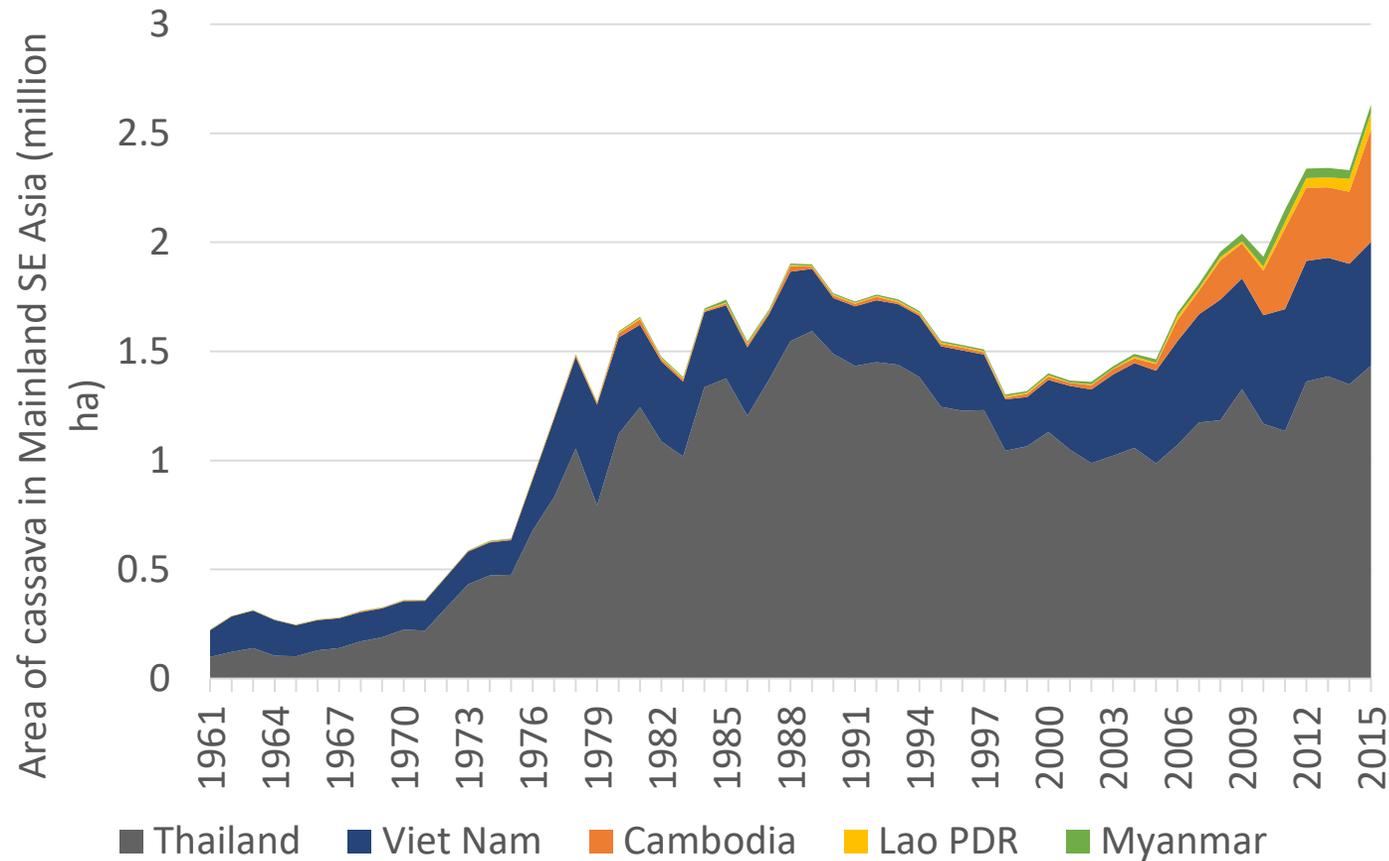


Developing profitable, sustainable and resilient cassava-based farming systems in the Kingdom of Cambodia



