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Final report

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Integrated Catchment Management and Capacity Building for Improving Livelihoods in Afghanistan

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Acronym

AAA	Action Aid Afghanistan
ACIAR	Australian Center for International Agriculture Research
Afs	Afghani (Currency)
AKDN	Aga Khan Development Network
APM	Annul Planning Meeting
AREU	Afghanistan Research and Evaluation Unit
ARIA	Agricultural Research Institute of Afghanistan
AusAID	Australian Agency for International Development
AVRDC	World Vegetable Centre (formerly Asian Vegetable Research and Development Centre)
AWP	Annual Work Plan
BGN	Baghlan
BLK	Balkh
CBOs	Community Based Organizations
CDCs	Cluster Development Committees
CGIAR	Consultative Group on International Agricultural Research
CIG	Common Interest Group
CIMMYT	International Maize and Wheat Improvement Center
CLAP	Community Livestock and Agriculture Project
CRIDA	Central Research Institute on Dryland Agriculture (ICAR, India)
CRS	Catholic Relief Services
DAIL	Department of Agriculture, Irrigation and Livestock
DFID	Department For International Development (United Kingdom)
DLFU	Dryland Farming Unit (of MAIL)
EPA	Entry Point Activity
ET	Evapo-Transpiration
FAO	United Nations Food and Agriculture Organization
FFS	Farmers' Field School
GIRoA	Government Islamic Republic of Afghanistan
GIS	Geographical Information System
GRP	Gender Responsive Plan
HRI	High Resolution Image
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRAF	International Centre for Research on Agroforestry (World Agroforestry Center)
ICT	Information and Communication Technology
IDRC	International Development Research Centre (Canada)
IFAD	International Fund for Agricultural Development (United Nations)
IIPR	Indian Institute of Pulse Research (of ICAR, India)
IWLM	Integrated Water and Land Management
JICA	Japan International Cooperation Agency

KBL	Kabul
L&WM	Land & Water Management
M&E	Monitoring and Evaluation
MAIL	Ministry of Agriculture, Irrigation and Livestock in Afghanistan
MOA	Memorandum of Agreement
MoU	Memorandum of Understanding
MTR	Mid-term Review
NADF	National Agricultural Development Framework
NEPA	National Environmental Protection Agency
NGO	Non-Government Organization
NGR	Nangarhar
NRM	Natural Resources Management
PAU	Punjab Agricultural University
POG	Program Oversight Group
PSC	Project Steering Committee
RPM	Research Program Management
SHG	Self-help Group
SLMI	Sustainable Land Management Institute
TNA	Training Needs Assessment
ToT	Trainer of Trainers
TWG	Technical Working Group
UNEP	United Nation’s Environment Program
VBSE	Village-based Seed Enterprise
WFP	United Nations World Food Programme
WHC	Water Holding Capacity
WUA	Water Users’ Association
WSUA	Watershed Users' Association

1 Acknowledgments

ICARDA sincerely acknowledges the splendid support and participation of MOFA, AusAID, DFAT, ACIAR, MAIL (Ministry, ARIA, Agriculture faculty/universities, NRM department, DLFS cell, DAILs of Baghlan, Balkh, Bamyan, Kabul, Nangarhar, Parwan, and Takhar, other Afghan government agencies), local community bodies (CDCs), WSUA (watershed users' associations), and CBOs – that make this program successful. We take this opportunity to mention due credits to all these stakeholders.

The Watershed Users Association (WSUA), the informal community group with both men and women members in it, worked with a lot of commitment and ownership; their efforts are acknowledged once again. Sincere effort needed to institutionalize these key groups as in other countries, and build their capacities to roll out and own NRM activities at ground level.

We acknowledge The Australian Agency for International Development (AusAID) for their support to this project under Australian Governments overseas aid program. As an Executive Agency within the Foreign Affairs and Trade portfolio, Australian Aid significantly contributed to the watershed project for sustainable land and water management towards impacting the agriculture and natural resource productivity, economic growth and poverty reduction. This serves to Australia's national interests by promoting stability and prosperity both in the region and beyond (http://aid.dfat.gov.au).

The support of ACIAR (Australian Centre for International Agricultural Research) directly working with ICARDA in planning, monitoring and evaluation of watershed project is sincerely acknowledged. As the statutory authority that operates as part of the Australian Aid Program, it shared with project the knowledge from Australia's agricultural scientists for the benefit of the community and government involved in watershed project implementation in Afghanistan. We acknowledge the contribution of ACIAR to align this research project within a framework reflecting the priorities of Australia's Aid program and national research strengths, together with the agricultural research and development priorities of Afghanistan (http://aciar.gov.au/).

The Ministry of Agriculture, Irrigation and Livestock (MAIL) in Government of Islamic Republic of Afghanistan through its offices and officers in Kabul and in project provinces (DAILs) have supported the project a lot for successful implementation at village level, and taking over the operation and management responsibility along with community. MAIL's effort to scale out watershed projects (best practices) under DLFS with support from DFAT s highly commendable and acknowledged. MAIL as the apex authority envisions to restore Afghanistan's licit agricultural economy through empowered human resource, enhanced agricultural production and productivity, natural resource management, improved physical infrastructure and market development. We acknowledge the effort and guidance of MAIL for coordinating and bringing together the research agencies (ARIA, other Universities/ Colleges), and extension Directorates (NRM, NEPA, OFWM, etc.) which is very crucial for successful implementation of watershed project, and ushering new land and water management technologies for dry land agricultural development in Afghanistan (http://mail.gov.af/en/).

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We acknowledge all stakeholders (regret if missed to quote here) who contributed to this project, directly or indirectly, in any manner.

2 Executive summary

The integrated catchment management project was initiated in 2012 with financial support from ACIAR/MAIL to address stress[1] to farm lands in Afghanistan from prolonged dry period and severe soil erosion. The project was revised in 2014-15 based upon the local learning and recommendations of the third POG 2014 (POG/meetings, *Appendix 11.7)*; a variation document was approved in the fourth POG meeting at Dubai in March 2015 along with a Results Framework and Project Impact Pathway (PIP) (*Appendix 11.8*) along with key project stakeholders, engagement and communication action (*Appendix 11.11*). This project is an adaptive and participatory research initiative with a focus on (a) research and standardization of improved catchment and NRM management practices, (b) training and capacity building of MAIL, research Institutions, department officers, CBOs and communities involving women and youth, (c) community-level watershed management, and (d) creating data/knowledge base on dryland watershed production systems, the adoption of dryland cereal and legume technologies that increase production and productivity. The Afghanistan Government, Ministry and Department of Agriculture (ARIA, MAIL, DAIL) are key collaborators and an implementing partner along with ActionAid and the Agha Khan foundation and United Nation's Environment Program (details as given in *Appendix 11.1*). The project is being implemented eight sites in six different provinces of Afghanistan (one province was dropped though micro-planning was done).

To implement eight model watersheds (1 research site and 7 community watershed sites), the participatory survey and micro-plans prepared in detail consultation with relevant authorities/ community, and DAIL. But due to escalating security/intractable conflicting situation, we had to drop 4 sites in later stages, and identify 4 new sites where participatory survey and micro-planning process was repeated. Hence, in total we did survey and micro-plans in twelve watershed sites out of which four sites were dropped, and implementation done in eight sites in seven provinces e.g. Kabul (1 R&D site), Balkh (2 WS), Nangarhar (2 WS), Baghlan (1 WS), Takhar (1 WS), and Parwan (1 WS). Four watershed sites that are dropped and changed to new sites are Kharuti WS changed to Aq-Masjid WS in Takhar province, Khoskak WS changed first to Qul-Roba watershed, then to Surkhdara WS, and all three sites in Bamyan province were finally cancelled due to security concerns, and unmanageable social conflicts in project villages. The watershed sites have been developed through a collaborative stakeholders' approach involving ICARDA, MAIL, DAIL, WUA, and communities. MAIL, DAIL and ICARDA conducted regular joint visits to ensure timely implementation of project activities as per plan, and do assessment of agreed activities at all WS site (*Appendix 11.2, 11.13*).

The project made desired progress, as per annual work plans, in regard to (a) partnering with government, policy makers, working groups, universities and community, (b) watershed component research, reviews, reports/papers publication, (c) microplanning with WSUAs and DAIL, (d) implementation of treatment measures, (e) community/ stakeholder training/capacity building, (f) policy consultations, and (g) hand over of assets created to community and relevant authorities. The project deliveries are made despite setbacks due to unpredictable security situations in five out of eight watershed sites (apart from 4 sites which were dropped due to unmanageable security conditions). Various research activities are carried out to standardize the best practices in local context - to bridge knowledge and policy gaps, and disseminate WS management knowledge. Watershed user associations as a key social institution introduced as a new concept by this project (referring to ws project operations in other countries); WSUAs

[1]**Sustainable Land Management 2007 report- Ministry of Agriculture and Food (MoAF), Afghanistan:** Over the past two decades 50% of farmlands in Afghanistan were not cultivated due, in part, to prolong dry periods and severe soil erosion. The barren and undulating topography dominates the landscapes and aggravates erosive nature of rainfall run-off. The impact of land degradation contributes to a complex interplay been food security and poverty that pervades large areas of rural Afghanistan. 80% percent of agriculture is under dryland farming depending on low and extremely variable rainfall. A declining water balance affects food security of 27 million populations in Afghanistan. In order to address food security and livelihoods, it is critical to invest in the conservation of soil and water resources. Apart from finances, Afghanistan lacks in trained human resources to support the agricultural research and development.

ensured enhanced community involvement and implementation of watershed activities. Each watershed was selected and developed using both manual survey methods and secondary survey (geo-informatics). ICARDA has established effective partnerships with GIRoA, ministry and line departments, communities and other stakeholders. Capacity development of all stakeholders is one of the most important achievements in the project. Capacity development efforts involved training activities (*Appendix 11.5*); 45 in-country trainings, 6 out-of-country trainings and 7 FFDs conducted to build capacity of 1865 individuals including 267 females involving 639 community persons and project staff, 17 policy makers, 32 stakeholders, 142 students; FFDs involved 373 farmers and students for intensive learning; six out-country trainings [4 in India (2 in Telangana and AP state of India, and 1 in PAU, 1 in New Delhi, India), and 2 in Jordan. Modern ICT tools used to send short technical message (4 messages) in local language sent to more than 2,500 farmers via mobile SMS) have been explored for faster dissemination of technologies to the end user.

High resolution watershed images were developed and geo-referenced with field photos for appropriate watershed delineation, identifying key entry points, prioritizing activities and field level validation. Watershed model plans were derived considering the slope, drainage pattern, drainage density, flow accumulation, discharge points, etc. that helped in the deciding suitable locations for key water harvest treatments; the locations are further field validated. Climatic data for the last six years were obtained from weather/civil aviation departments to support watershed modelling and other research. Instruments installed in Badam Bagh monitors temperature, rainfall, run-off, evaporation, sedimentation and infiltration. These data are being used for research on water management. Procurement done and installation finalized in locations for a range of instruments e.g. mini-weather station (6 locations), tensiometers- 100 nos, soil test kit (5-6 nos), pH and EC portable meter (2-3 nos), green seeker crop sensing units (10 nos), infrared thermometers (5 nos), plant biomass assessment unit, turbidity meter and flow meter/water flumes to contribute to data generated on local weather, land and water.

A baseline study has been completed for watershed project (baseline study findings, *Appendix 11.14*). A further study on 'Farmer's Adaption Strategy to Climate Change Risks in Dryland Farming in Afghanistan' is in progress. Two brochures on "Watershed projects" and "Build the Capacity and make the Outcome Sustainable" were published in English. Two publications in local languages have been finalized and are currently being printed (one is a manual on watershed management and other is a booklet on watershed information and techniques). A research and review publication on 'Watershed Development in Afghanistan: Lessons from South Asia' has been developed. A review paper on watershed management in Afghanistan has been submitted to a peer review journal.

In eight the watersheds (Badambagh in Kabul, Khwaja-alghor and Saiyad in Balkh, Qarasay in Baghlan, Otran and Amlah in Nangrahar, Aq-masjid in Takhar, and dashte Gawhar khan in Parwan), different land and water management structures are made e.g. contour bund/trenches (10516 numbers, 626.6 km), gully reclamation structures (62 numbers), check & diversion weirs (78 numbers), ponds (5 numbers), percolation tanks (8 numbers), diversion canal (13 numbers, 835 meters), spring renovation (4 numbers), protection wall (102 meters), pasture/horticulture/forest saplings planted (27638 numbers, 168.6 hectares), plantation pits of different designs (1954 numbers of pits of different design e.g. diamond pits, v- pits and semi-circle pits); 109051 sqm of surface directly treated through above structures to intercept in-situ precipitation with 28962 cum at full capacity; at 250 mm precipitation per annum, the structures are ready harvest 27.26 million liters excluding run-off collections from micro catchment of each structure; 1016.7 cum of soil sediment is intercepted by the gully control structure and check dams; 1 kanda/underground storage (21,000 liters), and 1 well was constructed, which immediately benefited the community. Pasture development on 35.55 ha (atriplex saplings), forest species plantation (68.75 ha), village forest protection advocacy on 900 ha through CFM, and horticulture plantation did well in 64.3 ha planted with pistachio, mulberry, grape, and hing (WS Key Activities, *Appendix – 11.4*). Mulberry plantations are established using different plot designs (16 m^2 and 36 m^2) with micro water harvesting (nigarime) techniques resulted in acceptable survival rates when compared to control treatments (survival highest i.e. 77-95% in 36 m^2 plot, 60-94% in 16 m^2 plot and lowest of <50% in control). While there are good achievements, the field implementation has been adversely affected due to the security situation. New replacement sites were assessed with greater security. HRI and hydroshed modelling work is in progress for new sites. In 7 community watersheds, 7 WSUAs are

established involving 113 members (34 women members). WSUA training field guide is followed in community trainings that cover aspects on institution formation and institution strengthening.

