Establishing sustainable solutions to cassava diseases in mainland Southeast Asia

Project Inception Meeting

Vientiane Lao PDR

11-13th September 2019

Enhancing smallholder livelihoods and economic development in mainland SEA by improving the resilience of cassava production systems and value chains to rapidly evolving disease constraints.

The research context

Throughout Southeast Asia (SEA), cassava (*Manihot esculenta* Crantz) has become an important upland crop in terms of both rural livelihoods and economic development. It is estimated that over 2 million households in mainland Southeast Asia (MSEA) are engaged in cassava production. Cassava production in the majority of MSEA is a commercially oriented activity, with the crop cultivated to meet the rapidly growing regional and global demand for animal feed, starch-based products, ethanol and biofuel. Cassava products (starch and dried chips) are used in many applications, including the production of sweeteners (glucose, sorbitol) MSG, paper, textiles, pharmaceuticals, processed foods, dairy products, ethanol, animal feed, and pet food, to name but a few. Beyond the domestic utilisation, the export of fresh cassava roots, starch and chips amounts to between $3.5-4 billion USD per year for the region (UN-Comtrade). In response to this strong market demand, cassava production has increased in the region with rapid expansion in Cambodia, Lao PDR, and Myanmar. This has involved significant cross-border trade in planting material (cassava planting stems - referred to as 'seed' for the purposes of this proposal) and raw materials (fresh roots and dry chips) with Vietnam and Thailand. There are strong inter-dependencies between countries for both feedstock and processing capacity, access to export infrastructure, access to new technologies, and foreign investment capital.

The problem

The recent cassava boom has coincided with the emergence and spread of two serious diseases throughout the region. Reported in Thailand in the 1990s, ***Cassava Witches Broom Disease (CWBD)*** is now widely distributed in SE Asia, with increasing field level incidence and yield impact. CWBD can cause yield reductions of up to 90%, and affect starch content and quality, thereby affecting root prices due to declining processing efficiency. The second (and most recent arrival) is a member of the cassava mosaic virus family of geminiviruses, which has caused a widespread epidemic with considerable yield losses in Africa. ***Sri Lanka Cassava Mosaic Virus (SLCMV)*** was first reported in in Cambodia in 2015, and is now present throughout the major producing regions of Cambodia, and southern and central Vietnam, and symptoms reported Northeast Thailand.

Both CWBD and SLCMV are spread through the movement of infected stems, with secondary infection via invertebrate vectors. Knowledge of the population and dynamics of the invertebrate vectors is very limited in the SEA context, especially in the case of CWBD, where the identity of the disease vectors remain unconfirmed and the disease itself is poorly characterised.

In regards to CMD, farmers' estimates of yield decline in the initial year of infection is between 30-50% from secondary infection, with experiences from Africa and India indicating that yield losses will increase over time with the replanting of infected stakes. The strong interconnection between the regional cassava economies has resulted in the rapid spread of these diseases across national borders, with significant impacts on household livelihoods and the competitiveness of the cassava sector in the global carbohydrate market.

This project directly addresses these two emergent diseases, which if left unchecked will continue to spread throughout the region devastating cassava production, the incomes of millions of smallholder farmers, and a multibillion-dollar industry. The project consists of a multi-pronged strategy involving breeding, surveillance, agronomy, and seed systems interventions, coupled with engagement with government institutions and agribusiness.

Aim - The overall project aim is to enhance smallholder livelihoods and economic development in mainland SEA by improving the resilience of cassava production systems and value chains by addressing the rapidly evolving disease constraints.

Summary of Objective

Objective 1: Assess the opportunities, challenges and risks for the development of sustainable regional solutions for cassava disease management in mainland SEA including coordinated policy development, sustainable business and public-private funding models;

Objective 2: Enhance the capacity and collaboration between breeding programs in mainland Southeast Asia to develop new product profiles for commercially viable cassava varieties by identifying and incorporating known and novel sources of resistance to Cassava Mosaic Disease (CMD) and Cassava Witches Broom Disease (CWBD) into national breeding programs:

