

ANNUAL PROGRESS REPORT

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Project Title: Harnessing Opportunities for Productivity Enhancement (HOPE) of Sorghum and Millets in Sub-Saharan Africa and South Asia

Organization Name: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

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Grant Amount (U.S. dollars): 18 million Project Duration (months): 48

Project End Date: June 2013

Has this project been granted a no-cost extension? No

Geographic Location(s) of project: Mali, Niger, Nigeria, Burkina Faso, Kenya, Uganda, Tanzania, Ethiopia, Eritrea, Southern Sudan, India

Report Prepared by: George E. Okwach Date Submitted: 07/31/2010

List below all Sub-Grantees and/or Subcontractors who received funds in the last project period:

Name	Total Amount \$U.S.	Duration From/to dates	Grant or contract
Asia		1 July 2009 to 30 June 2010	Contract
- CCS Haryana Agricultural University, India	29,021		
- Directorate of Sorghum Research (DSR), India	-		
- Junagadh Agricultural University (JAU), India	17,451		
- Mahatma Phule Krishi Vidyapeeth (MPKV), India	45,850		
- Marathwada Agricultural University (MAU), India	45,850		
- Rajasthan Agricultural University (RAU), India	33,933		
- Sardarkrushinagar Dantiwada Agricultural University, India	16,571		
West and Central Africa		1 July 2009 to 30 June 2010	Contract
- Association d'Eveil au Developpement Durable (AMEDD), Mali	6,125		
- Association des Organisations des Paysans Professionels (AOPP), Mali	3,625		
- Association Minim Song Panga (AMSP), Burkina Faso	9,000		
- Federation des Paysans Semenciers du Burkina Faso (FePaB), Burkina Faso	6,625		
- Fuma Gaskiya (Federation of Farmers), Niger	5,250		
- Institut d'Economie Rurale (IER), Mali	15,750		
- Institut de l'Environnement et des Recherches AGRicoles (INERA), Burkina Faso	25,500		
- Institut National de Recherche Agronomique du Niger (INRAN), Niger	56,684		
- Institute for Agricultural Research (IAR), Nigeria	14,500		
- L'Union Albarka de Bokki, Niamey	1,654		

- Lake Chad Research Institute (LCRI), Nigeria	19,750		
- Union des Groupements des Producteurs pour la Commercialisation Agricole (UGPCA), Burkina Faso	6,000		
- Union FAHAMAYE de Dantchiandou, Niamey	1,654		
- Union Harey-Bane de Tera, Niamey	1,654		
- Union Made-Bane de Falwel, Niamey	1,654		
- Union of Agriculturists of the cercle of Tominian (UACT), Mali	26,705		
Eastern and Southern Africa		1 July 2009 to 30 June 2010	Contract
- Africa Harvest Biotech Foundation International, Inc (AHBFI), Kenya	20,100		
- Department of Research and Development (DRD), Tanzania	54,362		
- Eastern Africa Grain Council (EAGC), Kenya	15,000		
- Egerton University, Kenya	2,500		
- Ethiopian Institute of Agricultural Research (EIAR), Ethiopia (covering also ARARI)	36,250		
- Kenya Agricultural Research Institute (KARI), Kenya	17,500		
- Kenya Seed Company, Kenya	2,900		
- Ministry of Agriculture, Govt. of Southern Sudan (GoSS)	10,000		
- Namburi Seed Company, Tanzania	6,000		
- National Agricultural Advisory Services (NAADS), Uganda	6,050		
- National Agricultural Research Institute (NARI), Eritrea	22,000		
- Ugandan National Agricultural Research Organization (NARO), Uganda	8,525		
- Victoria Seeds, Uganda	8,000		
- Zanobia Seed Company, Tanzania	6,000		
Total	605,993		

Grantee Geography Reporting Request

1. Geographic Location(s) of Work

We will submit separately along with Appendix C. Budget Spreadsheet.

2. Geographic Areas Served

We will submit separately along with Appendix C. Budget Spreadsheet.

NARRATIVE REPORT

Executive Summary

The HOPE project has made good progress during its first year of operation, since commencing in June 2009. Some 177 milestones and outputs of a total of 258 (almost 70%) have been fully achieved as of 30 June 2010 (refer to Appendix B for details). Of the 258 milestones and outputs for the project, 39 may be considered to be major milestones, of which 22 had been fully achieved as of 30 June 2010. The balance of milestones and outputs are currently in various stages of implementation and will be fully achieved by 31 December 2010. Further details may be found in Appendix B.

Major highlights include:

- Targeting- time series data on sorghum, and finger and pearl millet production have been collected in a number of countries in WCA (Burkina Faso, Mali, Niger, Nigeria); ESA (Ethiopia, Tanzania) and SA (India).
- Monitoring and evaluation- A monitoring framework has been developed and selected indicators identified across the three regions.
- Human resource development- at least 5 graduate students (PhD, MSc) have commenced or are about to commence their thesis work on different topics in several countries (Niger, India, Tanzania).
- Capacity building-15 NARS scientists trained in survey methods (WCA-4; ESA-11); NARS scientists trained in statistical methods for trial analysis across WCA and ESA; training in screening for pearl millet downy mildew across all three regions; 3 Indian scientists trained in use of molecular markers for crop improvement; more than 4,000 farmers in WCA (1,400) and ESA (2,650) trained in crop management; and, training workshops on cereal technology options held in WCA (30 participants from Burkina Faso, Mali and Niger) and ESA (41 participants from Tanzania, comprising 13 women and 28 men).
- Sorghum breeding- new sources of resistance or tolerance to key biotic constraints identified: midge resistant lines multiplied and shared across the regions for further trials; 493 farmer-preferred varieties selected for *Striga* in Ethiopia, Eritrea and southern Sudan; MAS for *Striga* being used by NARS in Eritrea, Kenya, Mali and southern Sudan; and, aphid and shoot fly sources screened and multiplied in India.
- Sorghum hybrid development- four hybrids have been registered in Mali and, together with an additional three hybrids, have been multiplied for commercial release; eight hybrids with significantly better yields than currently available check varieties (ranging from 4.4 – 5.9 t/ha) have been identified in India and seed is now being multiplied.

- Sorghum crop management- farmer trials and farmer field schools have been established in WCA (324 farmers); ESA (60 farmers); and SA (200 kg each of four advanced lines has been produced for farmer participatory trials).
- Pearl millet production- on-station trials to evaluate cultivar by soil fertility treatments prepared in WCA (Niger) and response trials for micronutrients planned for India.
- Finger millet production- millet core collection characterised and a sub-set of 144 lines planted in Kenya for field evaluation; genetic resource databases for Ethiopia, Kenya, Tanzania and Uganda acquired and accessions evaluated for different traits, including blast resistance.
- Finger millet trials- Participatory varietal selection trials established in Ethiopia, Kenya, Tanzania and Uganda and NARS scientists and extension staff and farmers trained in the testing and selection of improved varieties.
- Improving markets- Survey instruments for consumer surveys (sorghum, pearl millet) developed; sample locations chosen; and, consumer surveys commenced in Maharashtra.
- Improving markets- linkage with the West Africa Seed Alliance (USAID-funded) established; specifically in the first instance to provide joint training on small-scale business skills.
- Technology adoption- various outreach activities have been undertaken through print (training manuals) and radio media across WCA (Burkina Faso; Mali, Niger); ESA (4 languages); and, SA (India- information flyers).
- Technology adoption- 1,100 kg of certified pearl millet seed was produced in WCA and more than 14,000 small seed packs distributed; in ESA, 1,400 kg of certified sorghum seed was produced and about 14,000 small seed packs distributed; a further 25 t of two new varieties has gone into national performance trials in Tanzania; in India, a total of 40 t of improved sorghum seed has been distributed to 6,000 farmers with an expected planting area of 2,700 ha.

I OBJECTIVES:

(A) Activities Carried Out in the Reporting Period

- 1) **Activity 1.1 - Targeting innovations for up-scaling and for reaching resource poor farmers:** In WCA, data on sorghum and pearl millet grown at the level of “department” were collected by partners in Niger, Mali, Burkina Faso and Nigeria. In Niger, a time series (1995-2008) of production data on sorghum, pearl millet, maize, cowpea, groundnut, sorrel and vouandzou was gathered. In Mali, a time series of data from 1998/99 to 2007/08 was gathered on pearl millet, sorghum, maize, fonio and wheat. Data from Burkina Faso includes a series for cereals from 1999 to 2008. Data on major markets have been gathered in Niger and Mali and are being overlaid. Data on soils are drawn from FAO maps. In ESA, crop maps based on statistics for the target countries were developed. Additional data on agro-climatic conditions and socioeconomic characteristics is being collected to facilitate the collation with crop maps. Target areas within the crop growing regions in Ethiopia and Tanzania and hot-spot testing sites for the project were selected and defined with partners. In SA, state and district level data on area, production and productivity of post-rainy season sorghum and pearl millet were collected up to 2007-08 and time-series data is available from 1970-71 to 2007-2008. GIS maps of area and production of target crops were prepared, and are available.