Cambodia production part of global market demand

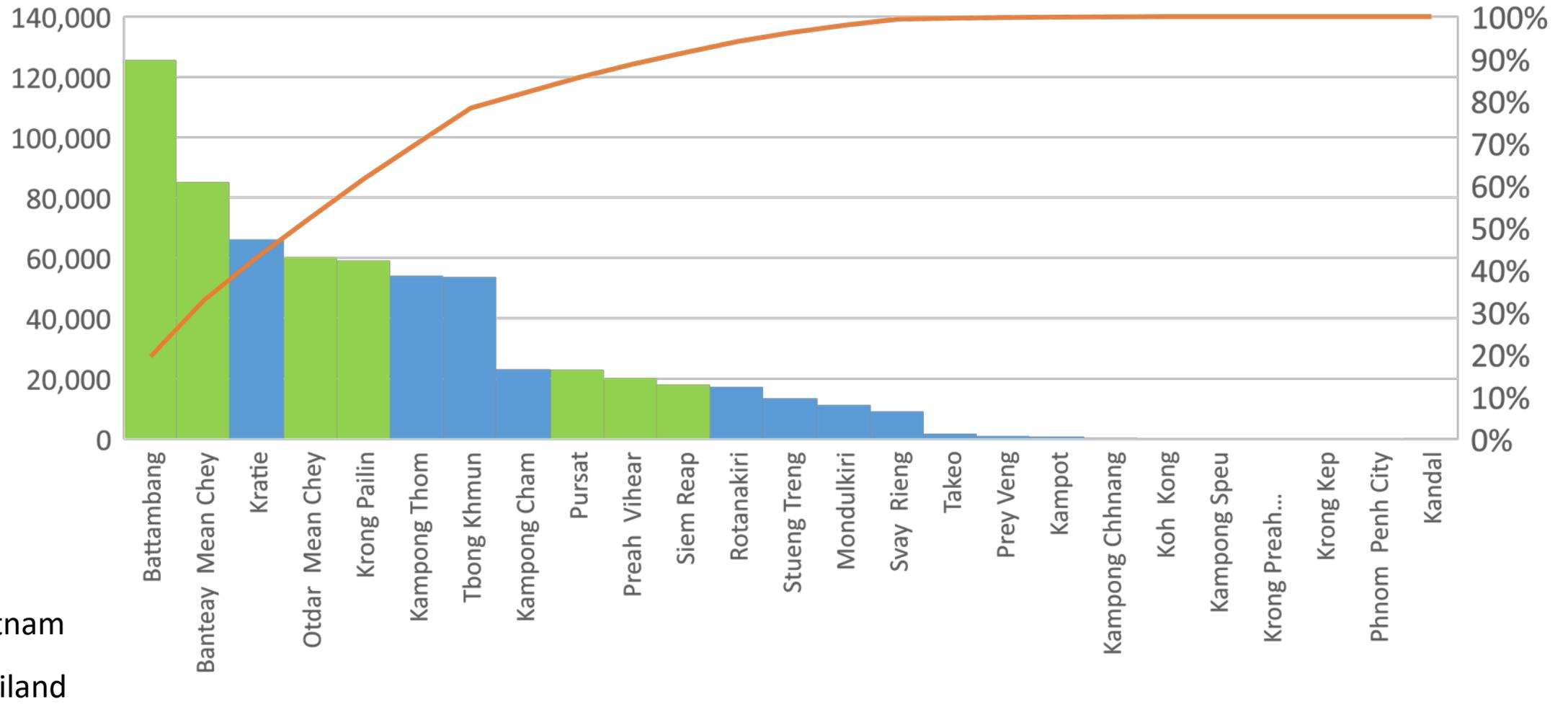


Limited capacity to expand production in Thailand and Vietnam.