As suggested in MTR, the project M&E team s formed and trained on monitoring processes; they periodically monitored and suggested for project improvements. TWG meetings are conducted to discuss progress, constraints and make important suggestions. Various coordination and review meetings are conducted involving MAIL, DAIL, partner NGOs and community persons. The activities in the field are regularly monitored by DAIL Directors or representatives, and they participate in all activities.

Field-specific adaptation activities are carried out utilizing project techniques that include the harvesting of rain water in Saiyad and allowing its gravity flow to irrigate the plantation instead of a 3-stage solar pumping of water from streams. The field research and learning suggest to limit the check dam to less than 5 meters, especially where the slope is greater than 15-20% to address irreparable damage due to flash floods. Date on the infiltration rate, runoff, sedimentation load is assessed. Macro/micro-water harvesting technologies are integrated into the design of structures. The vegetation (e.g. shrubs and bushes plantation) alongside these structures add to their strength and efficiency. The project is integrated with other ICARDA projects e.g. forage project of ACIAR and CLAP project of IFAD - to improve production and productivity of water, land, agriculture, and livestock.

There are a lot of evidences from the project to suggest that the project is generating economic, social, policy and environmental impacts (e.g. wage and ancillary employment, agriculture wellbeing, reducing soil and water erosion, policy and research advocacy, and environmental safety). Direct wage employment due to man-days created (10.32 mn Afs) through WSP activities apart from its long-term benefit from assets created and soft skills imparted. The project, has significant impacts on the WS R&D information, training policy makers and other stakeholders apart from water recharge, soil fertility improvement, environmental and a range of ancillary benefits.

The project upon its completion is prepared for best practices upscaling in the country. It is sharing the impacts and the practical experience on watershed implementation processes with ministry and the donors like DFAT/AusAID under DLFS strategy, and USAID under climate resilient production approaches apart from possible talks with EU, WB and US Naval Agency who is to implement Afghanistan Reconstruction project. Discussions are underway with AECOM-USAID (under ongoing SWIM project). The project did extensive capacity building of the community, MAIL, DAIL and other stakeholders for transfer of best bet knowledge so that they become capable to sustainably manage the watershed structures and assets created, and also to develop more watersheds in the locality using appropriate technology.

3 Background

To increase food security and improve rural livelihoods in Afghanistan, it is critical to invest in conservation of soil and water that enhance production, productivity and natural resource use efficiency, minimise risk and increase income and sustainability. For successful implementation of such land and water management programs, apart from financial resources, Afghanistan required trained human resources to conduct various component research and development activities, and developing adaptive research and pilot watershed sites development to assess and characterize dryland watershed sites and enhance catchment productivity through improving water and land resources, bridging knowledge gaps on watershed management, and hence improving livelihoods of rural people which will be achieved by enhancing conservation and efficient use of natural resources (land and water); increasing the production, productivity of food grain-forage-agroforestry-livestock systems; building the capacity of the Ministry of Agriculture, Irrigation and Livestock (MAIL), local communities, NGOs and other stakeholders in the area of watershed management, natural resource management and agricultural productivity; and sharing and enhancing knowledge transfer between project partners and farmers.

The project is supported by ACIAR/AusAID, and is managed by the International Center for Agricultural Research in the Dry Areas (ICARDA). The project worked with MAIL through its Agriculture Research Institute of Afghanistan (ARIA), the DAIL offices in Kabul, Baghlan, Balkh, Parwan, Bamyan, Nangarhar, and Takhar provinces; and involving universities in Kabul, Bamyan, Baghlan, Balkh, and Nangarhar. The project was planned involving International Maize and Wheat Improvement Center (CIMMYT), Actionaid, United Nations Environment Program (UNEP), and Agha Khan Foundation.

The selection of target provinces was done based on the area under rainfed agriculture, suitable catchment area for watershed development, low cereal productivity, accessibility and the security situation. Community-based catchment benchmark sites were proposed to be developed in the target provinces along with the establishment of a satellite site at the Badam Bagh Research Station of MAIL, located in Kabul. Other sites were community-based development initiatives with expectation to benefit more than 2,000 farmers. The data generation, practical knowledge sharing, and capacity development are important outcomes to make various stakeholders manage the program in long run. Capacity building of MAIL/DAIL staff, Watershed Associations (WSUAs) was planned at various levels: medium-term in-service training in India for 15 members from MAIL/DAIL, WSAs and university teachers in dryland agriculture; *in situ* training of researchers and extension workers in Afghanistan; and training of farmers, NGO workers through hands on training, field days and site visits. Training in Afghanistan were planned to be linked to initiatives such as DLF/ SLMI/UNEP at Bamyan, Actionaid and were to be used in project learning sites.

Training in India were linked to previous ACIAR projects on watershed development in Andhra Pradesh. The potential partner institutes such as the Department for Rural Development and other ICAR and State Agricultural Universities collaborating with ACIAR were identified and consulted for the training of different stakeholders. These initiatives were expected to increase the capacity of research and project implementation capacity of MAIL/DAIL/collaborating NGOs; university teachers who will be teaching agricultural graduates with a prospect of being employed by MAIL/DAIL; and farmers.

The project was planned to build upon the experiences and linkages ICARDA has developed for capacity-building opportunities to MAIL/DAIL, the Ministry of Higher Education and several of its universities through: the Research in Alternative Livelihoods Fund (RALF) funded by the United Kingdom's Department For International Development (DFID); the project on capacity development of Afghan researchers, funded by the Canadian International Development Research Centre (IDRC); and Japan International Cooperation Agency (JICA) – ICARDA program.

Research in this project were to focus on: understanding constraints and knowledge gaps on watershed management, measuring the effect of catchment-management interventions on water capture/run-off and soil loss; developing best bet practices water harvesting and soil conservation, improving *in-situ* and *ex-situ* water conservation and improving water use efficiency, measuring the effects of interventions to close the yield gap and generating good agricultural practice guidelines; and linking this watershed management research with existing farming systems, livelihoods and smallholder family needs; introduction of new cereal and legume cultivars (through associated projects and partners) with multiple uses through participatory approaches; and understanding uptake pathways and developing information and communication technologies.

The project had the plan to demonstrate the sustainable technologies for watershed management, economic wellbeing of rural poor through increased water and land productivity and the rehabilitation and efficient use of natural resources. Expected outputs, adoption and impacts were expected to heavily depend on several factors, including social acceptance of the project, extent of understanding and cooperation by the communities, willingness of the male members to allow their women to participate, and on the security situation at the implementation sites during the proposed activities.

4 Objectives

As per the initial project document, the overall goal is to bridge knowledge gaps on watershed management, developing community based watershed management model sites. The project was to develop and validate the “best bet practices” to enhance land and water productivity alternatively leading to improved livelihoods of communities dependent on dryland agricultural production systems. In the short term, the focus will be on using advanced tools (GIS and Remote sensing to assess and characterize watershed, developing and disseminating “best bet practices” to enhance water and land use efficiency and diversification. Over the longer term, the focus was to develop sustainable community based watersheds with adaptable farming systems in each watershed, and develop community/MAIL capacity especially women to adopt and contribute in Integrated Watershed Management (IWM) to enhance livelihoods.

The broad objectives of the Integrated Catchment Management Program in the initial project document were -

1. To form a coalition of partners working in the drylands to implement the project, and to establish a project management and technical working committee to implement, coordinate and manage the project
2. To strengthen scientific capacity of MAIL/ARIA, partner NGOs, and policy makers to create enabling policy environment as well as effectively implement, monitor, and disseminate integrated watershed management programmes in Afghanistan
3. To understand existing soil and water conservation practices linked with production systems and livelihoods (baseline data), including the roles and needs of males and females in farming households, and the social, economic and technical contexts (constraints/opportunities) influencing adoption of dryland technologies
4. Spatial assessment and characterization of the watershed catchment using advanced tools (GIS and Remote Sensing) and field surveys in five provinces of Afghanistan
5. Develop, disseminate and analyse impact of soil conservation technologies, water harvesting practices, and best bet production technologies for sustainable watershed management

During Programme Oversight Group meeting (POG-4) in Dubai during 28-29, March 2015, there was discussion and approval of variation document and development of elaborate Results Framework and Project Impacts Pathway. As per the variation document, the realigned objectives are

Obj. 1. To align GIRoA Ministries and other stakeholders in providing ongoing support for soil and water productivity improvements in watersheds;

Obj. 2. To improve capacity and confidence of project partners e.g. MAIL, Universities, ARIA, NGOs to conduct watershed management research and extension

Obj. 3. To increase understanding of soil and water conservation practices integrated with production systems, livelihoods (baseline data) and other factors influencing adoption of dryland technologies

Obj. 4. In participation with WUAs develop, disseminate and analyse impact of soil conservation technologies, water harvesting practices, and best-bet production technologies for sustainable watershed management

Obj. 5. To utilise spatial and other information management systems for prioritisation of investment for catchment management planning.

5 Methodology

In order to achieve the project objectives, consultation with partners took place in December 2010, September 2011 and January 2012 to develop the proposal framework, But there was still a requirement to engage partners to approve the prioritised project objectives and research sites, and formalise their roles and responsibilities by signing a MOA. The first or inception phase of 6 months included formalising a coalition of partners to strengthen dryland agriculture by prioritising project objectives and interventions (Objective 1), the new partners (UNEP and ActionAid) were included in the TWG and PMC of the project as a mid-term review of project activities, as well as project has developed and initiated a capacity-strengthening plan (Objective 2) and M&E plan, so that the project can be successfully implemented by coalition of partners. Further emphasis was put to prioritize the training activities through TWG. The training activities within country and outside country were be conducted in collaboration with partners and were built upon their strengths. Project well emphasized to build the capacity of policy makers through out-country trainings and in-country cross site visits and deliberations. Baseline data collection has been collected and analysed for the sites (Objective 3) during the inception phase, the base data as climate, soil, land cover, etc. were helpful to prioritize through use of remote sensing and field validation in selected sites. It is envisaged to do trainings for proper capacity building by the end of Year 2014, by the end of Year 2015 the capacity developed in the stakeholders to establish, operate and maintain benchmark sites. ICARDA was to implement the project in close cooperation and coordination with MAIL/DAIL, UNEP, ActionAid, SLMI and other partners. Following the approach, ICARDA has been successfully working in Afghanistan on several projects. In the subsequent phase of the project (phase II), the emphasis was made on collecting baseline data (Objective 3) that is essential for project M&E, establishing model or learning sites for community-based conservation and productivity interventions and the social processes or models needed to support the replication (Objective 4), and conducting different research on soil and water conservation practises, develop different water harvesting techniques, improve and develop the vegetation covers by increasing the rangeland, vegetation, orchards and forest trees, research on deficit irrigation of wheat, also cereal-based system productivity constraints, conservation practices and sustainability (Objective 5). Objectives 4 and 5 has the essence of the social, technical and research aspects of this proposal, including NRM and productivity, as well as community-based systems to implement catchment-management programs. Based on the situation in the target provinces, the following approaches strategies were adopted.

Initially, the potential watershed sites in five provinces (Balkh, Baghlan, Bamyan, Takhar and Nangarhar) were selected according the following procedure:

Watershed selection: for each selected province, the group of ICARDA scientist, MAIL, DAIL and some of the Community visited different watersheds in each province. Based on the field visits, the watersheds were listed according to criteria of - community cooperation and acceptance, watershed properties or characteristics as (size, topography, potential for water harvesting and land suitability).

Watershed characterization and Mapping: referring to field visit, GPS data, DEM map, and Google Topographic maps, basic maps were produced such as, watershed boundary map, contour map, stream map, general soil map, general land cover map, and natural resource map

Work plan: A watershed plan is made as a flexible framework for managing water resource quality and quantity within specified drainage areas, or watersheds. This approach included stakeholder involvement and management actions supported by sound science and appropriate technology.

The *watershed planning process* worked within this framework by using a series of cooperative, iterative steps to characterize existing conditions, identify and prioritize

problems, define management objectives, develop protection or remediation strategies, and implement and adapt selected actions as necessary.

A *watershed plan* is developed as a strategy that provides assessment and management information for a geographically defined watershed, including the analyses, actions, participants, and resources related to developing and implementing the plan. The development of watershed plans involved a certain level of technical expertise and the participation of a variety of people with diverse skills and knowledge. Using a watershed approach to restore impaired water bodies is beneficial because it addresses the problems in a holistic manner and the stakeholders in the watershed are actively involved in selecting the management strategies that will be implemented to solve the problems. Referring to watershed characterization and community interest, workplan were designed in a way to include: soil and water conservation measure, water harvesting techniques, and vegetation covers.

The watershed planning process were to follow following major steps:

1. Build partnerships.
2. Characterize the watershed to identify problems.
3. Set goals and identify solutions.
4. Design and implementation program.
5. Implement the watershed plan.
6. Measure progress and make adjustments.

Workplan implementation: work plans were implemented on a sequence of different stages, as soil and water conservation measure, water harvesting techniques, and farm development with cooperation with community.

Second approach: Department of Irrigation in the MAIL has been working to establish more than 500 watershed users' associations in the country. From the list of associations in the five target provinces, one association from each target province (Balkh, Baghlan, Bamyan, Takhar and Nangarhar) which is willing to participate in the project interventions were identified after discussing the project activities with their members. Watershed site and the catchment area where the identified association/community was functioning well, were delineated using the GPS and other relevant parameters such as rainfall, soil type, topography, etc.

One watershed site from among the potential sites will be selected after discussing in the Working Group meeting. Each watershed users' association to consist of 10 to 15 members. A farmer in a community can become a member of such association if he/she has land (one to five jerib) and has source of water for cultivating crops. The selected watershed site and its catchment area will be characterized on the selected parameters. Benchmarks for both NRM and cereal based dry land farming systems well established for the identified catchment sites in all the five target provinces while characterizing. Besides these 7 watershed sites in the target provinces, Badambagh watershed site in Kabul are to be a maintained as Model watershed site showing possible soil and water conservation techniques and water harvesting techniques to the policy makers. The Saiyad watershed site be maintained at low level in order to meet the Afghanistan Govt. requirements. While maintaining these sites, some research activities (comparing the performance or water use efficiency of water harvesting structures (diamond, semi-circle and V-shape) of different measurements) were also carried out. Runoff and sedimentation be estimated from the structures constructed. Water use efficiency or water productivity will be estimated from the crops grown using the water collected in the two ponds developed.