- 2) **Activity 1.2 - Analysis of investment opportunities for research and development in crop improvement (CI), crop management (CM) and market access (MA):** In WCA, literature on investment options has been assembled in all countries except for Nigeria. In ESA, data on available technologies for sorghum and millet is being assembled in Ethiopia and Tanzania to facilitate the process of determining expected benefits from new technologies in consultation with breeders and agronomists. In SA, data and literature on available technologies for post-rainy season sorghum in the Marathwada region in Maharashtra has been assembled. Impacts of adoption of recommended packages of practices and yields were assessed and a draft report prepared.
- 3) **Activity 1.3 - Conduct of baseline surveys for characterization of farmers, their trait preferences, input output levels and profitability of dry land cereals vis-à-vis competing crops:** In WCA, baseline surveys have been conducted in northern Nigeria. A total of 1,134 households were interviewed. Analysis of data is ongoing. In Niger and Mali, villages have been selected. Village and household questionnaires were developed and shared with NARS economists. In ESA reconnaissance visits were completed to the project areas in Ethiopia and Tanzania. Survey instruments were designed and developed for collection of baseline information from beneficiaries of the target areas and shared with partners in Ethiopia and Tanzania. All key indicators for monitoring impacts of the project were identified and included in the survey. The survey instruments were pre-tested in Ethiopia and then revised. In SA, survey instruments were designed and developed for collection of baseline information from beneficiaries of the target areas and shared with partners. Sample design for a baseline survey was finalized in consultation with partners.
- 4) **Activity 1.4 - Monitoring and evaluation of adoption and impact:** WCA contributed to the ongoing preparation of the gender plan and strategy. Monitoring and evaluation frameworks have been developed. In ESA, project planning meetings for the region and countries were held and, for the latter, in Ethiopia and Tanzania which facilitated the completion of initial interactions with partners and stakeholders. A survey instrument for gathering farmer preference data from Participatory Variety Selection (PVS) was developed and provided to breeders. Training for staff using the survey instrument was conducted in Tanzania. Monitoring and evaluation frameworks have been developed. In SA, monitoring and evaluation frameworks have been developed. Information on a few key indicators was collected from sample beneficiaries. A gender framework is in preparation.
- 5) **Activity 1.5 - Human resource development and policy dialogue to enhance targeting, adoption and impact of sorghum and millet technologies:** In WCA, one student registered at the “Universite Abdou Moumouni de Niamey, Niger” has been identified and will start field work on sorghum and pearl millet marketing. In ESA, training materials on survey design and data collection were prepared, and training participants identified in Tanzania and Ethiopia. Six lead socio-economists from Ethiopia and five from Tanzania were trained in survey design and data collection methods. Two MSc students have been identified in Ethiopia and Tanzania and are developing thesis proposals on sorghum and/or millet adoption and impacts. In SA, training material has been re-designed to meet the objectives of the HOPE project. One Masters student has been identified to work on “Resource use efficiency of post-rainy sorghum” in the Marathwada region of Maharashtra State under Objective 1.
- 6) **Activity 2.1 – Identify new sources of resistance/tolerance to and options for control of key biotic constraints:** The project achieved planned progress in terms of germplasm

assembly and seed multiplication for research on midge (WCA, ESA), aphid (SA) and shoot fly (SA) resistance. In Ethiopia, Eritrea and southern Sudan, a total of 493 farmer varieties have been collected in *Striga* endemic areas. In SA, the techniques to screen sorghum for resistance to sugarcane aphid have been standardized. Seed of midge-resistant cultivars was exchanged with ICRISAT (ESA, SA), and received from CIRAD, France.

- 7) **Activity 2.2 – Identify options for sorghum intensification in target ecologies:** In WCA, new photoperiod sensitive sorghum hybrids were tested in farmers' fields in Mali, under a wide range of growing conditions differing in productivity level, due to a variety of reasons. Unfortunately, very little variability was observed for sowing dates, due to the late onset of rains, and thus late sowing of all trials. In SA, ten post-rainy adapted R lines with varying maturity dates were evaluated at two dates of sowing. In ESA, morpho-agronomic data were collected on monthly sowings of 10 sorghum varieties with varying photoperiod responses and adaptation. All planned activities for seed multiplication were achieved, and mostly surpassed the targets.
- 8) **Activity 2.3 – Identify new and characterize already available hybrid parents for the targeted agro ecologies:** In ESA, the seed of 127 existing seed parents for the dry lowland ecology has been increased, and sent to two dry lowland sites for evaluation. A PhD student has been identified to conduct a diversity study on hybrid parents. In SA, seed of advanced generation potential B-lines (maintainers) was provided to partners in Sholapur for testing, and for creating new test-crosses. The same lines were also evaluated on-station by ICRISAT-Patancheru. Thirty-eight new B-lines, adapted to the post-rainy season environment were evaluated in detail at the ICRISAT-Patancheru station for productivity, charcoal rot and aphid resistance. For all traits, entries superior to the best controls were identified. In addition, 323 advanced potential restorer lines were evaluated. Selections were made based on bold and lustrous grain and grain yield. The same lines were test-crossed. Thus we initiated a hybrid breeding program targeted solely at the post-rainy season sorghum production system.
- 9) **Activity 2.4 – Develop hybrids with improved yielding ability and adaptation trials for specific target regions:** In Mali (WCA), testing of advanced hybrids and hybrid seed production has made more than expected progress. A total of 15 tall and 15 short guinea-type hybrids were tested across 10 sites. In addition, sets of 10 hybrids were tested by a large number of farmers. Hybrid seed production was successful and every farmer produced certified seed. Seed was thus available for large scale testing and demonstration in the season that is just starting. In SA, a total of 484 new hybrids were created using known A-lines adapted to post-rainy season conditions, and known R-lines from national partners. Hybrid testing during the *rabi* season in southern India included a multi-location trial with 28 post-rainy season hybrids along with three checks conducted at Sholapur and at ICRISAT-Patancheru for grain yield and charcoal rot resistance. Eight hybrids with a grain yield ranging from 4.4 to 5.9 t ha⁻¹ were significantly superior to the popular check. The seed of superior hybrids was multiplied. In ESA, a total of 390 test-crosses were made for the dry lowland and the sub-humid sorghum ecologies, far exceeding the planned numbers using a wide range of A-lines including sweet sorghum A/B lines. About 50% of the hybrids had 100% fertility restoration.
- 10) **Activity 2.5 – Develop open-pollinated varieties with improved yielding ability and resistance to the predominant biotic and abiotic stresses in target ecologies:** In WCA, recurrent selection and the breeding of new open pollinated varieties advanced as planned in Mali, with all the milestones being achieved. We have conducted a multi-location

evaluation of 1,100 S1 progenies, on-station and on-farm, in several replications. We selected 150 short and tall lines, for both the northern and southern Sudanian zones. In Burkina Faso these activities are being implemented in the 2010 season. In SA, a total of 140 post-rainy season sorghum varieties were evaluated at the ICRISAT-Patancheru station and compared to two check varieties. In Mali and in ESA (Kenya, Sudan and Eritrea), the team has advanced the seed multiplication of backcross lines with a varying number of *Striga* resistance QTLs into local varieties from all countries. Backcross lines for the introgression of stay-green QTLs have been advanced, and tested for the presence and absence of specific QTLs. Seed has been multiplied for detailed multi-location evaluations in Ethiopia, Sudan and Mali for studying the effects of the transferred QTLs. For the sub-humid zone of ESA, newly obtained midge resistant lines have been evaluated in the sub-humid zone for grain yield ability, as well as stem borer and foliar disease resistance. Sites at Torit in eastern equatorial and Juba in central equatorial, southern Sudan have been identified for experiments in 2010.