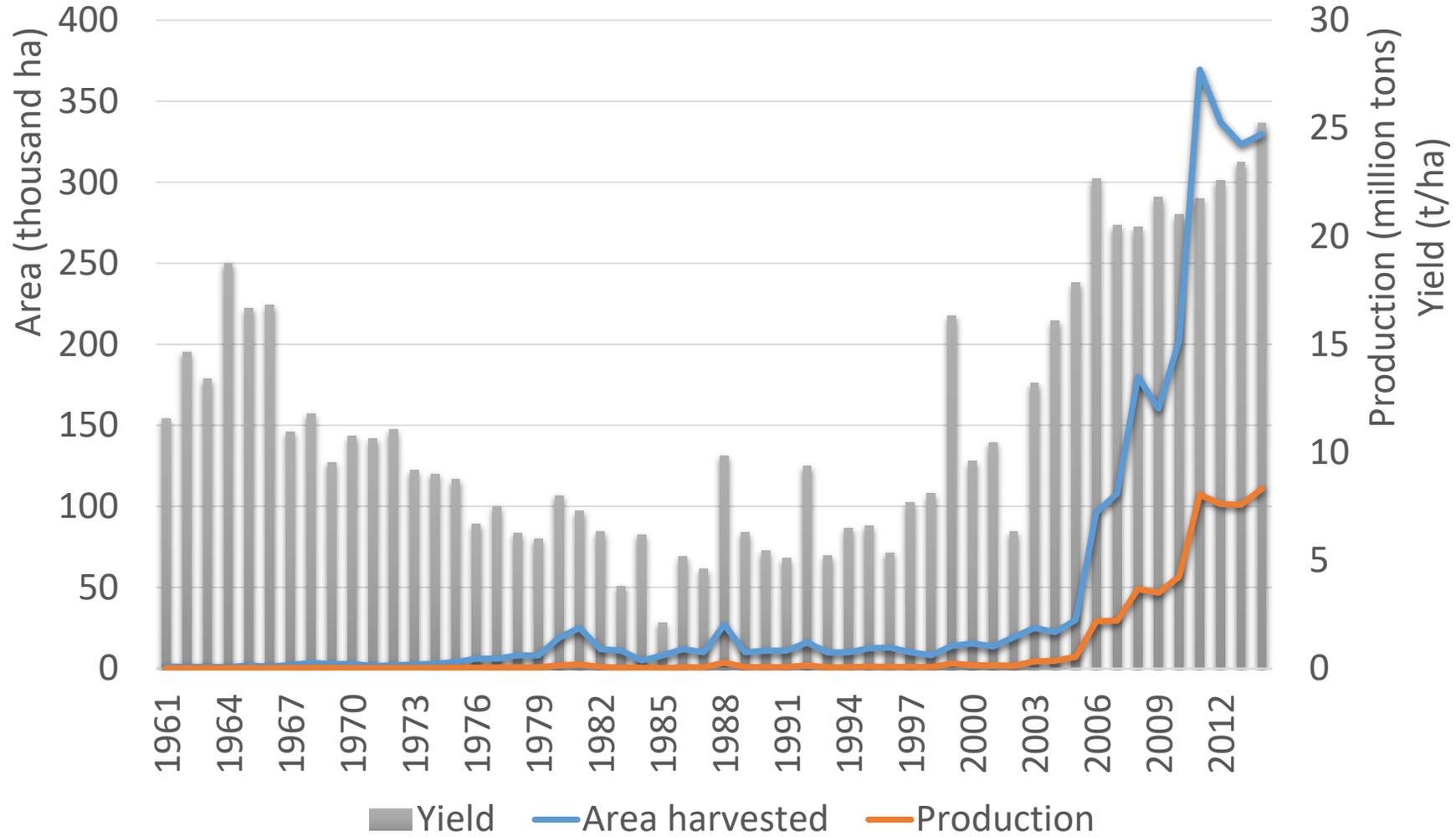
Excess processing capacity

Good market linkages and infrastructure

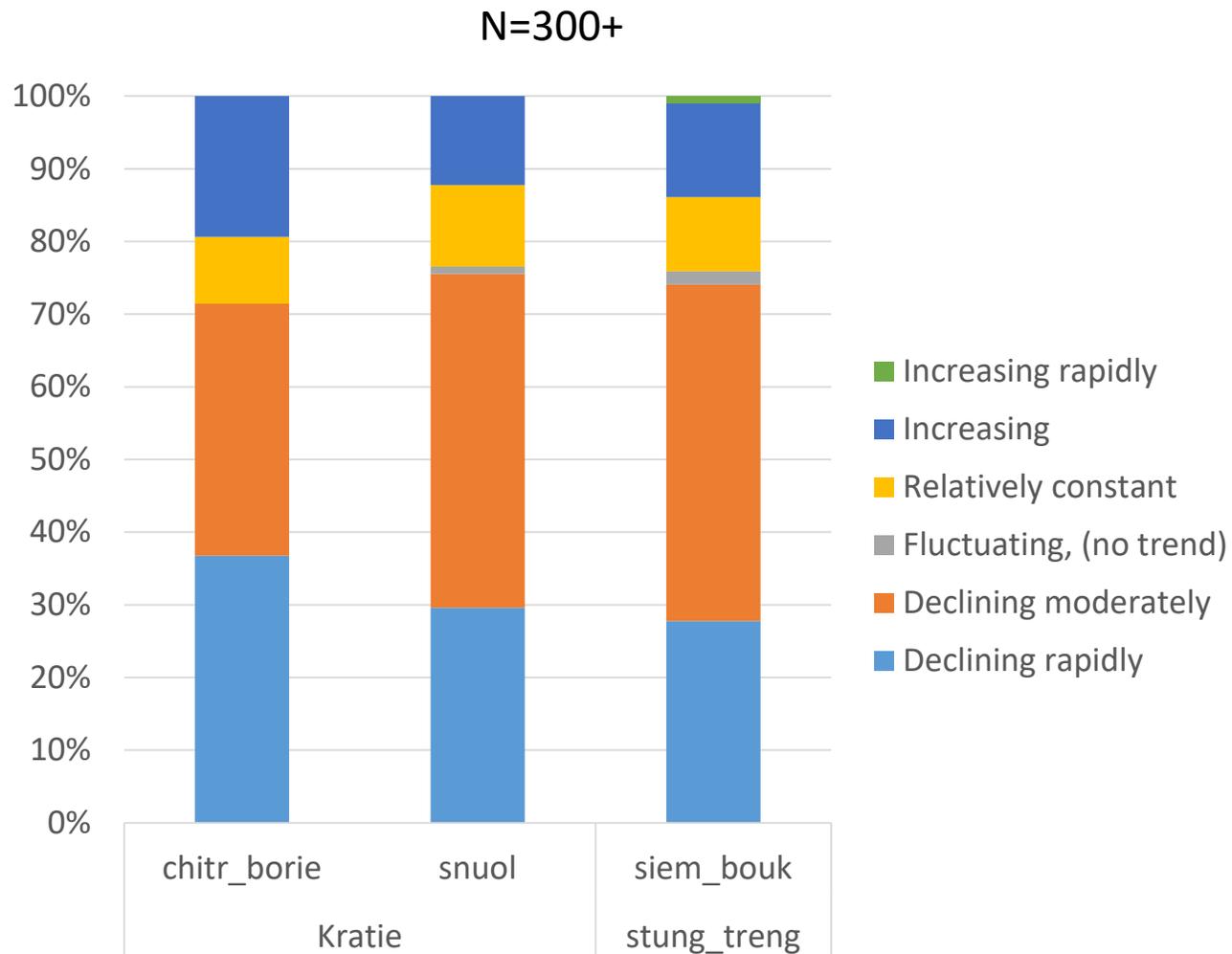
Area of cassava by Province and main market



