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Workshop Proceedings, Haiti, 27–29 October 2014

(Conferences, discussion)

Introduction

The workshop to plan activities for the Haiti Biofortification Project was held during 27 to 29 October 2014. This Project is financed by the HarvestPlus–LAC Program and co-organized with the AKOSAA Project.

The first part of the report summarizes the principal points made in the conference rounds carried out on 28 October. The second part includes matrices with the activities and/or products proposed for development in Haiti by different working groups set up during the workshop. Also included are the principal points discussed by the working groups in the plenary session. The third part contains the final conclusions of the LAC team after the completion of the session on 29 October.

Eighty persons participated in the workshop. They represented diverse organizations of Haiti, both public and private, such as the Ministries MARNDR and MSPP; other national entities such as EMBRAPA (Brazil) and IDIAP (Panama); international research centers, including CIMMYT–Mexico, CIP–Peru, CIRAD, FAO, and HarvestPlus (USA and Colombia); and NGOs such as ORE and World Vision.¹ For a complete list of participants, see Appendix.

The workshop was officially opened by Edie Charles and Joseline Marhone, respectively from the Ministries MARNDR and MSPP. They welcomed the participants and highlighted the importance of initiating biofortification activities in Haiti.

Agenda for 28 October

Conference rounds

- Observations of moderators: Anne Mackenzie, Standards and Regulatory Issues from HarvestPlus and Jacques Camille, Agronomist from MARNDR.
- Nolex Fontil, of MARNDR and in charge of follow-up and evaluation, presented a detailed panorama of Haiti's agricultural situation. He highlighted the following points:
 - Haiti's agricultural sector comprises about 5 million people, 66% of whom are employees from the rural sector.

¹ The names of the entities represented by the following acronyms have been translated into the English language: MARNDR: Ministry of Agriculture, Natural Resources and Rural Development (Haiti); MSPP: Ministry of Public Health and Population (Haiti); EMBRAPA: Brazilian Corporation of Agricultural Research; IDIAP: Agricultural Research Institute of Panama; CIMMYT: International Maize and Wheat Improvement Center; CIP: International Potato Center; CIRAD: French Agricultural Research Centre for International Development; FAO: Food and Agriculture Organization of the United Nations; NGOs: non-governmental organizations; ORE: Organization for the Rehabilitation of the Environment.

- Among the major challenges for Haiti are maintaining the sector's growth, and working to prevent the worst effects of frequent natural disasters.
 - Among the major constraints to agricultural development are lack of quality and availability of inputs, obsolete practices and infrastructure, high dependency on imports, land ownership and tenure system, and lack of soil conservation.
- Ina Schonberg, from HarvestPlus, presented a panorama of the current situation in terms of nutritional deficiencies and described the progress made by HarvestPlus in 2012–2014, as follows:
- Over 2000 million people are affected by hidden hunger.
 - The 2008 Copenhagen Consensus ranked biofortification as the fifth solution to malnutrition.
 - A sweet potato variety was released in Mozambique in each of 2007 and 2009, which enabled babies, children, and women to increase their vitamin A intake by 100%.
 - Crops with higher nutrient contents have been released around the world: 18 in Africa, 4 in Asia, and 5 in Latin America. More are expected to be released: 26 in Africa, 8 in Asia, and 9 in Latin America.
 - The Second Global Conference on Biofortification, held in Kigali (Rwanda), in March–April 2014, was an opportunity to discuss advantages, challenges, and solutions for this theme, as well as analyzing how to up-scale biofortification.
- Marilia Nutti, of Embrapa and HarvestPlus, reinforced the Program's panorama in Latin America and the Caribbean (LAC):
- She explained the process of biofortification and how it is not GMO material, but a natural improvement technique carried out in the field. The goal is to increase the nutrient contents of crops to positively impact the population's food and nutritional security. In LAC, crops being biofortified are maize, rice, beans, cassava, and sweet potato.
 - Potential LAC countries include El Salvador, Guatemala, Honduras, and Nicaragua. Haiti is a priority country for the biofortification program. Colombia and Panama need technical assistance.
 - To achieve impact on nutritional status, promoting consumption of these crops in combination is a must so that micronutrient intake would not depend only on one source or crop, but on a group, that is, on a "basket" of food crops.
 - Interesting experiences include those of Panama, who already has its own national biofortification program with AgroNutre. Guatemala and Nicaragua already have managing committees and are in the initial pilot stage to test varieties, conduct evaluations, and study acceptability.
- Emmanuel Prophète, National Seed Service (SNS) of MARNDR, suggests that:
- For Haiti, most varieties are introduced, thus there is little genetic seed available.
 - Most seed is bought, with the conservation rate for seeds being less than 10%.
- Joseline Marhone, from MSPP, explains that:
- To date, four national studies have been conducted (1975, 1978, 2005, and 2010) on the nutritional situation in Haiti.