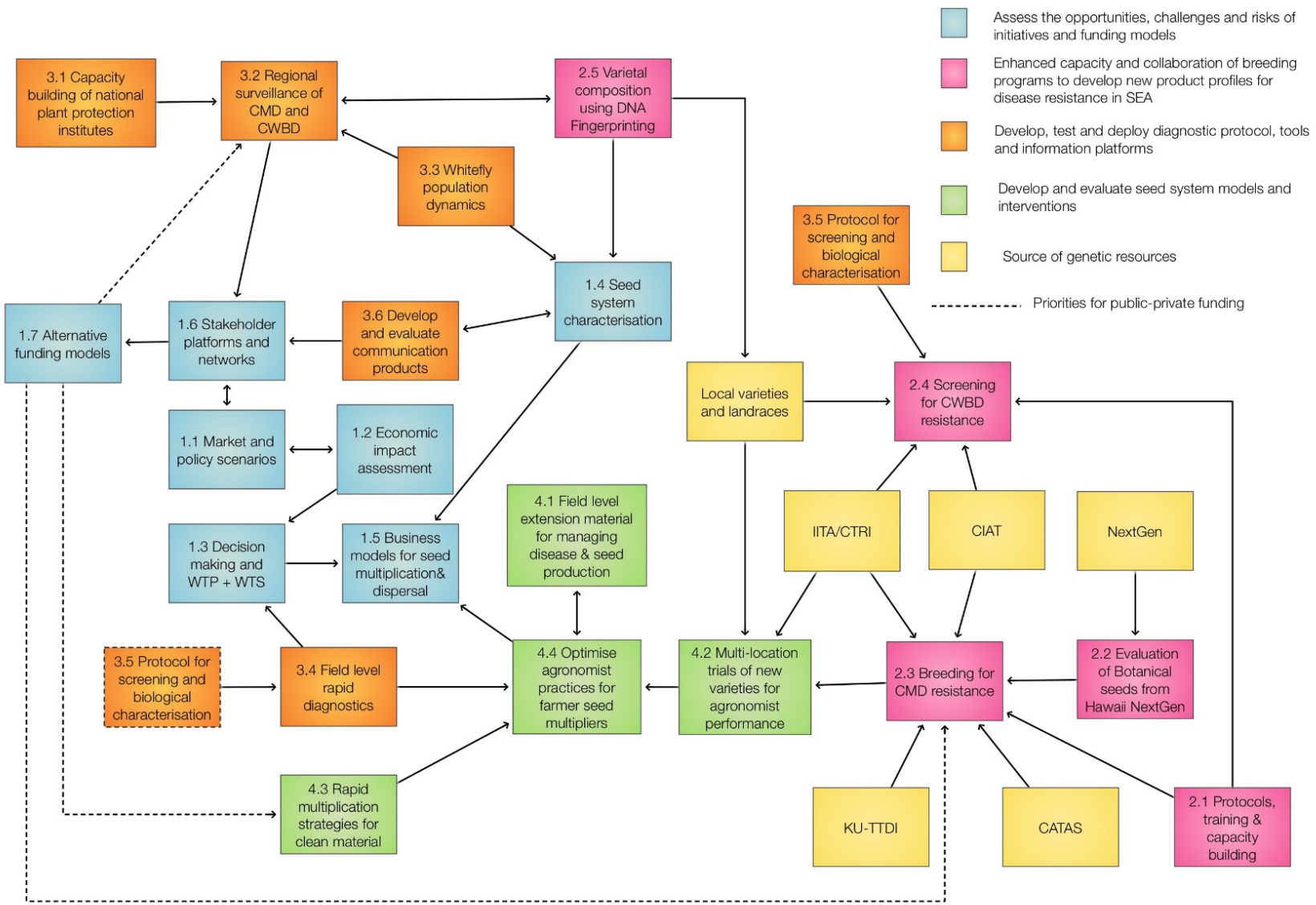
Objective 3: Develop, test and deploy diagnostic protocols, tools, and information platforms fit for purpose in monitoring, surveillance, and certification applications; and

Objective 4: Develop and evaluate technically feasible and economically sustainable cassava seed system models for the rapid dissemination of new varieties and clean planting material to smallholder farmers in different production systems and value chains.

The project will develop technically viable and economically sustainable solutions to address the disease related problems, test and evaluate methods for scaling, and prepare the region to defend against future pest and disease incursions by strengthening capacity and networks, and investigate opportunities for public-private funding models.

Outputs of the project will include:

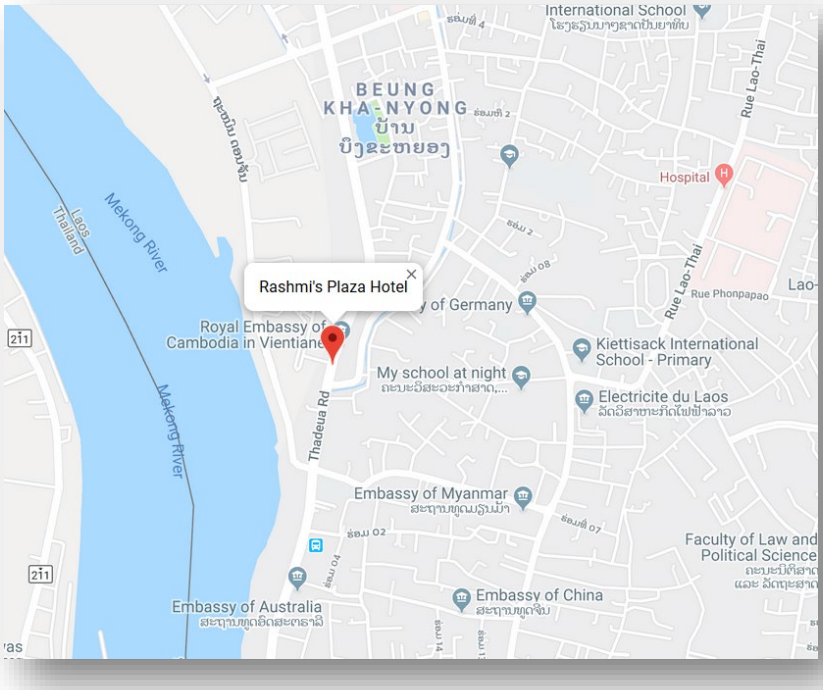
1. Commercially competitive and acceptable cassava varieties resistant to CMD and yield high the existing varieties under disease pressure through a process of screening, breeding and selection;
2. Source of resistance to CWBD identified and introduced into cassava breeding programs;
3. Enhanced regional diagnostic protocols, tools and information platforms fit for purpose in monitoring, surveillance, and certification applications across scales;
4. Models for the development of economically sustainable cassava seed systems for the rapid dissemination of new varieties and clean planting material to farmers in different value chains.
5. Business models, policy recommendations and alternative funding models for sustainability of interventions across multiple scales.