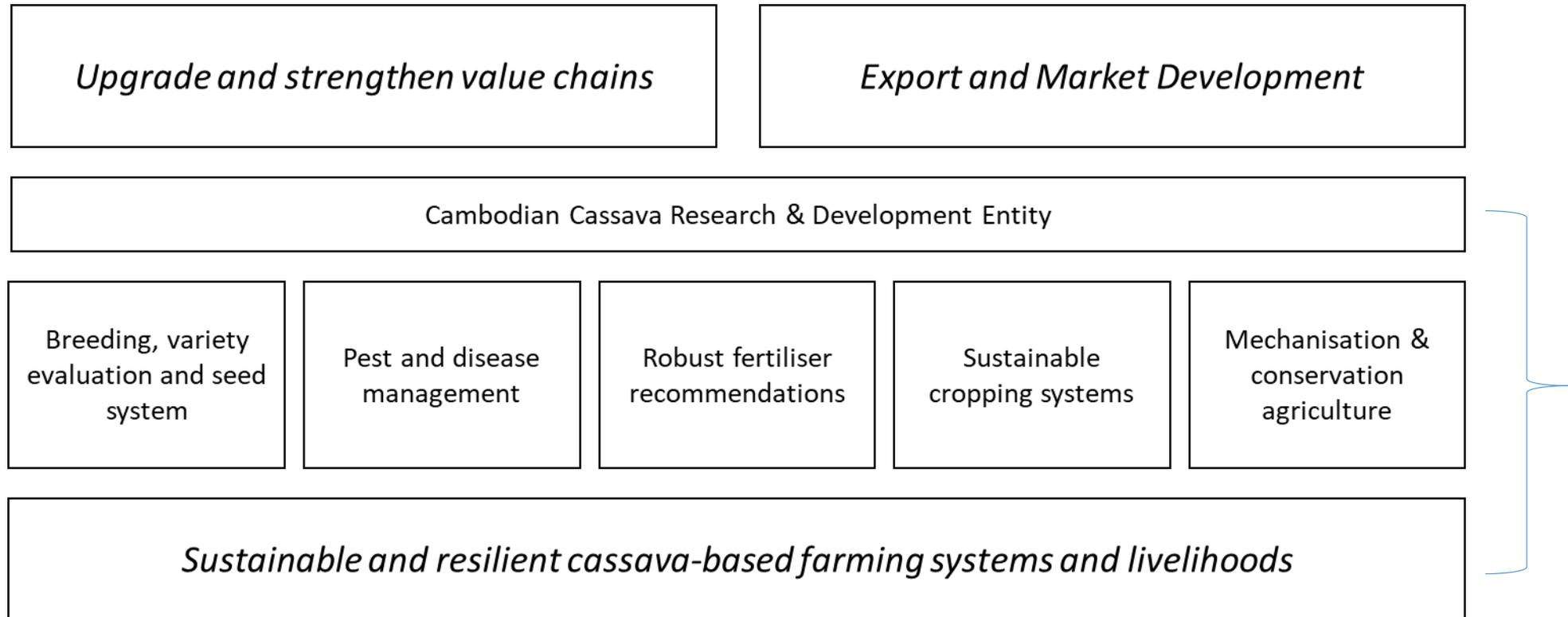
Rapid increase in area in Cambodia



Famer perception on yields (north-east)



Structure of the recommendations



Summary

1. Establish a **Cambodian Cassava Research and Development Coordination entity**;
2. Promote sustainable and resilient **cassava-based farming systems and livelihoods** avoiding interventions that focus on cassava in isolation of other components of a farming system;
3. Invest in **cassava breeding and coordinate variety evaluation** with industry stakeholders;
4. Develop **viable seed systems and business models** to promote the use of healthy planting material;
5. Develop and promote **robust fertilizer management recommendations** and flexible strategies for different agro-ecological regions of Cambodia;
6. Invest in and coordinate the **monitoring, surveillance and reporting of pest and disease** and promote appropriate management practices;
7. Develop **cassava-based cropping system options** suitable for different agro-economic regions of Cambodia; and
8. Invest in ongoing **development of mechanization technologies** that enable viable contracting models, address rising labour shortages, and enable the implementation of conservation agriculture practices

1. Establish a Cambodia Cassava Research and Development Coordination 'Entity'

- The successful implementation of the production component of the policy depends on **strong linkages** created between producers and other value chain actors, including the core value chain actors (collectors, traders, processors, and exporters), and other supporting actors in the value chain (credit providers, input retailers, extension services etc.).
- The policy should create the institutional environment for enhancing these linkages and intervening in areas of market failure.

- The sustainability of the sector requires coordinated and strategic support and investment. Partnerships between public, private sector, and producers is required to **set priorities, invest in research and development (extension), and establish responsibilities.**
- With limited resources to address these current and emerging issues, **coordination** is required through the establishment of an “Entity” for coordinating cassava research and development activities.



- a) Coordinate donor investments in R&D to ensure sustainable funding for long-term core activities (breeding and variety evaluation, pest and disease surveillance and robust clean-seed system).
- b) Over time, there should be a transition to an increasing level of industry and national government support with a declining dependence on external donor funding.
- c) Act as a national coordination platform (technical working group) to facilitate, coordinate and streamline information, program investments and interventions for pest and disease management.
- d) Act as a data repository for research and development activities and seek to coordinate activities in conjunction with public and private stakeholder.
- e) Organise an annual symposium where research results it funds/supports/coordinates are presented to industry and research stakeholders.
- f) Coordinate of capacity building of PDAFF, associations, and private sector based on new research and emerging priorities.