- The country's population has problems of growth stunting and low weight, and deficiencies of vitamin A, iron, iodine, and zinc.
 - Currently, 360,000 children are undernourished (4 times more than in Brazil and 2 times more than in Dominican Republic), with 385,000 children suffering vitamin A deficiency.
- Eliassaint Magloire, from ORE, presented results and advances made in this organization's work:
- Haiti had worked with biofortification in Phase I of the AgroSalud Project, with high quality protein maize (QPM).
 - Varieties of QPM maize were introduced, together with the use of chemical fertilizers, which was a novelty for Haiti. Nevertheless, there were problems of storage, rotting, and pests.
 - ORE was part of Phase I of the AgroSalud Project, later conducting three trials with hybrids and six with open-pollinating varieties.
 - In 2008, the variety 'Hugo' was selected. It was well accepted and distributed in the country's southern and eastern regions.
- Erick Boy, from HarvestPlus, presented the Program's activities and advances in nutrition:
- To measure the impact of nutrition, three aspects must be developed: validation of nutrient contents, evaluation of efficacy and monitoring, and evaluation of efficiency.
 - For all crops, studies of intake, retention, and nutritional status must be completed. In addition, studies on the efficacy and efficiency of sweet potato have been completed. Between 2016 and 2018, studies of all crops are expected to be completed.
 - One activity to be conducted between 2014 and 2018 is to consolidate evidence on biofortified crops in relation to different human age groups to understand (i) the crops' potential for infants and pregnant and nursing mothers, and (ii) the retention and diffusion of industrial foods made from these crops for rural and urban markets.
- Steve Beebe, from the CIAT (International Center for Tropical Agriculture) Bean Program, mentioned that advances made for this crop in LAC include:
- Five varieties of bean released in Nicaragua (2), El Salvador (1), Guatemala (1), and Honduras (1).
 - The generation of 560 lines with a higher-than-average productivity.
 - Varieties with high iron contents and a productivity equaling that of drought-resistant varieties.
 - The white bean consumed in northwestern Haiti performs as well as the red bean.
 - The lines with which CRS currently works are black beans, presenting good yields and 20 to 25 ppm more iron. Currently, 10 lines are being evaluated. Lines SMN 39, SMN 32, and SMN 50 average between 82 and 90 ppm of iron and between 31 and 33 ppm of zinc.
- Clair Hershey, from the CIAT Cassava Program, says that:
- Haiti is one of the regions where cassava production is concentrated, but its cultivation is weak, not having changed in the last 30 years.
 - With little access to markets, farmers have few options of using their production other than for their own consumption.
 - Ten cassava varieties grown in Haiti are currently in quarantine.
 - Because neither Haiti nor Cuba has a quarantine system, problems with insects, viruses, and diseases will become more severe.

- Most selection is done through screening, which is the easiest and quickest way of measuring beta-carotene contents.
- Wolfgang Gruneberg, from CIP, suggests that:
- Sweet potato can contribute towards the recommended daily intake of vitamin A.
 - Two sweet potato varieties grown in Peru exceed the 50% of carotene levels recommended by HarvestPlus, and are therefore considered as biofortified.
 - Two orange-fleshed sweet potato (OFSP) varieties are grown in Haiti, with more varieties to be introduced from Cuba and USA.
 - In Panama, eight clones have been selected, and two varieties are expected to be released next year.
 - In Brazil, 80 OFSP varieties have been collected. Hopefully, a like number will also be collected in Haiti.
- Félix San Vicente, from CIMMYT, explained the main activities for maize in Latin America:
- Approach is through potential for yield and broad stability, including tolerance of drought, heat, and low nitrogen.
 - Increased emphasis on root rots and foliar diseases.
 - Nutritional improvement (provitamin A and zinc).
 - The main problem throughout Central America is the tar spot complex, which burns the plant and which, through climate change, may spread to Haiti. However, some currently existing materials can effectively help tackle this constraint.
 - Most of the varieties released during Phase I (AgroSalud) were open-pollinating.
 - Work to improve zinc levels has been carried out for 2 years, with some varieties now having 35 to 50 ppm.
 - Haiti emphasizes vitamin A, even though few studies on vitamin A have been carried out in LAC because of the need to solve the biotic and abiotic problems causing low yields, and to evaluate varieties in production zones.
 - A pilot study should be conducted on variety 'Hugo'.
- Cernio Pierre, from Catholic Relief Services (CRS), presented results from an experiment that took place in spring 2013, when 10 bean lines were evaluated for their levels of iron contents and compared with commercial varieties used in Haiti. The trials were implemented in Camp-Perrin (commercial farm), Ducis (farm plot), and Les Anglais (farm plot). Results from the evaluation of the lines indicated that:
- Lines SMN 45 and SMN 46 appear to be the most promising in terms of yield.
 - Iron levels are highest in Ducis and lowest in Les Anglais, probably because of soil pH.
 - These materials also should be evaluated in humid mountainous areas (e.g., Beaumont) before validation.
 - Beans comprise the principal legume grown in Haiti and are significant in human nutrition, given their high protein content. National production in 2010 was 62,300 tons.
 - Ten lines, sent from CIAT and evaluated in Haiti, were shown to have higher levels of iron and zinc than conventional varieties.

