RESEARCH
PROGRAM ON
Dryland Systems

CGIAR

Bioversity International

2015 Annual Report

Food security and better livelihoods

for rural dryland communities

The CGIAR Research Program on Dryland Systems aims to improve the lives of 1.6 billion people and mitigate land and resource degradation in 3 billion hectares covering the world's dry areas. Dryland Systems engages in integrated agricultural systems research to address key socioeconomic and biophysical constraints that affect food security, equitable and sustainable land and natural resource management, and the livelihoods of poor and marginalized dryland communities. The program unifies eight CGIAR Centres and uses unique partnership platforms to bind together scientific research results with the skills and capacities of national agricultural research systems (NARS), advanced research institutes (ARIs), non-governmental and civil society organizations, the private sector, and other actors to test and develop practical innovative solutions for rural dryland communities.

The program is led by the International Centre for Agricultural Research in the Dry Areas (ICARDA), a member of the CGIAR Consortium. CGIAR is a global agriculture research partnership for a food secure future.

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Table of Contents

SECTION I – Key MESSAGES

a. Synthesis of Progress and Challenges

A key contribution of Bioversity to the Dryland System CRP has been to examine systematically the diversity of useful plant and animal species utilized by human populations in dryland systems, the benefits they derive from them and the trade-offs that they face in using them. During previous years Bioversity and partners carried out a set of Agricultural Biodiversity Assessments (ABD-assessment)[1] in several CRP target sites (Mali, Ghana, Malawi and India) as the basis for measuring and monitoring changes in ABD as a result of CRP interventions. In addition this effort should contribute to identify entry points where ABD could be used more effectively to reduce vulnerability or foster intensification depending on the context. Results of surveys with 924 rural households in the four countries (for India only data from Rajasthan were analysed since data from other regions were still being processed) show that during the main growing season between 12 and 39 different crop species were grown. Common patterns of use emerged across all areas. Households managed portfolios of crop species that ranged, on average, from 3 to 7 per household. Most species were produced either for self-consumption or for self-consumption and sale. Few were produced exclusively for sale. On average the contribution of the portfolios of species to food consumption was larger than to income. There is however, also a complementarity between self-consumption and sale. In spite of the wide geographic distances in which the study areas are located, 11 species were common among the African countries and 3 with India. These results indicate the importance of looking at improving the portfolio of species grown—its components and interactions—and not just at one component in isolation, thus improving the overall system. Further analyses are required, since the data on trees, animals, and useful wild species still need to be analysed. These results have implications for intensification (IDO 1.4), diversification (IDO 1.1, 3.1), better risk management (IDO 1.1), improved linkages to and participation in markets (IDO1.2), improved diets and enhanced food security (IDO 2.1). During 2016 the remaining results will be analysed and their implications for the IDOs identified will be addressed. During 2015 the survey in ESA region (Malawi) was completed and in other specific regions, the knowledge generated by the ABD assessment was used to do more in-depth and targeted research (Niger, Mali and Ghana) and to pilot some interventions in India and Uzbekistan. In the West African Sahel (WAS) region, in Maradi, Niger an assessment of the local management of tree, crop, and animal breeds (IDO 3.2) was undertaken, as well as another of the nutrient-rich local food diversity (IDO 2.1). In Koutiala in Mali and Wa in Ghana a multi-purpose tree diversity and distribution assessment was carried out (IDO 3.2). In the CA region, the diversity of native fruit trees in Action Sites located in Uzbekistan was also characterized, as well as the constraints and gaps in access to planting material of these diverse fruit tree species (IDO 1.1 and 3.3). Based on this information, 23 nursery managers (10 women and 13 men) were identified and trained in propagation of fruit trees to provide farmers in the region with access to high quality planting material and information about the tree diversity available (IDO 1.3, 1.4, 2.1, 3.1, 3.2). In South Asia the ABD assessment in Karnataka and Andhra Pradesh were completed and internal reports produced for the CRP. In addition a pilot intervention that provided 545 farmers in target sites with access to a more diverse set of selected fruit trees was implemented in Rajasthan, Karnataka and Andhra Pradesh to contribute to improve nutrition (IDO 2.1), improve resilience in the face of climate change (IDO 1.1) and provide income opportunities (IDO 1.3).

The primary challenge we have encountered in this work has been in processing the data collected, which has been far more time consuming than originally expected. The inherent diversity that the

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[1] The ABD-A is a methodology that combines quantitative and qualitative approaches to assess the biodiversity of plant and animal species both domesticated and wild used for food by human populations in specific locations.

ABD-A incorporates makes it complicated to ensure that the data are entered correctly, the identification of species and foods is accurate and the units used consistent. A particular issue has been the dietary data that has been elicited in a completely disaggregated way using local names. Identifying and translating these names has been difficult and time consuming. Due to reduced budgets and the cancellation of the CRP it will not be possible to carry out the interventions derived from the ABD-A data. However, all the data collected will be made publicly available in 2016.

b. Significant Research Achievements

Increasing the knowledge and skills of nursery managers about native fruit tree diversity and associated planting material leads to better orchards among Uzbekistan farmers

Central Asia is a centre of diversity for fruit trees such as apples, pears, apricots and grapevine. These trees are important for the livelihoods of local rural populations that live in drylands with a harsh environment, poor soils, spring frosts, soil salinity and water scarcity. The plasticity and adaptive capacity of these fruit crops allow farmers to grow them in different environments, providing them with an income and nutrients year-round. A diagnostic study found that the production and distribution of planting material of native fruit trees is carried out by independent nurseries and producers in a fragmented, uncoordinated way. Exchange of information on fruit tree varieties, new technologies used for growing saplings among nursery managers, fruit growers and scientific institutions is very weak. In order to strengthen the linkages between suppliers of planting material and fruit growing farmers, to establish collaboration among all groups of stakeholders dealing with fruit tree diversity, management roundtable discussions with participation of researchers, crop breeders, and famers, nursery managers and fruits growers were organised (see below). Based on these interactions 23 nursery managers (10 women and 13 men) were trained to improve their knowledge on propagation of fruit trees. Information leaflets on eight farmers, of which four were female farmers, were produced and disseminated among farmers – nursery keepers and fruit growers, fruit tree breeders and researchers to establish effective collaboration among them. As a result of all these efforts the 23 selected nursery managers in the Aral Sea Action Site produced and distributed 311,000 saplings of target fruit crops. In the Fergana Action Site, in 2015, 418,000 saplings of fruit trees and grape were produced. A total of 290 farmers directly received saplings of fruit trees in 2015 (110 in the Aral Sea and 180 farmers in Fergana). Although it is too early to assess the impact of these interventions, it is expected that by improving the skills of nursery managers, broaden the knowledge among farmers about from whom and where to obtain quality planting material, and giving them access to varieties with superior performance under environmental stresses, farmers' orchards will be better adapted to environmental stress. Farmers will have access not only to better quality planting material, but also to a broader diversity of it that is better adapted to the different environmental conditions that they face.

c. Financial Summary

Bioversity's 2015 CRP Dryland Systems Final Financial Report is available on CGXchange.

