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# Disease-resilient and sustainable cassava production systems in the Mekong region

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Project Leader

Inception meeting
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Bioversity International and the International Center for Tropical Agriculture (CIAT) are CGIAR Research Centers.
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# Background

- **Cassava Value Chain and Livelihood Program (2016-19)**

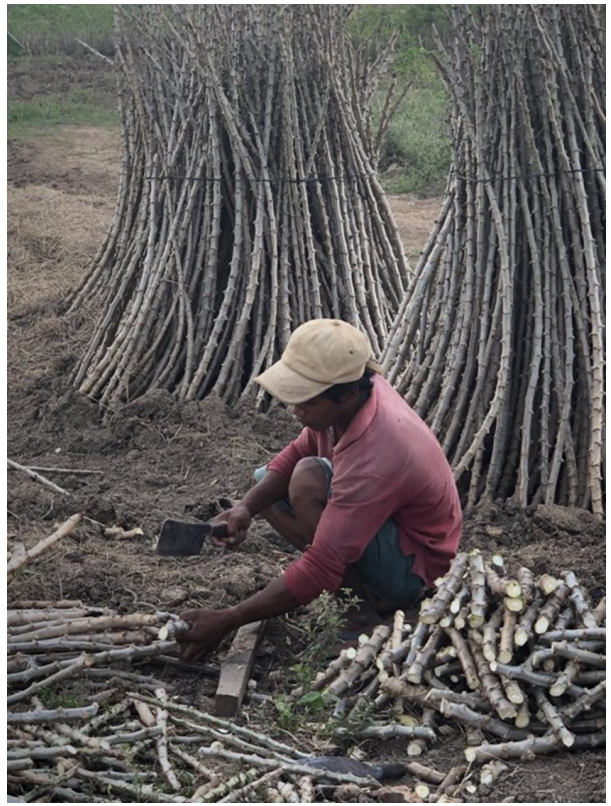
(Cambodia and Lao PDR ASEM/2014/05 and Vietnam and Indonesia AGB/2012/078)

- **Establishing sustainable solutions to cassava diseases in mainland Southeast Asia (2019-23)**

- **Addressing the rapid emergence of Cassava Witches Broom Disease in Southeast Asia (2023-2024)**