Youth Capacity Development: The project envisioned to hire postdoc/Ph.D./Masters students to conduct their research under the aegis of the project partially in Afghanistan and rest in India/Australia. The project also envision to sponsor the graduate students at universities in Afghanistan to conduct their projects at different watershed sites in Afghanistan. Different interventions to be introduced in each of the catchment sites of the identified watersheds (Soil and water conservation methods, dry land technologies,

improved varieties and the associated best practices) will be identified and prioritized based on the characteristics of watershed site, entry points obtained from baseline survey, consultation with communities.

Planned interventions: can be broadly grouped under four groups, e.g. Water harvesting techniques, Soil and water conservation techniques, farm development measures, and deficit irrigation. Type of intervention at each of the selected site would depend on the site characterization and community priorities. Structures to measure runoff and sedimentation, will be established at all five target sites which will facilitate in proper planning of interventions. Adaptive and Participatory Research trials to be done in all the provinces which include new technologies for soil and water conservation, innovative management practices, evaluating the adaptation of latest varieties of crops such as wheat, barley, mungbean, chickpea, and lentil and farming based systems for sustainable productions system models. Participatory demonstrations include best bet practices, deficit irrigation, demos on improved varieties and their associated practices, raised bed cultivation of wheat, supplementary irrigation, soil and water conservation technologies, water harvesting technologies, etc. Water conservation and its efficiency through all the interventions will be assessed besides measuring the economic benefits from different interventions to be introduced. Water and use efficiency enhanced, yield gaps reduced and incomes increased for those participated in different demonstrations in comparison with those who did not participate.

Gender inclusive engagement of communities: Considering the cultural constraints prevailing, efforts will be made to encourage participation of communities as per the gender plan prepared. Each of the planned association will have male and female members.

Knowledge sharing activities: All the watershed sites will act as focal points for training other farmers and communities (scaling up), and for raising awareness and interest among policymakers and other sectors (e.g. environment, health, education etc.) working in rural areas. field days, demonstrations on different interventions, publications (Technical bulletins, brochures, flyers), use of mass media tools such as radio and television by developing radio talks and video films on success stories including modern ICT tools, case studies, participation in exhibitions (International, National, Regional), cross visits of communities/associations to different sites in the target provinces will enhance awareness about the benefits of organizing communities into similar associations such as watershed users' association and the associated benefits from watershed development.

Project management – It is proposed to manage the project through a partnership coalition with key/core stakeholders and to form a project management committee represented by all the key partners including donor agency that will provide guidance and oversight. Another Technical Working Group (TWG) will be formed including the experts directly or not directly involved in the project activities, such as local experts/community leaders, watershed specialists, communication, partnership and policy experts, to add value as the need arises. The institutes from Indian Council of Agricultural research (ICAR- India) and some State University from India are such organisations that can provide long-term support to the dryland farming initiative. We are strongly committed to supporting and motivating MAIL and local partners such as DAIL, DLF, other NGOs and the SLMI to develop their capacity to manage the project as an exit and risk-reduction strategy. Emphasis will be given to involve DAIL and local/district/provincial government/units, the Ministry of Rural Reconstruction and Development, NEPA, and other players to ensure continued support to the community after phasing out of the project.

The project envisions to hire new postdoc/Ph.D./Masters students to conduct their research under the aegis of the project partially in Afghanistan and rest in India/Australia. The project also envisions to sponsor the graduate students at universities in Afghanistan to conduct their projects at different watershed sites in Afghanistan. Overall project implementation will be overseen by PMC with local management through TWG. The project will be implemented under the CGIAR Research Program 1.1, Integrated Agricultural Production Systems for the Poor and Vulnerable in Dry Areas (CRP 1.1) umbrella.

6 Achievements against activities and outputs/milestones

Objective 1: To align GIRoA Ministries and other stakeholders in providing ongoing support for soil and water productivity improvements in watersheds

SN.	Main Activity	Outputs/ Milestones	Achieved/ in progress	Date of Compl., & % Achv.
1.1	**Partnerships, working groups formation and establishing relationships for project implementation, coordination and management**	Functional partnerships and working groups involving concerned stakeholders established a. Technical working group (TWG) formulated b. Project Management Committee overseeing the project management, coordination and implementation	- Enhanced functional partnerships with community, WUAs, CDCs, DAILs, MAIL, ARIA and donor agencies; - Regular joint field visits and reviews with all stakeholders; - Demands by province governor, DAIL directors & community for continuation of WS/NRM activities in the project villages, and neighbouring villages;	July 2018, 100%
			- Technical working group (TWG) meetings conducted, reviewed progress and work plans; TWG suggested for intensive community capacity building and training so that community is skilled to manage the structures; TWG approved DAIL recommendations for taking up suitable new sites; As per TWG approval, the feasibility is studied and microplans prepared; (Appendix - 11.12)	July 2018, 100%
			- PMC meeting held on regularly, reviewed the project activities and progress in, Kabul) with participation of donor (ACIAR), ICARDA, MAIL, ARAIA, DAIL, field partners and community representatives; PMC expressed happiness in work progress and suggested for proper documentation and knowledge sharing;	Sep 2018, 100%
1.2	**Developing project management and coordination,**	Annual work plans (AWP) developed	- PMC reviewed work progress, discussed work plan for project years; looked into work plan involving DAIL, CDC and WUAs, etc. in processes of	Sep 2018, 100%

	implementation plan		site feasibility, microplan, treatments, trainings etc.; PMC approved all AWPs;	
1.3	**Contracts signed, engagement, communications, monitoring and evaluation, governance and training plans developed (Responsible: ICARDA will be overall responsible for M&E).** a. *Memorandum of Understandings (MoU) with different stakeholders will be signed and M&E put in place a system to monitor progress of the coalition,* *b. Identify capacity-building and training needs for project implementation and sustainability*.	Stakeholder engagement plan and M&E plan developed Memorandum of Understanding with different stakeholders signed Training plans developed in consultation with stakeholders PMC and TWG involved in M&E Improving capacity within MAIL (ARIA, DAIL, DLF, WUAs, local staff and stakeholders) is a high priority. The coalition will need to identify and prioritise the training needs	- As per stakeholder engagement (Appendix – 11.11) and M&E plan, action based work plans and MOUs agreed with MAIL, AA, faculties of agriculture in Kabul, Baghlan, Nangarhar and Balkh university, and WUAs in Balkh, Baghlan, Nangarhar, Takhar and Parwan provinces;	July 2018, 100%
			- M&E team formed involving PMC, TWG and others; M&E training for the team undertaken in different provinces during Jan – Apr, 2017 with support from ACIAR Impacts Manager; - Project officer and field support staffs monitor and document the achievements, and assess the community perception of impact due to project activities (in Nangrahar , Balkh , Takhar, Baghlan, Parwan and Kabul);	Apr 2017, 100%
			- The DAIL representatives, and NRM employees regularly visited watershed sites in all provinces. - DAIL colleagues participated in most of the ToT training conducted at provincial level in Parwan, Bamyan, Kabul and AA targeted provinces such as Jawzjan, Bamyan and Balkh provinces; - DAIL colleagues also attended many in village abased trainings - Attended the cross learning exposure trips to various watershed sites in Takhar, Baghlan, Parwan, Nangarhar, and Kabul. Regular capacity building of DAIL, MAIL staff under watershed/other projects done as per training need assessment (TNA) by PMC and TWG; reference material prepared and used during capacity building; 24 capacity building trainings	Aug 2018, 100%

			organized for participants from WUA,NGOs , DAIL and MAIL;	

Objective 2: To improve capacity and confidence of project partners e.g. MAIL, Universities, ARIA, NGOs to conduct watershed management research and extension

SN	Activity	Outputs/milestone	Achieved/ in progress	Date of Compl., & % Achv.
2.1	**In-country and out-of-country training activities for stakeholders conducted to build capacity for integrated watershed management**	Capacity of stakeholders on watershed management interventions build through suitable modules developed	- 45 in-country trainings organizedfor 1336 participants involving 236 females; - All out country trainings organized; total 6 out-of-country trainings done in the project for 85 participants involving 6 females); - 6 FFDs organized where 410 people participated including 27 Female. - Various publications in local language and English e.g. 2 project summary leaflet both in English and local language (1000 copies), 2 Watershed brochures (English/ Local language, 1000 copies), WS Project Impact Poster (English/Local language, 1000 copies), Sayad WS case study (English/local language, 500 copies) 1 revised WS manual in (local language (WS Management), and WS review document (English) prepared/ published; Distributed to community, offices, organization and donor;	May 2018, 100%
2.2	**Study tour and field trips held for MAIL officials to study abroad through international exposure on watershed policies**	Enabling policy environment created	- During 2017-2018 there was no plan for out-country training and visit. In 2016-17, one international training organized on Geo-applications in watershed management in Jordan for 2 MAIL staffs, 1 lecturer from Kabul Univ., and 3 ICARDA staffs; MAIL and Univ faculties are very enthusiastic to apply GIS tools and techniques for watershed and NRM in their institutes; (In 2015-16, two international exposures done for policy makers (to Telangana in Andhra Pradesh, India, and meeting	Nov 2017, 100%

			at Delhi, India; one on watershed policy issues and another on watershed approaches; for 39 MAIL/DAIL and ICARDA staffs including 2 female participants)	
2.3	**Creating a young workforce in Afghanistan on watershed management**	Capacity of young workforce on watershed management interventions built through project fellowships in collaboration with different universities.	- Out of 10 students who were trained under internship in PY 2015-16, 8 students got job in 2016-17 (two are engaged in ICARDA-ACIAR watershed project. 10 interns (including 1 female) are from faculty of Agriculture of Balkh, Baghlan Kabul and Nangarhar universities who underwent one month training at Punjab Agri University, India on watershed management	Dec 2017, 100%

Objective 3: To increase understanding of soil and water conservation practices integrated with production systems, livelihoods (baseline data) and other factors influencing adoption of dryland technologies

SN	Activity	Outputs/ milestone	Achieved/ in progress	Date of Compl., & % Achv.
3.1	**Review existing literature and reports on watershed management and production systems to summarize soil and water conservation practices integrated with current production systems in the target provinces** An International consultant will be hired to conduct the review of current status and constraints in watershed management in Afghanistan and a review will be published as a review report as well as a peer-reviewed journal paper. The compilation will be widely distributed among stakeholders including policy makers, MAIL/DAIL, Universities, NGOs, research centres, etc.	Review report on watershed management in Afghanistan is published	- Review report completed; report shared with donor by International consultant One review paper submitted in peer review journal	Jun 2017 100%
3.2	**Compile baseline information of key watershed sites with communities to document livelihoods, identify vulnerable groups, and identify constraints and needs** Based on baseline survey and local knowledge and needs, TWG will identify the key constraints of vulnerable groups and prioritize the	Baseline survey undertaken, indicators and entry points identified	- Completed baseline survey, report published in Feb 2016. Indicators and Entry point activities (EPAs) suggested	Feb 2016 100%

	entry points on NRM and best bet technologies. This will be supplemented with the identification of key indicators and technologies in reference to project objectives and goal; and design the key community-based entry points in all five selected watershed sites.			
3.3	**Gender responsive plan (GRP) and steps for collecting sex disaggregated data for project interventions developed** Based on the baseline data collected on gender, a gender responsive plan will be developed indicating the procedures to be adopted to engage gender in project activities.	Gender responsive plans developed for different project activities	- Activities suggested in GRP (prepared in 2014) taken up as per plan; - Three female community facilitators assigned and working with women and girls mobilization which resulted increment of the women member in WUA in Takhar and Amla. - Women and girls are trained and facilitated to participate in various relevant activities like irrigation of plantation like hing/ mulberry/ pistachio/ pomegranate etc.; - 34 women have membership in 8 WSUA ,	Jun 2018, 100%

Objective 4: In participation with WUAs develop, disseminate and analyse impact of soil conservation technologies, water harvesting practices, and best-bet production technologies for sustainable watershed management

SN	Activity	Outputs/ milestone	Achieved/ in progress	Date of Compl., & % Achv.
4.1	**Implement research to delivery watershed business model by establishing community-based organisations (CBOs) and self-help groups (SHGs) or common interest groups (CIGs) to disseminate and**	Research to Delivery Business model in target catchment sites developed	- All L&W research components are tested for efficiency under different designs and dimensions, and standardized for Afghanistan context. Such designs are recommended for out scaling as best practices to new locations and sites (based on observations by project	Jul 2017 100%

	sustain the best bet practices in particular watersheds Dissemination of the soil and water conservation technologies and best bet practices will be the key aim of project. The business model from research to delivery and its impacts will be developed for watershed based technologies. This will be achieved by focusing on the formation of community-based organisations (CBOs) and Self-Help Groups (SHGs) to disseminate and sustain the best bet practices in particular watersheds. Innovative WSA/ farmer group of at least 10 participating farmers in each of the selected sites formed to adopt and disseminate the technologies in collaboration with different NGOs, MAIL, DAIL, ARIA and other stakeholders. Further discussions will be held in TWG and PMC for developing the business model.		experts and community; more research evidence/ data will be gathered in remaining period of project); Important techniques found efficient and recommended are - (a) planting techniques for plain/<5% slope lands (diamond 4x4 m^2), 5-10% slopes (v-shape, 3m x 3m), and >10% slopes (semi-circles 2-3 m), (b) plantations with sub-surface irrigation (covered porous pipe) have more than 60% survival rate; (c) gully control without drop structure for gullies of width <2m, with drops along 20-30% width in gullies of 2-4 m width; (d) No stone masonry gully/check dam structure in drainage system with more than 4m width with slope >10%; [for >4m width and >10% slope, the stone masonry design is to be followed only if the terrain has a scope for diversion canal to carry 30% or more of water during peak flow; or else advised to go for concrete check dams with flow regulators; (e) Percolations tanks are preferred in slopes of 5-10% for 5-8 m width across slope and 15-20m along the slope; In slopes more than 15%, width across slope be reduced to 3-5m (length along slope as appropriate to location); (f) Concrete ponds are advocated in valleys where water storage is economically efficient looking at critical needs for drinking purpose, and viable for crop production; (g) run-off and sediment load data is analysed from	