SECTION II– IMPACT PATHWAY AND INTERMEDIATE DEVELOPMENT OUTCOMES (IDOS)

a. Progress along the Impact Pathway

b. Progress in WAS/AgroPastoral

I. Progress towards outputs

In 2015, six focus group discussions (FDGs) were carried out in three villages in Maradi, Niger. Two of the villages are target sites in the Kano–Katsina-Maradi transect defined by the research centres involved in the Dryland Systems CRP. An additional village was included to provide a more complete ecological dimension to the human management of natural resources in the transect. In each village, two FGDs, one with men and another with women, were carried out simultaneously. The FGDs elicited information on the diversity of crops, wild and semi-domesticated plants, trees, domesticated and wild animals, fish and insects, used for food, feed, fuel, construction, etc. (link to methodologies). Participants were asked to score these species based on their perceptions of their nutritional value from low to high. They were also asked to assess the percentage of people in the entire village by the extent that they integrated crops, trees and livestock in their farms. Three levels of integrations were defined from low to high based on a review of the literature for West Africa.[2] These assessments have been compiled into two reports and are the agreed deliverables for 2015, registered on the MEL Platform. The Reports are the following: (i) Crop, tree and animal breed diversification and improvement; and (ii) Nutrient-rich local food diversity. Results show a diversity of highly nutritious species utilized in the surveyed communities in Maradi. Wild-harvesting and hunting make an important contribution to food sourcing in the surveyed communities. A number of local crops and wild-harvested species (e.g. groundnut, millet, cowpea, grasshoppers, pumpkin, *Senna tora* and *Ceratotheca sesamoides)* are also perceived as nutritious or highly nutritious by the local communities. However, studies evaluating whether the communities' perceptions of nutrition value coincide with factual evidence that the species are or are not nutritious was beyond the current scope of the survey, and should be a priority research topic for future studies. Overall, the perceived nutritional value varied with gender, with women perceiving several species as nutritious while men did not. The nutrient-rich local food report also presents the diversity of locally produced foods compared to imported food products. The implications for crop improvement and livelihood security are presented in the survey report. Further data analysis is planned for 2016 to identify options for improved management of tree, crop and animal breeds, for improved nutrition status in the beneficiary communities. The findings will be used to develop Technical Advisory Notes on better tree, crop and animal breed management practices, for extension workers and farmers so better information is available and provided by the former and used by the latter to improve the performance of their farms. Results on the integration of crops, trees and animal breeds in farms show that the majority of farms integrate only two of three components. This was assessed as low. Few farms show a high level of integration. Further analysis of these results and their implications for farms' resilience and productivity are required.

II. Progress towards the achievement of research outcomes and IDOs

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[2] Achigan-Dako, G. Enoch, Sogbohossou O. Deedi, Segnon C. Alcade, N'Danikou Sognigbé, Sinsin A. Brice, Vodouhè S. Raymond, 2013. Agricultural ecological intensification options in the West African Sahel and Dry Savannas: current knowledge and possible scenario. Bioversity International, West and Central Office, Cotonou, Republic of Benin. pp 84.

It is expected that the outputs produced and mentioned above will contribute to the application of better tree, crop and animal breed management practices, leading to higher resilience (IDO 1.1), better nutrition (IDO 2.1) and an increase in income from local crops (millet, tiger nut, leafy vegetables, etc.) and small ruminants for marginal groups (women, youth, elderly people) (IDO 1.3). We also expect that national partners will develop and implement capacity building activities using the new knowledge that was generated through the WAS DS activities. Unfortunately due to budget cuts and finalisation of the Dryland System CRP no follow-up on our part will be possible.

III. Progress towards Impact

The work undertaken lays the foundations for future livelihood and nutrition improvements for rural populations in the region. Engaging the national researchers and local communities in understanding the processes and actively seeking their participation in applying improved management practices developed from the assessment analysis, will go a long way to ensuring uptake and impact in the project areas.

c. Progress in WAS/Rainfed

I. Progress towards outputs

In 2015 in Koutiala in Mali and in Wa in Ghana an assessment of the uses of the diversity of trees identified through FGDs and households surveys was carried out. The findings of this assessment are provided in a report, which is one of the agreed outputs for 2015, registered on the MEL Platform. Data collected were gender disaggregated. Results show that 25 and 19 trees species are used by households in Koutiala and Wa respectively. They are used for different purposes including food, fodder, medicine, etc. (Table c.1). It is noteworthy the important role of tree as source of food in both regions.

Table c.1. Number of tree species used for different purposes in Mali and Ghana (data from household surveys)

Uses	Koutiala (Mali)	Wa (Ghana)
Total	25	19
Food	21	18
Fodder	11	13
Fuel	11	9
Medicine	16	15
Construction	5	11
Improving soil fertility	4	0
Other	1	2

Results from FGDs show that there were important differences between men and women in terms of the number of wild and semi-domesticated species they knew and how they used them. Male groups named about the double of species compared to female groups. In both cases, however, the most important use of the species is as food, but also use for sale is common and many species are collected during the dry season, suggesting that these species play a significant function in household livelihoods and to resilience under adverse conditions (dry season and lean period) (Table c.2)

Table c.2. Number of wild and semi-wild species and their uses identified by FGDs by gender

Focus group	No. of species	Food	Sale	Dry season	Lean period
Male					
N'goutjina	27	17	27	6	3
Farakoro	22	19	5	13	0
Kani	18	16	2	10	0

Female					
N'goutjina	10	10	10	8	1
Farakoro	8	8	7	7	0
Kani	10	10	4	8	0

The report highlighted the multi-purpose tree species used by communities for food, animal feed, medicine and other purposes. It is also found that cultivated, wild and semi-domesticated species played a significant function in household livelihoods and resilience to shocks, and provided the necessary information in order to understand and identify the different interventions aimed at reducing food insecurity and overall poverty in the area. Further data analysis is planned for 2016 and findings will be disseminated through publications (due to lack of funding no other dissemination activities are planned). In this regard, a draft scientific paper is in the process of being developed from the data collected in Mali, and is planned for publication in the Journal of Ethnobiology and Ethnomedicine (see Section V, List of outputs). The results will also be used to develop a Compendium of locally recommended multi-purpose trees species for food, feed and medicine.

II. Progress towards the achievement of research outcomes and IDOs

It is expected that the different outputs being produced (scientific papers and compendium) for dissemination into the research community and local communities will provide the basis for enhancing awareness of the target marginal groups (IDO 1.3) on the role of multi-purpose trees to improve nutritional quality of food and feed (IDO 2.1). This should contribute to enhancing access to additional sources of nutritious food and feed by marginalized smallholder farming households for improve their livelihoods.

III. Progress towards Impact

While there is a strong focus on crops grown by farmers in the region, little is known about the trees and their roles in farmers' livelihoods. This limits the potential to improve their use and enhance the benefits farmers derived from them. Increasing the awareness of these roles should lead to more research and interventions to enhance their benefits.

d. ESA/Rainfed

I. Progress towards outputs

Agrobiodiversity (ABD) and dietary diversity datasets have been finalized and are ready for analysis. Due to budget cuts in the 2015 cycle, the analysis of the collected data and analysis results will be pulled into the 2016 activities. These will also help to identify gender differences in the use, access/control and management of ABD.

II. Progress towards the achievement of research outcomes and IDOs

Datasets are ready. They are being reviewed for quality control and will soon be made available in 2016 as open access databases. The datasets include information on the results of 13 focus group discussions (gender disaggregated) and a survey of 340 households, including information on diets for 342 mothers and 315 children. By providing data should allow a better understanding on how households use the portfolio of species they manage to cope with climate variability and shocks (IDO 1.1), contribute to income (IDO 1.3) and to their diets (IDO 2.1).