- Iderle J. Bois, from World Vision, commented on their foci and possibility of working with biofortification:
 - The NGO is based on four principles: good food, education, love for God and neighbor, and being an agent of change.
 - Its strategy for nutrition is based on mothers and children being well fed, protected from infections, and having access to quality medical care.
 - Its activities in nutrition seek to prevent malnutrition in communities, prevent the prevalence of malnutrition in children of 5 years old or younger, and increase the capacity of communities to manage the fight against malnutrition.

- Gaël Pressoir, from CHIBAS, presented the main problems and challenges of research in Haiti and the need to push research in Haiti to ensure that a program such as that for biofortification has continuity:
 - There is no university faculty with this approach.
 - There are few centers or laboratories in agricultural sciences.
 - There is no financing program for agricultural research.
 - CHIBAS develops crop varieties for the sub-humid regions and manages a technical center that assists farmers and the agroindustry to access suitable technology.
 - Together with CIRAD, CHIBAS has implemented a project on sorghum; with the University of Illinois, the sequencing and genotyping of *Jatropha*, and with Laval University, the diffusion of sorghum and production of *Jatropha* flours for animal feed.
 - CHIBAS is seeking to evaluate and adapt technological packages developed in other countries to Haitian conditions.

- Patrice Dion and Rachele Lexidort described how, within the AKOSAA Project, they work to intervene in agriculture, nutritional health, and cooperative agriculture with a chain approach:
 - Since 2013, AKOSAA has had a project to increase food security in the area of Saint-Marc, benefiting about 16,000 people.
 - The Project worked principally with maize, sorghum, beans, sweet potato groundnuts and others legumes.
 - Among other activities developed were the training of 361 persons in agricultural practices, strengthening of agricultural cooperatives, delivery of equipment for anthropometric evaluations, and the testing of crops with higher nutrient contents: beans with more iron and zinc, QPM maize, cowpea with high nutritional value, and sweet potato with provitamin A.
 - Some factors that determined trial results included low soil fertility and limited availability of products to develop crops.

- Ismael Camargo, researcher at IDIAP, described AgroNutre, Panama's successful biofortification program:
 - Panama initiated its biofortification work in 2008.
 - Biofortification began as a public policy from which the national program was created in 2013.
 - It has three work components: management, varietal development, and nutrition.
 - To date, 7687 people have benefited from the project.
 - Interinstitutional work has been key to the project's development.

- Salomón Pérez, who works in impact evaluation, said that HarvestPlus seeks to deliver and maximize the impact of nutrient-rich staple crops on populations suffering from micronutrient deficiencies. Achieving high impact depends on these new staple crops and their consumption.
 - In Colombia, areas have already been recommended for biofortification with iron (beans) and vitamin A (cassava); and, for intervention, geographic areas typified by both high production of staple crops and high nutritional deficiencies.
 - In Bolivia, a study on the adoption of rice varieties is being completed. Some results include an adoption index for improved varieties (46.85%) and consumption (400 g/day).
 - In Guatemala, the bean variety ‘Super Chiva’ is being tested for consumer acceptability to determine, among other things, socioeconomic and organoleptic factors that affect the acceptance of biofortified bean varieties in this country.
 - For Haiti, data on general aspects exist, including on production, consumption, and micronutrient deficiencies. Each participant was given this information in a USB.

Final discussion, 28 October

After the conference rounds were completed, a general discussion was held. The points mentioned were:

1. Given the problem of malnutrition in Haiti, the convenience of early maturing varieties was discussed. However, early varieties generally have lower yields than slower maturing varieties. Because an early variety with high yields is not possible, a balance must be reached between yield and early maturation.
2. Problems will persist if there is no diversification of food.
3. Although a school meals program already exists, the Haitian Government does not have sufficient resources. Nevertheless, it was made clear that, currently, a ministerial unit for local purchases is operating but a representative could not attend the workshop.
4. Interest was shown in biofortified green beans, an important item in the Haitian diet.

Working Groups and Their Matrices, 29 October

Three working groups were organized: (1) grains (maize and beans), (2) tuberous roots (cassava and sweet potato), and (3) nutrition. The two crop groups discussed and completed two matrices, one on genetic improvement and the other on seed system/adoption. The nutrition group was general, cross-cutting the crops. Before initiating the working group activities, participants were requested to add their names to the tables for the corresponding groups:

1. Group on grains (maize and beans)

<i>NAME</i>	<i>INSTITUTION</i>
Meike Andersson	Harvest Plus
Felix San Vicente	CIMMYT
Eugène Levaël	CIAT-HAITI/MARNDR
Eliassaint Magloire	ORE
Gaël Pressoir	CHIBAS
Iderle J. Bois	World Vision
Roman Gordon M.	IDIAP
Emigdio Rodríguez	IDIAP
Mayesse Da Silva	CIAT
Clair Hershey	CIAT
Steve Beebe	CIAT
Kodjo Tomekpe	CIRAD
Marie Eunide Alphonse	MARNOR
Robers Pierre Tescar	FAMV