			3 sites; shall be used to decide standard sediment and run-off volume under Afghanistan rainfall, slope and soil conditions; (h) Renovating springs, is supported by trenches, percolation tanks, plantations and water conservation pits like diamond, semi-circle etc., and plantations e.g. mulberry, almond and pistachio etc.	
		Watershed User Associations (WUA) established at each project watershed site	- Out of eight WS, Badam bagh is a research and demo unit. In remaining 7 watersheds, WUAS are formed involving 113 members (34 females, 79 male); (Appendix – 11.3)	Sep 2017, 100%
			In all WSUA concept, role and responsibilities discussed in community meetings; WSUAs are established with involvement in planning and supervision of physical works; the associations are now capacitated to implement the physical works in the site and maintain records, on works and expenses; and do reporting;	Jun 2018, 100%
			- PMC and TWG meetings discussed on ws project results; Project transition meeting discussed for furthering the effort in a sustainable manner; WS activities/ concepts/ results of research on best-bet practices shared with WUAs/SHG/community in different meetings;	Jul 2018 100%
4.2	**Research and testing of farming, land and water system based approaches conducted** One pond in each target catchment found suitable/ necessary with a capacity 500-1000 cubic meter on a snow covered hill top. The new research interventions will include: basic, strategic and	Water, soil, crop and forage options assessed and reported for project watersheds	- In all 8 watersheds, suitable L&W conservation structures are built in appropriate water recharge and harvest locations considering the terrain features and community experiences. - Various structures like contour bund/trenches new and renovation (10516 numbers, 626.6	Apr 2018 100% Apr 2018, 100%

	applied research on land use and land cover, hydrological research on surface and sub-surface water flow and water harvesting techniques, and Irrigation (techniques). Runoff plots in each watershed will be developed for measuring the runoff and sedimentation. Infiltration rate will be measured in each selected watershed site. Overall the aim will be to develop farming system based approaches at each watershed site.		km), percolation tanks (8 nos), ponds (5 nos), tanks (8 nos), gully reclamation structures (62 nos), check dams (78 nos), diversion canal (13 nos) /protection wall (102 m), pasture development (33.5 ha), and forest/horticulture plantation (64.3 ha), forest protection (900 ha), and pits for plantation (1954 nos of diamond, v and semi-circle pits) prepared; - All conservation structures like percolation tanks, ponds and check dams are built in suitable locations with potential to harvest 28,962 m^3 (28.96 million liter) during each effective splash of rain and snow at 250mm per year. - In Badam Bagh, Khwaj Alghor and Amla watershed run off, sediment, temperature, rainfall and ET measurement units are installed (last year); regular data collected and analysed for run-off and infiltration during precipitation; - 1016.7 cum of soil sediment is intercepted by the gully control structure and check dams (745.2 cum last years and 271.55 cum this year); - Finalized installation of six new mini weather station and other instruments; - Convergence with forage & other component projects; trials done for forage trial (planted with atriplex in semi-circles); - Research data shared with TWG/ POG/ PMC in review/AP meetings, and with WUAs and community.	Oct 2018, 100% Jun 2018, 100% May 2017, 100% Jul 2018, 100%

4.3	**Use participatory processes with communities (Key farmer and women farmers), MAIL and NGOs to prioritize the soil and water conservation watershed structures, and developing dry land farming systems)** Community involvement in work plan, implementation, management and agreement to leading the action research is therefore crucial. Finding suitable entry points around incentives, which may be associated with degradation, soil and water conservation, water for irrigation or greater crop or livestock production. Partners have experience with social processes and mobilisation, and use various 'models' to build capacity and implement social change at existing sites where they work. The work will involve the prioritization of macro catchments as: (pond, water spreading, stone wall, and ground water harvesting) at each watershed site; as well as micro catchments as: (cistern, semi-circle, and contour bund) at each watershed site involving key farmers and women farmers of established WUAs at each catchment site. Overall it will include finalization of Watershed development (planting different plants, shrubs, trees, vegetables, cereal crops) work plan in collaboration with all stakeholders.	Identified options prioritized with the participation of all stakeholders	- All catchments sites, ongoing (7)/ dropped (4) were suggested, identified, surveyed, planned and implemented in coordination with all stakeholders such as MAIL, DAIL, NGOs, Community, and WUAs - WS project activities are integrated with other ICARDA projects that include the forage project funded by ACIAR, and CLAP funded by IFAD to improve production and productivity of agriculture and livestock. Under forage research project, 36 semi-circle pits are constructed for atriplex plantation in Sayad ws site; - Completed project activities in all watersheds, and sites are handed over to the community and WUA in joint meetings of DAIL and ICARDA. - Due to social conflicts (that took violent forms despite all efforts of ICARDA and DAIL team), the watershed site in Takhar and Bamian are dropped; - In new sites suggested by MAIL/DAIL; implementation completed during 2018 (Appendix – 11.4)	Apr 2017, 100% May 2018, 100% Sep 2018, 100% (95% achv by Aug 2018) Apr 2017, 100% Jun 2018, 100%
4.4	**Dissemination of watershed "best bet practices" through collaborations and partnerships and Innovative ICT tools for faster communication of information about interventions with WUAs and other stakeholders** Dissemination of soil and water conservation technologies and best bet practices is one of the important objective of the	Instruments to improve adoption according to the watershed site developed Farmers received extension advice on soil and	- KLM (Knowledge and Learning Materials) developed and distributed to disseminate project knowledge to wider stakeholders - Project summery English version is reviewed and updated ready for printing in press. - 2 project summary leaflets both in English and local language (1000 copies), 2 Watershed brochures (English/ Local lang, 1000 copies), WS	Aug 2018, 100% Jul 2018, 100% Jul 2018, 100%

	project for a sustainable watershed management in Afghanistan. This will be achieved through a collaborative and farmer participatory evaluation of technologies for better capacity development to disseminate technologies to wider number of stakeholders. Innovative ICT tools will be used for faster communication of information on tested and proven technologies to WUAs and other stakeholders. The cross-visits of stakeholders from each catchment for mutual sharing and learning for widely conducted.	water conservation	Project Impact Poster (Eng/Local lang, 1000 copies), Sayad WS case study (Eng/local lang, 500 copies) 1 revised WS manual in (local language (WS Management), and WS review document (English) prepared/ published; distributed to community, offices, organization and donor; - Project fact sheets printed and distributed; - Case study of four site wa prepared in local language in disseminated and distribute - Four new booklets for Watershed, Potato production, Goat rearing, and dairy processing - Project information SMS (2500 sms) sent to community/WUA members; - Facebook of ICARDA-Afg is accessible and informative; - WS project site info are uploaded on Google map by ICARDA GIS Unit. - Bi-monthly newsletter published; - Research data on measuring precipitation, temperature, run off and soil erosion were installed at Badambagh, Kwaj Alghor, Sayad and Amlah ws site; field staff and farmers observe and do participatory evaluation of data and findings; - Convergence with forage & other components shared with TWG/ POG/ PMC in review/ AP meetings - Procurement and finalization of sites for installation done for mini-weather station at 6 locations, tensiometers 1000 nos, soil test kit (6 nos), pH and EC portable meter (2 nos), greenseeker crop sensing units (10 nos), infrared thermometers (5 nos);	June 2018, 100% Sep 2018, 100% (by Jun 2018, 90%)

Objective 5: To utilise spatial and other information management systems for prioritisation of investment for catchment management planning.

SN.	Activity	Outputs/ milestone	Achieved / In progress	Date of Compl., & % Achv.
5.1	**Produce topographic survey and geo-referenced map of catchments; high-resolution remote-sensing maps to establish historical and current status of natural resources (baseline and changes)** The field visits and reconnaissance survey for selection of the potential watershed locations will be conducted of all the watershed sites, this will be used for characterizing watershed site by integrating biophysical, edaphic and climate variables such as land use, land cover, terrain complexity, soil, hydrology and climate parameters.	Topographic survey and geo-referenced map, catchment plans produced Scaling up potential of successful watershed management approaches identified.	Topographic survey and geo-referenced catchment maps developed for - 8 WS projects (Khwaja-Al-Ghor, Saiyad, Otran, Amlah, Badam Bagh, Qarasay, and Aq-masjid, Dasht Gowharkhan in Parwan), - 4 dropped sites (Kharuti in Takhar, and Khoskak, Qul Roba, and Surkhak Hessar in Bamyan); Various maps developed are - HRI (high resolution imaging) for two sites; - Topographic features like contour, slope, drainage order, drainage density, land cover maps for 8 sites; Metrology data for the last seven years for target provinces obtained, to be used in hydrological and GIS applications Field vegetation data from the watershed with pictures collected and sent to GIS section of ICARDA head quarter for analysis; Elaborate research data collection planned from 2 sites, as decided in annual planning meeting e.g. Khwaj-al-Ghor in Balkh and Otran in Nangarhar province; the data required over a period of time Temperature, precipitation, and run off data from three sites for all years collected; Business models assessed and discussed with community and other stakeholders for finalization and introduction Scaling up potential of successful watershed management approaches advocated with govt. and policy makers (DLFS under DFAT, Watershed project works under SWIM/USAID, and NRM/Climate change resilient program under WB/EU etc.) Watershed concept, management policies and approaches deliberated with policy makers and department	Feb 2017, 100% Feb 2017, 100% Jun 2018, 100% Feb 2018, 100% June 2018, 100% Jul 2018, 100%

			officers; it is crucial for WS up-scale in Afghanistan; and to develop NRM strategies and approaches for Afghanistan; ▪ WS research and demonstration sites developed for exposure and learning of the concept; ▪ Watershed brochure (3), manual (2), training modules under Action Aid program (4), and research data and publications (2); ▪ 1865 manpower including 267 women trained; participation on department officers, students, youths, women, community persons/groups etc.; they would lead the scale up initiative; ▪ 7 WUAs are formed and trained on 5 different watershed management themes; they advocate with evidence for WS implementation, and O&M, and speak to new community in scale-up sites; would be the spokesperson for community and other implementers.	Apr 2018, 100% July 2018. 100% Feb 2018, 100% May 2018, 100%

7 Key results and discussion

As discussed in TWGs and PMC meeting, four to five years is a very small time for land and water related research and demonstration initiatives, to perceive concrete outcomes and impacts. It requires time to display its outcomes very prominently, mostly in terms of very important and anticipated outcome like ground water. However, very good signs in the research project sites are observed which are as bellow.

Objectively Verifiable Indicators (OVIs)	Achievement (Annual and Cumulative)
Improved natural resource management from the promotion of better catchment management options. • Improved natural resource productivity at each catchment site from the adoption of promoted options. Expected water productivity increment (Target: 20-30%); Soil/Land productivity increment (Target: 15-20%)	- In all eight watersheds, structural works related to L&WM is completed; - In all watersheds training and capacity building of community, WUA and local CDC is being done on O&M (operation and maintenance) of watershed assets, improved NRM through institution building, and sustainability and convergence with local government and non-government resources. - Productivity of barren lands enhanced through model conservation plantation with water and soil conservation, plantation pits (diamond, semicircle, v-pits), and subsurface irrigation methods. Conservation plantation is demonstrated in 168.6 ha of land for suitable species like mulberry, pomegranate, pistachio, atriplex, forage and hing. Plantation is in 1st to 3rd years; production expected from 4th/5th year; - contour bund/trenches (10516 numbers, 626.6 km), gully reclamation structures (62 numbers), check & diversion weirs (78 numbers), ponds (5 numbers), percolation tanks (8 numbers), diversion canal (13 numbers, 835 meters), spring renovation (4 numbers), protection wall (102 meters), pasture/horticulture/forest saplings planted (27638 numbers, 168.6 hectares), plantation pits of different designs (1954 numbers of pits of different design e.g. diamond pits, v-pits and semi-circle pits); 109051 sqm of surface directly treated through above structures to intercept in-situ precipitation with 28962 cum at full capacity; at 250 mm precipitation per annum, the structures are ready harvest 27.26 million liters excluding run-off collections from micro catchment of each structure; 1016.7 cum of soil sediment is intercepted by the gully control structure and check dams; 1 kanda/underground storage (21,000 liters), and 1 well was constructed, which immediately benefited the community Pasture development on 35.55 ha (atriplex saplings), forest species plantation (68.75 ha), village forest protection advocacy on 900 ha through CFM, and horticulture plantation did well in 64.3 ha planted with pistachio, mulberry, grape, and hing The establishment of mulberry plantations is undertaken on different plot designs (16 sqm