III. Unexpected Outputs, Outcomes and or Impact

The methodological framework used to assess agricultural biodiversity and dietary diversity (DD) has been adopted by some partners (Department of Agriculture Research Services (DARS) when doing rapid ABD inventory on behalf of World Vision International).

e. Central Asia/ Irrigated

I. Progress towards outputs

Central Asia is a centre of diversity and domestication for many globally important fruit tree species that grown under dryland conditions, contributing importantly to the nutrition and income of local rural populations. In 2014 the Uzbek Research Institute of Horticulture, Viticulture and Wine-making carried out a survey mission to assess the situation of access to planting material of native fruit tree species in the Aral Sea and Fergana action sites. The mission identified that lack of knowledge among farmers of the nurseries available and of the diversity of planting material offered by them, as well as the quality they offer, constrained their capacity to improve their fruit tree orchards. Based on this diagnosis, during 2015 Bioversity and the Uzbek Research Institute of Horticulture, Viticulture and Wine-making implemented a set of actions and interventions to address these constraints. In both action sites, a total of 63 nurseries supplying tree fruit planting material were identified and the varieties they offered were recorded (Table 1)

Table e.1. Number of nurseries and nursery managers by gender and varieties of native fruit trees on offer by 63 nurseries in two action sites in Uzbekistan.

Number of nursery managers by gender	Aral Sea	Fergana	Total
All	31	32	63
Men	21	21	42
Women	10	11	21
Number of varieties offered by species			
Apple	20	19	39
Pear	1	8	9
Apricot	29	13	42
Grape	1	12	13
Peach	1	0	1
Pomegranate	1	4	5

The varieties of the different fruit trees were evaluated by the Uzbek Research Institute of Horticulture, Viticulture and Wine-making for their adaptation to drought, salinity and frost to identify superior varieties to be multiplied. A diagnostic study was carried with nursery managers, farmers and researchers to identify existing linkages among nurseries and fruits producers and existing constraints and gaps. Most of the varieties used are not part of officially sanctioned production and distribution system. The production and distribution of planting material is carried out by independent nurseries and producers in a fragmented, uncoordinated way. Exchange of information on fruit tree varieties, new technologies used for growing saplings among nursery managers, fruit growers and scientific institutions is very weak. In order to strengthen the linkages between suppliers of planting material and fruit growing farmers, to establish collaboration among all groups of stakeholders dealing with fruit tree diversity, management roundtable discussions with participation of researchers, crop breeders, and famers, nursery managers and fruits growers were organised (see below). Based on these interactions out of the 63 nursery managers originally identified, 23 (10 women and 13 men) were trained to improve their knowledge on propagation of fruit trees and grape. Information leaflets on eight farmers, of which four were female farmers, were produced and disseminated among farmers – nursery keepers and fruit growers, fruit tree

breeders and researchers to establish effective collaboration among them (leaflets in Russian available in Section V).

These nursery managers offer a range of varieties of different native fruit tress (Table 2).

Table e.2. Selected nursery managers and number of fruit tree varieties and planting material is offered by them by species

Number o f nursery managers by gender	Aral Sea	Fergana	Total
All	10	13	23
Men	3	9	12
Women	7	4	11
Number of varieties offered by species			
Apple	18	11	21
Pear	8	2	3
Apricot		11	19
Grape	0	4	4
Pomegranate	1	2	3

As a result of all these efforts in 23 selected nursery managers in the Aral Sea Action Site produced and distributed 311,000 saplings of target fruit crops. In the Fergana Action Site, in 2015, 418,000 saplings of fruit trees and grape were produced (Table 3). A total of 290 farmers directly received saplings of fruit trees in 2015 (110 in the Aral Sea and 180 farmers in Fergana).

Table e.3. Number of saplings offered by selected nursery managers

Species	Aral Sea Action Site/# saplings	Fergana Action Site/# saplings
Apple	144,000	91,000
Pear	12,000	43,000
Apricot	92,000	118,000
Grapevine	50,000	143,000
Pomegranate	2,000	7,500
Other crops	11,000	15,500

In addition one training workshop and three roundtable discussions were organized to increase the knowledge and skills of farmers with fruit tree orchards in both action sites (Table 4).

Table e.4. Number of participants in capacity building activities.

Activity	Total	Men	Women
Training workshop "Growing fruit trees and planting material"	14	10	4
Roundtable 1 "Specific issues on fruit tree quality planting material production in salinity affected soils"	21	14	7
Roundtable 2 "Specific issues on fruit tree quality planting material production in salinity affected soils"	20	13	7
Roundtable 3 "Production of fruit trees quality planting material adapted to stress factors: drought and spring frosts"	30	19	11
Total	85	56	29

Three databases were also compiled on: (a) suppliers of quality fruit tree planting material suppliers (23); (b) fruit tree crops, varieties multiplied by farmers and their geo-location; and (c) the assessment of fruit tree diversity resistance (75 varieties) to environmental stress factors such as soil salinity, drought and spring frosts.

II. Progress towards the achievement of research outcomes and IDOs

Due to the fact that these activities just took place, it is too early to assess how they are contributing to the research outcomes and IDOs. It is expected however that by improving the skills of nursery managers , broaden the knowledge among farmers about from whom and where to obtain quality planting material, and giving them access to varieties identified to cause they perform well under environmental stresses, farmers' orchards will be better adapted to environmental stress (IDO 1.1). Furthermore, the improved coordination between nursery managers and the formal research system should provide access to planting material of varieties produced by the formal research system. Farmers will have access not only to better quality planting material, but also to a broader diversity of it that is better adapted to the different environmental conditions that they face.

III. Progress towards Impact

The databases on suppliers of planting material and varieties characterized (see file "Key suppliers of quality planting material of fruit trees in Uzbekistan" in MEL system) contribute to a baseline to assess the extent to which these interventions may have the desired impact of increasing the diversity of fruit tree varieties present in orchards in the target regions.. However, further work is required, such as a broad survey among a representative sample of target farmers, to assess what they are actually planting today and the benefits they derive from their current portfolio of fruit trees to monitor changes in the composition of their portfolio, as well as the associated benefits of these changes, particularly if the local agricultural research and extension services build on these interventions. Unfortunately due to lack of funding no other activities are planned. See for example the following story, or this article.

f. South Asia/Rainfed

I. Progress towards outputs

In 2015, the data collected from the ABD-A in India, in Karnataka (1 district, 3 villages, 200 households, as well as 6 focus group discussions) and Andhra Pradesh (2 districts, 2 villages per district and 50 household per village, as well as 6 focus group discussions) were processed and a set of descriptive reports were produced with key results. These data, however, still require further review and analysis, which will be carried out in 2016. Based on this report we developed and finalized intervention plans for crop diversification, however, due to severe drought conditions across all project sites, we were unable to undertake farmers' field trials, except for the planting of tropical fruit trees. Thus a pilot intervention providing farmers with access to planting material of a diversity of tropical fruit trees from 12 different species was implemented in the three action sites in India (specific species varied by region) (reports available here: Use and conservation of agrobiodiversity for increased agricultural sustainability, smallholder wellbeing and resilience to climate change in India - Rajasthan; Use and conservation of agrobiodiversity for increased agricultural sustainability, smallholder wellbeing and resilience to climate change in India – Karnataka; Use and conservation of agrobiodiversity for increased agricultural sustainability, smallholder wellbeing and resilience to climate change in India - Andhra Pradesh. The intervention included awareness raising through a series of "awareness" camps so that participants got a better knowledge of the species and varieties that were provided, as well as providing the planting material and technical advice to selected households so that they can assess the performance of the varieties/species provided (Table f.1) Analysis of the data resulting from this intervention should take place in 2016. It should be pointed out that in Kurnool districts no fruit plants were planted due to severe drought conditions. The plants will now be distributed in cooperation with the Dr. Y.S.R. Horticultural University in February 2016 to 90 families who showed interest in receiving them.