- 11) **Activity 2.6 – Develop crop management options for key production constraints in target sorghum production ecologies:** In WCA, new cluster-based farmer field schools (CBFFS) were initiated in 2 communities in the Mopti region of Mali during the 2009 cropping season, For integrated *Striga* management, farmers focused on pearl millet, rather than sorghum, as *Striga* is primarily a constraint for pearl millet production. Village level diagnostic interviews were performed in 6 new sites and over 20 villages in southern Mali in the main sorghum production ecologies. A database was created with the characterization data. Thirty farmer trainers and 8 field agents from above mentioned sites were trained and preparations completed for installation during the 2010 season. In Mali, specific discussions with women's groups have been held to identify crop management options for testing in their fields. Specific varieties for testing have been chosen for each target ecology, with women and men farmers separately, targeting the key production constraints identified by them. For the 2010 season, a total of 344 such mini-experiments combining 2-4 new varieties and hybrids with one combination of agronomy treatments have been distributed through the collaboration with various partners. In ESA, a desk study to define specific agronomy treatments for on-farm experimentation has been completed. A protocol for testing these treatments for the dry lowland production system in Ethiopia has been finalized, and farmers have been chosen at the Mieso and Kobo communes. In SA, trials on sowing dates of post-rainy season sorghum intercropped with safflower and deep sowing with deep placement of fertilizer were conducted on-station, in the target region by project partners.

- 12) **Activity 2.7 – Farmer participatory multi-environment testing of newly developed sorghum varieties and hybrids with crop management options in target ecologies:** In all three regions of the project, and in most target ecologies, collaboration with extension services, NGOs, farmer organizations and seed companies have been established for the large scale organization of farmer managed trials with the aim to identify new varieties for release and dissemination. Each region has adapted the trial protocols to the region's specific needs, and has in most cases added a crop management component, or options for farmers to choose from. Thus the trials have now been planned and distributed for all the regions. In WCA, 15 new hybrids were included in the multi-location yield evaluations for the Sudanian zone of Mali in 2009. These were evaluated in seven villages, with 4 replications per villages, and at 2 research station sites, including artificial *Striga* infestation. The highest yield entries were all hybrids. In the post-rainy season ecology of SA the first results are available, and have attracted the attention of the seed industry. 200 kg of seed of each of four new/advanced lines were produced for farmer participatory

trials. At MAU and MPKV, new varieties were identified for farmer's participatory varietal trial for the 2010-11 season and 15 kg seed of each variety has been produced. In ESA existing Farmer Field Schools were identified for the work in Tanzania; 15 farmers in each of the 4 districts in Tanzania, have evaluated two varieties chosen from a set of 4 under improved agronomy treatments, i.e., no fertilizer and 17 kg N/ha. In Ethiopia and Eritrea, trials have been planned and distributed for the 2010 growing season.

- 13) **Activity 2.8 – Enhancing research and leadership skills of sorghum scientists:** In WCA and ESA, the ICRISAT biometrician conducted a training course on analysis of multi-location variety trials, using the Genstat software focusing on multi-variate statistical tools, such as GGE and AMMI biplots, as well as graphical tools. From all African partner countries, sorghum scientists participated in the course. Several have started using these tools for trials they had conducted earlier. In all regions, specific training workshops and sessions to adapt and apply protocols for conducting farmer managed variety by agronomic treatment trials were held with all partners in each region. In WCA, this included also Objective 6 partners. Thus, the variety evaluations are oriented towards dissemination approaches used by some of the partners. Graduate students have been identified in ESA (2 PhD students). In WCA, 1 PhD student is finalizing his studies, while 2 MSc students have been recently accepted to conduct their thesis research on topics important under Objective 2. Recruiting of additional students is on-going. In WCA, students are preparing for their degree as “agricultural engineer (ingenieur agronome)” (1 in breeding, 1 in *Striga* management) and technicians (2 in sorghum breeding, one female), as well as young graduates who have finished their degree training, but expressed interest in specific aspects of technical training have been accepted into the program (3 in breeding, one female).
14. **Activity 3.1 - Identify new sources of resistance to key biotic constraints, validate these resistance sources, determine resistance inheritance and where necessary identify markers as a selection aid:** During the off-season 2009/10, 139 lines of the wild × cultivated pearl millet *Striga* resistance mapping population was advanced to F4 at ICRISAT-Niger. The full population (total 324 lines) was supposed to be advanced by Dr. Jeff Wilson in Georgia, USA, but seed is not yet available. A rainy season 2010 pot trial is being designed and part of the mapping population will also be tested under field conditions. A PhD student from Niger is involved in this work, to be supervised by C.T. Hash and B.I.G. Haussmann. In the 2009 rainy season, samples of downy mildew populations were collected from pearl millet hybrids growing in farmers' fields in the Indian states of Haryana, Rajasthan and Gujarat, and representative isolates were established under greenhouse conditions at ICRISAT-India during the first half of 2010. During the coming year, the virulence of these pathogen isolates will be compared with available differential isolates, and sources of resistance effective against newly arisen virulence combinations will be identified.
15. **Activity 3.2 - Identify integrated control options for pearl millet insect pests:** During the 2009 rainy season a trial was conducted to assess the impact of four different pearl millet crop residue management treatments on incidence of insect pests. A preliminary survey was conducted during millet harvest at the INRAN research stations of Konni and Kollo, in WCA, to identify a second site for millet residue management studies. Some 0.4 ha has been reserved for an entomology trial to be conducted in 2010.

- 16. Activity 3.3 - Identify options for pearl millet intensification in target ecologies for effective implementation of IGCRM:** In WCA, seed was produced and a protocol developed to test 16 soil fertility management options (combinations of organic manure with inorganic fertilizers) with 10 different pearl millet cultivars on-station at ICRISAT-Sadore, INRAN-Kollo and INRAN-Maradi. These trials will be complemented by on-farm demonstrations (covering only part of the treatment combinations) at several project sites in Niger. In SA, a recently concluded multi-year study of response to ZnSO₄ micronutrient fertilization have been summarized and best-bet treatments selected (along with three locally-adapted hybrids for each targeted state) for on-station micronutrient response trials to be conducted during rainy season 2010.
- 17. Activity 3.4 - Strengthen national program capabilities for screening for resistance to key biotic constraints:** The ICRISAT-Niger research assistant, H. Dodo, received 4 weeks training at ICRISAT-India in the use of potted seedling screens for downy mildew resistance assessment in February 2010. Establishment of improved downy mildew screening facilities at ICRISAT-Niger was initiated, using available greenhouses. The pearl millet breeder from IER-Mali, M.D. Sanogo, present at ICRISAT-India as part of another research collaboration, also joined in this training program, along with four participants from the Indian national program: one representative from each of the states of Gujarat, Haryana, and Rajasthan, and one from the national program coordinating unit. Air conditioners were purchased for incubation rooms being established with pearl millet breeding programs in each participating Indian state.
- 18. Activity 3.5 - Identify and/or develop pearl millet breeding lines and hybrid parents for target ecologies:** At ICRISAT-India, seed of 225 and 216 pearl millet breeding lines was produced, and distributed to HOPE project partners for multi-location evaluation in the target environments of Gujarat, Haryana and Rajasthan in the 2009 (Y1) and 2010 (Y2) rainy seasons. Based on the 2009 rainy season evaluations, 32 of 144 early-flowering B-lines were selected, along with 18 progenies from the ICRISAT-CAZRI B-Composite, for conversion to cytoplasmic-male sterile A-lines, and crosses to initiate conversion of the latter 18 inbreds were made during the 2010 dry season. In addition, 9 of 60 early R-lines, 3 of 40 high-tillering R-lines, and 4 of 41 stay-green R-lines were selected for advance. These were included among the total of 29 R-lines involved R×R crosses during the 2010 dry season to generate new breeding material. Similarly, seed of 74 and 75 potential hybrid parents was produced at ICRISAT-India and distributed to project partners for evaluation during the rainy seasons of 2009 and 2010, respectively. During the 2009 rainy season, 74 potential B- and R-lines were visually evaluated for flowering time and agronomic score on-station at 4 sites distributed across the target region. Parental lines involved in development of testcross hybrids (240 R-lines and 15 B-lines) were screened under greenhouse conditions at ICRISAT-India against downy mildew (DM) isolates (one each from Jodhpur, Jamnagar and Bhiwani) representative of the most virulent identified to date from project target states of Gujarat, Haryana and Rajasthan. Integrated marker-assisted and conventional backcrossing to improve DM resistance of elite pollinator lines J 2340 (male parent of early-maturing released hybrid GHB 538) and ICMR 01004 (male parent of early-maturing released hybrid HHB 67 Improved) using a total of 6 previously mapped DM resistance sources was advanced two generations during Y1. Selected J 2340-derived BC3F3 progenies (30) and their recurrent parent were selfed and testcrossed to male-sterile line ICMA 95444 during the 2010 dry season to produce replicated nursery sets of both J 2340-like inbreds and GHB 538-like hybrids, which were distributed for evaluation in Rajasthan and Gujarat during the 2010

rainy season. Pyramiding of resistances in J 2340 background will be initiated in Y2 while confirmation of resistance and agronomic performance are on-going.

