

SASHA Phase 1 Final Report: Narrative for 30 June 2014 – 31 July 2015

I. Executive Summary. SASHA Phase 2 (SASHA2) is building on the successes realized during the first phase of the SASHA (SASHA1) project, with a strategic focus on adaptive research to break the remaining bottlenecks to unleashing the potential of sweetpotato to reduce undernutrition and food insecurity. All sub-grant agreements (SGAs) for year 1 were processed. The updated results tracker is provided in Appendix A. The approved expenditures by CIP-HQ (Lima) finance in the BMGF budget format for year 1 of Phase 2 (July 2014–June 2015) are summarized in Appendix B1 and shown in detail in Appendix B2.

RP1. Breeding. The overall breeding objective is to ensure that sweetpotato breeding programs efficiently produce at least 30 superior varieties to serve producer and consumer needs for food and nutrition security, fresh markets, diversified nutrition value chains, and processed products for expanding urban populations. As in SASHA1, population development is conducted at “support platforms” (SSPs) in Uganda, Mozambique, and Ghana, with backstopping from CIP-HQ. Work is done in an integrated and collaborative fashion with 12 national partners to ensure efficiency of breeding efforts. Specific breeding objectives are to (1) continue to improve sweetpotato population development in sub-Saharan Africa (SSA) through the validation of improved breeding methods, linked with participatory varietal selection at national level; (2) breed for key biotic constraints in Africa; (3) breed orange-fleshed sweetpotato (OFSP) populations for drought-prone regions in Africa; and (4) breed quality types of sweetpotato for urban markets.

Breeding activities under SASHA2 are largely a continuation of those from SASHA1. During the reporting period, a full program of breeding research activities was conducted across each of the three SSPs and at CIP-HQ. Key achievements were the following: (1) Activities to estimate yield gains achievable by reciprocal recurrent selection (RRS) in sweetpotato were ahead of schedule at CIP-HQ; (2) Setting up of genetic gain studies and monitoring genetic gains resulted in a change at HQ with old check clones—namely, ‘Jonathan’ and ‘Jewel’ being replaced by ‘Dagga’ (199062.1) and ‘Cemsa’ as standard check clones under evaluation in the population improvement program and the accelerated breeding scheme (ABS); (3) Modified demonstration trials have been introduced at HQ in which newly launched varieties are evaluated together with old variety releases and predominantly grown varieties. These can then serve as a fast-track approach to report on genetic gains; (4) Initial results from trials to validate potential to exploit heterosis under virus pressure in Uganda and drought in Mozambique are available; (5) Production and distribution of seed to partners from adapted populations with key attributes (virus resistance, drought tolerance, and low sweetness) at the SSPs; (6) Identification of nine varieties for release in Mozambique as a continuing output of the accelerated breeding scheme; (7) Expansion of the West African sweetpotato breeding efforts into Northern Ghana; and (8) Strengthening of the African sweetpotato breeding community of practice (CoP) through integrating genomics into the annual “Speedbreeders” meetings in collaboration with the BMGF-funded genomics project.

RP2. Weevil Resistance. The screening and testing of about 100 transgenic events with *cry* genes has resulted in no clear activity against weevils when tested, due most likely to low accumulation of the insect-toxic Cry protein in the storage roots. But three transgenic events appeared to show what could be sub-lethal activity. Over 170 new *cry* gene

transgenic events are in greenhouse for storage root production and will be screened for high Cry protein accumulation and efficacy. RNAi targeting 11 essential genes of both weevils was shown to result in 70% mortality by nano-injection. Ingestion experiments identified three of them as suitable candidates for genetic transformation. The combination of best of both strategies, *Bt* (Cry) and RNAi, represents our best option for controlling this devastating pest of the sweetpotato crop in SSA.