Table f.1. Distribution of different species of fruit trees among households in three target regions of India and associated capacity building activities

Site	Rajasthan	Andhra Pradesh	Karnataka
No. fruit tree species	12	8	6
Total no. plants distributed	2238	855	375
No. household received plants	299	171	75
No. of Awareness camps	16	10	3
No. of participants awareness camps	315	485	130
No. of men awareness camps	228*	6	NA**
No. of women awareness camps	87*	4	NA**
Partner organizations contributed to implementation	Gramin Vikas Vigyan Samiti (GRAVIS); Central Arid Zone Research Institute CAZRI (ICAR)	Dr. Y.S.R. Horticultural University, Andhra Pradesh	University of Horticultural Sciences (UHS), Bagalkot, Karnataka

*Number of participants
**Separate awareness camps for men and women were not conducted

II. Progress towards the achievement of research outcomes and IDOs

It is expected that the outputs produced and mentioned above will contribute to broadening the genetic base of farming system across these village through the use of a wider diversity of fruit trees that should lead to higher incomes (IDO 1.3), better nutrition (IDO 2.1) and more income opportunities, as well enhancing the resilience of these farmers to climate change (IDO 1.1).

III. Progress towards Impact

The work undertaken lays the foundations for future livelihood and nutrition impacts in the region, by providing a baseline of the current conditions, an understanding on how the status quo contributes to livelihoods and nutrition, and by implementing a pilot intervention to assess the potential to improve farmers' well-being and adaptation to climate change through the access and use of a diversity of fruit trees.

SECTION III – CROSS-CUTTING ISSUES

a. Gender Research Achievements

An important component of the ABD-A implemented by Bioversity International and partners in the Dryland System CRP was the implementation of 57 focus group discussions about the agricultural biodiversity present and managed in target communities. The data generated are gender disaggregated since in men and women focus group discussions were run simultaneously. During 2015 the data generated in by 6 focus groups in Koutiala, Mali were analysed. Preliminary analysis of the data, collected through participatory methods and eliciting local knowledge and perceptions, show that while there was a high level of agreement between male and female groups about the

species grown and their uses, there was enough variation to suggest that there are differences in the perception about these species. We hypothesize that differences are due to differential gender roles, responsibilities and particularly in decision-making associated with those species, both by those directly responsible, as well as by others who may agree or disagree with these decisions. Analysing these differences should provide entry points for improving their use and conservation, as well as helping to identify interventions that use these species more effectively and equitably, to generate benefits. This was the basis for a proposal submitted to Dr Karin Reinprecht, Gender & Youth Program Coordinator Dryland Systems CRP to be implemented in 2016. The proposal was accepted, unfortunately, due to funding constraints the proposal will not be implemented. However, further analyses of the data generated by the gender disaggregated focus groups discussions following will be carried out in 2016.

b. Partnerships Building Achievements

During the course of implementation of the WAS DS activities in Wa, Ghana, staff at the District offices of the ministry of Food and Agriculture (MoFA) in Lawra and Jirapa, and personnel from the Savanna Agricultural Research Institute (SARI), where trained and participated in the field activities. In Mali we have collaborated with the Institute for Rural Economy (IER) and AMMED NGO. In Niger, we had collaboration with the National Agricultural Research Institute of Niger (INRAN). We also collaborated with ICRISAT and shared background information on sites and strategic planning for field interventions. These partners will be co-authors of publications arising from the data for which they have made tangible contributions (e.g. the annual reports, the ISI publications, etc.).

During the course of implementation of the South Asia activities in Andhra Pradesh and Karnataka, we worked in strong collaboration with staff from Dr. Y.S.R. Horticultural University and the Andhra Pradesh University of Horticultural Sciences (UHS), Bagalkot, Karnataka. Staff in both universities was trained in the implementation of the methods of the Agricultural Biodiversity Assessment. They provided also important input on the approach to provide farmers with access to planting material, as well as providing the actual planting material. In Rajasthan we worked in collaboration with staff from the Gramin Vikas Vigyan Samiti (GRAVIS) a very active NGO in the region, as well as with the Central Arid Zone Research Institute CAZRI (ICAR), the , KVKs, Horticulture Dept., Dinesh Nursery. They provided planting material and implemented the activities on the ground.

During the course of implementation in East and Southern Africa activities in Malawi, researchers from the Malawi Plant Genetic Resources Centre at Chitedze Research Station, part of Malawi's Department of Agricultural Research (DARS), were trained in the implementation of the methods of the Agricultural Biodiversity Assessment. They found the approach and methodologies useful and used them in 2015 to assess the crop diversity present in the Mzuzu District.

c. Capacity Building Achievements

In South Asia 930 men and women participated in awareness activities to promote the use of a diversity of fruit trees.

Site	Rajasthan	Andhra Pradesh	Karnataka
No. of Awareness camps	16	10	3
No. of participants awareness camps	315	485	130

No. of men awareness camps	228*	6	NA**
No. of women awareness camps	87*	4	NA**

*Number of participants
**Separate awareness camps for men and women were not conducted

In Central Asia, 85 farmers participated in trainings and roundtable discussions.

Activity	Total	Men	Women
Training workshop "Growing fruit trees and planting material"	14	10	4
Roundtable 1 "Specific issues on fruit tree quality planting material production in salinity affected soils"	21	14	7
Roundtable 2 "Specific issues on fruit tree quality planting material production in salinity affected soils"	20	13	7
Roundtable 3 "Production of fruit trees quality planting material adapted to stress factors: drought and spring frosts"	30	19	11
Total	85	56	29

In West Africa, 46 research staff (researchers and technicians) and 10 women farmers were trained.

Activity	Total	Men	Women
Training farmers to produce quality seed of newly domesticated *Ceratotheca sesamoides* and *Senna tora* – Niger	10	0	10
Training on Agricultural Biodiversity Assessment – Mali	17	15	02
Training on Agricultural Biodiversity Assessment – Ghana	23	15	08
Training on Agricultural Biodiversity Assessment – Niger	05	04	01
Total	55	34	21

d. Risk Management

The three major risks were:

1. The unexpected reduction in available budgets hindered achievement of the deliverables in the CRP.
2. Processing and management of the data collected were more difficult and time-consuming that originally anticipated.
3. Some partners were not as reliable as expected, delaying the delivery of outputs.

e. Lessons Learned

The main lesson learned is that processing, managing and analysing the data generated by the ABD-A has been much more difficult and time-consuming than originally foreseen. This also means that many of research outputs have been delayed, particularly making the data publicly available and publishing scientific papers based on analysis of the data. Working with multiple partners in many different situations also has made the standardisation of the data and research outputs difficult to achieve. Some partners require much more supervision and support than others, and working simultaneously in different regions makes the interactions with the partners challenging.

Implementing activities with the limited funding received from the CRP has also been a major challenge; however, Bioversity has provided strong financial support from its own funds to ensure the implementation of many activities described above. The key activities for 2016 relate to insuring that the data and research results are made publicly available. Due to the closure of the CRP it will not be possible to develop further interventions based on the research outputs generated.