2. Promote resilient and sustainable cassava-based farming systems and livelihoods

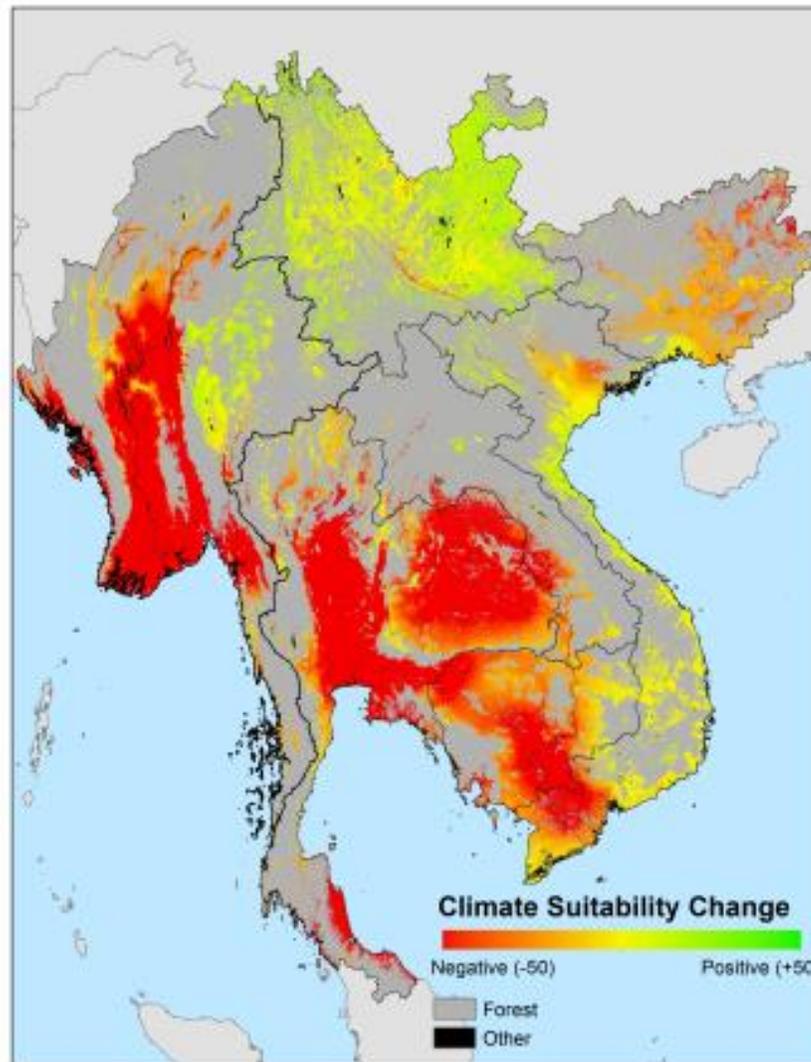
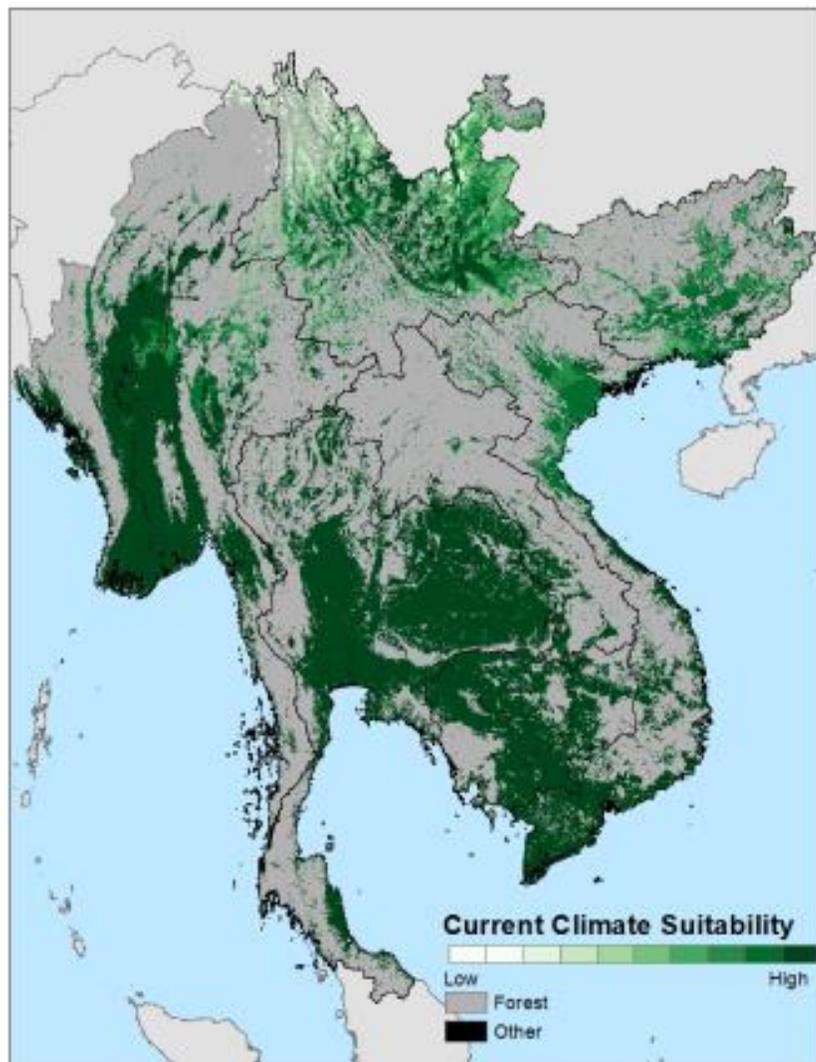
- Cambodian cassava producers in are exposed to both production and market risk and uncertainty.
- Policy should encourage, where appropriate, cropping system and livelihood **diversification**. It should address the physical, technical, market, and institutional constraints to developing more profitable and resilient **cassava-based** farming systems
- Cropping system diversification is a key component required to address productivity and sustainability issues around soil fertility and health, pest and disease management, and reducing market risk.