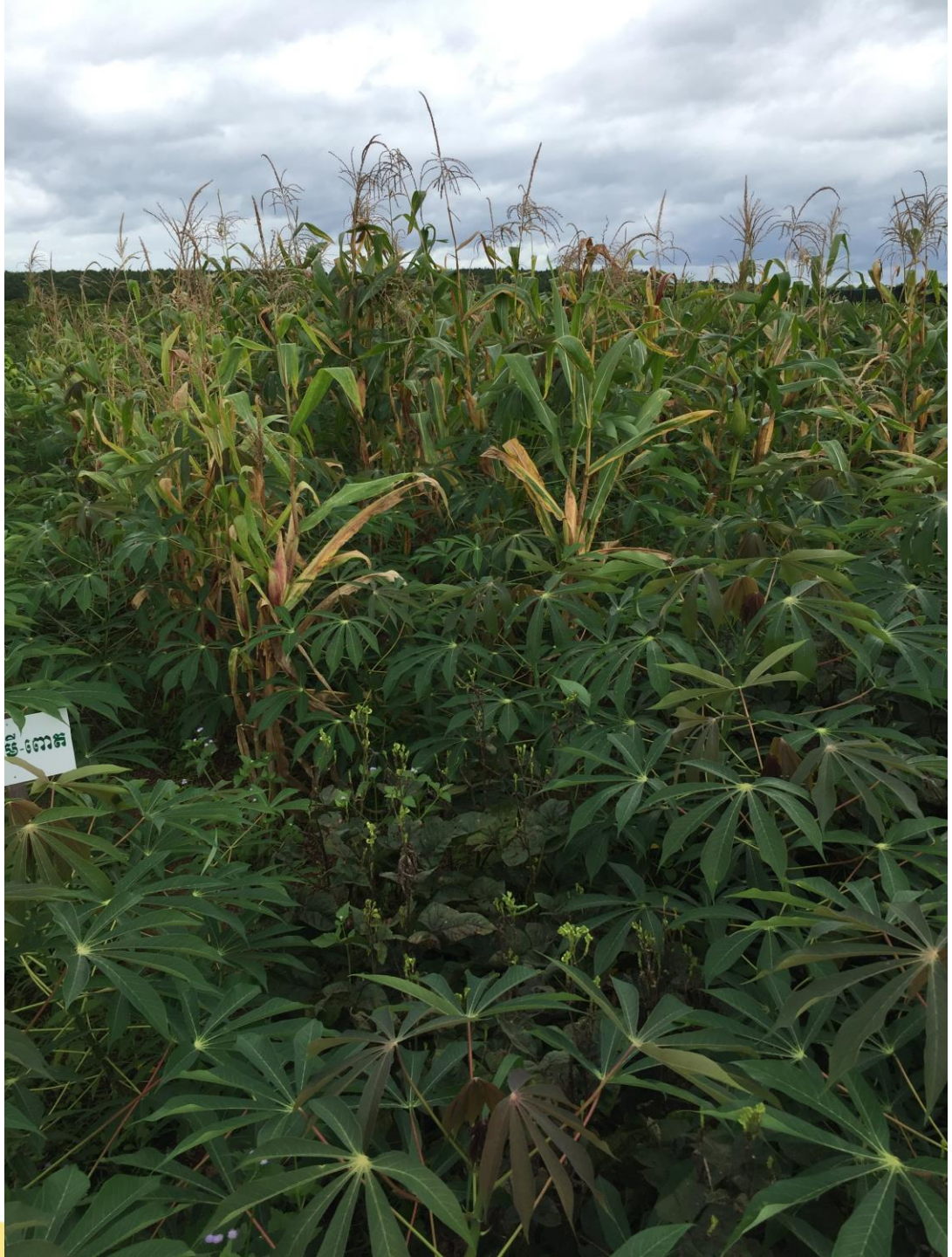
# Background

**Optimize productivity**
**Breeding for disease resistant**
**Fertilizer application and Field management**



# Project Aim

The overall aim of the project is to maintain a profitable cassava sector that supports the livelihoods of smallholder farmers and a competitive industry by co-developing adoptable and scalable innovations that address disease pressures and sustain soil productivity.



**1 NO POVERTY**

- Improved crops
- A better deal for farmers and consumers


**15 LIFE ON LAND**

- Preserving ecosystem services
- Pest and disease management
- Soil health



**8 DECENT WORK AND ECONOMIC GROWTH**

- Inclusive markets
- Seed availability and access

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# Research questions

**Soil fertility management**

- What are the technically feasible technologies that can improve the sustainability of cassava production, minimize disease incidence, and maximize farm productivity?
- How will male and female farmers' participation and preferences impact the adoption of the new technologies?
- What are the current market demand, trends, and potentials that may influence the adoption of alternative systems?