SECTION IV - RESEARCH OUTCOME STORIES

OUTCOME STORY 1

Name of research activity/project title:	Support to farmers' production of quality planting material
Flagship:	Irrigated Crop Systems & Agro-pastoral systems
Geographical region:	Fergana Valley and Aral Sea Region (Uzbekistan)
Name and email of Activity Lead:	Muhabbat Turdieva, m.turdieva@cgiar.org
Name and email of Outcome Story Lead:	Muhabbat Turdieva, m.turdieva@cgiar.org
Activity Lead Center:	Bioversity International
Activity Partner Center(s):	Uzbek Research Institute of Plant Industry and Uzbek Research Institute of Horticulture, Viticulture and Wine-making
Activity Partner CRPs:	ICARDA

1. Outcome Story Headline:

Increasing the knowledge and skills of nursery managers about native fruit tree diversity and associated planting material leads to better orchards among Uzbekistan farmers

SELF-CHECK – Have you:

☐ *Captured the overall message of the outcome story?*

☐ *Included an action verb?*

☐ *Captured the reader's attention?*

2. Outcome Story Abstract

Central Asia is a centre of diversity for fruit trees such as apples, pears, apricots and grapevine. These trees are important for the livelihood of local rural populations that live in a harsh environment, with poor soil, spring frosts, soil salinity and water scarcity. For centuries generations of farmers selected from wild, domesticated and improved fruit trees diversity specific aimed at the development of varieties adapted to highly heterogeneous and difficult environments of their farming systems. Apple, apricot, pomegranate and grape are among most spread fruit species in the region with high varietal diversity. Plasticity and adaptation capacity of these fruit crops allow farmers to grow them in different environments: mountainous, foothills and plain landscapes. Moreover, these fruit species provide local people with income and nutrients all year round due to their long shelf-life capacity (apple and pomegranate) and processing (dried apricots and raisins). However, access to quality planting material of these trees and varieties available in nurseries is limited. By training nursery managers and providing them with knowledge of the diversity of fruit trees that are well adapted to these conditions, they can in turn provide farmers with a wider diversity of planting material to cope with the environmental challenges they face. This should lead to higher incomes and better food security. In 2015 partner nursery managers in the Aral Sea Action Site produced and distributed 311,000 saplings of target fruit crops including 144,000 saplings of apple, 92,000 of apricot, 50,000 of grape, 12,000 of pear, 2,000 of pomegranate and 11,000 of other crops. In the Fergana Action Site, in

2015, 418,000 saplings of fruit trees and grape were produced, including 91,000 saplings of apple, 118,000 of apricot, 143,000 of grapevine, 43,000 of pear, 7,500 of pomegranate and 15,500 of other fruit trees. A total of 290 farmers directly received saplings of fruit trees in 2015 (110 in the Aral Sea and 180 farmers in Fergana).

SELF-CHECK – Have you:

☐ *Summarized the problem, program/activity, and outcomes?*

☐ *Provided a summary with specific measurable outcomes that avoids broad, sweeping statements such as "There was a noticeable increase in healthy eating habits"?*

3. Problem/Challenge Overview:

As indicated above, environmental conditions are extremely challenging in the target areas. The production and distribution of planting material of native fruit trees is carried out by independent nurseries and producers in a fragmented, uncoordinated way. Exchange of information on fruit tree varieties, new technologies for growing saplings among nursery keepers, fruit growers and scientific institutions is very weak. These trees are an important source of income and nutrition to rural populations in the target regions, as well as part of coping mechanisms to deal with a heterogonous and harsh environment.

This story is about how to reach farmers by targeting their sources of planting material, which are nursery managers. A total of 290 farmers directly received saplings of fruit trees in 2015. By connecting diverse actors in the process such as nursery managers, crop breeders and fruits growers, fruit production can be improved since exchange of information on fruit tree varieties, new technologies used for growing saplings among them is very weak.

Word limit: 150 words

SELF-CHECK – Have you:

☐ *Described the issue(s), challenge(s), problem(s), opportunities being addressed and why are these important?*

☐ *Used data to frame the problem, including the social and economic costs?*

☐ *Specified the affected dryland population(s)?*

☐ *Specified the affected dryland area (in hectares)*

4. What are the main research activities:

The diversity of locally important fruit trees present in orchards (apple, pear, apricot and grapevine) was assessed in the Areal Sea and in the Fergana Action Sites.

To strengthen the linkages between suppliers of planting material and fruit growing farmers, to establish collaboration among all groups of stakeholders dealing with fruit tree diversity, one training workshop and three round table discussions with researchers, crop breeders and famers, both nursery keepers and fruits growers, were organized.

Based on these interactions 23 (10 female and 13) male nursery managers were selected and participated in training workshops and round table discussion to improve their knowledge of varieties of these trees, as well as on their propagation for supply to farmers in the region.

Word limit: 150 words

☐ *Described your approach of designing and implementing the research?*

☐ *Identified the various research users involved at different stages of the research process?*

☐ *Identified any major shifts or changes to the research activities and approach?*

5. What are the main <u>Outcomes</u> of your research?

23 nursery managers produced a more diverse set of planting materials of five native fruit trees, thus increasing the supply of well-adapted material to farmers in their regions. They supplied 729,000 saplings of target fruits to fruit growers in their regions. A total of 290 farmers directly received saplings of fruit trees in 2015. Nursery managers now know each other and have exchanged their contact details (mail address, phone numbers), creating a network that should help to scale out access to diverse planting material of native fruit trees. They also know what fruit trees and varieties have been multiplied in their nurseries. Farmers – fruit growers - are now ordering from these nurseries saplings of those varieties and crops they would like to plant in their orchards. This ensures quality planting material of fruit tree varieties with desirable traits for fruit growers and stable income and reputation for nursery managers.

Word limit: 200 words

☐ *Described <u>actual changes that occurred</u> as opposed to <u>desired</u> or <u>anticipated</u> changes in your initial research proposal?*

☐ *Identified any outcomes that you <u>did not intend</u> or <u>anticipate</u>? How are these justified and/or attributed to your activities?*

☐ *Demonstrated the scalability of the outcomes for greater reach and impact (in terms of both dryland communities and land area?*

6. What are the main research Outputs that resulted in the outcome(s)?

An inventory and characterization of the 109 varieties of 6 native fruit trees grown in the target regions (apple, pear, apricot, grape, peach and pomegranate).

An evaluation of the performance of 110 varieties of the six native fruit trees with respect to salinity, drought and frost.

An assessment of the functioning of the "seed system" that underpins access by local famers to the diversity of fruit trees available, both local, as well as diversity improved by the research system.

Increased knowledge and capacity of nursery managers to provide farmers with planting material of diverse varieties of well-adapted six native fruit trees.

