-related varieties have generated economic benefits estimated at $9.2bn USD in LAC and SE Asia.

Release of S. American parasitic wasps to control cassava mealybug saved an estimated $20bn USD in Africa.

Biofortified varieties from LAC contributing to improved nutrition.
**Varietal adoption in SEA**

- $12bn USD over the last 20 years from improved varieties
- 48 CIAT-related varieties planted on 1.5 Mha (40% of growing area)
- **85% of cassava area planted to improved varieties** in Vietnam.
- $51 USD more gross annual income per family in Vietnam due to increased yields.
- **Economically achievable yield almost doubled** in 20 years, from 25 t/ha to 46 t/ha
Cassava Program Strategy 2030

Research pathways for the next 10 years

Strengths of the Cassava Program
Challenges to the Cassava Program
Future opportunities
Mission and Objectives
Longer-term outcomes
Program logics for each longer-term outcome
Monitoring and evaluation
Strengths of the Cassava Program

**Direct access** to the global cassava germplasm collection held by the Alliance.

**Highly qualified scientists in-country, embedded into cultures and landscapes.**

**Diverse and robust partnerships in target countries** with access to regional and local technology distribution pathways.

**Established relationships** with a range of donor agencies, creating pluralism to empower a holistic response.

Program structure delivering an **integrated technical, cultural and socioeconomic** approach.

**Cross-disciplinary RSAs feeding the varietal breeding-to-deployment pipeline** and capable of working across whole farm systems.

A **team of passionate researchers** seeking **innovative and context-appropriate solutions**.

**Established institutional and government relationships**, with capacity building in target countries.

**Long history** of crop-specific R&D and quantifiable, global impacts.
Challenges to the Cassava Program

- **Ongoing threat of pests and diseases** placing pressure on varietal resistance.

- **Informal seed systems.**

- Closing the farm **yield gap requires improved agronomic practices**, including use of inputs.

- **Complexity of technology adoption pathways** with dependence on local intermediaries.

- **Dependence on national policies** and crop-specific support to implement on-ground change.

- **Disruption from organisational changes.**

- **Negative perceptions of cassava** as contributing to deforestation and erosion in SEA.
Future opportunities

- **Resilience of cassava** to stresses and climate change, while maintaining production capability in poor growing conditions

- Association of cassava growing with disadvantaged smallholders, allowing interventions to use cassava as an entry point to support some of the world’s poorest

- **Strong relevance** of the Cassava Program to nine of the UN’s Sustainable Development Goals and secondary influence on a further six goals
Mission and Objectives

Mission

Improving livelihoods of cassava growing smallholders and their communities. The Cassava Program will deliver technical packages of sustainable and regionally specific solutions that maximise yield and quality of the crop throughout the value chain.

Objective A
Building local resilience and addressing climate change challenges faced by smallholders growing cassava as part of their farming system

Objective B
Building productivity and creating opportunities for disadvantaged smallholders growing cassava as part of their farming system

Genetic solutions must be deployed into local systems together with appropriate land management to realize genetic potential.

Varietal deployment requires engagement of technology adoption intermediaries across the value chain.

To maximise gains from genetic solutions, improvements in production systems and across the value chain are required.

Locally appropriate solutions require in-country work across disciplines and partner organisations.
The longer-term outcomes

Objective A
Building local resilience and addressing climate change challenges faced by smallholders growing cassava as part of their farming system

- Diversified cassava for specific landscapes and uses
- Improving soil health on degraded lands

Objective B
Building productivity and creating opportunities for disadvantaged smallholders growing cassava as part of their farming system

- Maintained yield potential in changing farming systems, with minimal yield gap
- More sustainable resource use

- Smarter, more affordable solutions across the breeding and value chain
- More efficient management of pests and diseases
- Research and interventions targeted to beneficiaries and technology adoption pathways
The game changers

Strategic, region-specific trait combinations and management packages delivered to NARS in LAC and SEA, and to IITA for Africa.

New traits
- High provitamin A; delayed postharvest physiological deterioration; low glycaemic index
- High and stable dry matter; waxy and small granule starch; herbicide resistance; high-density tolerance
- CMD, CBSD and whitefly resistance; drought and heat tolerance; early maturity; vigorous growth
- Haploid inducing lines for fast trait capture

Outcomes
- Diversified cassava genetics targeted to specific environments and uses.
- Reduced yield gaps in diverse farming systems.
- Smarter, cost-effective solutions across the breeding and value chains.
- Variety-specific agronomic packages, including more efficient pest and disease management.
- More sustainable resource utilization.
- Targeted research and interventions for efficacious technology adoption.
- Improved soil health on degraded lands.

SDGs
- No Poverty
- Zero Hunger
- Good Health and Well-Being
- Life on Land
- Climate Action
- Gender Equality
Program logics for each longer-term outcome

Objective A
Diversified cassava for specific landscapes and uses

Cassava Program Objective
Cassava Program Longer-term outcome

SDGs

Increased climate change resilience

Improved natural resource use

Increased productivity

Adoption of regionally appropriate varieties

RSA-1: Enhancement of Genetic Resources

RSA-2: Agronomy & Soil Management

RSA-3: Crop protection

RSA-4: Value Chain, Markets & Policy

RSA-5: Post Harvest & Enhanced Nutrition

Outcomes

Research and Service Activities

Program logics developed for each longer-term outcome.

RSAs contribute to each other and the desired outcomes.
Research and Service Activities

Priority Research and Service Activities identified by focusing on the objectives and working down the logic.

64 Research and Service Activities identified as required to achieve the longer-term outcomes and objectives in the Program Logics.

All activities are purposeful, as defined by the strategy.

Activities span the value chain, to ensure genetic solutions are embedded in sustainable farming and processing systems.
Into the future

Successful implementation of the strategy will require:

• An **integrated, multidisciplinary team** to work through, with and around the barriers to adoption and limitation of genetic solutions

• **Demonstrating contribution to the SDGs** through monitoring and evaluation

• Ongoing research to understand adoption and **identify alternative pathways to influence so that interventions are strategically targeted** to points of change

• **Building a positive narrative on the potential role of cassava** in managing land degradation, as a gateway crop to prosperity for smallholders, and a resilient crop for future climates and a viable alternative food crop on poorer soils

• **Diverse partnerships** with National programs, NGOs and others servicing and supporting smallholders