Objectively Verifiable Indicators (OVIs)	Achievement (Annual and Cumulative)
	and 36 sqm) with micro water catchment technique; survival rate is higher with applied techniques than in control (survival highest i.e. 95% in 36 sqm plot (77% last year), and 94% in 16 sqm plot (60% last year), and lowest in control i.e. <50%). - Hing cultivation is given the income to the community in Sayad and we can say it is a good impact of the project that they cultivated hing even in their Irrigated land to get more income compared to other field crops. - 29 ha land brought under the irrigation by the pond in Utran and community harvest two crop from there in a year wheat and Maiz or fodder - In Amla ws, two hectares of land demonstrated for planting with trees, munbeans and vegetable which is irrigated by spring water (before project the land was mountain area) - By managing the spring water, one hectare land is now under the Irrigation and established orchards of Almond and Pomegranate - The data on soil and water conservation and productivity is collected; WS wise analysis is elaborated 'WS wise detailed activity' section.
Number and percentage of farmers (men, women) of watershed users' associations (WUA) (members and non-members) who have adapted the recommended catchment management options and have enhanced skills in taking watershed management decisions. • ICARDA working with WUA each with 30-40 farmers (Men and Women) at five watershed sites. (Target: 150-200)	- Seven WSUAs formed in watershed sites in Khwaja alghor, Sayad, Qarasay, Aq-masjid, Utran and Amla and Dashte gawharkhan with participation of 113 members with34 women members. Project is intended to be implemented under supervision of WSUA (a new community level group to be institutionalized as in other countries; they are crucial for successful watershed management); completed watershed sites are ultimately delivered to community/ WSUA after completion; afterwards they would own and manage the project. - WSUAs have been formed and registered involving MAIL/DAIL to learn the processes; this brings a close and long term linkage between community and DAIL/MAIL; DAIL would better lead the WSUAs; - 2 WSUA members have undergone out country training under institutional study tour to Hyderabad 2015-16; - 23 farmers adopted introduction of new forage crop in the WS projects, i.e. more than 15,000 bushes of atriplex as a new forage crop distributed to farmers, members/ non-members, of WUA; this serves as a hardy crop and good fodder for livestock; AA has adopted this fodder cultivation in their project area; - 150 farmers planted Asafoetida in dry barren lands by (including 2 female) - is an example of alternate beneficial land use; it would impact other farmers as the economic benefits are derived in 3-4 years after. 45000

Objectively Verifiable Indicators (OVIs)	Achievement (Annual and Cumulative)
	bushes planted in 2017 harvest 8.1 mt which bring 931500 US for the villagers;
Accessibility to tested conservation options (crops, forages, soil and water conservation structures) to farmers • More than 3000 farmers (Men, women) from five target provinces and one model site will directly benefit through improving their skills and knowledge on conservation options to maintain NR at target sites and indirectly benefit 10,000 farmers (Men, women) • Field days, demonstration plots, other communications (SMS, radio broadcast, cross learning visits, study tours, etc.) on tested NR management options for different watershed sites increased adoption of promoted options. • Data base on technology development and knowledge generated from the watershed sites available in Public domain.	- Tested soil and water conservation options and its access to public is ensured through exposure, field days, training and published in public domain. - The WSUA and watershed community know the evaluated intervention results that include (a) check dam and gully control structures check erosion and flood control; (b) semi-circle (nigarime) catchpit for planting Atriplex, Mulberry, Asafoetida etc. are tested effective practices; (c) Semicircle is effective in mid-slope positions of 5-10%, not more than 25%, (d) Check dam should not be more than 5meter length; (e) Check dams with gabion structures give effective results; - Check dams, ponds, gully structures, retaining wall and contour ridge bunds as soil and water conservation structures are constructed 6 watersheds. Farmers, policy makers and other stakeholders have visited the site. Farmers, students and other partners undergone training - Formal and informal training activities and regular village/community level informal training activities are being conducted to educate more than 4688 young and adult populations in 8 villages of 11 targeted ongoing watersheds; as a ripple-out effect, the knowledge is definitely reach at an expected ratio of 1:3 to 14064 (~15000) persons; - 6 field days in target were conducted involving 410 farmers/ stakeholders (along with 32 female) – hands on training and orientation done on different water harvesting, WS management and production techniques. Last year, two WUA members participated in International study tour in Hyderabad and shared their views on watershed management needs in Afghanistan. - As of last year, ICARDA-Afghanistan program used social media. Its Facebook account is accessible in social media. More than 500 friends are there with ICARDA facebook and more than 200 people are following our posts and making comments. 30 of them are female. - Short message service over mobile to 2,500 farmers and WUA on relevant watershed and agriculture programs. More than 250 women growing atriplex nurseries; involved in forage, forest and orchard in the same watershed.

Objectively Verifiable Indicators (OVIs)	Achievement (Annual and Cumulative)
	Measuring rainfall, runoff, infiltration, mulberry survival and growth, Hing germination and planting methods etc. are studied and research findings shared with community, MAIL/ DAIL and other stakeholders - The database is shared and will be in public (https://mel.cgiar.org/projects/icmcba)
Improved capacity and policy commitment of Afghan agencies to the running of their own catchment management and conservation options programs.	
• Young workforce with better understanding of NR management options ready to contribute in the sustainability of promoted options in target and non-target dryland regions of the nation. (Target: Men 20; Women 10)	- Out of 10 young students graduated in internship courses (who acquired skills in watershed and related activities), 2 have got jobs in ICARDA, 7 have got job with universities, NGOs and other organizations. Youth (male and female) are participating and sharing at ICARDA social media.
• Key Women and men farmers and stakeholders enhanced their confidence in watershed management options. (Target: Men 300 (All stakeholders), women 50 (All stakeholders) and Youth 30 (All stakeholders)	- 1336 women, men, youth, students, officers and policy makers are trained in 45 formal in-country training activities; 6 out country trainings involved 85 people including 6 female, and 6 FFDs for 410 persons including 27 female. Formal and informal training activities and regular village/community level informal training activities are being conducted to watershed educate more than 1000 young and adult populations in 10 villages of 8 watersheds;
• Economically feasible options with high BCR convinced different stakeholders for adapting.	- Alternate land use for forage with Atriplex and hilly lands with Asa foetida plantation, are successful and are good business models; - Atriplex and alternate pasture crop, Hing (Asa fetida, direct sown) crop in barren lands and Mulberry in middle lands are economically feasible production systems researched and advocated in the project. By cultivation of Hing Sayad Community harvest 8 mt and obtained more than 0.9 Million USD - Adoption of catch pit (diamond pit in 36 sqm mulberry plot improved the survival by 50% over control (90% in diamond and 50% in control);
• Enabling environment created for policy changes from increased understanding of different options for managing watershed catchments by the policy makers • Programmed visits for MAIL and other government agency staff will help key policy makers identify what measures	-23 famers have adapted such techniques, 36 WUA member would replicate these practices of their own; this would initiate a movement for change - AA, a partner of ICARDA, has adopted watershed approaches, (L&WM, forage and hing plantation etc.) in their targeted area; - 6 out-country policy and other training (all 6 out country trainings last year) activities exposures made MAIL/DAIL officials to

Objectively Verifiable Indicators (OVIs)	Achievement (Annual and Cumulative)
work best in the Afghan context, and hence formulate improved policies.	understand and own the project apart from involvement in 45 in-country training activities (21 in country trainings were in last years and 24 were in this reporting period) and 4 field days last year two in this reporting period ; - 49 MAIL and DAIL staff (3 this year and 46 last year) have participated in training, field days and study tours in and out of country; they observed and learnt various techniques to apply in Afghanistan where applicable. It brings change in their understanding of watershed importance in the country. - MAIL/DAIL empowered to lead watershed/NRM projects in the country, and finalized NRM strategy for 2017-2021; - ARIA and MAIL participated in POG, PMC and TWG meetings; for opinion sharing, and learning; this enable MAIL to lead project processes in future. - Watershed and NRM strategy prepared in Otran watershed and the DAIL officials have acknowledged the policy and strategy. Based on the planning and discussion in the watershed, 20 hectare of additional land is brought under cultivation of maize and other crops in 2016-17, which gave additional yield of $5300 (area this year is 28 ha; economic results to be calculated) - DAIL and WUA directly undertakes planning and implementation at community and province level; - Community adopted dryland suitable horticulture plantation in Khwaja Alghor; they planted 500 pomegranate saplings;
Improvement in the livelihoods of women, men and youth in the watershed sites through adoption of different catchment options. • Introduced options increased the productivity of dry land crops, forages and enhanced employment opportunities and income of households at different watershed sites. (Target: 150-200 hhs)	- More than 13 mn Afs worth man days are directly created/contributed as wage labours. Project was considerate of the poor economic circumstances of farmers and hence did not to impose community contribution. However, people in Otran WS contributed their labour to build the pond before ICARDA worked (need participatory quantification) - Horticulture plantation on nearly 60 ha with pistachio, mulberry and grape, and Hing plantation in more than 600 ha has significant potential as a development outcome. - Training of youth and women through formal and many informal village/ community level training activities increased their employable skills; - Increased water and land efficiency, new crops for dry lands and trained manpower in project will have a combine defect on farming, income and employment which need to be studied.

8 Impacts

8.1 Scientific impacts – now and in 5 years

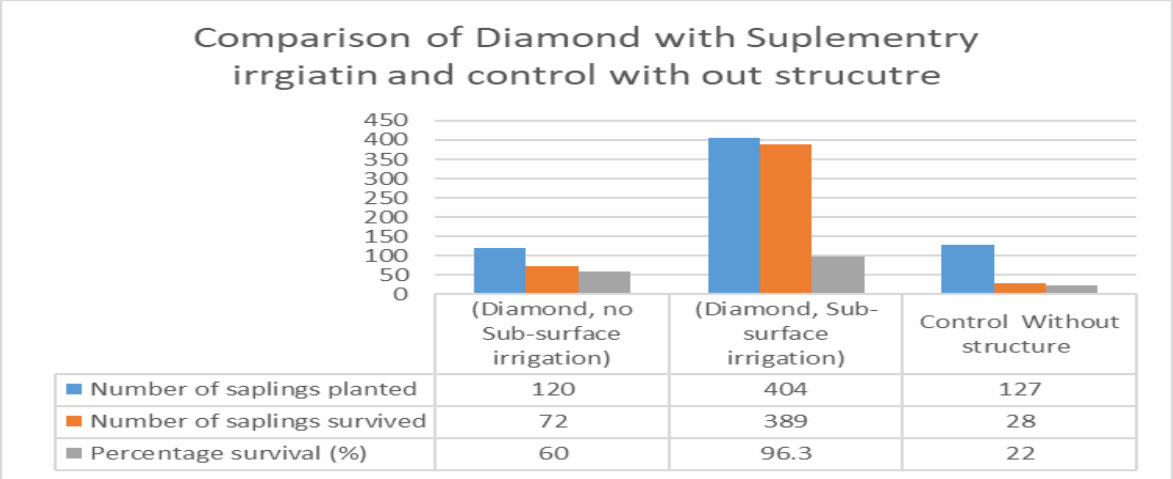
Best fit LWM techniques

Various L&W research components are tested for efficiency under different designs and dimensions, and standardized for Afghanistan context. Such designs are recommended for out scaling as best practices to new locations and sites (based on observations by project experts and community; more research evidence/ data will be gathered in remaining period of project). Important techniques found efficient and recommended are

(a) planting techniques for plain/<5% slope lands (diamond 4x4 m2), 5-10% slopes (v-shape, 3m x 3m), and >10% slopes (semi-circles 2-3 m),

(b) plantations with sub-surface irrigation (covered porous pipe) have more than 35% survival rate over no sub-surface irrigation (data from different sites);

	Badambagh	Aq-Masjid Qarasay, Gowharkhan and Badam bagh	Bghlan, Takhar, Parwan and Badam Bagh
	(Diamond, no Sub-surface irrigation)	(Diamond, Sub-surface irrigation)	Control Without structure
Number of saplings planted	120	404	127
Number of saplings survived	72	389	28
Percentage survival (%)	60%	96.3 %	22 %
Increased efficiency of sub-surface irrigation	-	36.3%	



(c) gully control without drop structure for gullies of width <2m, with drops along 20-30% width in gullies of 2-4 m width;

(d) No stone masonry gully/check dam structure in drainage system with more than 4m width with slope >10%; [for >4m width and >10% slope, the stone masonry design is to be followed only if the terrain has a scope for diversion canal to carry 30% or more of water during peak flow; or else advised to go for concrete check dams with flow regulators;

(e) Percolations tanks are preferred in slopes of 5-10% for 5-8 m width across slope and 15-20m along the slope;

(f) In slopes more than 15%, width across slope be reduced to 3-5m (length along slope as appropriate to location);

(g) Concrete ponds are advocated in valleys where water storage is economically efficient looking at critical needs for drinking purpose, and viable for crop production;

(h) run-off and sediment load data is analysed from 3 sites; shall be used to decide standard sediment and run-off volume under Afghanistan rainfall, slope and soil conditions;

Planting techniques and Plant biomass

Badambagh site

(a) Mulberry planted with diamond water conservation structures produced significantly more fresh and dry biomass over control.

(b) Mulberry planted at 4X4 spacing produced more fresh and dry biomass per hector over those planted at 6X6 spacing because of more trees planted.

(c) Homulus variety of atriplex produced significantly more fresh and dry biomass over lentiformis variety planted at 4mx4m spacing with semi-circle water conservation structure (in plains).

(d) Lentiformis variety of atriplex planted at 4mx4m spacing with semi-circle water conservation structure in plains produced significantly more fresh and dry biomass over atriplex lentiformis planted at 3mx5m spacing on hills.

(e) Homulus variety of atriplex planted at 4mx4m spacing with semi-circle water conservation structure in plains produced significantly more fresh and dry biomass over atriplex lentiformis planted at 3mx5m spacing on hills.

Mazar (Kwaja Al Ghor)

(f) Atriplex planted at 3mx3m spacing with semi-circle water conservation structure produced significantly more biomass (fresh and dry) over atriplex planted at 2mx2m spacing with semi-circle and at 2mx2m spacing in contour.

(g) Atriplex planted at 2mx2m spacing with semi-circle structure produced more biomass (fresh and dry) over those planted at 2mx2m spacing in contour.

(h) Atriplex in semi-circle structure at 2x2 spacing with two bushes per pit produced more biomass than atriplex with one bush per pit with and without semi-circle structure in all seasons.

(i) Atriplex in semi-circle structure at 3x3 spacing with two bushes per pit produced more biomass than atriplex with one bush per pit with and without semi-circle structure in all seasons.

(j) Between 2x2 and 3x3 with two bushes per pit, atriplex in 2x2 produced more biomass

(k) Atriplex planted in contour line at 2x2 spacing with one bush per pit produced more biomass than atriplex with two bushes per pit in all seasons.