Word limit: 150 words

☐ *Identified all types of outputs delivered and observed?*

☐ *Included facts and figures to demonstrate the strength and outreach of your research outputs?*

☐ *Avoided vague output statements such as "farmers benefited from increased food security as a result of our assessments of crop varieties."*

7. **Who were the intermediary and direct users of your research outputs and what role did they play in achieving the outcome:**

> 23 nursery managers produced and distributed planting material in two target sites: 1) Aral Sea Action Site: 311,000 saplings of target fruit crops including 144,000 saplings of apple, 92,000 of apricot, 50,000 of grape, 120,000 of pear, 2,000 of pomegranate and 11,000 of other crops; 2) Fergana Action Site: 418,000 saplings of fruit trees and grape were produced, including 91,000 saplings of apple, 118,000 of apricot, 143,000 of grapevine, 43,000 of pear, 7,500 of pomegranate and 15,500 of other fruit trees. A total of 290 farmers directly received saplings of fruit trees in 2015 (110 in the Aral Sea and 180 farmers in Fergana).
>
> Word limit: 100 words

SELF-CHECK – Have you:

☐ *Clearly identified all users and distinguished between intermediary and direct users of your research?*

☐ *Described their specific related role in terms of research, development, technology dissemination, policy formulation, adaptation, adoption, etc.?*

☐ *Used facts and figures to strengthen your statements?*

8. **How were your research outputs used (will be used in the future):**

> Links and exchange of information among nursery managers, fruit growers and scientific institutions have been strengthened by putting them in contact, provided them with additional training and systematize information on the crops and varieties they offer. The knowledge and training was used by nursery managers to produce and distribute a more diverse set of planting materials of well-adapted varieties of native fruit trees.
>
> Word limit: 150 words

SELF-CHECK – Have you:

☐ *Described actual changes that occurred during or immediate after the release of your research outputs?*

☐ *Identified how the use of research outputs set the stage for achieving the outcomes?*

☐ *Identified steps and actions for ensuring sustainability?*

9. **What is the Evidence of Your Research Outcomes:**

> A database with information on the varieties of native fruit trees that were assessed, as well as of the nursery managers trained in fruit tree propagation is available upon request and uploaded in the MEL system.
>
> Word limit: 150 words

SELF-CHECK – Have you:

☐ *Identified how the actions and behaviours of key stakeholders have now changed?*

☐ *Identified how these changes will be sustained?*

10. **Testimonials:**

Unfortunately no testimonials available.

☐ Testimonials from Beneficiaries (quote, video, letter, interview, survey, etc.)
☐ Testimonials from Partners (quote, video, letter, interview, survey, etc.)

SELF-CHECK – Have you:

☐ *Included the name, position, organization and location of person giving the testimonial?*
☐ *Included a testimonial that clearly identifies a direct benefit to a person/community/organizations, as opposed to vague general praise for the program activity?*
☐ *Included a testimonial that captures the beneficiary's strong emotion stemming from the outcome of your activities in his/her life, community, organization, etc.?*
☐ *Ensured each quote is no more than 2-3 lines.*

11. Lessons Learned:

Increasing the knowledge about the diversity of varieties of native crops among nursery managers stimulated their interest in producing and distributing them.

Linking nursery managers among themselves and with other stakeholders provided them with important information to improve their offer of planting material, which leads to more options of planting material to local farmers to improve their fruit orchards.

A crucial constraint has been the limited funds available. Lack of funds will not allow us to monitor how these interventions are having an effect on orchard tree diversity, household income or nutrition.

Word limit: 200 words

SELF-CHECK – Have you:

☐ *Identified both challenges/weaknesses and successes/strengths?*
☐ *Identified what you might have done differently to ensure a better outcome or greater impact?*
☐ *Identified who/what other organization/canter/CRP can potentially benefit from these lessons?*

12. Full reference citations and URL link to published research work.

For all research publications and other types of research outputs (data, tools, guidelines etc.) associated with this outcome story, please include below:

http://www.cacilm.org/en/articles/detail/592

SECTION V – LIST OF 2015 PUBLICATIONS AND SCIENTIFIC OUTPUTS

In 2015, Bioversity International produced under the framework of the CGIAR Research Program on Dryland Systems a total of several technical briefs.

The following represents a summary of all 2015 publications and research outputs produced by Centre under Dryland Systems by Region/ALS Flagship, including full and correct citation of all publications, weblink and categories of scientific output marked with the following codes to indicate:

- (S) = multidisciplinary/system research
- (M) = mono-disciplinary research
- [X.XX]= ISI Impact Factor
- (O) = Open Access

Table 1. Summary of all ISI publications

Region/ ALS	ISI Articles	ISI Factor [range of ISI scores]	ISI Open (% of ISI articles)	ISI Monodisciplinary (% of ISI articles)	ISI Multidisciplinary (% of ISI articles)
WAS	4	.631-2.000	25%	50%	50%

Table 2. Summary of Non-ISI Publications

Region/ALS	Non-ISI Articles	Book Chapters	Technical Reports & Working Papers	Proceedings	Datasets	Other
WAS/Agro pastoral And rainfed	1		6			2 Tools
CA/Irrigated			1		3	8 manuals; 1 Brochure; 1 Map
SA/Rainfed			8			
TOTAL	1		15		3	12

ISI Journal Articles (4)

The following ISI publications are relevant to CRP Dryland Systems – West Africa; however, they do not contain proper acknowledgement:

1. **(M) - [1.461]** Achigan-Dako, E.G.; Tchokponhoue, D.A.; N'Danikou, S.; Gebauer, J.; Vodouhe, R.S. (2015). Current knowledge and breeding perspectives for the miracle plant Synsepalum dulcificum (Schum. et Thonn.) Daniell. Genetic Resources and Crop Evolution 62(3) p. 465-476 ISSN: 0925-9864; *http://dx.doi.org/10.1007/s10722-015-0225-7 /* http://mel.cgiar.org/xmlui/handle/20.500.11766/4597

2. *(S) - [1.461]* Dossou-Aminon, I.; Dansi, A.; Ahissou, H.; Cisse, N.; Vodouhe, R.; Sanni, A. (2015). Climate variability and status of the production and diversity of sorghum (Sorghum bicolor (L.) Moench) in the arid zone of northwest Benin. Genetic Resources and Crop Evolution On-line first paper (09 Sep 2015) p. 1-21 ISSN: 1573-5109; *http://dx.doi.org/10.1007/s10722-015-0310-y* http://mel.cgiar.org/xmlui/handle/20.500.11766/4602

3. (M) - [0.631] N'Danikou, S.; Achigan-Dako, E.G.; Tchokponhoue, A.D.; Assogba Komlan, F.; Vodouhe, S.R.; Ahanchede, A. (2015). Improving seedling production for Vitex doniana. Seed Science and Technology 43(1) p. 10-19 ISSN:0251-0952 .
http://doi.org/10.15258/sst.2015.43.1.02
http://mel.cgiar.org/xmlui/handle/20.500.11766/4598

4. (M) - (O) - [2.000] N'Danikou, S.; Achigan-Dako, E.G.; Tchokponhoue, D.A.; Agossou, C.O.A.; Houdegbe, C.A.; Vodouhe, R.S.; Ahanchede, A. (2015) Modelling socioeconomic determinants for cultivation and in-situ conservation of Vitex doniana Sweet (black plum), a wild-harvested economic plant in Benin. Journal of Ethnobiology and Ethnomedicine 11:28 ISSN: 1746-4269
http://dx.doi.org/10.1186/s13002-015-0017-3
https://cgspace.cgiar.org/handle/10568/68048

Non-ISI Journal Articles and Theses (1)

The following publication are relevant to CRP Dryland Systems –West Africa; however, they do not contain proper acknowledgement:

1. Sidibe, A.; Vodouhe, R.S.; N'Danikou, S. (2015). Mali: an overview of community seed and gene banks. IN Community seed banks: origins, evolution and prospects. (Vernooy, R. et al. (Eds.)) Bioversity International p. 125-131 ISBN: 978-0-415-70806-7;
http://hdl.handle.net/10568/68049.
http://mel.cgiar.org/xmlui/handle/20.500.11766/4601

Draft publications (1)

WAS/Rainfed

A draft scientific paper from the data collected in Mali is been prepared for publication. It is not ready however to be shared yet.