Assess the opportunities, challenges and risks of initiatives and funding models
Enhanced capacity and collaboration of breeding programs to develop new product profiles for disease resistance in SEA
Develop, test and deploy diagnostic protocol, tools and information platforms
Develop and evaluate seed system models and interventions
Source of genetic resources
Priorities for public-private funding
3.1 Capacity building of national plant protection institutes
3.2 Regional surveillance of CMD and CWBD
2.5 Varietal composition using DNA Fingerprinting
3.3 Whitefly population dynamics
3.5 Protocol for screening and biological characterisation
1.4 Seed system characterisation
1.7 Alternative funding models
1.6 Stakeholder platforms and networks
3.6 Develop and evaluate communication products
Local varieties and landraces
2.4 Screening for CWBD resistance
1.1 Market and policy scenarios
1.2 Economic impact assessment
4.1 Field level extension material for managing disease & seed production
IITA/CTRI
CIAT
NextGen
1.3 Decision making and WTP + WTS
1.5 Business models for seed multiplication& dispersal
3.5 Protocol for screening and biological characterisation
3.4 Field level rapid diagnostics
4.4 Optimise agronomist practices for farmer seed multipliers
4.2 Multi-location trials of new varieties for agronomist performance
2.3 Breeding for CMD resistance
2.2 Evaluation of Botanical seeds from Hawaii NextGen
4.3 Rapid multiplication strategies for clean material
KU-TTDI
CATAS
2.1 Protocols, training & capacity building

INCEPTION MEETING PROGRAM

Day 0 – Arrival

Rashmi's The Plaza – Vientiane is a medium sized hotel with 53 rooms. Rated as a 5+ star establishment the facility offers a variety of high-end room types of excellent quality. The hotel provides some of the better suite rooms in the city plus Roof-top Pool, Fitness Center, and various food and beverage outlets. The Hotel is a 5 minute drive from the city center, and a 20 minute drive to Wattay International Airport



Tel. +856 21 315088
Fax. +856 21 315089
Email:
Thadeua Road Ban Beungkhayong-Tai
Sisattanak District Vientiane, Lao PDR
https://www.rashmishotel.com/

Regional taskforce Steering committee meeting

3:30 – 5:30pm – Rashmi Hotel Board Room

Day 1 – Country disease status and activity updates

8:30	Registration	
9:00	Welcome	NAFRI - Dr. Chantsamone Phongoudome (DDG) ACIAR – Howard Hall (RPM Agribusiness) CIAT – Joe Tohme (Ag-Biodiversity Program Leader)
9:30	Introduction to the project aims, objectives and activities	Dr Jonathan Newby (Project leader)
10:00	Photo and Coffee	
	Session II – Disease status in SE Asia Chair: Dr Lê Huy Hàm	
10:30	Vietnam status update	PPRI – Dr. Trinh Xuan Hoat
10:50	Cambodia status update	GDA – Dr. Ny Vuthy
11:10	Thailand status update	DOA – Dr. Prapit Wongtiem KU - Dr. Wanwisa Siriwan
11:40	Lao PDR status update	PPC - Ms Khonesavanh Chittarath
12:00	Lunch	
1:00	China status update	CATAS – Songbi Chen
1:20	Myanmar status update	DAR - TBA
1:40	Questions and Panel Discussion	Chair: Wilmer Cuellar
2:00	Industry and government Panel	Chair: Jonathan Newby TTSA - Mr Anuwat Ruthaiyanont TTDI – Prof. Chareinsuk Rojanaridpiched AGI – Dr Lê Huy Hàm
3:00	Coffee	
Session III – Breeding and screening activities Chair: Dr Eric Huttner (ACIAR)		
3:30	Summary of transfer of genetic material to the region and future plans	Dr Augusto Becerra - CIAT
3:50	CAVAC trials in Cambodia	Dr Imran Malik - CIAT
4:10	Screening in Vietnam by HLRC-CIAT	HLRC – Miss Pham Thi Nhan
4:30	Screening by AGI in Vietnam	AGI - Nguyễn Anh Vũ
4:50	Breeding activities in Thailand	KU-TTDI - Assoc. Dr. Chalermpol Phumichai
5:10	Breeding and screening activities in China	CATAS - Songbi Chen
5:30	Close	
6:30	Welcome Dinner – Kong View Restaurant	

Day 2 – Field trip and planning

8:30	Registration	
9:00	Agricultural policy in Lao PDR and impact on cassava disease	H.E. Dr. *Phouang Parisak* Pravongviengkham, *Vice Minister* of *Agriculture*
9:30	Status with development of diagnostic drone	UQ – Jimmy Botella
9:50	Modeling CMD for real-time decision making and intervention	University of Florida – Kelsey Andersen
10:30	Coffee	
11:00	RTB activities	Wilmer Cuellar/James Legg
11:20	Rapid multiplication	Roosevelt Escobar and Erik Delaquis
11:40	Applying a gender lens to the project activities	CIAT - Vanya Slavchevska
12:00 – 1pm	Lunch	
1:00 – 3pm (2 hours)	Objective planning for the timing of activities, budget required, location. Impact pathway	1. Jonathan Newby 2. Augusto Becerra 3. Wilmer Cuellar 4. Imran Malik
3:00-3:20	Coffee	
3:20 – 5:30	Field visit	Napok Research Centre
6:30	Drinks and Dinner	Rashmi Hotel