(l) At both the sites, mulberry is managed by communities. Biomass during Spring was more than during Summer. In Sayad

(m) Biomass from Pistachio and atriplex was more during Spring than during Summer. In Sayad

(n) *Atriplex nummularia* produced more biomass than *Atriplex homulus*. In Amla

(o) Biomass production was more during summer than in spring.in amal

(p) Mulberry planted during 2016 was damaged due to grazing by Kuchi animals. Biomass from survived mulberry plants was estimated during Spring 2017.in Amla

(q) So another site in the same catchment was selected for planting mulberry saplings. During Summer 2017, biomass was estimated from this new site.in Amla

Hydrological modelling (done for one model site in Takhar)

One major reason for the reduced crop yield in arid and semi-arid regions is the limited availability of water for supplemental irrigation during critical crop growth stages. In the summer season, a drinking water crisis exists in many parts of Afghanistan. The water stress that prevails in agricultural fields during dry spells can be managed mainly by adopting water harvesting practices to harvest and utilize the available rainwater for supplemental irrigation. The main objective of the hydrological modelling component of the project is to assess the water harvesting potential of the watershed. The water cycle is driven by two main forcing variables: temperature and rainfall.

Hydrological modelling is done for Takhar province. The province covers an area of 12,376 km^2. More than half of the province (56.8%) is mountainous or semi mountainous terrain while more than one-third of the area is flat (36.7%). Takhar province consists of 17 districts with a population of about 830,000. Rural Takhar is characterized by diverse agro-ecological conditions that feature large areas of fertile land under permanent irrigation fed by large canal systems along the Takhar River. The majority population of Takhar Province belongs to a middle class level, and the region has good potential for economic growth.

Description

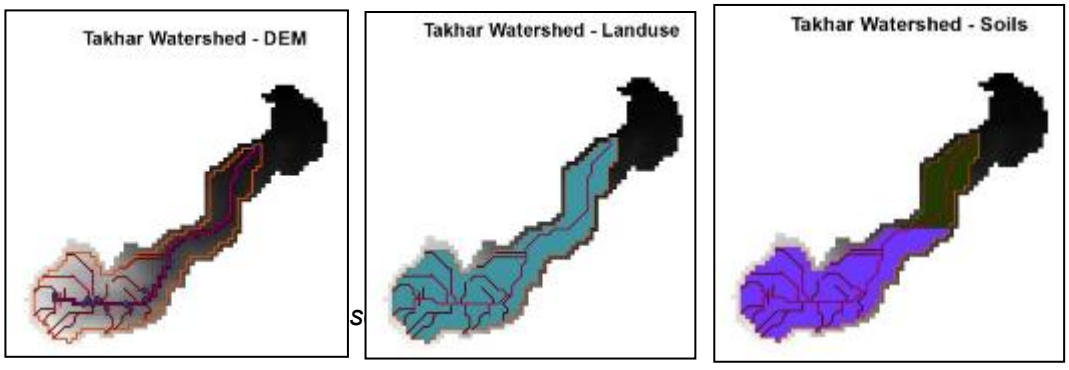
The village is located about 50 km East of Taluqan, with the following specifications:

- Coordinates 69.456-69.482 E and 36.71-36.665 N
- Area 72 ha,
- Length 2 km, directed west-south to north-east,
- Width 0.2 to 1 km,
- Elevation 750 – 1200 m asl (above sea level).
- Slope- the watershed is divided into two sites, upstream characterized by deep soil, and a slope of 22%, and the downstream characterized by deep soil, and a slope of 8%. In general, the average watershed slope is about 15%.

Data Collection

A comprehensive collection and compilation of the hydrologic data needed to model watershed systems is currently being assembled. The following data have been collated:

- A land use map of the watershed was prepared using Landsat imageries. The map consisted of two distinct classes.
- A 90m spatial resolution Shuttle Radar Topographic Mission (SRTM) Digital Elevation Model.
- Soil map of Takhar Watershed.
- Climatic data obtained from re-analysis data.



Distributed hydrological Modelling using SWAT

Arc SWAT has been selected as the tool for modelling the hydrology of watershed. It is an ArcGIS - ArcView extension to the **SWAT (Soil and Water Assessment Tool)** model, and has a graphical user input interface (see Arnold *et al.*, 1998). The SWAT model is a process-based continuous hydrological model that can be used to assess the impacts of land use and hydrological structures on stream flows. The SWAT model uses data on the spatial variability in land use, soil and climate to capture human induced land and water management practices in

a given catchment. The main model components are: climate, hydrology, erosion, plant growth, nutrients, pesticides, land management, channel and reservoir routing. For this study, the surface runoff volume is predicted from daily rainfall and actual evapotranspiration derived from climatic data using SWAT and channel routing is carried out by using the Muskingum method which is built into the model.

Runoff Estimation

ArcSWAT pre-processes the data for the SWAT model simulation into three different sections: a Watershed Delineation; a hydrological response unit (HRU); and a Weather Data Definition. The SWAT model divides the watershed into different sub-basins, based on the stream network. These sub-basins are further sub-divided into HRU's, all which consist of homogenous land use and soil characteristics. The HRUs represent percentages of the Sub-basin area and are not identified spatially.

The model was run using forcing data (daily rainfall, maximum and minimum air temperature). Rainfall data for 33 years were used in the model. The annual rainfall varies from 480mm to 740mm with an average of 600mm. Model was run on a daily time step and the runoff was calculated for the whole year and is presented in figure below.

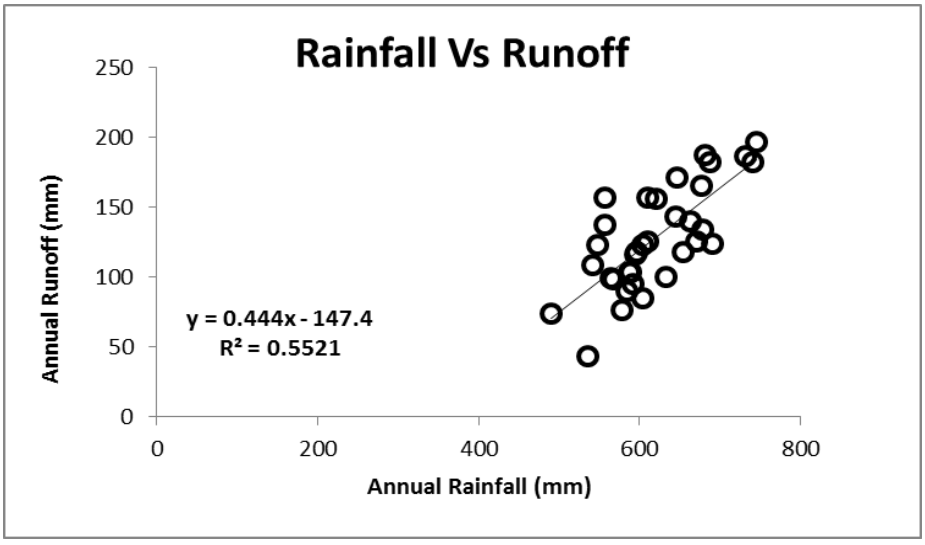


Figure: Rainfall vs runoff

The annual runoff varies from 42mm (535mm of rainfall) to 196mm (745 mm rainfall) and is highly dependent on the annual rainfall received and its distribution. Average runoff was estimated as 128 mm. Rainfall to runoff coefficient varied from 0.06 to 0.26 in different years. The average runoff was estimated for each decade and is presented in Table 1.

Table 1. Decadal rainfall-runoff relationship

Period	Rainfall	Runoff	Runoff coefficient
1980-89	610	124	0.20
1990-99	631	139	0.22
2000-10	618	118	0.19
2010-13	619	133	0.21

Using the daily runoff estimated from the model, the total volume of runoff that can be harvested for useful purposes is estimated. The runoff volume varies between 37,400 m^3 to 170,000 m^3 in different years with an average of 110,000 m^3. This amount of water would be sufficient to supply 150mm of supplemental irrigation to an area of 70ha.

Various research outcomes from the watershed project can be summed up as (a) standardization of L&WM measures and designs for in hilly slopes and uplands, such as in-situ rain water conservation and ground water recharge; through construction of percolation

tanks and gully control structures. This reduced run-off water volume down the slopes, reduced erosion and sand cast in valley lands (374.25 + 371.= 745.2 cum silt check by 26 check dams in Qarasay); (b) standardized treatment measures for middle and low lands, e.g. for water collection, spreading and storing mostly through check dams, WHS, storage structures, and ponds (with diversion weirs and canals as per potential for water diversion for domestic and irrigation uses); (c) screened improved plantation species and techniques for the region e.g. mulberry and Asa foetida plantation with catch-pit (nigarime) techniques in 6x6 sqm plots, (d) new fodder crop introduction in pasture and barren lands e.g. atriplex plantation in pasture lands as alternate fodder crop, and hing (Asa foetida) plantation in dry barren lands which would bring a substantial economic return where nothing can be planted.

The research results indicated that more than 20-25% of rainwater is lost as runoff in the peak precipitation month of October (varies w.r.t slope, vegetative or mechanical barriers); it is evident that a significant amount (135–210 cum) of soil under different slope conditions, is eroded (run-off and sediment study done in Badam Bagh and Qarasay). Sediments along with runoff water causes obstruction in river flow and aggravates flooding. The runoff in rainy season is perceived, from silt load in gully plus and check dams, to be more eroding compared to run-off due to snow melting in spring/summer. The research and standardization of L&W management structures and land use practices have visibly controlled erosion and generated good income source for the participated community members.

The water yield efficiency of the spring in Khwaja Alghor site, as per participatory estimates increased by 20 – 25 % due to excavation and concrete of pond that collects water from spring. This water is used for domestic and irrigation purpose. The farmers observed the results of the project activities on rain water conservation, check of soil erosion, which is realized more and more. There is less flood and sand cast on field and crops in Balkh and Baghlan; otherwise the community was unable to cultivate legume and triticale; they are now making lands ready to grow these crops.

In Qarasy, 26 check dams were built which collected large amounts of sediment. It is of note that the sediment load is extremely high which resulted in damage to structures which the community is currently repairing (ICARDA suggested changes in design that is based on sediment load).374.25 cum of sediment would effectively develop 600 sqm of productive land when deposited at the bottom of the slope and used for mulbeery plantation in Nigariem pit (gully would be changed to arable land in future). Since the gully is very long, we need to establish series of gully structures to stabilize the whole gully reverting it to stepped land. Such results make the community believe the usefulness of the structures. These sediments otherwise would have been deposited in crop fields and damaged the crops.

People of Otran constructed a pond; the water collected in it was used to cultivate an addition 29 hectares than the previous years to cultivate a second season of maize crop apart from providing critical lifesaving irrigation to rainy season wheat crop; this resulted in an income increase of200 ,000 Afs in each spring season.

In Balkh, the pond water wastage is decreased and it supports villagers to cultivate about a hectare of land using the same water sources as compared to the previous year (10% increase in water use effeicincy). In Khwaja-Algjor, the yield of a perennial spring has increased by 20% due to water conservation and construction of a storage structure. The spring has more water yield this year. It usually supplies water through a pipe to Nayeb Adab village. The flow was 2.0 liter per second the previous year, in the current year it has incresed to 2.5 lps; 25% increment in water flow due to L&WM measures. Last year in Sayad, water was pumped from valley to upland to irrigate pistachio, but in this year we established a collection pond on hill. This pond supplies water under gravity flow.

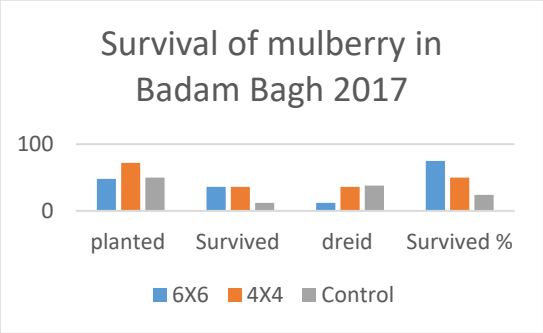
In Khwaja Alghor and Sayad, Asa foetida was introduced. Seeds were given to the community to cultivate it as a cash crop grown on barren lands. The crop is grown at a high elevation on the top of the mountian. The community know how to harvest and sell it. But they did not know how to cultivate it in barren lands. The watershed project trained and mobilized the community. They have sown hing plants which are being established. Economic yields will be evident in 3-4 years. Now the community cultivated even in the Irrigated land by a good incoem Similar is the case of atriplex as a new fodder crop grown

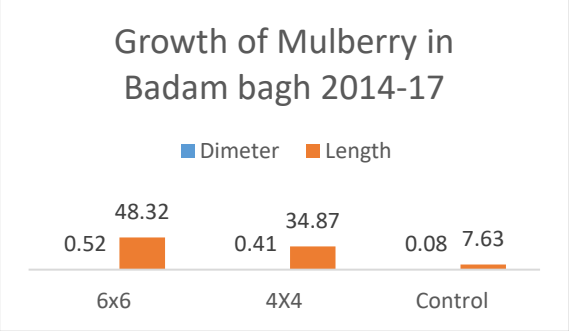
in pastures. In Sayad, they have sown 12 kg seed of atriplex received in this year and planted 5,000 bushes in Khulm. The following tabel showa the yield and income of Asafetida Hing

Year	No of Bushes	Yield in Kg	Price/Kg	Total income in $
2015	18000	1440	100 USD	144000
2016	30000	3000	107 USD	321000
2017	45000	6750	110 USD	742500

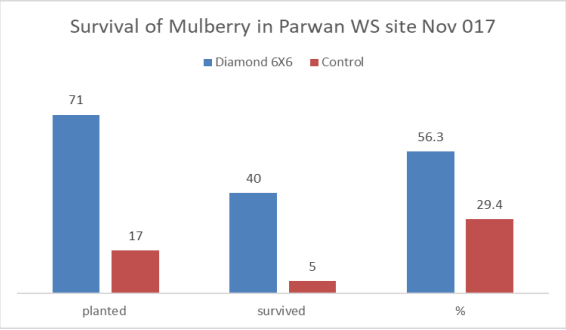
In Otran village of Dara-e-Noor district water of the snow melt and rain is collected and kept for agriculture uses. Due to the development of a pond, about 20 hectares of land is cultivated under irrigation. They have a second crop of maize Research designs were developed to test the efficiency of the catchpit (nigarime) around the mulberry plantations.