MAIZE AND BEANS: Breeding and Validation of Biofortified crops

Activities carried out	Current/planning situation* ²		Participating institutions/ Contact	Results/ Comments
	Physical Resources	Human Resources		
Selection of germplasm, pre-breeding	<p>CIAT + CIMMYT: Existing</p> <p>ORE maize: population improvement, line development, line maintenance, 3-way hybrids</p>	Existing	<p>Bean: CIAT</p> <p>Maize: CIMMYT, ORE</p>	“Improved” germplasm has thin pod walls; thick walls are preferred to avoid pre-germination under excess humidity before harvest
Crosses	Existing	Existing	CIAT, CIMMYT	
Micronutrient analysis	<p>Iron+Zinc: CIAT</p> <p>Provitamin A: CIMMYT, ORE</p>	Existing	CIAT, CIMMYT, ORE	ORE: training/validation may be needed
Evaluation of yields, resistance to biotic and abiotic stress (TESTING ON-STATION)	<p><u>Beans:</u></p> <p>MARNDR: 2-3 sites (Levy, Damien, Salegnec), up to 200 lines per season, 4 trials max; could;</p> <p>potential: can add two more sites (Moje Fram, Besboin) but need more staff/human resources (agronomists); potentially universities</p> <p>ORE:</p> <p>2 sites (Camp Perrin lowland, Deron highlands); screening capacity for 250 up to 500 local lines, plus CIAT materials; have expansion project in Les Anglais, could test beans there too</p> <p><u>Maize:</u></p>	<p>MARNDR: 4 agron (Damien); 1 agronomist (Levy), 1 agronomist (Salegnec)</p> <p>ORE: 5 agronomists in Camp Perrin, 1 staff in Les Anglais</p>	<p>MARNDR+FAO</p> <p>ORE</p>	<p><u>Beans:</u></p> <p>2 climbers exist, but bush are preferred; climbers could adapt in mountain regions</p> <p><u>Maize:</u></p> <p>OPVs are preferred because of seed saving; ORE interested also in hybrids</p> <p><u>Find out more:</u></p> <p>USAID Avancee project with maize in N region; can do testing and/or</p>

² 1)Exist, 2) Exist and needs upgrade 3) Does not exist

	MARNDR: 2 sites (Levy Farm and Savane Damien), up to 200 lines per season, 2 trials max ORE: No on station testing of maize			multiplication?→ Philippe Matthieu
Participatory evaluation of cultivars (on-farm, demo plots)	<u>Beans:</u> MARNDR: can do demo-plots up to 20 farmers ORE: can test 10-20 lines at 4-5 farms/sites MFK: interested in testing in the North, with/through if-Foundation <u>Maize:</u> MARNDR: can do testing and demo-plots with up to 40 farmers in North (Saint Raphael, 1 staff), 20 in South (Levy and Savane Diane), 20 in Nippes area (farmer association), 20 in Artibonite region ORE: can test up to 9 trials (past: 6 OPV, 3 hybrid trials) per season with up to 12 farmers; starting to expand also to Les Anglais this season MFK: interested in testing in the North, with/through if-Foundation	MARNDR: same as above ORE: 5 agronomists (same for bean+maize); in addition have team of 10 staff for maize planting and monitoring	MARNDR ORE MFK	
Scientific training	CIAT+CIMMYT: Breeding ORE: Agronomy, testing, planting	CIAT, CIMMYT, ORE		
Institutional strengthening for certification of varieties	NA	NA		
Validation	See above (on-station and on-farm testing)	See above		
Release	NA	NA		

Feedback of varieties (field days)	See above (on-farm trials, demo plots)	See above		
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MAIZE AND BEANS: System of seeds, distribution, and adoption of biofortified varieties

Maintenance of lines			ORE	
Basic and “certified” (commercial) seed multiplication	<p>MARNDR: Beans: 1 site (Savane Zombie), 12 ha, highlands (1400m), cold; for basic and “certified” seed; Maize: 1 site (Savane Damien), 10 ha on-station, additional up to 100ha with farmers (irrigation, good control); Potential for additional 60-70ha with NGOs: Hands Together, Gonaive, N Artibonite – 3ha (B+M); Partner for Health, Mirebalais, Central Plateau - 15 ha (beans and maize); Bas Artibonite – up to 50ha (B); NGO/private farm “Double Harvest” – up to 40ha (maize).</p> <p>ORE (beans and maize): Genetic and basic seed: 15 ha on-station; Commercial seed: via payback-contracts with farmers; 3 sites, up to 100ha; farmers register their land with ORE should have irrigation, give 50% credit for fertilizer and seed free (payback after harvest); monitoring 4 times before ORE accepts or rejects seed; pay up to double price of grains</p> <p>MFK: can multiply beans and maize; work with Kombite Du Nord, lowland, 30ha</p>		<p>MARNDR</p> <p>ORE</p> <p>MFK</p>	<p>ORE: in the past, in collaboration with ministry, used to produce 80t of beans and up to 200t of maize (OPV)</p>