RP3. Seed Systems. Activities under the component to support national agricultural research institutions (NARIs) to test models for the sustainable production of pre-basic seed are underway for the first group of seven countries. SGAs with Burkina Faso, Nigeria, and Zambia were prepared for signature and start up for the beginning of year 2. Activities have focused on construction or rehabilitation of screenhouses, micro-propagation of tissue culture plantlets, hardening, and subsequent multiplication. Linkages to basic seed multipliers are being established. Business plans for public (NaCRRI) and private sector (BioCrops) pre-basic seed production have been prepared for Uganda (Milestone reports OBJ3MS1.5.A & OBJ3MS1.5.B). Trials to validate the Triple S and net tunnel technologies are underway in Ethiopia. Sandponics research is being set up in Kenya and continues in Uganda with a focus on formulating a nutrient regime that would enable optimum vine multiplication rates. Work continues on validating the ClonDiag tube array with good convergence of results with NCM-ELISA, grafting, and PCR for Sweet potato feathery mottle virus (SPFMV), Sweet potato Virus G (SPVG), and sweetpotato Begomoviruses. However, there was low convergence in results for other viruses, implying need to improve the probes for the fourth iteration.

RP4. Postharvest and Nutritional Quality. Natural Resources Institute (NRI) led two feasibility studies (Milestone reports OBJ4MS1.1.A & OBJ4MS1.1.B). The studies investigated existing sweetpotato marketing systems in selected districts in Kenya and Mozambique aligned with ongoing dissemination projects to determine whether investment in fresh root storage made sense, and if so, where facilities should be located. A test (10-ton) curing and storage facility was constructed that is linked to a factory processing OFSP puree in Homa Bay County, Kenya. Studies were designed to investigate improved methods for fresh root transport in Northern Ghana and Kenya, which will be implemented by December 2015. Preliminary results indicate that the “double-S” method (using dry, cool sand) in simple brick boxes for storing roots for home consumption in drought-prone areas shows promise, with additional experimentation continuing in year 2. In collaboration with ILRI-BecA, CIP launched the Food and Nutrition Evaluation Laboratory (FANEL). ILRI-BecA supplied the facilities and most of the equipment; CIP has contributed two staff members and supplies. Beta-carotene analysis using high performance liquid chromatography (HPLC) began on 29 January 2015, and the microbial analytic capacity was in place by July 2015. Data collection was completed on the first 6-month study to develop storable OFSP puree (boiled and mashed sweetpotato) not reliant on cooling facilities; analysis is underway. Preliminary results indicate that appropriate puree preparation, combined with vacuum packing and preservatives, will be a viable option. In June 2015, a second study was initiated that includes using acidified puree in combination with vacuum packing and preservatives.

RP5. Support Platforms, Knowledge Management, and Governance. The second 5-year phase of SASHA2 builds on the SASHA1 experience. The vision remains of building a vibrant

and growing sweetpotato CoP, in which knowledge advances are shared through virtual media and meetings; field visits, trainings, and services for key functions of germplasm exchange; virus diagnostics; and comprehensive training on sweetpotato. The fifth Annual SPHI Technical and Executive Steering Committee meetings under SASHA1 were held on 9–12 September 2014, in Nairobi, Kenya. At the meeting, emphasis was on celebrating the achievements of the first 5-year phase. RP5 was heavily involved in the preparation of 39 briefs (updates and research findings) and the 2014 updated catalogue of 60 OFSP varieties prepared for that meeting. Three new CoP technical groups were created (Seed Systems & Crop Management; Marketing, Processing, and Utilization; Monitoring, Learning, and Evaluation) during the first year of SASHA2 and the scope of the Breeding CoP was extended to include genomics. All CoP technical meetings were held during the first half of 2015. The Sweetpotato Knowledge Portal (SKP) is being revamped, drawing on support from BMGF's Sentinel grant program. The new governance structure for SASHA has been defined and a Project Advisory Committee, comprising seven members, has now been formed as a separate entity from the Steering Committee for the Sweetpotato for Profit and Health Initiative (SSC). The new SSC will have broader organizational representation and is focused on monitoring the progress of delivering improved sweetpotato varieties at scale.