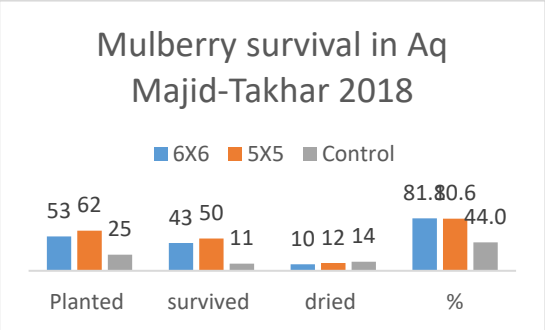
The data on techniques used in mulberry indicates 50 % more survival of plants due to local water harvesting around the plants because of nigarime technique; this increases moisture and soil biomass content (color and feel method) (drought resistance increased by 10-27%) over control. Subsurface irrigation (pitcher pot/ bottle/ cylinder etc.) and drip irrigation is appreciated by trainees and farmers. ActionAid has planned to establish a unit of the drip irrigation in Balkh province as a demonstration. ICARDA would scale up the mulberry plantation with nigarime and subsurface irrigation methods in Taluqan and other new sites. In Saiyad, the community has planted Asafoetida and atriplex because of its good income potential to support livelihoods apart from soil and water conservation. As shows in above table





The different plot design had different effects on the number of branches and growths in Mulberry. In 6x6 sqm plots with catch pits, the average length of branch was 48.32 cm while it was 34.87 cm for 4x4 sqm plot with catchpit and 7.63 cm for control plots. Biomass increment in mulberry and atriplex will be measured in the forthcoming reporting year as they are at their very tender age and surviving.



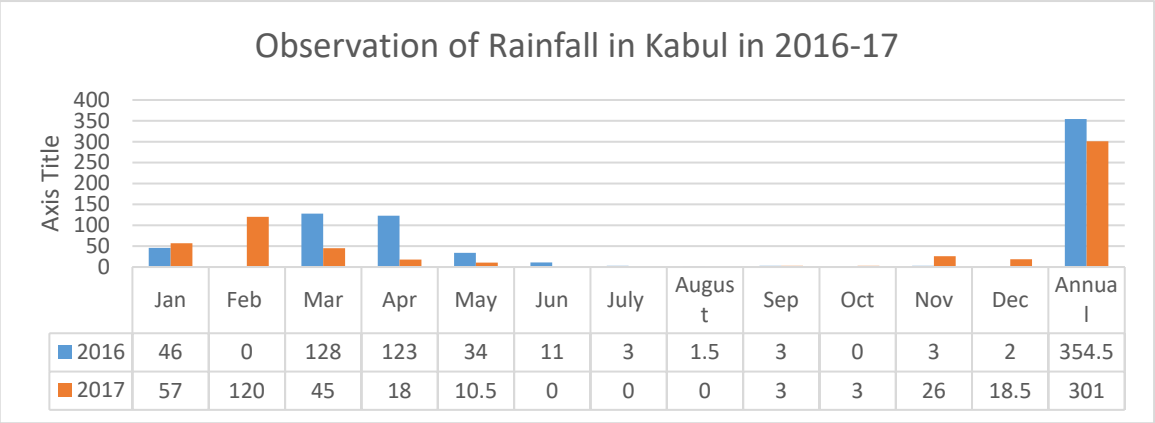


Research instruments in Badam Bagh (run off and rain gauge), Sayad (temperature, rain gauge and evaporation pan), Baghlan (temperature) and in Nangarhar (rain gauge, and thermometer) collect metrological date for analysis and assist in watershed and other agricultural planning in these areas.

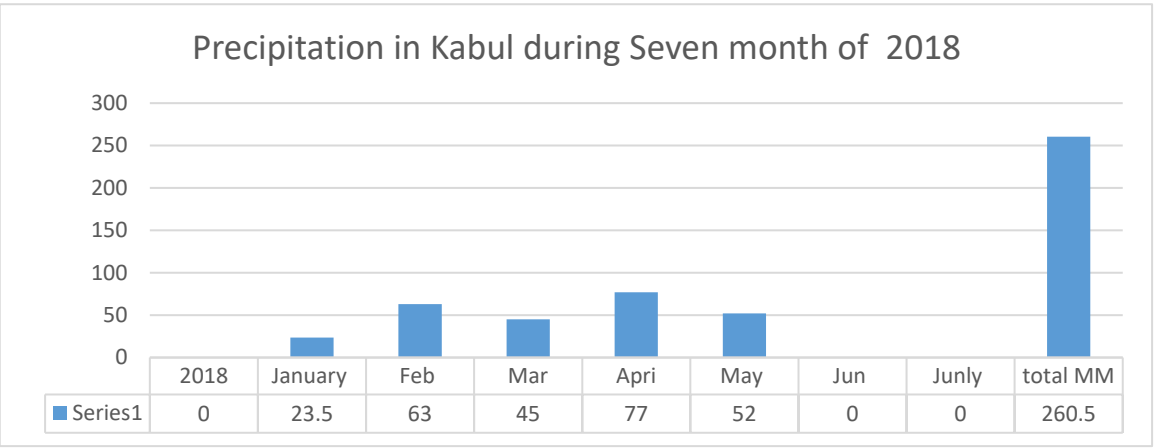
Precipitation in year 2016 in Badambagh was very erratic in nature. It did not rain adequately when crops needed water. Hence, we need to utilize the underground water source as supplementary irrigation during the summer season. Comparing rain receipt in the last two

years, it is seen that the spring season in 2016 and 2017 has received better rainfall compared to 2015; Also if we consider the rain fall is more than 300 MM annually but due to increased temperature, the evaporation has been more and the farmers faced with shortage of water, more the utilization of underground water caused the water table to go down annually. This year in 2018, the city of Kabul has shortage of drinking water.

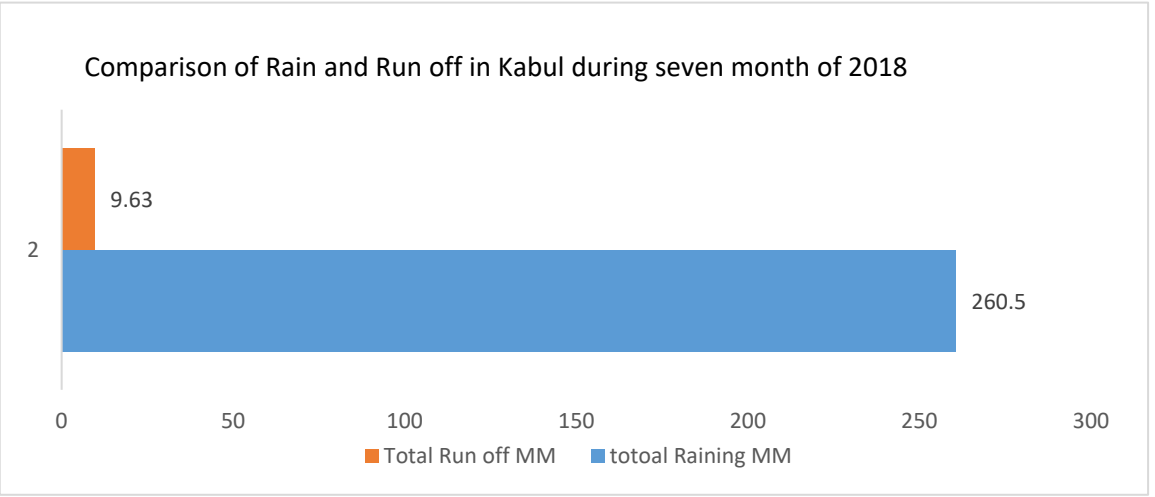
The soil sample of the Badam bagh was anlysed for its texture. It is sandy clay and the infiltration rate is high. Therefore water collected in the pond stays for a lesser period and percolates very fast into the ground water benefiting the water table.



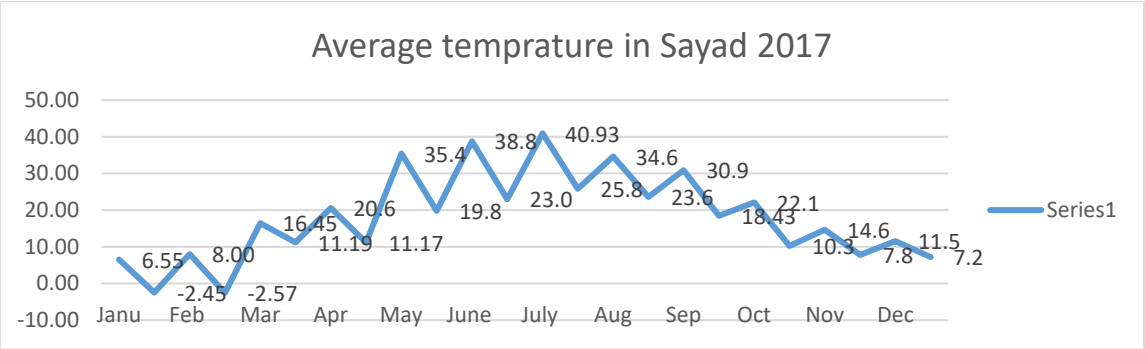
	Jan	Feb	Mar	Apr	May	Jun	July	August	Sep	Oct	Nov	Dec	Annual
2016	46	0	128	123	34	11	3	1.5	3	0	3	2	354.5
2017	57	120	45	18	10.5	0	0	0	3	3	26	18.5	301

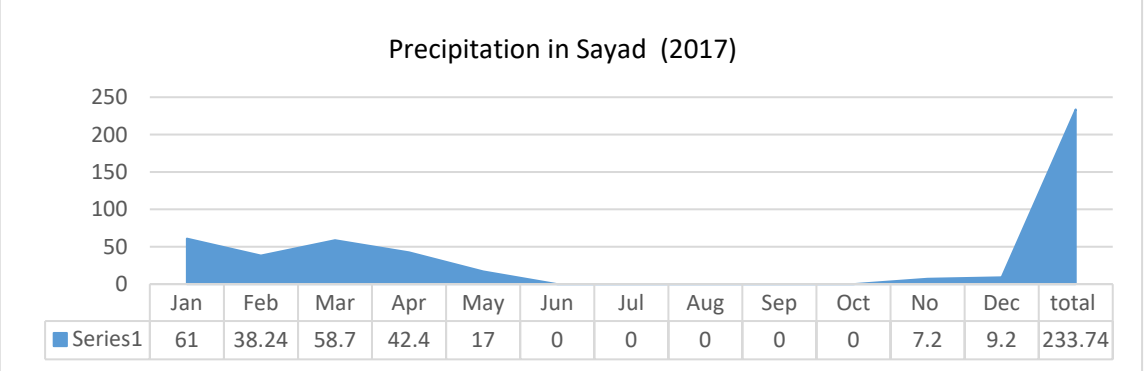


	2018	January	Feb	Mar	Apri	May	Jun	Junly	total MM
Series1	0	23.5	63	45	77	52	0	0	260.5

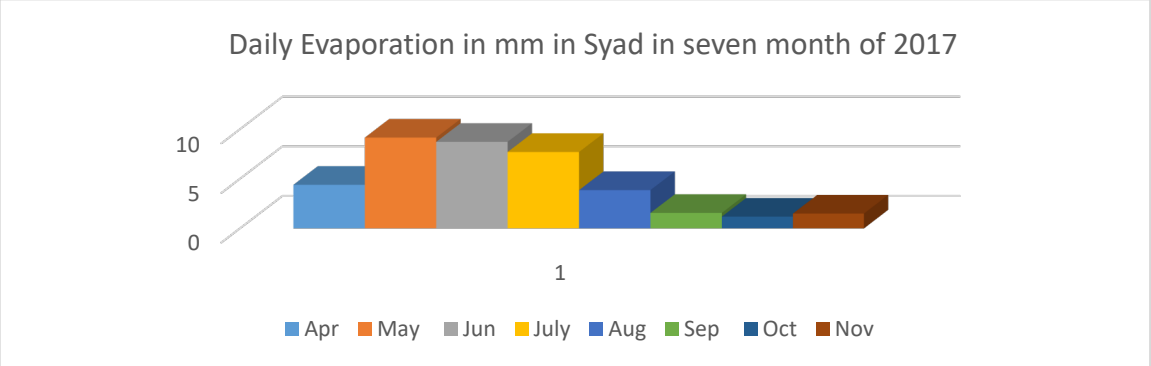


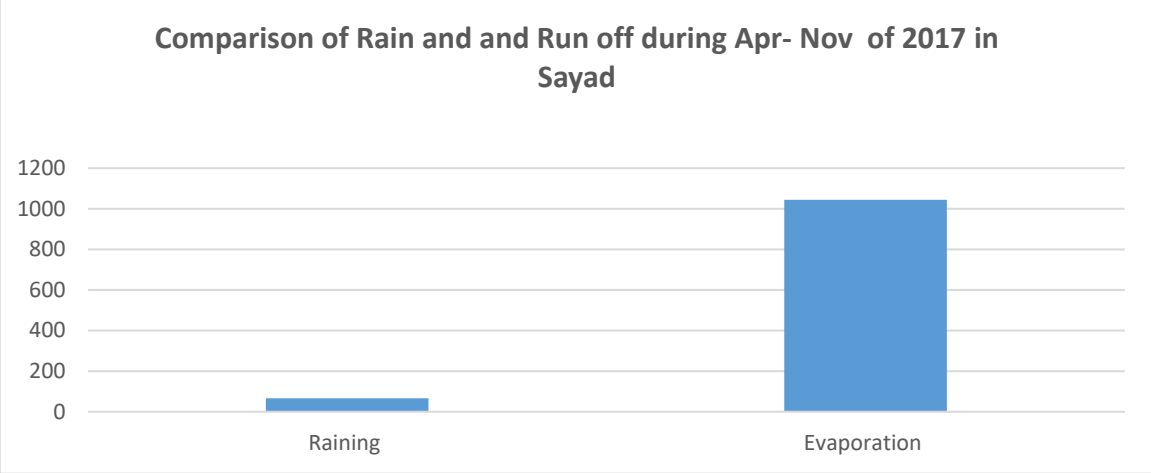
The temperature was high during the winter in Sayad and Mazar as there was no rain and snowi during 2016.