Certified seed multiplication	NA	NA		
Training of producers for artisanal seed production	Included above		MARDR, ORE	
Commercial seed production	See above	See above		
Quality control and validation of micronutrients	CIAT for beans (Fe and Zn), CIMMYT/ORE for maize (pVAC)		CIAT, CIMMYT, ORE	
Seed packaging and/or labeling	?	?	?	
Support to transfer and extension			ORE	
Institutional strengthening for seed production, quality control, and distribution	ORE does training in seed storage (warehouse), seed testing lab (germination, humidity, emergence), seed processing (grading and chemical treatment)		ORE	
Support for commercial seed distribution	Warehouse with capacity 400t at Camp Levine, Cold store for basic and genetic seed (8-10 C)		ORE	
Education, information, and communication strategies				
Diagnosis (status of the production systems in Haiti) and variety adoption studies	Bean: through Min Economy & Impact Maize: through ORE	Ministry: needs training	Ministry ORE	

The only conclusion derived from this compilation of information was that, when the 2015 workplans are being prepared, they must incorporate, where possible, these activities and potential partners, collaborators, and other interested parties.

2. Group on tuberous roots (sweet potato and cassava)

<i>NAME</i>	<i>INSTITUTION</i>
Andre N. Dusi	EMBRAPA
Arne Fritz	FAO
Louis Jean Louis	ODVA
Louis Jeyne Stéruís	Zanmi Agrikól
Roger Urbina	Havest Plus
Federico Díaz	CIP
Edie Charles	MARNDR
Jean Harry Dominique	CRS
Jean Joceline	MARNDR
Bince Jean Martimeau	MARNDR
Pierre Cernio	CRS
Lucas Freud	CRDD/FONHDAD
Lucson Innocent	AKOSA/U. LAVAL
Diana Carolina Lopera	CIAT
Ismael Camargo	IDIAP
Arnulfo Gutierrez	IDIAP
Dominique Laforest	Meds and food for kids
Emmanuel Prophète	MARNDR
Wolfgang Gruneberg	CIP
Jacques Camille	MARNDR

CASSAVA: Improvement and validation of biofortified crops

Activities conducted	Current/planning situation* ³		Participating institutions	Results / Comments
	Physical resources	Human resources		
Germplasm selection	Levy Experiment Station	CHIBAS researcher (lecturer or doctorate level)	MARNDR Universities CIAT CRS	<ul style="list-style-type: none"> • 40 to 60 <i>in vitro</i> clones will be ready in November for distribution. This phase is being executed by CRS in southern Haiti • There is no ministerial functionary in charge of cassava—a person or institution must be identified to run the cassava program in the future • Collection of all local cassava materials that are consumed, including bitter cassava for industrial starch • Consumption is increasing (cassava)
Crosses				Propagation is difficult
Evaluation of micronutrient contents, yield, resistance to biotic and abiotic stresses	Levy Experiment Station	CHIBAS researcher (lecturer or doctorate level)	MARNDR CHIBAS CIAT CRS MSPP	<ul style="list-style-type: none"> • Botanical seed • <i>In vitro</i> materials
Participatory evaluation of cultivars (on-farm experiments)			CHIBAS MARNDR CRS	

³ 1)Exist, 2) Exist and needs upgrade 3) Does not exist

Scientific training				<ul style="list-style-type: none"> • Evaluation of advanced materials • Micropropagation
Institutional strengthening for certifying varieties	MARNDR CHIBAS	Specialist consultant		Although a governmental framework exists, there is no legislation for registering varieties. However, a law for authors' rights operates and can possibly be used in lieu. Whether varieties can be registered under this law needs verifying
Validation				NA
Release				NA
Feedback on varieties (field days)				NA

CASSAVA: Seed system, distribution, and adoption of biofortified varieties

Activities	Current or planned situation ⁴		Participating institutions	Results / Comments
	Physical resources	Human resources		
Maintenance of lines				
Multiplication of basic seed				
Multiplication of certified seed				Although a governmental framework exists, there is no legislation for registering varieties. However, a law for authors' rights operates and can possibly be used in lieu. Whether varieties can be registered under this law needs verifying
Training farmers in artisanal seed production				
Commercial seed production				No
Quality control and validation of micronutrient contents				No
Packaging and/or labeling of seed				No
Support of transfer and extension				
Institutional strengthening for seed production, quality control, and distribution				

⁴ 1)Exist, 2) Exist and needs upgrade 3) Does not exist

Support for commercial seed distribution			CIAT/CHIBAS/ MARNDR (National Seed Service)	<ul style="list-style-type: none"> • Informal system • A study is needed across the crop's production chain
Strategies for education, information, and communication			MSPP	
Diagnosis of status of production systems in Haiti, and studies on the adoption of varieties				To be identified in plenary session

SWEET POTATO: Improvement and validation of biofortified crops

Activities conducted	Current or planned situation* ⁵		Participating institutions	Results / Comments
	Physical resources	Human resources		
Germplasm selection			MARNDR CIP ORE	<ul style="list-style-type: none"> • Does not exist • Different varieties are introduced • Collection of varieties and of botanical seed of different varieties growing in Haiti. Collection should be carried out in January and February, the period of highest production
Crosses				
Evaluation of micronutrient contents, yield, resistance to biotic and abiotic stresses				
Participatory evaluation of cultivars (on-farm experiments)	Levy Experiment Station and other areas in southern Haiti		AKOSAA Project ORE MARNDR	
Scientific training				Inducing flowering to make crosses in Haiti
Institutional strengthening for certifying varieties	MARNDR CHIBAS	Specialist consultant		Although a governmental framework exists, there is no legislation for registering varieties. However, a law for authors' rights operates and can possibly be used in lieu. Whether varieties can be registered under this law needs verifying