Day 3 – Planning for operationalising 2019-2020 activities

8:00	Registration	
8:30	Report back from Day 2 planning	10min presentation +5 min Q&A per group
9:30	Introduction to the sister TR4 project	Tony Pattison
9:40	Rotation 1	1 & 3 2 & 4
10:20 (20mins)	Coffee	
10:40	Rotation 2	1&4 2&3
11:20	Rotation 3	1&2 3&4
12:00	Lunch	
1:00 – 3:30pm	Finalise Year 1 planning	Obj 1 – Household survey Obj 2 – Transfer of genetic material/what where Obj 3 – Surveillance protocol Obj 4 – Rapid multiplication
3:30	Coffee	
4:00	Report back	10 mins per group
4:40-5pm	Closing remarks and next steps	ACIAR CIAT NAFRI-DOA

Return Flight times:

Destination	Flight	Flight time	Leave hotel
Vientiane - Hanoi	Fri, 13 Sep VN0920 VTE-HAN	19:55-21:05	
Vientiane – Bangkok	Fri 13 Sep PG940 VTE-BKK Fri, 13 Sep TG575 VTE-BKK	19:35-20:50 20:30-21:35	
Vientiane – Phnom Penh and HCMC	Sat, 14 Sep VN921 VTE-HCMC	12:10-15:15	
Vientiane – Yangon	Sat, 14 Sep TG2571 VTE-BKK	13:-14:25	
Vientiane – Haikou	Sat 14 Sep VTE-BKK QV441	7:15-8:35	
India	Sat, 14 September VTE-BKK TG2571Y	13:20-14:25	

List of participants

Number	Name	Gender	Organisation	Country
1	Dr Joe Tohme	M	CIAT	International
2	Dr Jonathan Newby	M	CIAT	International
3	Dr Imran Malik	M	CIAT	International
4	Mr Erik Delaquis	M	CIAT	International
5	Miss Cu Thi Le Thuy	F	CIAT	Vietnam
6	Mr Sok Sophearith	M	CIAT	Cambodia
7	Mr Laothao Youbee	M	CIAT	Lao PDR
8	Dr Vanya Slavchevska	F	CIAT	International
9	Miss Chantana Douangsavanh	F	CIAT	International
10	Dr Luis Augusto Becerra	M	CIAT	International
11	Dr Roosevelt Escobar	M	CIAT	International
12	Dr Wilmer Cuellar	M	CIAT	International
13	Dr Maria Isabel Gomez	F	CIAT	International
14	Miss Oriana Muriel Guzman	F	CIAT	International
15	Dr Mike Masson	M	UQ	International
16	Prof Jimmy Botella	M	UQ	International
17	Dr. Nguyen Van Liem	M	PPRI	Vietnam
18	Dr. Trinh Xuan Hoat	M	PPRI	Vietnam
19	Dr. Le Xuan Vi	M	PPRI	Vietnam
20	Dr Nguyen Huu Hy	M	HARC	Vietnam
21	Miss Pham Thi Nhan	F	HARC	Vietnam
22	Miss Nguyen Thi Thu Huong	F	HARC	Vietnam
23	Dr Lê Huy Hàm	M	AGI	Vietnam
24	Dr Nguyễn Anh Vũ	M	AGI	Vietnam
25	Dr Siviengkhek Phommalath	M	NAFRI	Lao PDR
26	Mr Saythong Oudthachit	M	NAFRI	Lao PDR
27	Dr Chanphasouk Tanthaphone	M	NAFRI	Lao PDR
28	Mr Santisouk Insisiengmay	M	NAFRI	Lao PDR
29	Miss Soukphathay SIMEUANG	F	NAFRI	Lao PDR
30	Mrs Viengkham Sengsoulivong	F	PPC	Lao PDR
31	Ms Khonesavanh Chittarath	F	PPC	Lao PDR
32	Ms Pinkham Vongphachan	F	PPC	Lao PDR
33	Mr Touy Bounvilayvong	M	PPC	Lao PDR
34	Dr Iv Phirun	M	GDA	Cambodia
35	Mr. Ly Chamroeun,	M	GDA	Cambodia
36	Dr. Ny Vuthy,	M	GDA	Cambodia
37	Mr. Oeurn Samoul,	M	GDA	Cambodia
38	Assoc. Prof. Ed Sarobol	M	KU	Thailand

39	Assoc. Dr. Chalermpol Phumichai	M	KU	Thailand
40	Dr. Wanwisa Siriwan	F	KU	Thailand
41	Dr. Wannasiri Wannarat	F	KU	Thailand
42	Dr.Suwanna Praneetvatakul	F	KU	Thailand
43	Prof. Chareinsuk Rojanaridpiched	M	TTDI	Thailand
44	Mr. Pornsak Aiemnaka	M	TTDI	Thailand
45	Dr. Prapit Wongtiem	F	DOA	Thailand
46	Prof. Songbi Chen	M	CATAS	China
47	AN Feifei,	F	CATAS	China
48	ZHU Wenli,	F	CATAS	China
49	LUO Xiuqin	F	CATAS	China
50	Soe Soe Hmwe	F	DAR	Myanmar
51	Thet Yee Khaing	F	DAR	Myanmar
52	XUE Jingjing	F	CATAS	China
53	James Legg	M	IITA	International
54	Sheela Mn	F	CTCRI	International
55	Eric Huttner	M	ACIAR	International
56	Howard Hall	M	ACIAR	International
57	Dulce Simmanivong	F	ACIAR	International
58	Sarina Macfadyen	F	ACIAR	International
59	Kelsey Andersen	F	UF	International