19. **Activity 3.6 - Develop pearl millet hybrids with improved yielding ability and the necessary adaptation and market-required traits for specific target regions:** At ICRISAT-India, seed was produced and distributed for 188 testcross hybrids for evaluation in the 2009 rainy season, and seed of >300 new testcross hybrids was produced with 236 distributed for evaluation in the 2010 rainy season. During the 2009 rainy season, a total of 188 new testcross hybrids were evaluated, along with standard checks, in three different testcross trials conducted at target locations (10 trial × site combinations) in northwestern India. Forty-seven hybrids were identified for further evaluation based on their superior agronomic scores and flowering times compared to standard checks. During the 2009-10 dry season, seed production of 40 of these 47 selected testcross hybrids was successful, so a trial of these 40 hybrids, and standard checks, was sent for evaluation at 3 locations (Hisar, Durgapura and Jamnagar) during the 2010 rainy season.
20. **Activity 3.7 - Create diversified populations, perform recurrent population improvement for priority traits, and generate new pearl millet OPVs adapted to specific target environments:** Targeting development of new diversified breeding populations, ICRISAT-Niger created full-sib (FS) families in eight types of material. These populations were then shared with HOPE project partners for 2010 rainy season evaluation. Building on results from previous projects, FS families were produced at ICRISAT-Niger and distributed for a final cycle of FS selection towards creating new experimental open-pollinated varieties based on seven populations. Activity 3.7 is expected to lead to the development of eight new breeding populations and nine new open-pollinated cultivars for the WCA region within the frame of the first phase of the HOPE project.
21. **Activity 3.8 - Evaluate the potential of newly developed pearl millet varieties and hybrids, and crop management practices, using large-scale, gender-specific, farmer-participatory multi-location testing approach:** In WCA, the IGNRM trials foreseen under this activity have been combined with agronomy trials from activity 3.3 in Niger (both on-station and on-farm trials involving 10 cultivars and 16 fertilization treatments). In the Mopti region of Mali, over 30 trials with 5 pearl millet varieties and two management options have been prepared for installation during the rainy season 2010. A training course for conducting FFSs was given in Niger in April 2010 (25 participants). Diagnostic interviews were then performed and FFSs are being installed at 7 sites in Niger (16 villages, about 400 participants). Topics treated in these FFSs are integrated *Striga*, soil fertility and head miner management, as well as variety demonstrations plots. Two field agents were trained in the implementation and facilitation of cluster-based farmer field schools (CBFFS) in May 2010 for 3 days. A one-day training course on CBFFS methodology was given in Mali in May 2010 (60 participants). Diagnostic interviews were performed for 2 new sites (13 villages) and FFSs are being installed in 13 villages and are being continued from last year in 2 sites (8 villages, about 575 participants). Topics treated in these FFS are integrated *Striga* and soil fertility management (micro-dosing, composting etc.), as well as variety demonstrations plots. In SA, 16 pipeline hybrids were identified by project partners (SK Rajasthan Agricultural University, Durgapura, Rajasthan; CCS Haryana Agricultural University, Hisar, Haryana; and Junagadh Agricultural University, Jamnagar, Gujarat) and their seed produced for participatory trials. Five researcher-managed participatory on-farm trials comprised of 19

pipeline hybrids (16 from project partners and 3 from private seed companies) were distributed in each village cluster and included in Objective 6 farmer-participatory technology demonstration/evaluation activities (5 trials \times 2 clusters/state \times 3 states = 30 trials) along with respective standard checks (HHB 67 Improved, HHB 197, HHB 117, RHB 121, GHB 538, GHB 744) for evaluation in rainy season 2010. The three private sector pipeline hybrids (1 from Bayer BioScience Pvt. Ltd, India and 2 from Bioseed Research India Private Ltd.) were included in order to better to assess their performance in drought-prone environments.

22. **Activity 3.9 - Strengthen research-for-development capacity:** Training courses were conducted in WCA on the following topics during Y1:

- Participatory research and PVE
- Statistical analysis of genotype \times environment interaction
- Field agents (15) and lead farmers (70) trained in CBFSS system implementation and integrated *Striga*, soil fertility and millet head miner management in Niger and Mali.

Similarly, Y1 training courses were conducted at ICRISAT-India on the following topics:

- Three Indian pearl millet national program scientists participated in a 3-week training course (Nov-Dec 2009) on application of molecular marker-based tools for crop improvement, with two these (one man and one woman) supported by the HOPE project.
- One ICRISAT-Niger research assistant received 4 weeks training (Feb 2010) in screening of potted pearl millet seedlings against downy mildew, and was joined for two weeks by 4 national program scientists from India (all supported by the HOPE project) and the IER-Mali pearl millet breeder whose visit to ICRISAT-India coincided with this course.

Further, a junior breeder (Kassari Ango Issoufou) is involved in HOPE project activities at INRAN-Maradi in Niger.

23) **Activity 4.1 - Assemble finger millet genetic resources and use it to identify new sources of resistance to key biotic stresses:** The millet core collection was characterized and a subset of 144 lines that expressed variability in morphological traits and blast reaction was composed and planted at Alupe, Kenya. Agronomic traits, days to flowering, days to heading, plant height, number of tillers, panicle size and shape and reaction to different biotic stresses data were taken. The trials have been harvested and are being processed for post harvest data. ICRISAT in collaboration with Tanzanian and Ugandan NARs conducted collection missions in June-July 2010 to fill gaps. In Tanzania collection targeted the southern part of the country: Sumbawanga, Nkasi and Mbozi districts); a major millet growing area, but where little is known of its production. Ugandan collection targeted all major growing areas (Soroti, Kumi, Serere, Apac, Lira, Hoima and Masindi districts). A total of 37 and 92 samples were collected from Tanzania and Uganda, respectively; they are yet to be tested for duplicates.

24) **Activity 4.2: Identify sources of resistance to the key abiotic stresses, adaptation and quality traits:** No work was done in Activity 4.2 in year 1. Milestones are due from Year 2.

25) **Activity 4.3 - Develop breeding and mapping populations for improving finger millet resistance to blast, drought and adaptation to different agro-ecologies:** Varieties with contrasting morpho-agronomic traits (plant height, head compactness, seed color, plant color, days to maturity) were identified and 11 cross combinations

were made using two emasculation techniques. The objective being to identify an efficient finger millet emasculation procedure. F₁ populations have been planted at Kiboko, Kenya and F₁s will be determined using morpho-agronomic marker traits and efficiency and ease in F₁ production determined. Contrasting varieties for blast resistance were crossed to initiate blast mapping populations at Kiboko. Twelve combinations and 69,258 seeds were produced. The parents are being genotyped to establish those contrasting genotypically, for their F₁s to be used in marker assisted selection (MAS).

- 26) **Activity 4.4. Identify and develop varieties with improved yielding ability, resistant to key biotic and abiotic stresses for the targeted agro ecologies and end uses:** Participatory Varietal Selection (PVS) trials were established in different countries using released or about to be released varieties. The trials are in different stages depending on when the season set. In Tanzania the trials were established in February and March, with a total of 57 farmers. Most trials did not do well because seed was sent late; however improved varieties did relatively better than the locals. The trials in Uganda and Kenya are doing well; a total of 24 and 11 farmers respectively established PVS trials. PVS in Ethiopia have just been established and an update is yet to be provided. Farmer field days were then held in Tanzania and Kenya to help farmers appreciate the new varieties. Farmers were grouped based on their district of origin and requested to select varieties, and give reasons for their selections. Earliness, grain color, grain size and taste featured in all groups. More than 100 farmers participated per country. The field days are to be done in Uganda this month and later in Ethiopia. A workshop on PVS and participatory technology delivery mechanism was held in Tanzania in May 2010 as a training of trainees' course. Training focused on the use of participatory methods to identify key crop traits in the selection of varieties, collect data and use of PVS protocols, identify and initiate information and seed dissemination mechanisms for selected varieties and identify and prioritize production. Participants were requested to describe desirable traits and to give the most favorable varieties in their districts. At the end of the course participants were taken to a PVS plot for participatory selection. Key traits participants considered when selecting were earliness, drought tolerance, panicle (head) size, seed size, seed color, taste and market value. The training is to be extended to Kenya, Uganda and Ethiopia.
- 27) **Activity 4.5. Determine adaptability and yield stability of improved varieties for the targeted agro-ecologies and end use:** Testing sites in Ethiopia, Uganda, Kenya and Tanzania, have been identified and their biophysical characteristics are being gathered for collation. However, a number of sites are missing information and some of it needs to be collected; this is ongoing. NARS breeders have been requested to supply their best performing varieties for regional evaluation in MET trials. Kenya has already sent its materials and arrangements for shipment have been finalized for Uganda and Ethiopia and import permits have been dispatched.
- 28) **Activity 4.6. Develop and assess crop management options for key constraints in the targeted finger millet production ecologies to enhance productivity:** Information on the type of weeds in the region, the type of control practices (weeding, herbicide use, cultural practices) has been gathered. Fertilizer application combined with use of trap crops and herbicide application has been identified as the most practical weed control strategy. Trials have been established in Ethiopia and are to be established in Uganda, Tanzania and Kenya the following season. Drafts of

experimental protocols to be used to assess the main and interactive effects of tolerant/resistant varieties on the incidence and severity of *Striga* damage have been developed and are being circulated among partners.