⁵ 1)Exist, 2) Exist and needs upgrade 3) Does not exist

Validation				No
Release				No Although a governmental framework exists, there is no legislation for registering varieties. However, a law for authors' rights operates and can possibly be used in lieu. Whether varieties can be registered under this law needs verifying
Feedback on varieties (field days)				No

⁵ 1)Exist, 2) Exist and needs upgrade 3) Does not exist
Planning - 3-4 years

SWEET POTATO: Seed system, distribution, and adoption of biofortified varieties

Activities	Current or planned situation* ⁶		Participating institutions	Results / Comments
	Physical resources	Human resources		
Maintenance of lines				
Multiplication of basic seed				Has been conducted for more than 5 years and MARNDR has a program for sweet potato
Multiplication of certified seed				Although a governmental framework exists, there is no legislation for registering varieties. However, a law for authors' rights operates and can possibly be used in lieu. Whether varieties can be registered under this law needs verifying
Training farmers in artisanal seed production	Farms Research centers MARNDR		MARNDR CIP	Training farmers to maintain seed and control pests
Commercial seed production				No, except for some trade in stakes
Quality control and validation of micronutrient contents				No
Packaging and/or labeling seed				No
Support for transfer and extension				No

⁶ 1)Exist, 2) Exist and needs upgrade 3) Does not exist

Institutional strengthening for seed production, quality control, and distribution				No
Support for commercial seed distribution			CIAT CHIBAS State University of Haiti MARNDR (National Seed Service)	<ul style="list-style-type: none"> • Informal system • A study is needed across the crop's production chain
Strategies for education, information, and communication			MSPP MARNDR	
Diagnosis of status of production systems in Haiti, and studies on the adoption of varieties				To be identified in plenary session

Considering the similarities between the two vegetative propagated crops, some common recommendations were made:

- (1) Privilege local adapted materials as a starting material.
- (2) Establish a germplasm collection including local variability.
- (3) In the need of introducing biofortified materials from abroad, it is necessary to articulate with MARNDR officials to prevent unnecessary phyto-sanitary requirements and the appropriate emission of the Import Permit.
- (4) Evaluate the existing system for sweet-potato planting material distribution and map the distribution routs of planting material use by cassava growers as part of a transversal study.
- (5) Analyze the Haitian legal frame to implement IP rights in the country.
- (6) Hire a specialist to support the Haitian Government in designing and implementing IP framework in the country.
- (7) Tissue culture facilities must be available

3. Nutrition–Impact

<i>NAME</i>	<i>INSTITUTION</i>
Carl Rahmaan	Partners of America
Foreste Sonneus	Zanmi Lasante
Polynice Sulphise	AKOOSA/U.LAVAL
Antoine Jnyorel	MSPP
Verónica López	Unison
Chenet Ulyse	MEDIC Haiti
Joseline Marhone	Nutrition/MSPP
M. Mona Aloxis	CNSA
Coimin Yues Marcel	MARNDR
Myrtho René Cineas	PNCS
Ketsia Clermont	PNCS
Salomón Pérez	CIAT
Erick Boy	Harvest Plus
Marie Mireille	MSPP/ UCPNANU

NUTRITION: Consumption and promotion of biofortified foods and Monitoring and Evaluation of impact

Activities carried out	Current/planning situation ⁷		Participating / Responsible institutions	Results/ Comments
	Physical Resources	Human Resources		
Food patterns and nutritional needs in the population (focus on iron, zinc, Vitamin A and other macro and micronutrients)	(2)	Expertise (2)	Ministry of Health Ministry of Agriculture (CNSA)	<ol style="list-style-type: none"> 1. There's a dietary diversity survey (Patrice Dion/Lavall) 2. There's no other related study since 1960 3. Food intake and dietary intake adequacy needs to be assessed by geo-ecological region (need to map out prevalence of MND overlaid on departments, and crop locations)
Identification of factors of vulnerability (geographical and socioeconomic)	(1)	(2)	Ministry of Agriculture (CNSA) Ministry of Interior (civil protection unit) Ministry of Health UNDP – IHSI (Haitian institute of statistics) EMMU5 (survey morbidity mortality and services utilization)	<ol style="list-style-type: none"> 4. Need to get, compile and summarize: 5. Food security map (annually) from M.Agric./NPSA 6. Multi-risk map (natural disasters): need to get from Min. of Interior 7. Impact of climate change, 8. management of watersheds (Cuenca) 9. Epidemiology of infectious and vector-borne diseases by department (MOH newsletter/reports) 10. Poverty and socioeconomic