Summary details of key participants' roles and responsibilities

International Center for Tropical Agriculture (CIAT)

Dr Jonathan Newby (CIAT-Asia) is an agricultural economist and the regional coordinator of CIATs cassava program in Asia. Dr Newby will serve as the overall project leader and coordinator of activities under ***Objective 1***. Based within the region (Lao PDR) he will be responsible for coordination of activities with objective and country leaders. He will be responsible for market analysis, economic analysis and value chain assessments. He will oversee the development of survey and experimental economic tools and coordinate government and industry stakeholder dialogues.

Dr. Luis Augusto Becerra (CIAT-HQ) is CIATs Cassava Program Leader for Asia and Latin America. Dr. Becerra is an experienced senior agricultural researcher. Since 2009, he has also been leading the Cassava Molecular and Quantitative Genetics Laboratory at CIAT. Based at Cali-Colombia, he will be coordinating the project's alignment with the CGIAR's research program for Root Tubers and Bananas activities

Dr Hernan Ceballos (CIAT-HQ) is a cassava breeder based in Cali Colombia. Dr Ceballos will coordinate activities under ***Objective 2***, including germplasm exchange to introduce useful sources of resistance diseases and other relevant traits; enhanced recombination of selected progenitors (through the use of techniques to enhance flowering and early fruit see), and efficient evaluation and selection to identify clones carrying resistance to CMD and/or CWBD combined with key agronomic traits (high fresh root yield and dry matter contents and acceptable plat architecture and vigor). He will assist in the design of field screening methods for disease resistance and lead training and capacity building activities in relevant topics such as induction of flowering, general breeding with special emphasis in trait introgression.

Dr. Wilmer J. Cuellar (CIAT-HQ), joined CIAT in 2012 to lead the Virology laboratory. He has worked on diseases affecting tropical crops since 2005 and currently coordinates the CGIAR-RTB research cluster on cassava biological constraints in Asia and the Americas. He will support the project's activities on diagnostics, monitoring and host-pathogen characterization. He holds a PhD in virology from the University of Helsinki, Finland.

Dr. Imran Malik (CIAT-Asia) is Cassava Production System Specialist based in Lao PDR. He started his career as Plant Physiologist, and then he has worked in the field of Molecular Biology, Plant Nutrition and Agronomy. He will be responsible for coordinating ***Objective 4*** including on-station agronomy trials and multi-location adaptation trials. He will also contribute to crosscutting activities within the project.

Mr Erik Delaquis (CIAT Asia– WUR) is a Laos-based agroecologist and PhD candidate with Wageningen University's Production Ecology and Resource Conservation department. Erik has worked for CIAT for the past 3 years throughout SEA and in Peru. He will be coordinate activities related to seed systems research, also the topic of his PhD dissertation.
Dr Vanya Slavchevska (CIAT-Asia) is a gender and labour economist. She will be responsible for integrating gender and social-economic considerations in the project activities. She will also conduct analyses on the impacts of cassava disease on farmers and analyses

around household decision-making about cassava in order to inform the development of sustainable business models.

María Isabel Gómez (CIAT-HQ) has worked in CIAT since 2013 as a research assistant. Is based in Cali-Colombia and since 2015 has coordinated the cassava entomology team in HQ. She is a biologist with an MSc in agricultural sciences with emphasis in entomology from the Universidad Nacional de Colombia. She will coordinate training and field surveys activities focused on the evaluation of diversity and distribution of whitefly populations.

University of Queensland (UQ)

Dr Michael Mason (UQ) is a method development scientist who will adapt his current diagnostic technology to detect diseases in Cassava. He will work with regional partners and oversee the field testing and implementation of the Cassava molecular diagnostic technology in SE Asia.

Prof Jimmy Botella (UQ) is a Professor of Plant Biotechnology and will work with Dr Michael Mason and oversee the design, field testing and implementing the Cassava molecular diagnostic technology in SE Asia.

Vietnam

Hung Loc Research Agricultural Research Center (HLARC)

Dr Nguyen Huu Hy (HLARC): Is Director of the Hung Loc Agricultural Research Center (HLARC), under the Institute of Agricultural Science for Southern Viet Nam. He is responsible for deployment and managing research and development projects of crops, especially cassava. He has significant experience and knowledge about cassava breeding and will be responsible for developing new disease resistant varieties of cassava with good traits, favoured by the market. He was the main author of 3 popular cassava varieties in Vietnam: HL-S10, HL-S11, KM101.