# Research questions

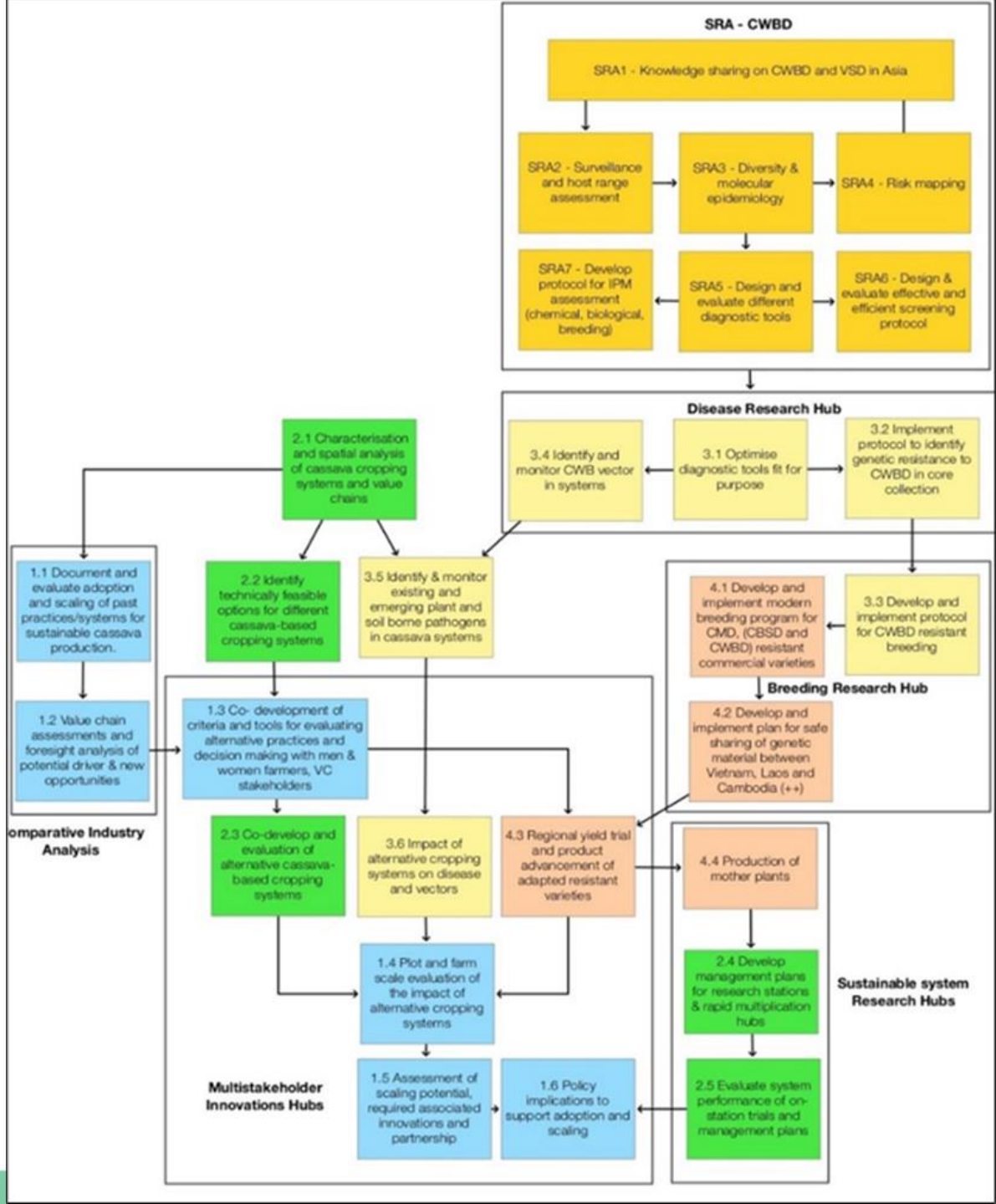
**Disease management**

- Can CWBD resistance, tolerance and susceptibility be systematically identified within in existing cassava germplasm (landraces, global diversity cassava panel, improved varieties)?
- What are the possibilities to enhance genetic gain by deploying modern breeding technologies that increase the intensity and accuracy of introgressing disease resistance traits into products that meet the requirements of different market segments?
- What are the effects of altering cropping patterns on cassava disease prevalence, incidence and severity of cassava disease?
- Can diagnostics, rapid multiplication, and seed system intervention be sustained through viable partnerships that supply timely, high-quality seed at volumes that address disease and meet changes in demand from alternative cropping systems.

# Project Objectives and outputs

- **Objective 1** A comprehensive analysis of the conditions of past and present adoption of improved economically and environmentally sustainable cassava production system technologies will be completed, including gender-informed impacts of practices at plot and whole farm levels through both literature and consultative participatory approaches.
- **Objective 2** Develop economically sustainable cassava-based cropping/farming systems targeting to minimize soil degradation and disease management linking with crop/forage-production systems and value chains.

- **Objective 3** Efficient protocols for detection and chemical and genetic management of CWBD will be developed and deployed in the project area, and improved methods will be implemented for surveillance and detection of emerging threats.
- **Objective 4** Enhance national cassava breeding scheme and regional networks for the delivery of well-adapted disease resistant varieties in farmers' fields through the seed system.