^{7,14} 1) Exist 2) Exist and needs CAPACITY BUILDING 3) Does not exist
 Planning situation: 3-4 years

				index (HDI) national & by department
Strategies for promotion of biofortified crops/foods Institutional strengthening for development and promotion of biofortified crops/foods	(2)	(2)	Ministry of Health Ministry of agriculture –NGO's	11. Promotion of healthy diets is paramount in the existing National nutritional policy* & national nutrition strategy** 12. Promotion of local production
Identify and characterize potential private sector and civil society actors (food transformers and distributors)	(2)	(2)	ONG's ANATRAF (http://www.anatraf.org/) Small producers associations (Ministry of Agriculture) Faculty of Agronomy	13. List of associations
Market and economic viability studies (crops/food)	(3)	(2)	Ministry of Trade Ministry of Agriculture Faculty of Agronomy ANATRAF (http://www.anatraf.org/)	1. Most of information is focused on cassava (the iF foundation from NY (espencer@if-foundation.org works on cassava bread factories in rural areas)***
Evaluation of nutritional composition	(2)	(2)	Ministry of health and CHIBAS Ministry of agriculture (TAMARINIER Laboratory)	2. Food composition table requires transformation of 100g portions to actual ration sizes (<u>requires study by department</u>)
Retention	(3)	(2)	Ministry of Health CHIBAS University (& Lab)	3. NA. No material available for testing.
Dietary intake	(3)	(3)	Ministry of Health CHIBAS	4. No survey to date

Sensory analysis	(3)	(3)	Ministry of Health CHIBAS Ministry of Agriculture	5. NA. No material available for testing.
Sudy of the chain (crops and foods)	(2)	(2)	Ministry of Agriculture Private sector Universities: UEH University Faculty of agronomy UNDH- Quisqueya FONDWA (Rural University) IICA IDB –WB – USAID (Founding)	6. Maize, rice, cassava, beans. Needs to be updated
Consumer acceptance studies	(2)	(2)	UEH- Law and economy faculty	7. No studies to date. Need to carry out when varieties become available.
Economic and nutritional impact evaluation	(2)	(2)	Ministry of Finance, Agriculture and health	8. NA. No varieties released. With the proper data for assumptions, <i>ex ante</i> assessment could be considered as a first step in this direction.

* (<http://mspp.gouv.ht/site/downloads/livret%20pns%20for%20web.pdf>)

** http://scalingupnutrition.org/wp-content/uploads/2013/06/Haiti_Plan-Strategique-Nutrition-2013-2018.pdf

*** <http://www.if-foundation.org/updates/cassava-production-resumed/>

List of immediate actions

1. Transfer of technology and capacity building for 24 hour recall of dietary intake using HarvestPlus' CS Dietary software: Mourad Moursi to plan and execute a 2 weeks workshop with field staff and nutritionist of AKOSAA project (Marie Sulphise Polynice), Univ. of Sonora (Verónica López), Director of Nutrition Department/MPSP (Jocelyne Mahrone Pierre) in February or March 2015.
2. Compile and juxtapose maps of risk indicators and food consumption from governmental and nongovernmental organizations in Haiti during Mourad's visit to Haiti (perhaps bring an RA with him or hire a local consultant to access Min. of Agriculture, Min. of Health, and other organizations' files).
3. Perform an ex ante impact estimation (Salomón Pérez and CIAT economists and nutritionist) for Haiti.
4. Provide technical assistance to MOH to convert 100 g portions of foods in the current food composition table into actual rations used by the population. Mourad or consultant.
5. Identify opportunities for collecting dietary intake data prospectively in 2015-16: living standards measurement Studies (LSMS or DHS).

Plenary Discussion of the Working Groups, 29 October

Major issues discussed

- ✓ Nutritional issues will continue to arise beyond the HarvestPlus Program's life span. What will the Program leave Haitians to build on when it ends in a few years' time? We would like to see a project with a training component; with students at master's and doctorate levels in different institutions, making a united front against challenges previously tackled by HarvestPlus.
- ✓ Research is normally a university field, although, in Haiti, this is difficult because there is no public policy for it. Hence, we would like to see, within the Program's framework, local capacity continuing research.
- ✓ MARNDR has a food security program for different parts of the country, and a sweet potato program with a budget for its development.
- ✓ Although work was conducted on four cassava varieties in Haiti, work was unfortunately halted for lack of a budget. There is also a quality laboratory that needs improvement.
- ✓ CRS and ORE are closely linked in their work in Haiti, but further improvements in seed storage are needed, as well as in other capacities such as statistical programs.
- ✓ CRS would like to continue their research but to strengthen their capacity they need help from international entities. They also hope for support in strengthening local capacity and training.