MSc Pham Thi Nhan (HLARC): is Deputy Director of HLARC. She obtained a Master Degree in Crop Science in 2014 from the Agriculture and Forestry University. She has over 10 years' experience working on cassava. Ms Nhan has join many government projects as well as non-governmental organizations. She is the co-author of three cassava varieties HL-S10, HL-S11, KM101. Authors of articles "The research of cassava breeding by mutation treatment"

Mr Bach Van Long (HLARC): Graduated at Da Lat University and he has worked with HLARC since 2010. He has assisted in the research and development of new cassava varieties with high fresh yield, high percentage of dry matter and high starch content. He has also developed varieties less susceptible to aphids, pests and diseases. He has experience on design of Field Experiments for Cassava Modelling in Vietnam

Ms Nguyen Thi Thu Huong (HLARC): Graduated at Ha Noi University of Agriculture in 2014. She had attending cassava training to be held in Hung Loc Agricultural Research Center from 14 to 15 December 2015 include five participating countries: Vietnam, Thailand, Myanmar, Cambodia, Laos. Research cultivation process high yield cassava varieties on slope land and erosion.

Mr. Nguyen Ba Tung (HLARC) has worked with HLARC since 2016. He has a bachelor's degree in crop science from Viet Nam National University of Agricultural, Ha Noi, Viet Nam. He has previously participated in the Monitoring of plant diseases and insect pests at the cassava isolation fields at HLARC.

Plant Protection Research Institute (PPRI)

Dr. Nguyen Van Liem (PPRI), the Director General of PPRI, is an entomologist and will serve as the principle investigator (PI) of the objective 3 of the project. He has experienced in entomology, weed sciences and IPM; especially in biology and ecology of entomology. He and his team were the first team in Vietnam involved in detection and identification of Sri Lankan Cassava Mosaic Virus is the causal pathogen of CMD in Vietnam and it's insect vector. His team is still working on CMD in Vietnam. He will be responsible for coordination of project's activities of the objective 3. He will involve in training and capacity building of plant protection institutes in key diagnostic tools.

Dr. Trinh Xuan Hoat, the Deputy Director General of PPRI, is a Plant Pathologist and he has experienced on molecular and biotechnology. Specially, he and his team at PPRI are only working group that has been studied on cassava disease and insect pests including cassava witches broom, cassava anthracnose, cassava bacterial blight, cassava mosaic virus. He was in the research team who detected and identified the virus (SLCMV) causing CMD and it's insect vector in Vietnam. He will assist Dr. Nguyen Van Liem in coordination and management of objective 3. He will be responsible for sample designing and data management platforms; and involve in developing protocols and evaluating technologies for rapid detection and identification of CMD and CWBD.

Dr. Le Xuan Vi is an entomologist with more than 15 years working on plant protection in Vietnam focusing on insect taxonomy and biological control. He has involved in several research programs on insect pests and diseases on cassava, which was supported by CIAT and JICA. He will design survey, carry out field activities. He will develop and evaluate the effectiveness of communication products and strategies utilising different public and private sector stakeholders; and will involve in studying the distribution, diversity and dynamics of whitefly populations throughout the cassava production regions of Vietnam.

Dr. Le Thi Tuyet Nhung is entomologist and as an expert on whitefly (Bemisia tabaci) in Vietnam. She has studied many years on biological and ecological characteristics of whitefly and its management in different crops. She has worked with CIAT's experts in different projects focusing on pink cassava mealybug (Phenacoccus manihoti) and its control using Anagyrus lopezi. She will be responsible for studying the distribution, diversity and dynamics of whitefly populations throughout the cassava production regions of Vietnam.

MSc. Mai Van Quan (PhD candidate at VAAS) is a plant pathologist with more than 15 years working on diagnosis and identification of plant pathology and biological control. He has studied on cassava witches broom, cassava bacterial blight, cassava mosaic virus, cassava anthracnose diseases. He will be responsible for evaluating new technologies for rapid field diagnostics for CMD and CWBD with particular applications in seed systems; and involves in developing protocols for screening and biological characterisation of CWBD and CMD.

MSc. Ngo Quang Huy is a plant pathologist at PPRI. Mr Huy has experienced on cassava mosaic virus disease, and whitefly as insect vector of CMD. He will responsible for designing and implementing regional surveillance for CMD and CWBD in Vietnam with results shared in

a common platform. He also will involve in studying the distribution, diversity and dynamics of whitefly populations throughout the cassava production regions of Vietnam.

Mr. Le Quang Man is a biotechnology engineer. He has good work abilities on microorganism and molecular biotechnology. He is a member of several projects on cassava diseases funded by Vietnamese government and JICA. He will be responsible for developing protocols for screening and biological characterisation of CWBD and CMD; and will involve in evaluating new technologies for rapid field diagnostics for CMD and CWBD with particular applications in seed systems.

MSc. Bui Hai Yen graduated from VNUA and now is a researcher of PPRI who has experienced entomology, weed sciences and IPM. She will be responsible for understanding the distribution, diversity and dynamics of whitefly populations throughout the cassava production regions of Vietnam; and will involve in developing and evaluating the effectiveness of communication products and strategies utilising different public and private sector stakeholders

Agricultural Genetic Institute

Dr. LE Huy Ham (Prof.) is the Chairman of the Scientific Committee of AGI. He had been the Director General of AGI from 2006 until 2017. Dr. Ham has been the PI of several Cassava research programs. He will be the PI and coordinate research at AGI in this project.

Dr. NGUYEN Anh Vu (PhD) is the Deputy director of National Key Laboratory for Plant Cell Technology. He has coordinated cassava research projects at ILCMB from the beginning of its establishment in 2012. Dr. Vu will be the co-PI of this project.

Mr. Le Ngoc Tuan has worked at the International Laboratory of Cassava Molecular Breeding as a researcher since 2017. He will carry out breeding and field trials for AGI.