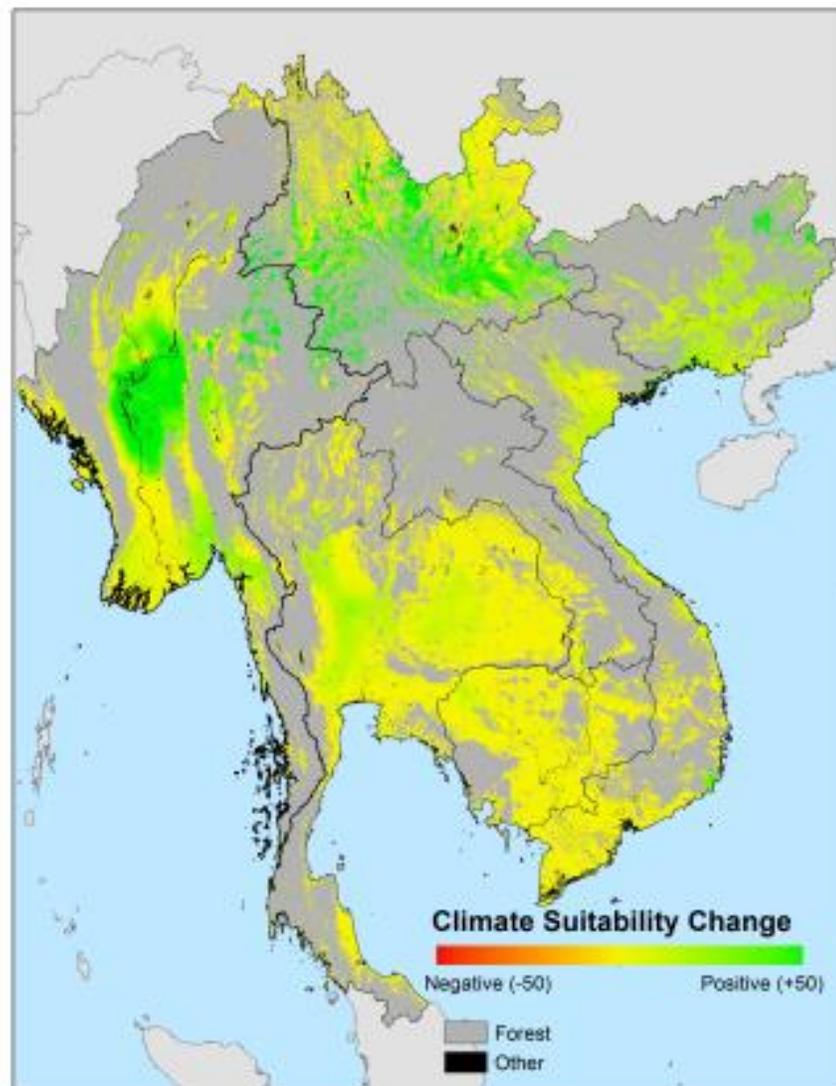
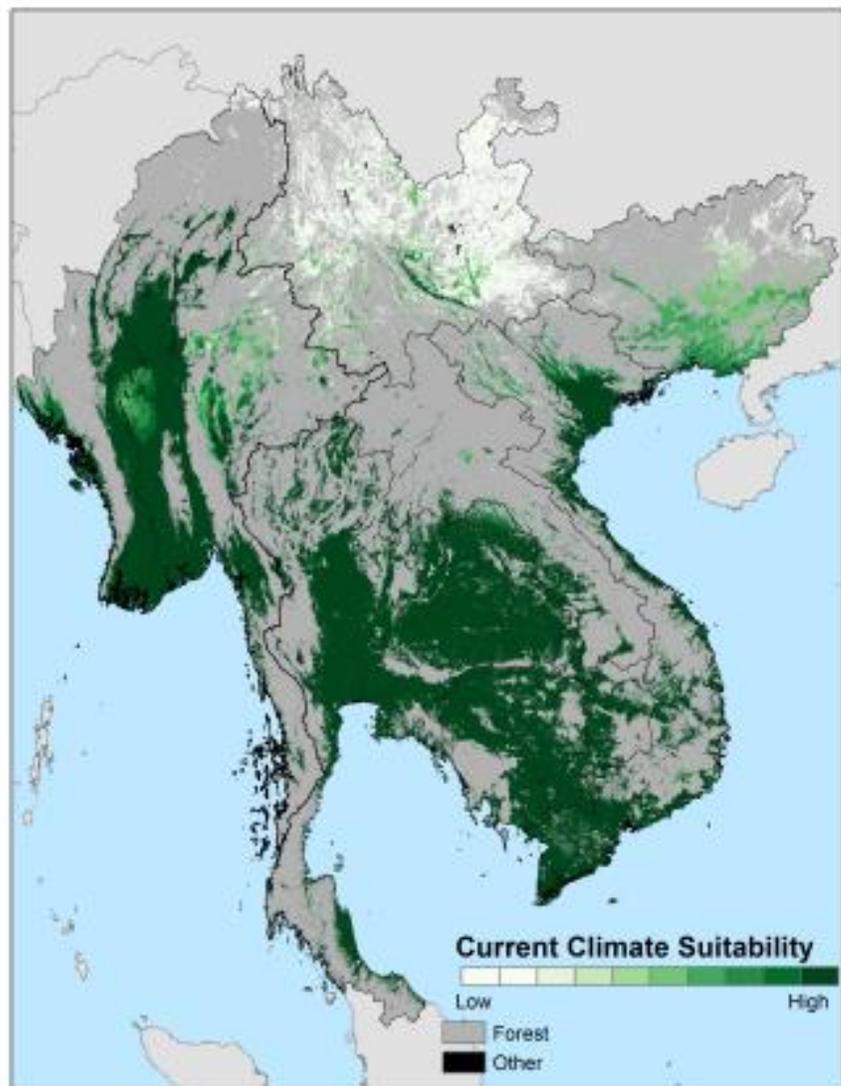
- Viable cropping system **options** should be developed and promoted for the different agro-economic regions of Cambodia. These options should take into account the current biophysical and economic situation, as well as production and market risks.
- The development of cropping options should consider climate variability and establishment mechanisms to inform farmers of expected conditions (climatic and market) prior to the growing season through the development of decision support tools.



Predicted climate suitability for maize



Predicted climate suitability for cassava



3. Invest in cassava breeding and variety evaluations

- There are many cassava varieties grown throughout the world. Farmers have selected these varieties for a range of reasons, including high yields, good eating qualities, ease of peeling, early maturity, and resistance to a diversity of pests and diseases.
- Cassava breeders continue to develop varieties that are better adapted to environmental and **biological stresses**.
- Cambodia currently does not have a national cassava breeding program. In other programs in the region and abroad, there are new varieties under development for specific markets and applications.
- Varieties will perform differently in different agro-ecological zones, depending on factors such as soil type, climate, and agronomic management practices.
- High-yielding varieties have been bred specifically for high-density, monoculture conditions. It should be recognized that less effort has been made to date on selecting for plant types adapted to diversified and low-input systems; for this reason farmer varieties should not be excluded from evaluations and further development.