- 29) **Activity 4.7. Participatory validation of integrated improved varieties with crop and fertility management options to enhance productivity:** A protocol for evaluation of the four varieties across the countries is being developed. The trials are to be conducted the following season.
- 30) **Activity 4.8. Capacity building, knowledge and information sharing for pursuance of finger millet crop improvement and management:** Fifteen scientists from ICRISAT and NARS (Uganda, Kenya, Tanzania and Ethiopia), implementing HOPE project had one week training in Multi-locational Experimental Trial (MET) data analysis.
- 31) **Activity 5.1 - Map marketing channels and measure transaction costs for selected value chains (food, feed, fodder) including competing crops (maize):** In WCA, markets to be surveyed were identified in collaboration with the “Observatoire des Marchés Agricoles” (OMA) du Mali, the “Système d’Information sur les Marchés Agricoles” (SIMA) of Niger and NARS economists. Contacts were initiated with NAERLS in Nigeria and market information systems in Burkina Faso for the same purpose. Participatory market chain analysis methodology has been developed and is being discussed with NARS economists and relevant stakeholders. Value chain actors, stakeholders in the institutions and policy environment and providers of business services are being identified in Niger and Mali in order to map the markets. Following market mapping, channels will be identified and transaction costs analysis performed. In ESA, objectives and methodology were drafted and discussed with partners in Tanzania and Ethiopia and the East African Grain Council (EAGC). In SA, survey instruments were developed to elicit information from traders, commission agents, processors and retailers of post-rainy season sorghum and pearl millet and distributed to partners to conduct market surveys. Household surveys (farmers growing post-rainy season sorghum in 2009-2010) were conducted to obtain data on marketing costs and the marketed surplus. Reconnaissance surveys were carried out to identify grain and fodder markets and information on prevailing marketing costs like commission charges, market fees, transport and labor charges etc. Time series data (1989-90 to 2008-09) on supply and prices of post-rainy season sorghum in major market of Maharashtra were collected and analyzed.
- 32) **Activity 5.2 - Establish existing seasonal demand, quality characteristics, prices and relative competitiveness of sorghum and millets in alternative uses (food, feed, fodder):** In WCA, a review of literature was carried out on sorghum and pearl millet utilization in the poultry sector and processing industries in Niger and Mali. Standardized survey instruments have been developed, although this has not yet been shared with partners. Meetings were held with the Food Technology Laboratory (LTA) of the IER in Mali and the Food Technology Laboratory of Niger (LTA) to develop a roster of sorghum and/or millet small-scale processors. In addition, using key informants, a list of poultry farms has been developed especially in peri-urban Niamey and Bamako. A sub-set of these stakeholders will be interviewed. Then the potential demand for sorghum and/or pearl millet for food and feed in those countries will be assessed. In ESA, this activity has not yet started. In SA, sorghum and pearl

millet consumption demand, seed demand, export demand and demand for alternative uses was estimated at all India level using data from National Survey Sample Organization (NSSO), Government of India.

- 33) **Activity 5.3 - Identify consumer preferences, perceptions and price - and non-price factors that determine the demand for sorghum and millet in human diets:** In WCA, consultations with the National Directorate of Statistics of Mali and Niger have been established. Discussions were held on the sampling scheme used by these institutions to conduct the consumption-expenditure surveys and the possibility to use their data because they were collected quite recently and are large representative samples. In Niger, data were collected in 2007 and in Mali in 2005. The sample scheme is based on income groups even in the urban areas and rural versus urban groups. Standard questionnaires have been developed and shared with experts in those institutions. In ESA, this activity will follow the expanded VCA completed by partners, (Activity 5.1). In SA, Survey instruments were developed and made available for conducting consumer surveys. Sample design and sample locations were finalized for consumer surveys in consultation with partners. The consumer surveys and additional reconnaissance surveys (meeting traders, processors and hotels for consumption demand) in target areas are in progress to estimate potential demand.
- 34) **Activity 5.4 - Evaluate and identify effective grain and fodder marketing strategies for reducing transaction costs and develop strategies for introducing grades and standards:** In WCA, five Producer Marketing Groups (PMG) have been identified by AOPP in Mali and five other PMGs have been chosen by Mooriben in Niger. Linkage with WASA is being established to train the management committees of the associations in small-scale business skills. In ESA, according to the proposal, this activity is scheduled for September 2010. In SA, market surveys have been initiated to evaluate marketing and transaction costs.
- 35) **Activity 5.5 - Develop appropriate models for farmer-market linkages using alternative formal and informal arrangements with buyers to improve market access:** In WCA, in the project sites in Mali and Niger, rural radio stations have been identified. Meetings have been held with the Head of Market Information Systems in the 2 countries for the best way to supply information to rural radios. One of the outcomes of the meetings was that market information is already supplied to farmers on a weekly basis. Discussions are initiated with the heads of MIS to look for possibility to increase the frequency of information supplied. In ESA, according to the proposal, activity will start in January 2011. In SA, farmers associations are being established under Objective 6 and models of bringing bulk buyers and farmer association under one platform are being explored based on information available from expert's opinion and literature. Existing channels of market information dissemination on post-rainy season sorghum are documented.
- 36) **Activity 5.6 - Determine opportunities for small-to-medium scale agro-enterprise development, local processing and value addition to stimulate markets and expand consumption demand:** Activity 5.6 commences in Y2 in WCA and ESA. In SA, some low-cost equipment for grain cleaning and sorting and low-cost fodder chopping equipment was identified for post-rainy season sorghum processing.

- 37) **Activity 5.7 - Strengthen local capacity for value chain and policy analysis and market projection:** In WCA, training modules have been drafted and will be finalized in September 2010 and training will take place in November 2010. One student from the Universite Abdou Moumouni of Niamey has been identified in Niger to do his thesis on “Competitiveness between sorghum and pearl millet relative to other cereals in Niamey, Niger”. The student in Mali is yet to be identified. In ESA, two qualified graduate students have been identified for an MSc program in Tanzania, starting in the new semester (September 2010). In Ethiopia, the selection process is ongoing and one graduate student will be selected for the start of the new semester (September 2010). In SA, One MSc student has been identified to work on fodder marketing of post-rainy season sorghum in Maharashtra and one PhD student on consumption and marketing of pearl millet in Rajasthan.
- 38) **Activity 6.1 - Increase farmers’ access and use of know how about the use and benefits of profitable crop management technologies and improved cultivars:** In WCA, the first draft of a training manual on integrated *Striga* management for pearl millet based systems in the Sahelian zone of Mali and Niger was completed, reviewed and awaits publication. Fourteen rural radio stations in 7 regions (4 regions of Mali namely Koutiala, Tominian, Dioila and Mandé; Sanmatenga province in Burkina Faso and Boucle du Mouhoun (Toma et Gassan, and Center-Nord in Niger) have been broadcasting 73 programs (days) on *Striga*, seed and variety issues in 5 different languages. In ESA, English versions of training manuals on integrated *Striga* management and micro-dosing for sorghum; integrated blast and weed management and micro-dosing for finger millet have been drafted, reviewed and are awaiting translation into 4 main languages (Oromiya, Amharic, Tigrinya and Swahili) by September 2010. Extracts from the training manuals in WCA and ESA have been used in training programs about managing *Striga* and other biotic stresses and the gained knowledge created demand for seed of improved pearl millet varieties in WCA. In SA, for sorghum, identification of primary and secondary diffusion villages in each of the three clusters in two targeted regions (Marathwada and Western Maharashtra) was completed. Outreach strategies were developed to encourage participation in project activities and also to inform farmers of the importance of post-rainy season sorghum, awareness about improved varieties, profitable crop management technologies and market opportunities as well as methods to increase productivity and profitability. Flyers on sorghum crop management and cultivation technology have been developed for each released variety. For pearl millet, 6 clusters were surveyed in Rajasthan state and Gujarat and 7 clusters for Haryana state and for each state two village clusters were identified for project activities. A total of 71 villages were identified as secondary diffusion areas for the three states and in collaboration with state Agricultural Universities, meetings have been conducted and flyers developed in local languages.
- 39) **Activity 6.2 - Increase availability and use of quality seeds of improved varieties:** In WCA, 1.1 tons of 15 pearl millet experimental varieties were produced and more than 12,000 mini-packs (100-200g each) were distributed through farmer/partners’ organization in Niger, while 403 mini packs of 3 varieties were distributed in Mali, 95 mini packs of one variety in Nigeria, and 1750 mini-packs of 2 varieties in Burkina Faso. For sorghum, 1.4 tons of certified seed of 28 varieties was produced, and 4,000 mini-packs were distributed. In Mali, certified seed of 15 varieties and hybrids was provided and 2,181 mini-packs were distributed. In Nigeria, 3,980 mini-packs and 44 large packs (weighing 500g each) were distributed, while in Burkina Faso 3,830