1. Sognigbe N'Danikou, Raymond Vodouhe, Mauricio R. Bellon, Amadou Sidibé. 2016. Access and use of wild agricultural biodiversity to improve household food security in West African dryland systems, [For submission to *Journal of Ethnobiology and Ethnomedicine in 2016*]
http://mel.cgiar.org/xmlui/handle/20.500.11766/4600

Technical Reports and Working Papers (15)

1. Crop, tree and animal breed diversification and improvement in Niger, West Africa: Annual report http://mel.cgiar.org/xmlui/handle/20.500.11766/4353
2. Nutrient rich local food diversity in Niger, West Africa: Annual report 2015 http://mel.cgiar.org/xmlui/handle/20.500.11766/4222
3. Multi-purpose tree diversity and distribution assessment in Mali http://mel.cgiar.org/xmlui/handle/20.500.11766/4355
4. Multi-purpose tree diversity and distribution assessment in Mali and Ghana, West Africa http://mel.cgiar.org/xmlui/handle/20.500.11766/4356
5. Report of the agrobiodiversity baseline survey in Western Rajasthan, India http://mel.cgiar.org/xmlui/handle/20.500.11766/3179
6. Use and conservation of agrobiodiversity for increased agricultural sustainability, smallholder wellbeing and resilience to climate change in India – Rajasthan http://mel.cgiar.org/xmlui/handle/20.500.11766/3182

7. Baseline Survey for Agricultural Biodiversity in Vijayapur District of Karnataka
    http://mel.cgiar.org/xmlui/handle/20.500.11766/3178
8. Use and conservation of agrobiodiversity for increased agricultural sustainability,
    smallholder wellbeing and resilience to climate change in India – Karnataka
    http://mel.cgiar.org/xmlui/handle/20.500.11766/3181
9. Baseline survey for agricultural biodiversity in Anantapuramu and Kurnool districts of
    Andhra Pradesh http://mel.cgiar.org/xmlui/handle/20.500.11766/3183
10. Use and conservation of agrobiodiversity for increased agricultural sustainability,
    smallholder wellbeing and resilience to climate change in India - Andhra Pradesh
    http://mel.cgiar.org/xmlui/handle/20.500.11766/3184
11. Baseline Survey for Agricultural Biodiversity in Vijayapur District of Karnataka, India 2014
    http://mel.cgiar.org/xmlui/handle/20.500.11766/4352
12. Baseline Survey for Agricultural Biodiversity in Anantapuramu and Kurnool Districts of
    Andhra Pradesh, India 2014 http://mel.cgiar.org/xmlui/handle/20.500.11766/4351
13. Enhanced system of quality fruit tree planting material production in Uzbekistan
    http://mel.cgiar.org/xmlui/handle/20.500.11766/3398
14. Locally produced nutritious foods and imported foods survey in Niger, West Africa:
    Progress report: http://mel.cgiar.org/xmlui/handle/20.500.11766/4221
15. Crop, tree and animal breed diversification and improvement in Niger, West Africa:
    Progress report: http://mel.cgiar.org/xmlui/handle/20.500.11766/4354

Factsheets (8)

1. Leaflets on knowledge and experience of farmers in production quality planting material of
    fruit trees: http://mel.cgiar.org/xmlui/handle/20.500.11766/3574;
2. Leaflets on knowledge and experience of farmers in production quality planting material
    of fruit trees: http://mel.cgiar.org/xmlui/handle/20.500.11766/3575;
3. Leaflets on knowledge and experience of farmers in production quality planting material
    of fruit trees: http://mel.cgiar.org/xmlui/handle/20.500.11766/3576;
4. Leaflets on knowledge and experience of farmers in production quality planting material
    of fruit trees: http://mel.cgiar.org/xmlui/handle/20.500.11766/3577;
5. Leaflets on knowledge and experience of farmers in production quality planting material
    of fruit trees: http://mel.cgiar.org/xmlui/handle/20.500.11766/3578;
6. Leaflets on knowledge and experience of farmers in production quality planting material
    of fruit trees: http://mel.cgiar.org/xmlui/handle/20.500.11766/3579;
7. Leaflets on knowledge and experience of farmers in production quality planting material
    of fruit trees: http://mel.cgiar.org/xmlui/handle/20.500.11766/3580;
8. Leaflets on knowledge and experience of farmers in production quality planting material
    of fruit trees: http://mel.cgiar.org/xmlui/handle/20.500.11766/3581.

Data sets (3)

1. Fruit tree crops, varieties multiplied by farmers, geo-locations:
    http://mel.cgiar.org/xmlui/handle/20.500.11766/3687
2. Fruit tree crops, varieties multiplied by farmers, geo-locations:
    http://mel.cgiar.org/xmlui/handle/20.500.11766/3097
3. Key suppliers of quality planting material of fruit trees in Uzbekistan:
    http://mel.cgiar.org/xmlui/handle/20.500.11766/3385Otherpublications

Maps (1)

1. Geographical distribution of quality planting material of fruit trees produced in Fergana
    and Aral Sea Action Sites: http://mel.cgiar.org/xmlui/handle/20.500.11766/3404

Brochures (1)

1. Brochure - List of suppliers of quality planting material of fruit trees:
   http://mel.cgiar.org/xmlui/handle/20.500.11766/3403

Tool (2)

1. Tool- Protocole pour l'évaluation de la Biodiversité Agricole (ABD) et Alimentaire à Maradi, Niger, Afrique de l'Ouest: http://mel.cgiar.org/xmlui/handle/20.500.11766/4223
2. Tool: Protocole pour l'évaluation de la diversité des cultures, des espèces agro forestières et des animaux à Aguié, Maradi: http://mel.cgiar.org/xmlui/handle/20.500.11766/4224

Cancelled publications (4)

ESA/Rainfed

Below we provide a list of planned publications for 2016, however, these have been cancelled due to budget cuts.

1. Atieno F.O, Maliro M.O, Mponya N.K, Mauricio B and Ndemo P. Agrobiodiversity resources in Ntcheu District, Malawi-Chinyanja Triangle.
2. Atieno F.O, Maliro M.O, Mponya N.K and Mauricio B. Gender differences in the use, access, management and control of Agrobiodiversity .The Case of Ntcheu District, Malawi-Chinyanja Triangle.
3. Bellon, M., Atieno F.O, Voduohe R. Turdieva M., Marthur, P Celine T., Raneri J., (Bioversity and other colleagues). Agro-biodiversity (ABD) and Dietary Diversity (DD) assessment guideline/manual.
4. N.K Ngoma Zhulu R., Atieno F.O and Mauricio B. Dietary Diversity and Food systems in Ntcheu District, Malawi-Chinyanja Triangle