In the short-term, the productivity of the Cambodian cassava sector can benefit from ongoing evaluation of existing varieties

- a) Procure information of the current varietal composition across the Cambodian agricultural landscape using advanced DNA-based molecular methods.
- b) Establish a mandate and procedures for institutions to receive advanced clones from international breeding programs, such as CIAT, or breeding programs in neighbouring countries.;
- c) Invest in physical and human capacity within these institutions to conduct adaptation trials. Establish common protocols for trials and minimum criteria for data collection;
- d) Encourage active participation in regional and global breeders networks, such as the Asian Cassava Breeders Network;
- e) Establish rapid multiplication centres in core cassava growing regions, where new varieties can be multiplied for evaluation and distribution;
- f) Conduct a characterisation of the Cambodia cassava growing areas for strategic evaluation of cassava varieties with cassava farmers and other value chain stakeholders;
- g) Coordinate the evaluation and analysis of new cultivars through the CRDE.

Long term

- The viability of establishing a separate Cambodian breeding program should be evaluated
- Establishing Cambodia's own breeding program for ongoing genetic improvement within the country is a **long-term** priority that requires secured long-term funding.
- While the breeding objectives of Cambodia remain similar to the neighbouring countries, initiating a local breeding program is not considered a high priority until secure funding from Industry and Government can be assured.
- Currently Cambodia remains a non-signatory to the international convention on plant breeders rights (UPOV) further reduces incentives for domestic breeding programs. This also poses a significant disadvantage since other national breeding programs within the region (who also seek to establish competitive industries) may be hesitant to share new varietal releases.

Develop viable seed systems and promote the use of healthy planting material adapted to local conditions

- **Promote appropriate on-farm management of planting material.** As a vegetatively propagated crop, the use of healthy planting material (stem cuttings) is essential to reducing pest and disease pressures, and improves productivity.
- Existing techniques for preferential management of planting material, including using positive and negative selection, can sustain yields and reduce pest and disease pressures. These simple on-farm strategies should be promoted to farmers in partnership with local extension and value chain actors, including dissemination through extension campaigns.

- **Development of clean seed systems for the provision of quality cassava stakes.** The movement of infected stakes is one of the primary mechanisms of the spread of pests and diseases.
- Many potential clean seed system pipelines for cassava exist. These include a range from relatively high-tech and costly pipelines beginning from in-vitro & other micropropagation techniques, to open field multiplication, local seed business development, and different levels of certification from farmer seed, quality declared seed (QDS), and lab-tested, formally certified seed.
- Business cases for several options specific to Cambodia's context should be evaluated and promising avenues piloted.
- Physical isolation and seed management at higher elevations where white flies do not occur should be explored when considering the location of pilot activities or open field multiplication sites.

- **Strengthen the involvement of industry actors** in the provision of information and in the production of clean planting materials.
- Cambodia is currently a net-importer of significant amounts of planting material from neighbouring countries. Farmers frequently purchase new planting material of poor or unknown quality.
- While the large movement of planting material through the value chain can result in movement of pest and disease, it presents an entry point through the development of viable business models.



- Recognition of 'farmer seed' in the seed law and joining international conventions such as International Convention of Protection of New Varieties (UPOV) are steps that can be taken to enhance development and distribution of new cultivars or varieties for the benefit of farmers and industry.

Develop and promote robust fertilizer recommendation for agro-ecological zones

- Cassava achieves its best yields under proper management. With a lack of inputs to replenish the nutrients removed by harvest, it is inevitable that yields will decline.
- However, with appropriate fertilizer application, research shows that yields can be maintained over longer periods of continuous cropping.
- In the long-term this is not a replacement for the more holistic management of soil management and health.

- Many participatory trials have shown that even a relatively conservative application of fertilizer in can provide farmers with very attractive returns on investment
 - the appropriate balance of N:P:K,
 - applied at the right time,
 - and with appropriate placement,
- Farmers in Cambodia are often unaware of the correct type of fertilizer to use, an economically appropriate rate, or when to apply the fertilizer to the crop.
- Furthermore, these fertilizers are frequently not accessible for smallholder farmers.