SRA - CWBD
SRA1 - Knowledge sharing on CWBD and VSD in Asia
SRA2 - Surveillance and host range assessment
SRA3 - Diversity & molecular epidemiology
SRA4 - Risk mapping
SRA7 - Develop protocol for IPM assessment (chemical, biological, breeding)
SRA5 - Design and evaluate different diagnostic tools
SRA6 - Design & evaluate effective and efficient screening protocol
Disease Research Hub
2.1 Characterisation and spatial analysis of cassava cropping systems and value chains
3.4 Identify and monitor CWB vector in systems
3.1 Optimise diagnostic tools fit for purpose
3.2 Implement protocol to identify genetic resistance to CWBD in core collection
1.1 Document and evaluate adoption and scaling of past practices/systems for sustainable cassava production.
2.2 Identify technically feasible options for different cassava-based cropping systems
3.5 Identify & monitor existing and emerging plant and soil borne pathogens in cassava systems
4.1 Develop and implement modern breeding program for CMD, (CBSD and CWBD) resistant commercial varieties
3.3 Develop and implement protocol for CWBD resistant breeding
Breeding Research Hub
1.2 Value chain assessments and foresight analysis of potential driver & new opportunities
1.3 Co- development of criteria and tools for evaluating alternative practices and decision making with men & women farmers, VC stakeholders
4.2 Develop and implement plan for safe sharing of genetic material between Vietnam, Laos and Cambodia (++)
omparative Industry Analysis
2.3 Co-develop and evaluation of alternative cassava-based cropping systems
3.6 Impact of alternative cropping systems on disease and vectors
4.3 Regional yield trial and product advancement of adapted resistant varieties
4.4 Production of mother plants
1.4 Plot and farm scale evaluation of the impact of alternative cropping systems
2.4 Develop management plans for research stations & rapid multiplication hubs
Sustainable system Research Hubs
Multistakeholder Innovations Hubs
1.5 Assessment of scaling potential, required associated innovations and partnership
1.6 Policy implications to support adoption and scaling
2.5 Evaluate system performance of on-station trials and management plans

# Laboratory and on-station research within research hubs

| Type | Location | Partners |
|---|---|---|
| Breeding research hub | LamDong; DongNai, TayNinh - VIETNAM | HLARC<br><br>OneCGIAR-ABI |
| Disease research hub | Vientiane, LAO PDR | NAFRI, PPC<br><br>OneCGIAR-PlantHealth |
| Sustainable seed systems and cropping systems research hub | Vientiane, LAO PDR<br><br>Phnom Penh/Kampong Cham, CAMBODIA | NAFRI<br><br>CARDI/GDA<br><br>OneCGIAR – Seed Equal |
| Southern Lao Innovation hub | LaoNgam, Salavan<br><br>Thateng, Sekong | NAFRI, PAFO, DAFO, Winrock, WWF. Starch factories<br><br>OneCGIAR – Sustainable Intensification |
| Central Lao Innovation hub | Bolikhan, Bolikhamxai<br><br>Viengthong, Bolikhamxai<br><br>Thatom, Xaysomboun | PAFO, DAFO<br><br>(LuxDev, NamNgiep PowerCompany, 3x Starch factories) |
| Northwest Cambodia Innovation hub | Banteay Meanchey<br><br>Oddar Meanchey | PDAFF<br><br>(GIZ, ThaiWah Starch) |

# Outputs of the project

- Scalable cassava production systems incorporating other crops (i.e., legumes) or forage options
- Sustainable management plan for the research station and rapid multiplication hubs.
- Impact of altered cropping pattern on insect vector-disease interactions
- Guide to safe germplasm exchange within Southeast Asia
- More than 5 advanced breeding lines with resistant to CMD tested in Laos and Cambodia, on station and (potentially on-farm)
- Public private models for cassava research and scaling beyond the project

# Outputs of the project

- Improved knowledge on cassava cropping system sustainability techniques.
- Quantification of yield impacts of alternative cropping pattern
- Protocol for disease diagnostics
- Disease tolerant varieties or breeding lines, genetic information about disease resistance traits

Australian Centre for International Agricultural Research

Australian Aid

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|---|---|---|
| 8:00 | Registration | |
| 8:30 | **ACIAR Crop Portfolio** | Dr. Eric Huttner |
| 8:50 | Project Overview | Dr. Imran Malik |
| 9:10 | Lessons from Value Chain Project | Dr. Jonathan Newby |
| 9:30 | Addressing the rapid emergence of Cassava Witches Broom Disease in Southeast Asia (CROP-2023-157) | Dr. Warren Arinaitwe |
| 9:50 | Precision farming in cassava-Thailand | Prof. Piya Kittipadakul |
| 10:10 | Strengthening soil knowledge and capability in Cambodia to support sustainable upland agricultural development (SLAM/2022/103) | Dr. Wendy Vance |
| 10:30-11:00 | Coffee | |
| 11:00-12:00 | Separate discussion group and some discussion topics | |
| | **Breeding** | **Pathology** | **Seed systems and Sustainable Cropping systems** |
| | | | |
| 12:00-100 | Lunch | |
| 1:00 - 2:30 | Separate discussion group continue…. | |
| 2:30-3:00 | Coffee | |
| 3:00 – 4:00 | Summary of group discussions | |
| | | |
| 3:00 – 3:15 | Breeding | Dr. Xiaofei Zhang |

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# Thank you!

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