Annex 1: CRP indicators of progress, with glossary and targets

Center	Bioversity	2015 (Budget Allocation: $238,648)
KNOWLEDGE, TOOLS, DATA		
1. Number of flagship "products" produced by CRP	**Concepts**: Intervention plans for crop diversification; Deployment of agrobiodiversity for reducing vulnerability and promoting sustainable intensification **Geographical Focus**: India	2
2. Number of flagship products produced that have explicit target of women farmers/NRM managers (Selection from Above)	**Concepts**: Intervention plans for crop diversification **Geographical Focus**: India	1 (50%)
3. Number of flagship products produced that have been assessed for likely gender- disaggregated impact (Selection from Above)	**Concepts**: Intervention plans for crop diversification **Geographical Focus**: India	1 (50%)
4. Number of "tools" produced by CRP	**Guideline**: Protocole pour l'évaluation de la diversité des cultures, des espèces agro forestières et des animaux à Aguié, Maradi; Protocole pour l'évaluation de la Biodiversité Agricole (ABD) et Alimentaire à Maradi, Niger, Afrique de l'Ouest; Better management practices of multipurpose trees are disseminated directly to extension workers to benefit farmers **Geographical Focus**: Burkina Faso; Ghana; Mali	3
5. Number of flagship tools produced that have explicit target of women farmers/NRM managers (Selection from Above)	**Guideline**: Better management practices of multipurpose trees are disseminated directly to extension workers to benefit farmers **Geographical Focus**: Burkina Faso; Ghana; Mali	1 (33%)
6. Number of flagship tools produced that have been assessed for likely gender- disaggregated impact (Selection from Above)		0 (0%)
7. Number of open access databases maintained by CRP	**Other**: Fruit tree crops, varieties multiplied by farmers, geo-locations; Key suppliers of quality planting material of fruit trees in Uzbekistan	2
8. Total number of users of these open access databases		0
9. Number of publications in ISI journals produced by CRP	**Publications**: Climate variability and status of the production and diversity of sorghum (Sorghum bicolor (L.) Moench) in the arid zone of northwest Benin; Improving seedling production for Vitex doniana; Current knowledge and breeding perspectives for the miracle plant Synsepalum dulcificum (Schum. et Thonn.) Daniell	3
10. Number of strategic value chains analyzed by CRP		0
11. Number of targeted agro-ecosystems analysed/characterised by CRP	**Type**: Mixed Crops (2), **AEZ**: semi arid **Geographical Focus**: Niger; Nigeria; Malawi	2
12. Estimated population of above-mentioned agro-ecosystems		0

CAPACITY ENHANCEMENT AND INNOVATION PLATFORMS		
13. Number of trainees in short-term programs facilitated by CRP (male)	**Subjects**: Production of quality planting material of fruit trees	16
14. Number of trainees in short-term programs facilitated by CRP (female)	**Subjects**: Production of quality planting material of fruit trees	4
15. Number of trainees in long-term programs facilitated by CRP (male)		0
16.Number of trainees in long-term programs facilitated by CRP (female)		0
17. Number of multi-stakeholder R4D innovation platforms established for the targeted agro-ecosystems by the CRPs	**Innovation Platforms**: Farmers' identification of adaptive crop diversity through field experimental networks and their seed production through community participation	1
TECHNOLOGIES/PRACTICES IN VARIOUS STAGES OF DEVELOPMENT		
18. Number of technologies/NRM practices under research in the CRP (Phase I)	**Biological:** Intervention plans for crop diversification finalized for implementation Management and cultural practices: Local management of tree, crop and animal breeds ; Production of quality planting material of local fruit trees varieties Geographical Focus: Niger; Nigeria; India; Uzbekistan	3
19. Number of technologies under research that have an explicit target of women farmers (Selection from Above)	**Biological:** Intervention plans for crop diversification finalized for implementation Management and cultural practices: Production of quality planting material of local fruit trees varieties **Geographical Focus**: India; Uzbekistan	2 (67%)
20. Number of technologies under research that have been assessed for likely gender- disaggregated impact (Selection from Above)		0 (0%)
21 Number of agro- ecosystems for which CRP has identified feasible approaches for improving ecosystem services and for establishing positive incentives for farmers to improve ecosystem functions as per the CRP's recommendations		0
22. Number of people who will potentially benefit from plans, once finalised, for the scaling up of strategies		0
23. Number of technologies /NRM practices field tested (phase II)		0
24. Number of agro-ecosystems for which innovations (technologies, policies, practices, integrative approaches) and options for improvement at system level have been developed and are being field tested (Phase II)		0
25. Number of above innovations/approaches/options that are targeted at decreasing inequality between men and women		0 (0%)

26. Number of published research outputs from CRP utilised in targeted agro- ecosystems		0
27.Number of technologies/NRM practices released by public and private sector partners globally (phase III)		0
POLICIES IN VARIOUS STAGES OF DEVELOPMENT		
28. Numbers of Policies/ Regulations/ Administrative Procedures Analyzed (Stage 1)		0
29. Number of policies / regulations / administrative procedures drafted and presented for public/stakeholder consultation (Stage 2)		0
30. Number of policies / regulations / administrative procedures presented for legislation(Stage 3)		0
31. Number of policies / regulations / administrative procedures prepared passed/approved (Stage 4)		0
32. Number of policies / regulations / administrative procedures passed for which implementation has begun (Stage 5)		0
OUTCOMES ON THE GROUND		
33. Number of hectares under improved technologies or management practices as a result of CRP research		0
34. Number of MALE farmers and others who have applied new technologies or management practices as a result of CRP research		0
35. Number of FEMALE farmers and others who have applied new technologies or management practices as a result of CRP research		0

Annex 2: Performance indicators for gender mainstreaming with targets defined

Performance Indicator	CRP performance meets requirements
1. Gender equality targets defined	Sex-disaggregated social data collected and used to diagnose important gender-related constraints in at least one of the CRP's main target populations **And** The CRP has defined and collected baseline data on the main dimensions of gender inequality in the CRP's main target populations relevant to its expected outcomes (IDOs)
2. Institutional architecture for integration of gender is in place	- CRP scientists and managers with responsibility for gender in the CRP's outputs are appointed, have written TORS and funds allocated to support their interaction. - Procedures defined to report use of available diagnostic or baseline knowledge on gender routinely for assessment of the gender equality implications of the CRP's flagship research products as per the Gender Strategy -CRP M&E system has protocol for tracking progress on integration of gender in research **And** A CRP plan approved for capacity development in gender analysis

Annex 3: List of Centre Research Staff contributing to Dryland Systems

Bioversity's 2015 CRP Dryland Systems Final List of personnel and consultants contributing to CRP Dryland Systems in 2015 is available on CGXchange.

RESEARCH PROGRAM ON
Dryland Systems

CGIAR

The CGIAR Research Program on Dryland Systems aims to improve the lives of 1.6 billion people and mitigate land and resource degradation in 3 billion hectares covering the world's dry areas.

Dryland Systems engages in integrated agricultural systems research to address key socioeconomic and biophysical constraints that affect food security, equitable and sustainable land and natural resource management, and the livelihoods of poor and marginalized dryland communities. The program unifies eight CGIAR Centers and uses unique partnership platforms to bind together scientific research results with the skills and capacities of national agricultural research systems (NARS), advanced research institutes (ARIs), non-governmental and civil society organizations, the private sector, and other actors to test and develop practical innovative solutions for rural dryland communities.

The program is led by the International Center for Agricultural Research in the Dry Areas (ICARDA), a member of the CGIAR Consortium. CGIAR is a global agriculture research partnership for a food secure future.

For more information, please visit

drylandsystems.cgiar.org

Led by:

ICARDA
Science for Better Livelihoods in Dry Areas

In partnership with:

ICRISAT
Science with a human face

Bioversity
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CENTRO INTERNACIONAL DE LA PAPA
CIP

World Agroforestry Centre

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

IWMI
International Water Management Institute