sorghum mini-packs were distributed. About 30 tons of pearl millet seed was marketed by a farmer organization in Niger, and 2.5 tons of 7 sorghum varieties were commercialized. An existing training manual on seed production for pearl millet OPV's in the Sahelian zone and one for sorghum for Mali were adapted and reviewed by seed experts. A total of 62 persons (42 farmers including 10 women and 20 extension officers) from 4 different farmer organizations have been trained using the prepared manual. In Burkina Faso, 72 pilot farmers of three farmer unions were trained as trainers by INERA and a farmer organization in cultural aspects of sorghum and millet cultivation and experimentation. To ensure availability of seed for the 2010 planting season, more than 100 kg of sorghum breeder seed of 50 experimental and improved sorghum varieties is available at ICRISAT and IER and about 1 ton of breeder seed of 14 pearl millet varieties is available at ICRISAT Niger and INRAN. About 1.4 tons of foundation seed for 15 sorghum varieties and more than 1.6 tons of 11 pearl millet seed has been produced during the 2009 and 2010 season and off-season by ICRISAT and NARS.

In ESA, the certification standards have been compiled together with regionally agreed standards for Eritrea, Ethiopia, Tanzania and Kenya. The harmonized seed policies for SADC were endorsed and the process of domestication of harmonized policies has been initiated in 4 countries. More than 25 kg of breeder seed of each of the 12 improved finger millet varieties (P224, Tadessa, Boneya, Okhale1, GuluE, Padet, U15, Seremi 1,2,3 and Pese1) has been multiplied and is available for further multiplication. The total seed production for the 6 improved finger millet varieties is 2,230 kg. More than 2,000 kg of U15, KNE1034 and P225 will be harvested by the end of July 2010 and packaged into 500g packs for the 2010 October/November season. In Ethiopia, 0.5 ha each of Padet, Tadessa and Boneya has been planted as a source for foundation seed. A total of 23,000 kg of Macia seed produced by Namburi Agricultural Co Ltd in Tanzania and 2,000 kg of KARI Mtama 1 - a multipurpose variety is already in the National Performance Trial (NPT).

In SA, the MPKV identified 7 open pollinated varieties of sorghum which are suitable for the target areas i.e. Phule Vasudha, Phule Chitra, Phule Anuradha, RSV 1006 (Phule Revati) and the MAU identified varieties are Parbhani Moti, Parbhani Jyoti, Phule Vasudha, Phule Chitra and Akola Kranti. More than 200 kg of breeder/foundation seed of the identified OPVs were produced to meet the requirements for the coming season. A site has been identified at Mehboob baugh farm, in MAU Parbhani for construction of a seed warehouse. Developing training material (one flyer each) in the Marathi language on purity maintenance in post-rainy season sorghum seed production, seed storage and seed has been completed in MAU and is in progress in MPKV. Large scale commercial seed multiplication of the sorghum crop was done at Central Campus of MPKV, Rahuri (BSP Farm) and at the central farm (MAU), Research stations (Badnapur, Parbhani), KVK (Ambejogai/Jalna). Previously multiplied sorghum seed at Central Farm of MPKV, Rahuri was distributed to cover 1,500 ha (3,000 farmers) area in the selected cluster villages and at MAU procured seed was distributed to >3,000 farmers each with 0.4 ha area. A total of 40 tons of seed was multiplied and distributed in the project villages. Seed of parental lines of 7 pearl millet hybrids identified for adoption trials in 2010 was produced and supplied to APSSDC (Andhra Pradesh State Seed Development Corporation) for hybrid seed production. Based on the performance of promoted hybrids in different states, respective State Seed Corporations and private-sector seed companies will be approached to produce and market seed of identified

farmer preferred hybrids. Seed of promoted hybrids was purchased from APSSDC and delivered to target clusters in Rajasthan, Gujarat and Haryana. Fertilizer (DAP) was procured and test-kits (seed for 0.4 ha plot + 25 kg DAP) were developed with the help of farmer organizations and distributed. In 2010, about 4,000 households were covered across the three states. The test-kits were distributed free to farmers, thus no revolving fund could be generated in 2010.

40) Activity 6.3 - Increase availability and use of fertilizer and other crop management technologies: In WCA, one key participant of the micro-dosing project in Mali was trained in on-farm experimentation and seed diffusion. A series of 12 demonstrations with 8 varieties and 3 crop improvement options were sown in June in Niger and partners will participate in evaluation visits. In addition, 22 farmer facilitators from 3 states identified in Nigeria and 12 TOTs and 52 FFS are being established. In ESA, two farmer organizations, with a total of 801 women and 1,849 men, have been identified in Kondoia and Dodoma districts of Tanzania. These farmers will be linked to identified agro-dealers who will be marketing subsidized fertilizer. In Kenya, farmer organizations based in the western province districts of Siaya, Teso and Busia and working on finger millet were identified and are already linked through the McKnight Foundation. In SA, for sorghum, the MPKV identified soil testing facilities and 100 soil samples from each region encompassing all clusters were collected and analysis reports disseminated for the first year to all farmers related to this project. Linking farmer associations with input suppliers (fertilizer and pesticides) is on-going under MPKV, in the Rahuri region. The best management practices (fertilizer, spacing, insects and drought management) for the target regions for increasing the grain and fodder yield of sorghum were identified. On-station evaluations and Front Line Demonstrations (FLD) were conducted at MPKV (38) and MAU (35). For pearl millet, soil testing facilities were identified in all three states, but soil sampling and other related activities couldn't be accomplished due to a delay in signing of the MOU with the partner institutes. Crop management practices were identified and 30 demonstration trials have been planned for each state.

41) Activity 6.4 - Improve access to output markets to increase technology adoption and cash incomes for farmers: In WCA, several meetings with P4P were conducted which resulted in a contract between P4P and the ULPC farmers' organization which sold 150 tons of sorghum and millet grain to P4P in 2010. The P4P program also indicated interest in working in Fana/Beleko, where seed was produced with ICRISAT/IER and the ULPC in 2009. Milestones were achieved for one FO and partially for the second. In ESA, a meeting with Unga Mills in Kenya indicated that the company is able to purchase 600 Mt of finger millet monthly. Unga also provided specifications of the grain quality characteristics preferred by consumers. One finger millet buyer has been identified in Singida districts and there are on-going efforts to identify buyers to be linked with farmer organizations. A supplier of post-harvest equipment was identified and three sets of equipment (each for Ethiopia, Uganda and Tanzania) consisting of a thresher and a dehuller have been purchased and plans for testing and delivery to the target areas are under way. In SA, identification of retail market chains and grain wholesalers in the target areas is in progress. Weekly market, village level shop keeper, APMC's, Co-operative societies and wholesalers have been identified.