Ms. Pham Thi Hanh is an experienced technician in National Key Laboratory, AGI since 2011. Her speciality is tissue culture (corn, soybean and cassava). Ms. Hanh will involve in maintaining and propagating elite varieties for breeding and field trials.

Cambodia

Dr. Ny Vuthy, (GDA) is a plant pathologist. Currently he is a deputy director of department plant protection sanitary and phytosanitary of general directorate of agriculture, MAFF Cambodia. He has responsible for plant quarantine. Over the past 10 years, he had worked with Cambodian Agricultural Research and Development Institute (CARDI). He did research in plant protection office, involved with the ACIA Project on Rice Diseases in Cambodia, and worked with British American Tobacco (BAT) and was in charge of tobacco leaf research and leaf development.

Mr. So Thavrith who is chief of plant protection technology research and development and pest diagnostics office, will be responsible for design and implement regional surveillance for CMD and CWBB in Cambodia as he had a good experience with CMD following project “Strengthening capacity in managing incursion of cassava mosaic virus infestation in

Cambodia". He is good in Entomology and has done many different surveys for tracking pest and disease in Cambodia including whitefly.

Mr. Oeurn Samoul who has a master's degree of plant pathology from Khon Kaen university, Thailand. He is good in molecular study and has done many samples of cassava leaves for DNA extraction and running PCR to detect SLCMV and CWB form cassava. Based on his experiences, he will implement field surveillance, field testing, diagnostic and data collection.

Mr. Iv Phirun, Deputy Director of Department of Industrial Crop of the General Directorate of Agriculture, is agronomist and will serve as a focal point and project coordinator. Based working places in Cambodia he will be responsible for day-to-day coordination of activities under the objectives 1, 2 and 4 with local partners and related activities of the project.

Mr. Ly Chamroeun, Chief of Office of Starch and Sugar Crops of Department of Industrial Crop, is agronomist will be responsible for the development, implementation and analysis of participatory trials of the project together with local partners, including variety selection, fertility management, and intercropping systems.

Mrs. Kan Sopha, Technical staff of Seed Management Office of the Department of Industrial Crop. She will work for the development and implementation of the project activities with focusing on the cassava seed systems and the trials on varietal selection and dissemination the clean and resistant cassava varieties to the farmers in Cambodia.

Mrs. Din Lamy, Technical staff of Starch and Sugars Crops of the Department of Industrial Crop. She will work and assist on field surveys, cassava field research activities and participate in more gender strategic research activities where opportunities and needs are identified.

Lao PDR

Dr. Xaysongkhame Phimmason (Deputy Director General of NAFRI) will be project leader. He will give advice and lead activities under each of the objectives with local partners.

Mr. Chanthasouk Tanthapone is director of Economic and Rural development Research Center, and he will provide advice and coordinate on economic and social science research. He is currently involved in ACIAR cassava research in Laos and coordinating policy and stakeholder dialogues. Mr Chanthasouk Tanthapone has previous experience working with seed multiplication for the rice sector.

Dr. Khamtom Vanthanouvong is breeder, and he will give advice and technical support on cassava breeding activities.

Mr. Phanthasin Khanthavong is agronomist, he will be responsible for project coordinator, design, data analysis on agronomic and seed system trials. Mr Phanthasin has been involved in several previous cassava projects with CIAT, including ASEM/2014/053.

Mr. Saythong Outhachit is agronomist, he will response for field implementation of agronomic and deed system trials.

Mr. Santisouk Insisiengmay has worked on economic and rural development research, he will response for economic and household survey.

Ms. Phatsalakhone Manivong has worked on plant pathology, she will be responsible for lab and field work on seed system, screening, identify and evaluate diseases.

Ms. Soukphathay Simueang had worked on plant tissue culture, she will involve on seed system activities.

Thailand

Dr. Chareinsuk Rojanaridpiched is a professor of plant breeding. Under this project he will be coordinating the activities within TTDI program especially tolerant cultivar developmental plan and field trials.
Dr. Ed Sarobol (KU) is an agronomist/crop physiologist. Under the project he will serve as KU coordinator and be responsible for coordination of activities among KU researchers within the project.
Dr. Vichan Vichukit has been working with TTDI for more than 10 years. He will be responsible for overseeing the collaboration between TTDI and KU for the entire project.
Dr. Suwanna Praneetvatakul conducted research in several areas of agricultural economics. She will oversee the economic aspect of the CMD project of TTDI – KU and ACIAR/CIAT project.
Dr. Piya Kittipadakul is a plant breeder. He will work very closely with Dr. Chalermpol Phumichai on resistance variety development at KU.
Dr. Chalermpol Phumichai has worked with cassava, as plant breeder and biotechnologist since 2005. At present, he leads the project on CMD (TTDI - KU) for KU. He will be responsible for resistant variety development.
Dr. Wannasiri Wannarat is very keen in multiplication and rapid propagation of plant through tissue culture and other laboratory techniques. Under the project, she is responsible for rapid propagation of resistant variety for multi – location trials.
Dr. Pasajee Kongsil is the faculty member of Department of Agronomy, KU. Her expertise fields are plant breeding, plant stress physiology, plant biotechnology and plant molecular biology. Currently, she is working on cassava flower induction in Thailand to assist CMD breeding program.
Dr. Wanwisa Siriwan is a virologist and will be responsible for Surveillance, Diagnostics, Virology and Molecular biology.
Mr. Pornsak Aiemnaka has been working as cassava breeder of TTDI since 2016. In this project he will assist in resistance variety propagation (field propagate, single leaf method and tunnel method) and developing resistance variety.