- ✓ A food chemistry laboratory exists in Tamarinier, working on food sanitation control among other things.
- ✓ Precise data needs to be collected on the impact of biofortified crops.
- ✓ Gaël Pressoir spoke about strengthening local capacities to provide a sustainable response to biofortification initiatives.
- ✓ Within the framework of the AKOSAA Project, a request was made for an atomic absorption spectrometer for the Faculty of Agronomy, State University of Haiti. AKOSAA also considers as very important to conduct more research, using Haitian personnel.
- ✓ Representative institutions who can lead biofortification activities in Haiti are the ministries MARNDR and MSPP.
- ✓ Joseline Marhone proposed that the Directorate of Quality Control of the Haitian Chamber of Commerce and Industry (CCIH) be included. It would be represented by Mrs. Michèle Paulte, who is in charge, with a management team, of food matters in Haiti.
- ✓ Jacques Camille suggested that, in Haiti, there exists a “sectorial table”, which brings together departments. These working groups can act as a channel for socializing the biofortification theme, thus concentrating into a future working group for this project. For example, Eliassaint Magloire could socialize the workshop proceedings with the sectorial table for southern Haiti.
- ✓ At the ministry level, all the departmental directors meet on the last Monday of every month. Thus, the current secretary can request that, in this meeting, the directors’ attention be brought to bear on farmers.
- ✓ Using existing mechanisms is important, so not to create others, which would hamper activities.
- ✓ MARNDR has a sweet potato program. Although the potatoes are not biofortified, this program could be used to incorporate those with high levels of beta-carotenes.
- ✓ In Haiti, no researcher is working in the field with cassava. CHIBAS can provide one third of the cost of such a researcher.
- ✓ MARNDR has worked with four cassava varieties in collaboration with EMBRAPA. Although the Ministry was, and is, willing to continue with this program, funding problems had stopped work. Nor is there a quality laboratory to meet needs, but if MARNDR could be strengthened in this respect, it could then participate in collaborative efforts.
- ✓ The National Association of Fruit Processors (ANATRAF) is experienced in industrial processing. There are other entities that process crops such as cassava. Some university laboratories can evaluate foods, and some in other countries may provide support in evaluating retention. Collaboration with these laboratories must go through MSPP.
- ✓ Data on foods need to be updated.

- ✓ Although Eliassaint Magloire agrees to socialize the departmental meeting, he is concerned that institutions group together to execute actions on the ground, for example, the Levy Experiment Station, CRS, and ORE. It is important not to work in isolation within the same activities, and to conform to bases for implementing work. Loss of materials (seeds) through the country's storage conditions must be prevented.
- ✓ There was overall consensus that the ministries MARNDR and MSPP should be the entities in charge of biofortification activities and should lead this work in Haiti. A representative from the quality control group of the Haitian Chamber of Commerce should be a member of this group.
- ✓ Roman Gordon, from IDIAP, mentioned that, first, a group should be selected to monitor the project's goals. In reality, such a large working group would be difficult to coordinate and to monitor its activities.
- ✓ It was suggested that, in the current context, Emmanuel Prophète, Joseline Marhone, Eliassaint Magloire, and two other people, making up five in all, become part of the team committee to facilitate dialogue between actors, collect information, and be operators.
- ✓ Marilia Nutti proposed that there was no need to decide on the committee immediately. Considering that HarvestPlus cannot decide on matters concerning the country, AKOSAA and HarvestPlus will prepare a report, with all the proposals, for discussion.
- ✓ It was suggested that CRS be part of the committee, as this entity has experience in working with biofortified crops.
- ✓ The promotion of moringa as a crop is a successful example for introducing or implementing biofortified crops into Haiti.

Final agreements

- ✓ The socialization process must pass through the ministries MARNDR and MSPP, to officially endorse biofortification as a national objective in Haiti. To assist departments in this task, a secretariat will be formed which will include both ministries and various Haitian organizations that already have experience in biofortification. This secretariat will have the support of countries that have already implemented biofortification programs.
- ✓ Joseline Marhone indicates that the MARNDR and MSPP will sign a memorandum expressing support to the Haitian government biofortification program. Of particular importance will well distinguish between genetically modified seeds and bio-fortified seeds. Other public and private institutions will assist the departments in this task.
- ✓ The presentations and discussions made during the workshop will be shared with the participating institutions in order to reach a consensus. An official document expressing support to the Haitian government biofortification activities must also be issued.

Propositions - futures actions

The objective of this first workshop on biofortification in Haiti was to lay the foundation for research and extension work on the production, distribution and consumption of nutritious food based on biofortified crops. All public and private organizations that were expected to contribute to this work have been invited to this initial event. Following the workshop, a first action was taken, which corresponded to official support for biofortification research expressed by the Government of Haiti. The statement forwarded to the Codex Alimentarius Commission read as such:

"I would like to inform you that the Government of Haiti strongly supports further work on the subject of Biofortification. This is an important nutrition intervention in our Country."

Further proposed steps are as such:

- At the Haitian government level, Agreement between the Ministry of Agriculture, Natural Resources and Rural Development and the Ministry of Public Health and Population, in the form of a Memorandum of Understanding stating joint support from the two Ministries in favor of research on biofortified crops and promotion of their consumption.
- Organization of a second, restricted workshop, in during the first quarter of 2015, for the design of a pilot study dealing with the testing and adaptation of biofortified lines of beans, maize, cassava and sweet potato. Participants to the restricted workshop will include those organizations which are in a position to immediately contribute to the pilot study, notably through experience previously gained on biofortification. The will also include key organizations which will be expected to diffuse the results of the research on a national basis.
- Following the pilot study, coordinated involvement of all organizations with an interest on biofortification, so as to better associate production, marketing and consumption of biofortified foods with a strong potential for nutritional health improvement.