- 42) **Activity 6.5 - Improve farmers' access to finance to increase adoption of purchased inputs, production of seed, and surplus grain for marketing:** There were no activities planned for Activity 6.5 for Year 1 in both WCA and ESA. In SA, 5 banks were identified. On-going activities include: development of a flyer on the post-rainy season sorghum value chain and market opportunities, informing financial institutions about business opportunities from post-rainy sorghum, development of training materials (one brochure) on good business practices in accessing finance from alternative sources, and training of farmers on good business practice. The pearl millet milestones are delayed.
- 43) **Activity 6.6 - Enhance capacity of partners (e.g., NGOs, farmer organizations, private-sector, extension) to deliver appropriate cereal technology options to farmers and increase alternative use of dryland cereals:** In WCA, 16 representatives from Farmer Organization (FO) extension services and NGOs were identified to be trained as trainers, and 14 scientists and research technicians from NARS and ICRISAT were trained in on-farm participatory breeding. A comprehensive one-week workshop was held in Koutiala in collaboration with the AMEDD NGO. Over 30 participants from Burkina Faso, Mali and Niger, including NARS scientists, farmers and FO agents participated. Training materials were produced for each participant and 5 practical information leaflets for a specific topic and two session reports were produced. In ESA, a training workshop on participatory research (mainly participatory variety selection) and technology delivery for collaborating partners from research, extension, seed production and marketing was held in Singida Tanzania in April 2010. The 41 participants who participated included 13 women and 28 men. Potential partners for seed production and distribution were identified and these included 4 private seed companies and CBSP groups that are managed by each district agricultural office. In Ethiopia, Ethiopian Seed Enterprises (ESE), regional seed enterprises, Ethiopian Seed Association, research institutes, and NGOs have been identified as potential partners for sorghum seed production and are engaged in the 2010 cropping season. Similarly, Eritrea has identified farmer groups, individual lead farmers and the government agencies as avenues for sorghum seed production. A draft training manual on integrated blast management of finger millet was developed and TOT is planned for September and October 2010. In SA, training material (one flyer each) was produced on soil sample collection, post-rainy season sorghum crop management, seed production, village seed systems and grain and stover marketing in the target areas. Other ongoing activities are training of farmers, development of information and organizing field days and these will be delivered in Y2 as scheduled.

(B) Outputs and Milestones

The status of Year 1 outputs and milestones as at 30th June 2010 is presented in Table 1.

(C) Deviation from proposal:

No deviation in all cases except in Activity 4.6 where it is now proposed that milestone 4.6.12 be achieved through secondary data, rather than through surveys, and collection and analysis of soil samples as described in the proposal.

(D) Measurable Outputs and Outcomes: See Appendix A

(F) Knowledge Generated:

- A large body of baseline and experimental / scientific data.

- Production and farmer preference of newly tested sorghum hybrids in WCA and of improved varieties in ESA especially those that exhibit industry specified quality traits.
 - Insights into the extent of soil fertility depletion found in women's fields in WCA.
 - Insights into the negative effects of the collapse of the cotton sector in Mali on farmers' incomes, reduced availability of draft animals, and non-availability of fertilizers.
 - Appreciation by farmers in Tanzania of the potential of early maturing varieties and the need for a viable seed system to ensure availability.
 - Data available from diagnostic interviews on cropping systems, major rain fed crops, constraints to production of these crops, infestation levels of *Striga hermonthica* and farmer knowledge of *Striga hermonthica* biology and control in more than 30 intervention villages in Mali and Niger.
 - Study data and experience in working with partners.
 - Seed production techniques, regulations and procedures, inspection standards and criteria, harvesting, packing and storing techniques and contracting.
- (F) Activities that cannot be completed in grant period:** None identified in all activities.

Table 1: Status of Year 1 outputs and milestones as at 30th June 2010

Objective	Region	No. of Y1 outputs & Milestones Achieved	No. of Y1 Outputs & Milestones Not Achieved	Reasons for Non-Achievement
1	WCA	5	3	- Staffing problems due to delay in recruiting project economist. The budgeted salary for the project economist was not enough to attract suitable candidates, hence the delay. A visiting scientist from a NARS institution has now been engaged for one year; work has now started and is progressing well.
	ESA	15	2	- It is taking longer than expected to identify suitable students in some countries. - Identified students are still developing thesis proposals.
	SA	6	6	- Departure of lead scientist (Dr. KPC Rao) shortly after commencement of project, and delay / long process in recruiting a replacement. A replacement is due to join ICRISAT in Sept 2010. Meanwhile, work on non-achieved outputs is in progress.
2	WCA	27	1	- Milestone 2.7.1 was achieved in Mali but not in Burkina Faso. It took longer than expected for partners in Burkina Faso to sign sub-contract agreements with ICRISAT, hence the delay.
	ESA	11	2	- Delay in signing of sub-contract agreements by partners. Work is now in progress.
	SA	9	2	- Milestone 2.5.11 - The trial was found to be too big to handle. Consequently work focused on screening selected genotypes from the Year 1 evaluation for improving screening efficiency. - Milestone 2.6.1 – The activity commenced late due to a delay in signing sub-contract agreement with MPKV.
3	WCA	6	2	- The project commenced after the start of 2009 rainy season so some activities were moved to the 2010 cropping season. Work is now on-going at 3 on-station and several on-farm sites.
	SA	11	5	- Late hiring of the state university staff to be employed for day-to-day implementation of the on-farm participatory trials in Objectives 3 (and 6).
4	ESA	9	11	- Difference in start of seasons between ESA countries. - Unforeseen delay in (long procedures of) germplasm transfer and gathering of biophysical data in some countries.

				- Milestone 4.7.1 - there was little time between commencement of the project and the start of the season to develop a protocol for use.
5	WCA	3	7	- Delays by NARS partners in signing sub-contract agreements which, in turn, delayed funding to the partners who were to gather information. - Delay in identifying suitable student by partners. - Delay in recruiting a project economist (See explanation under Objective 1 in WCA). - Work on these activities is now on-going.
	ESA	0	7	- Departure of lead scientist (Dr. Bekele Shiferaw) early in the project left a major vacuum which was not filled soon enough. Successor is now in place.
	SA	8	1	- Delay in signing of sub-contract agreements by the partners forced a corresponding delay in commencement of activity 5.3.2
6	WCA	14	14	- The start of the project after the start of 2009 rainy season affected / delayed the commencement of a number of activities in WCA.
	ESA	10	4	- Untimely departure of economist and objective leader (Dr. Richard Jones) affected some activities for awhile, before restructuring was done. The activities are now in progress.
	SA	43	14	- Delay in signing of sub-contract agreements by a number of partners.

Notes:

- Activities leading to outputs and milestones which were not achieved in Year 1 are at various stages of implementation, and are expected to be fully accomplished at various dates between July 2010 and December 2010, in Year 2.

II MANAGEMENT UPDATES

One of the most destabilizing occurrences throughout much of Year 1 was the untimely departure of a few key scientists, including objective leaders. This had the effect of slowing down work in the activities affected. The Project had constantly to re-organize its scientists, recruit new ones and reshuffle those still on board, with a view to ensuring continuity and minimum disruption. Current project management structure is as described below.

- **Principal Investigator:** Dr. Said N. Silim
- **Project Manager / Coordinator:** Dr. George E. Okwach
- **Objective Leaders:**
 - Objective 1: Dr. Nareppa Nagaraj (Based in India)
 - Objective 2: Dr. Eva Weltzien-Rattunde (based in Mali)
 - Objective 3: Dr. SK Gupta (based in India)
 - Objective 4: Dr. Henry Ojulong (based in Kenya)
 - Objective 5: Dr. Alastair Orr (based in Kenya)
 - Objective 6: Dr. Mary Mgonja (based in Kenya)
- **Regional Objective Coordinators**
 - Objective 1
 - WCA: Dr. Jupiter Ndjeunga
 - ESA: Dr. Franklin Simtowe
 - SA: Dr. Nareppa Nagaraj
 - Objective 2
 - WCA: Dr. Eva Weltzien-Rattunde
 - ESA: Dr. Mary Mgonja
 - SA: Dr. Belum Reddy
 - Objective 3
 - WCA: Dr. Bettina Haussman
 - SA: Dr S.K. Gupta
 - Objective 4
 - ESA: Dr. Henry Ojulong
 - Objective 5
 - WCA: Dr. Jupiter Ndjeunga
 - ESA: Dr. Alastair Orr
 - SA: Dr. Parthasarathy Rao
 - Objective 6
 - WCA: Dr. Kirsten Vom Brocke
 - ESA: Dr. Mary Mgonja
 - SA: Dr. Belum Reddy / Dr. Rajan Sharma

III. LESSONS LEARNED:

- The process of negotiating and signing sub-contract agreements with national partners was found to be more complicated and time consuming than earlier envisaged at the time of writing the proposal and launching the project. This process took longer than anticipated, leading to delays in transferring funds to the partners and initiating agreed activities. This was the single most important factor in slowing down the accomplishment of a large number of milestones in year 1.
- Off-season nursery facilities for NARS pearl millet breeding programs of all partner countries in WCA need to be strengthened to enhance seed production and breeding progress.