China

Professor Songbi Chen (CATAS, China) is a deputy director in Tropical Crops Genetic Resources Institute, CATAS. He is a professor working in cassava genetic breeding, molecular and integrated evaluation of cassava genotypes, cassava value chain, proteomics and protein-protein interaction, and mechanism of cassava tolerance to CMD and CBSD.

Dr. Jingjing Xue (CATAS, China) is assistant professor who works in Tropical Crops Genetic Resources Institute, CATAS. She is working at cassava molecular breeding, DNA methylation and mechanism of cassava fluid metabolism.

Ms Wenli Zhu (CATAS, China) is assistant professor who works in Tropical Crops Genetic Resources Institute, CATAS. She is working at cassava tissue culture, cassava tolerant breeding to CMD, cassava modified breeding.

Ms Feifei An (CATAS, China) is assistant professor who works in Tropical Crops Genetic Resources Institute, CATAS. She is working at cassava proteomics, gene editing, cassava autotetraploid and cold stress.

Ms Xiuqin Luo (CATAS, China) is assistant professor who works in Tropical Crops Genetic Resources Institute, CATAS. She is working at cassava genomics, gene editing, and cassava molecular breeding regarding high carotenoid content.

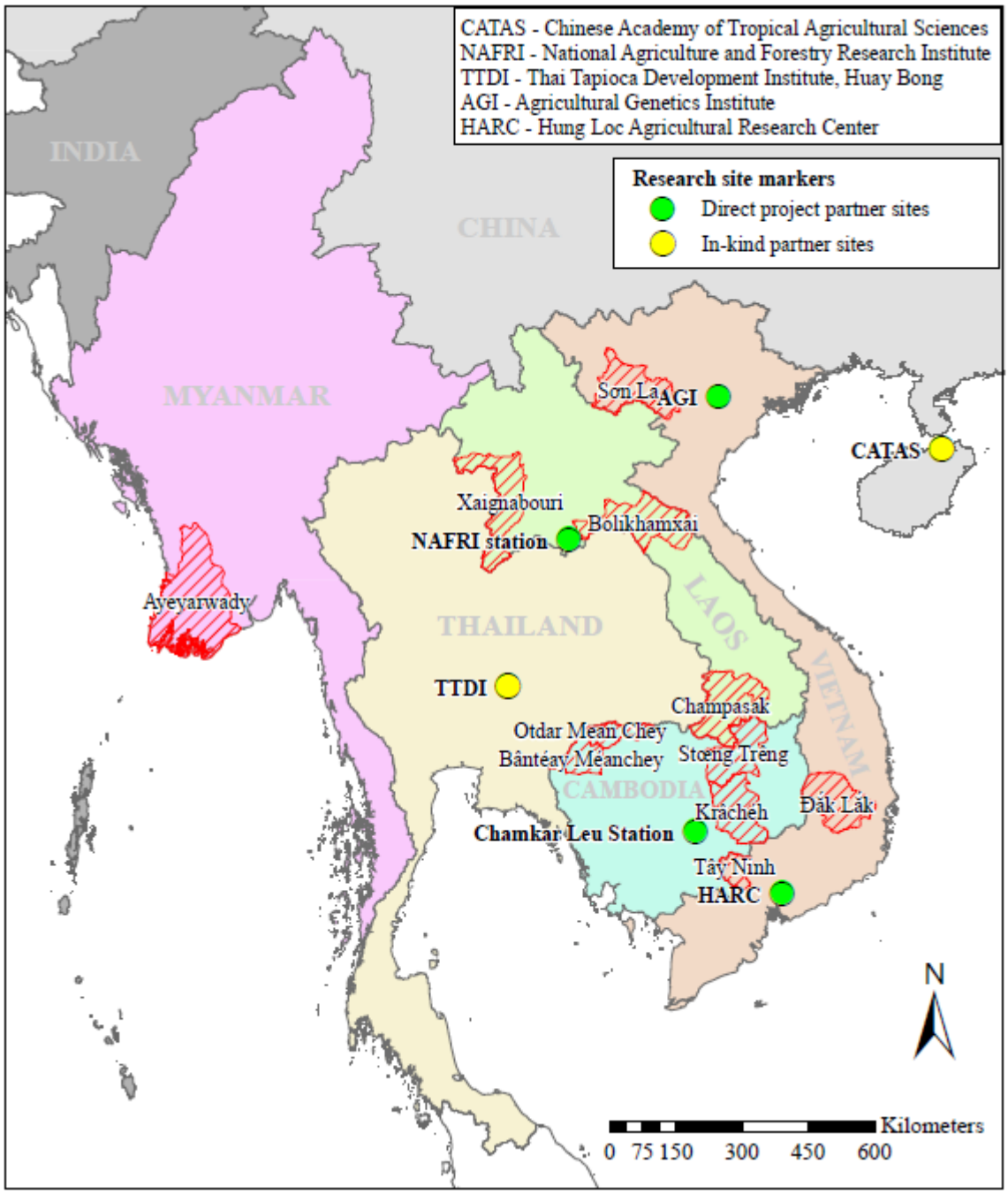


Figure 1 – Location of Research Stations and priority Provinces for multi-location evaluations