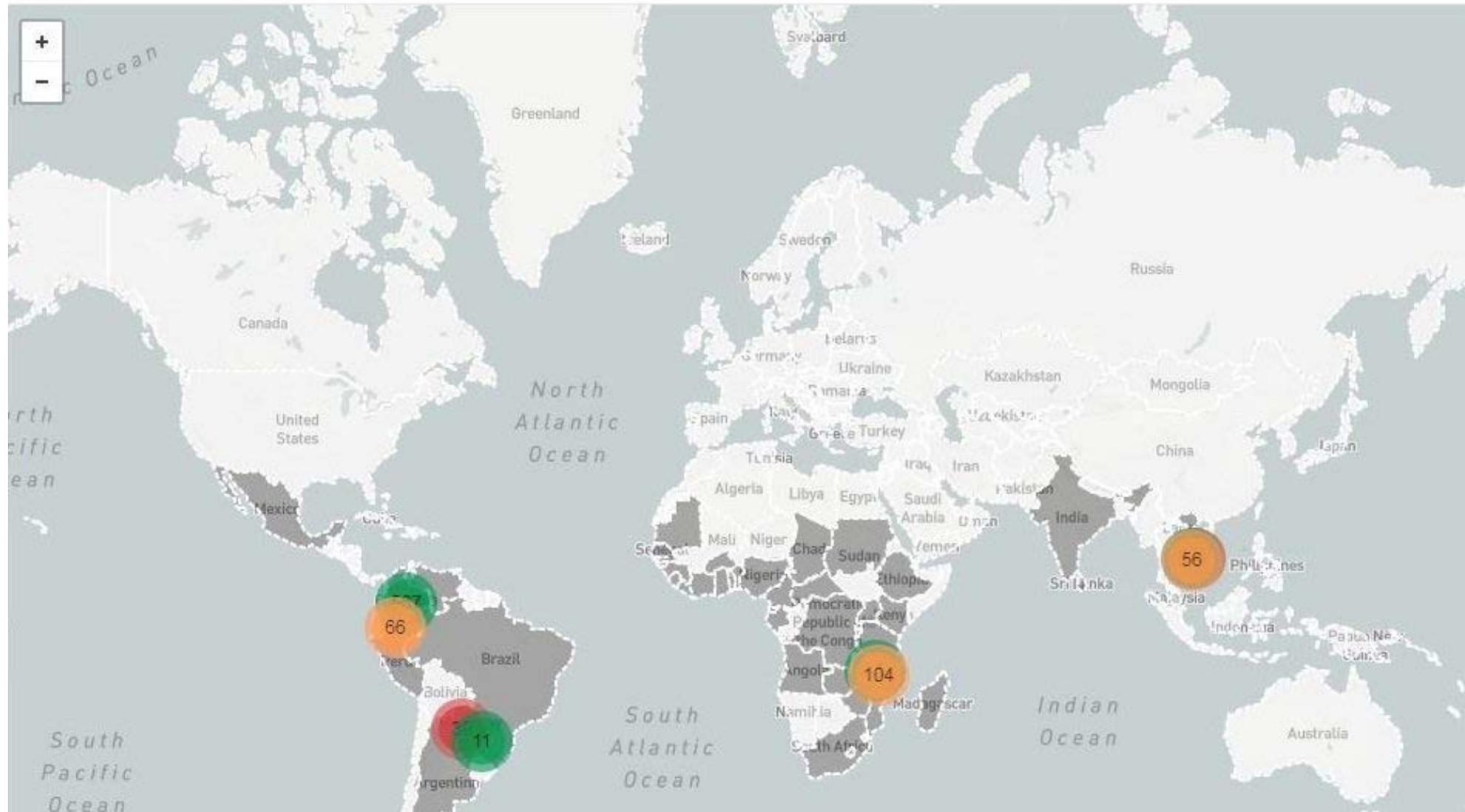


- a) Develop a characterisation of the main cassava agroecological zones based on soil types and climate as a means of developing broad, robust fertility recommendations.
- b) Encourage fertilizer companies to create and market blends targeted specifically for cassava production for specific zones. These should provide the appropriate mix of nutrients in easily purchased quantities.
- c) It should be ensured that accurate extension information about the products and their application techniques are provided in Khmer with the product.
- d) Improve the distribution arrangements between fertiliser companies and retailers, and the provision of associated technical advice and information.
- e) Improve access to credit for the purchase of inputs that are based on the use of appropriate inputs.
- f) Test and certify new products that aim to enhance soil fertility in terms of their efficacy. Regularly test fertilizers for their nutrient content, and ensure that products certified specifically for use on cassava bear an insignia stating such.

Develop and coordinated a response to emerging pest and disease

- Cassava production in Southeast Asia was nearly free from phytosanitary constraints until recently. A complex of invasive arthropod pests and disease are now significantly affecting cassava production in the region, including Cambodia.
- There is an urgent need for coordinated investment in research and capacity building to develop a more comprehensive understanding of the local population dynamics and control of invasive pests (such as mealybug and mites) and to understand the causes, spread and control of new diseases such as cassava witches broom disease (CWB), and cassava mosaic disease (CMD). Several actions are suggested below:

- a) The development and promotion of locally appropriate Integrated Pest Management (IPM) packages is of critical importance, including the promotion of alternatives to the increasingly widespread use of pesticides.
- b) Implementation of capacity building, awareness raising and extension, including the development of appropriate extension and communication materials (including video, radio, or other innovative media). This needs to happen at all levels (from technicians to farmers).
- c) Set-up a system for near-real-time intelligence of disease presence and incidence, and appropriate communication strategies for farmers and industry actors.
- d) Implementation of quarantine measures that restrict the movement of planting materials out of infected areas. Encourage the production and marketing of clean planting materials in regions that are currently disease-free.
- e) Progressively control the movement of uncertified planting material across national borders as the domestic supply of healthy planting materials increases.
- f) Implementation of a scheme with a clear incentive system for farmer-level reporting, eradication, and replacement of infected materials



Invest in the development of mechanisation options that address labour shortages and enable the implementation of conservation agriculture practices

- Labour prices in Cambodia have risen significantly in recent years, and available household labour to perform peak season operations, such as planting and harvesting, will continue to decline as household livelihoods become increasingly diversified.
- Farmers are already preferentially adopting technologies that save labour, such as contract land preparation, and the widespread use of herbicides to reduce labour requirements for weeding.

- Ongoing investment in the development of economically viable machinery and contracting models is needed to move beyond pilot scale on conservation agriculture.
- Financing and leasing arrangements for equipment need exploring, and other sustainable mechanisms should be evaluated to encourage the use of proven conservation agriculture practices.
- Exploration and evaluation of mechanisms to encourage more sustainable cultivation practices, particularly in key sensitive areas, should be pursued, including innovative mechanisms such as the production of certified organic or 'environmentally safe' products.

Conclusion

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International Center for Tropical Agriculture
Since 1967 Science to cultivate change

Headquarters
Km 17 Recta Cali-Palmira C.P. 763537
P.O. Box 6713, Cali, Colombia
Phone: +57 2 445 0000

✉ ciat@cgiar.org
www.ciat.cgiar.org

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