- Rajasthan's RAU-Bikaner test location is too harsh for pearl millet inbred evaluation, so after attempts to use this site in Y1, it has been dropped in favor of better alternatives.
- Differences in planting dates, between countries and regions, should be considered when drawing timeframes for the activities.
- Timely dispatch of resources is essential for proper implementation of activities.
- Some partners need guidance and capacity strengthening in carrying out project activities. Heavy administrative procedures faced by some partners (such as universities in India) may constrain the smooth implementation of project activities.
- Scientists from the NARS have little time or priority to review documents. In some cases this may be due to language challenges, such as Francophone NARS partners receiving documents written in English.
- Seed packs need to be sufficient to plant a reasonable area. It is proposed that packs sufficient for 0.5 ha should be the minimum size.
- It has not been clear whether the mini-packs be sold at market price or at a subsidized price and the implications for sustainability.
- Isolation distances may be a challenge where farmers have small landholdings.
- There is a need to strengthen private seed companies to enhance sustainability.
- Training should be a recurring activity for the trainees to grasp and practice the knowledge gained.
- There is a need to understand seed policy and regulations in each country to ensure that project actors adhere to the regulations.

IV. **CHANGES:**

No changes within ICRISAT, but the reforms taking place in the CGIAR around mega program development; specifically MP3: Dryland Cereals, have implications for the HOPE project since this MP will include sorghum, pearl millet and finger millet. This will have a positive impact as it will build and expand on the work funded under the HOPE Project. For example, in ESA the Project covers parts of Ethiopia, Tanzania and South Sudan for sorghum and MP3 will likely expand work in these countries in addition to Sudan, Mozambique, Botswana and Zimbabwe, where the HOPE Project is not presently located. MP3 will benefit from the analysis of constraints and opportunities that has been conducted under the HOPE Project.

V. **RISKS:**

- Staff changes: The untimely departure of a number of project scientists adversely affected the continuity and timeliness of planned activities. When this happened, ICRISAT responded by (1) immediately re-organizing its staff to ensure that the work progressed, and (2) initiating the process of recruiting new staff to fill the vacancies created.
- Many national / partner institutions took longer than expected in signing sub-contract agreements. This resulted in the late transfer of funds, and corresponding late commencement of planned activities.
- Crop failure in some countries.

VI. OTHER SOURCES OF PROJECT SUPPORT

This is presented in Table 2.

Table 2: Other Sources of Project Support.

Funding Sources	Amount In \$U.S.	Type of Funding	% of project	Committed or Potential
McKnight Foundation,	Ug 135,000 Ken 190,000 Et: NA	Finger Millet Field activities- , breeding, On farm participatory variety selection and seed systems [Objectives 2, 4 and 6 in Uganda, Kenya and Ethiopia]	-	This project ended June 2010. A phase II is planned
BMZ/GTZ	Ug: 24,000 Ken: 30,000 Tz: 28,000	Sustainable Conservation & Utilization of Genetic Resources of Finger millet and Foxtail millet- participatory variety selection and seed systems [Objectives 4 and 6 in ESA]	-	Ongoing (Jan 2007-Dec2010) Targets sites different from HOPE
BMZ/GTZ	170,000	Fighting Striga: Resistance Genes Deployed to Boost Sorghum Productivity Integrating MAB and conventional Breeding [Activity 2.1 in ESA]	-	Ongoing (Jan 2009 – Dec 2010)
ASARECA	99,000	Making the best of climate - Adapting agriculture to climate variability [Activity 2.2 in ESA]	-	Ongoing (Jan 2009 -Dec 2010)
FAO	109,000	Seed production of sorghum, groundnut, cowpea, pearl millet and maize varieties -intendance breeding and production of basic and pre-basic seed [Activity 6.3 in ESA]	-	Ongoing (Nov 2009 - Oct 2010)
Generation Challenge Program	15,300	Screening sorghum for drought resistance / Renovation of irrigation facility in Tz [Activity 2. 2, 6.3 in ESA]	-	Ongoing (2008 - 2011)
Africa Biofortified Sorghum	1,600,000	Micronutrient enhancements using transgenics [Activity 2.6 in ESA]	-	Project Ended June 2010
<ul style="list-style-type: none"> • NARI Eritrea • EIAR Ethiopia • DRD Tanzania • MOA SSudan • NARO Uganda • KARI Keny 	<ul style="list-style-type: none"> • 60,000 • 74,400 • 30,000 • NA • 20,000 • 13,000 	Sorghum and Millets Improvement [Objectives 2, 4 and 6 in ESA]	-	Ongoing (Annual funding for sorghum and millets)
IAEA (Eritrea)	160,000	Improving sorghum productivity	-	Ongoing (2008 -

		through application of N ¹⁵ [Activity 2.6 in ESA]		2012) in Eritrea
ASARECA	111,699	Integrated technology for drought mitigation [Activity 2.2 in ESA]	-	Ongoing (2007-2010) in Ethiopia
ASARECA	27,660	Integrated striga management [Activity 2.2 in ESA]	-	Ongoing (2008-2010) in Ethiopia
AGRA	240,000	Breeding sorghum for improved productivity and resistance to biotic and abiotic stresses [Activities 2.2; 2.5 in ESA]	-	Ongoing in Ethiopia
INTSORMIL	25,000	Development and promotion of sorghum production technologies for major sorghum growing stresses for Ethiopia	-	Ongoing (2009-2010) in Ethiopia
McKnight Foundation, West Africa Community of Practice (Seed project)	567,270	Field activities, student training, including social science PhD student, Support to Farmer Organizations. This project maintains its own identity but works with other projects such as HOPE [Support for Obj. 2, activities 2.5, 2.7 and Obj. 6, Activities 6.2 and 6.6 in WCA]	-	Ongoing
McKnight Foundation, West Africa Community of Practice (Genepool project)	432,000	Field activities, support to partner organizations for pearl millet improvement in the Sudanian zone [Support for Obj. 2, activity 2.5 and Obj 3. activity 3.3 in WCA]	-	Ongoing
BMZ/GTZ small grant	77,000	Field and lab activities in the evaluation of the <i>Striga</i> resistance I lines created by backcrossing resistance QTL's into farmer varieties [Support for Obj. 2, activity 2.5 in WCA and ESA]	-	Ongoing
University of Hohenheim facilitated stipend	25,000 for two years	Stipend for PhD student conducting a detailed evaluation of the MABC lines [Obj. 2, activity 2.5]	-	Ongoing
Aga Khan Foundation, Mali office	34,000 for 2010 season	Scientist salary for field activities to support integrated rural development [Obj. 2, activities 2.6 and 2.7; Obj. 3 activities 3.3 and 3.8 in WCA]	-	Ongoing
Mobiom Association, Mali (via Helvetas)	6000 annually	Support for farmer association for experimentation with new varieties of sorghum and pearl millet [Obj. 2 activity 2.7; and Obj. 6, activities	-	Ongoing

		6.2 and 6.6 in WCA]		
Action contre la Faim	In kind	Support to farmers in 3 “communes” in the Kita district of Mali / facilitate farmer experimentation, and seed dissemination [Obj. 2 activities 2.6 and 2.7; and Obj 6, activities 6.2 and 6.6 in WCA]	-	Ongoing
Fonds Francais pour l’environnement	70,000 for 4 years, starting Jan 2010	Funding to support activities of lead partners in Mali; focus is on PPB and training [Obj. 2 activities 2.5, 2.7 and 2.8 in WCA]	-	Ongoing
Accion contra el Hambre (ACH), Niger	Unknown	Support for seed production and testing mini-packs in the Keita and Meyayi regions of Niger [Obj 6 in WCA]	-	Ongoing
Alheri private seed enterprise (Doutchi, Niger)	Unknown	Large-scale production of foundation seed of 3 ICRISAT pearl millet cultivars. Co-funding of the seed production activity by an AGRA-financed Alheri project; additional training by WASA [Obj 6 in WCA].	-	Ongoing

VII. **BUDGET VARIANCES:**

VIII. **OTHER:**

APPENDICES

Appendix A: Project Objectives and Outcomes

- Attached

Appendix B: Timeline

- Attached

Appendix C. Budget Spreadsheet

- To be submitted separately.

PRIVACY AND CONFIDENTIALITY NOTICE

Nil