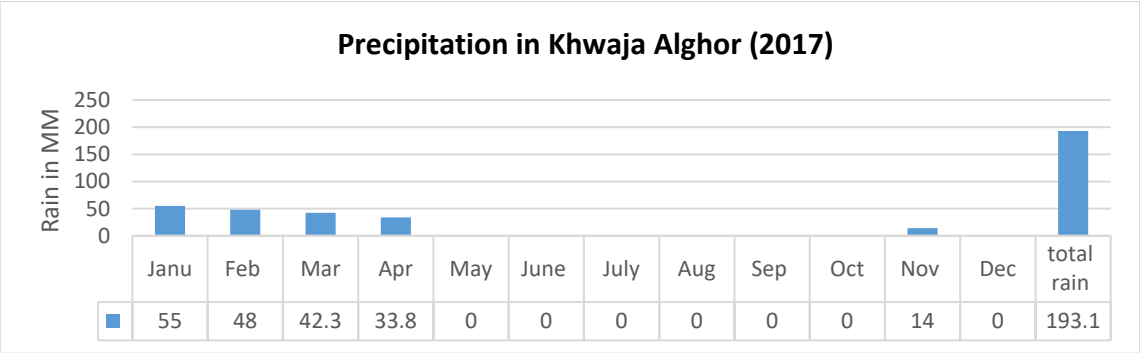


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	No	Dec	total
Series1	61	38.24	58.7	42.4	17	0	0	0	0	0	7.2	9.2	233.74



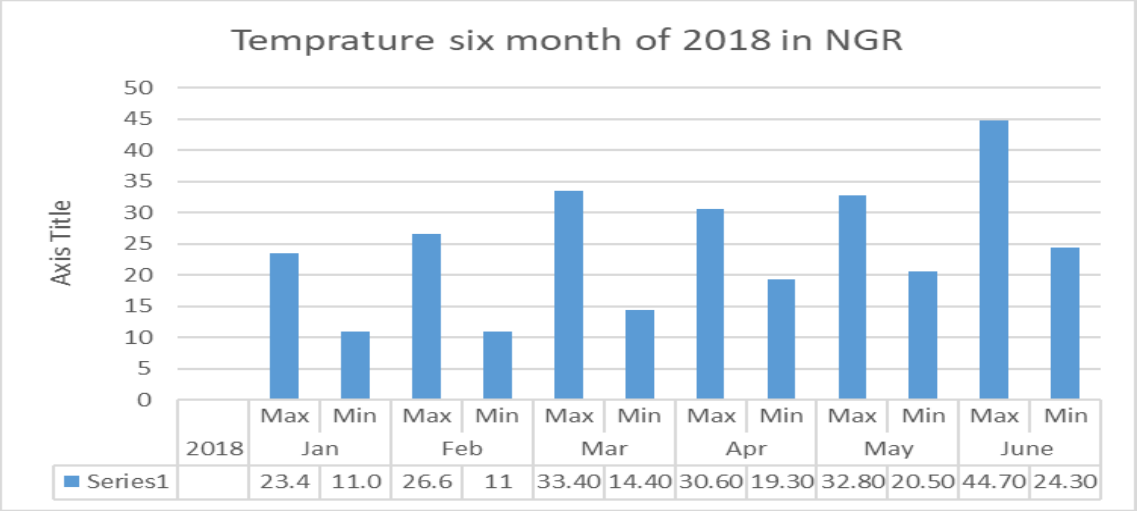


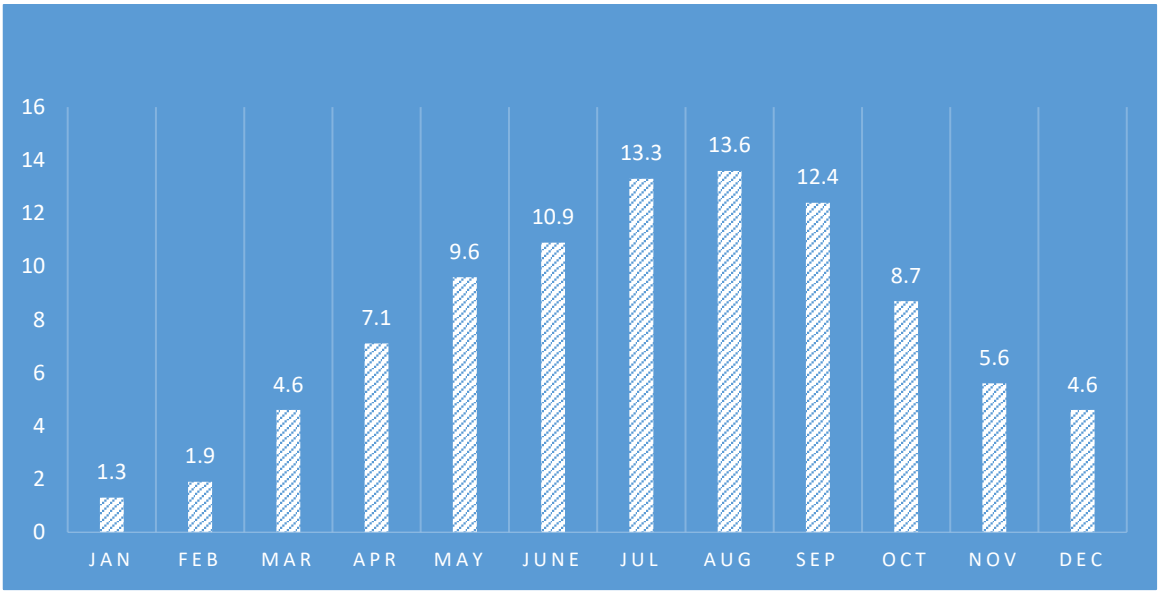
The above graphs indicated that the critical time for irrigating the crop in a season – when the temprature goes high resulting in higher evaporation and no much raining; hence need for suplementry irrgiations.



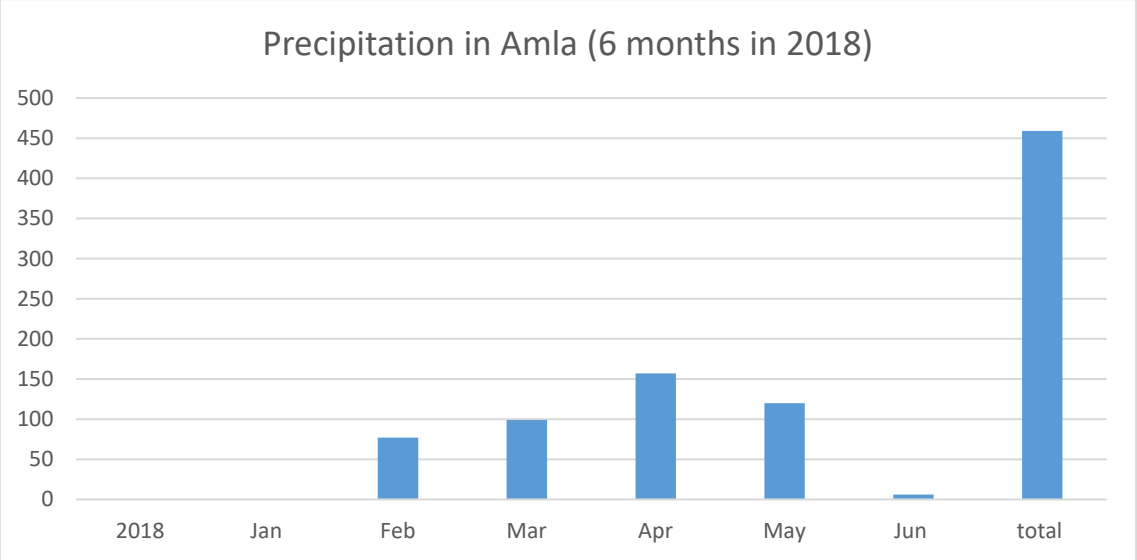
In khwaja alghor, the runoff is less due to soil structure and infiltration is high but no raining during the critical time of crop growing

Meteorology data of Dara Noor weather station (which newly installed) is recorded for required analysis. The evaporation is going high graphs for 2017 and During the 2018 the temperature is going up to 45 degree during the month of June 2018.

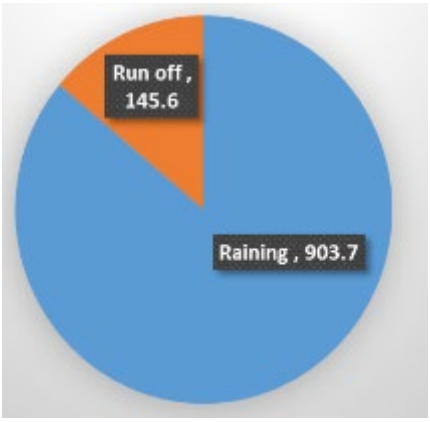


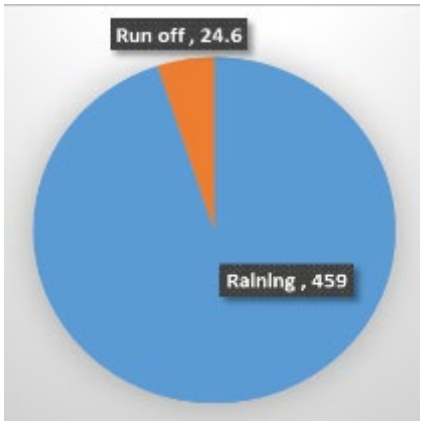


Evaporation in Amla Watershed (2017): the rain and run off graphs in Amla vilage of Dara noor district , Nangrhar provicne

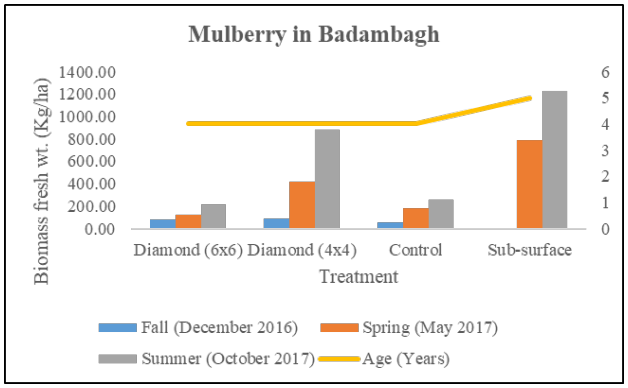


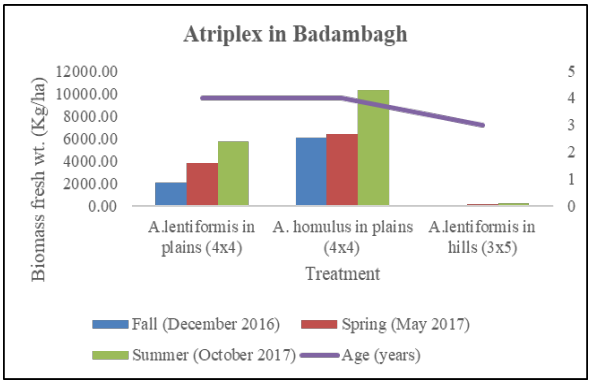
Comparison of precipitation and run off (in mm) in Amla in Dara-e-Noor, Nangrahar province for year 2017 (in left) and six months of year 2018 (in right)





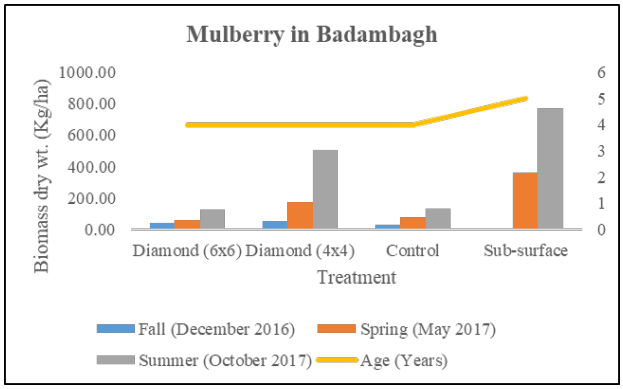
Biomass production for animal husbandry in the targeted watershed areas

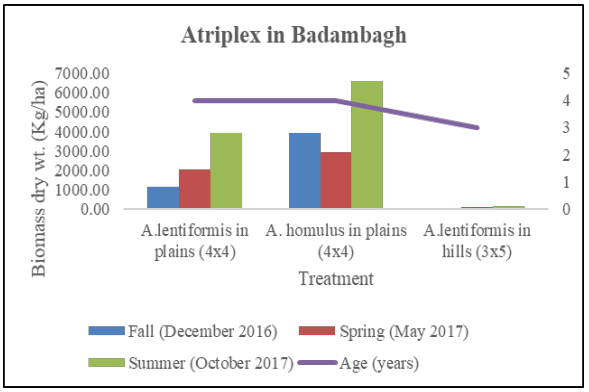


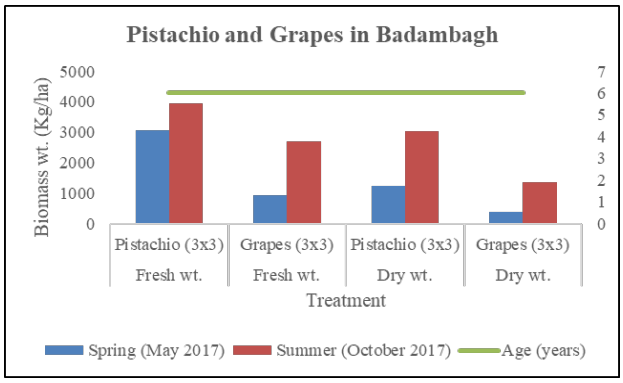


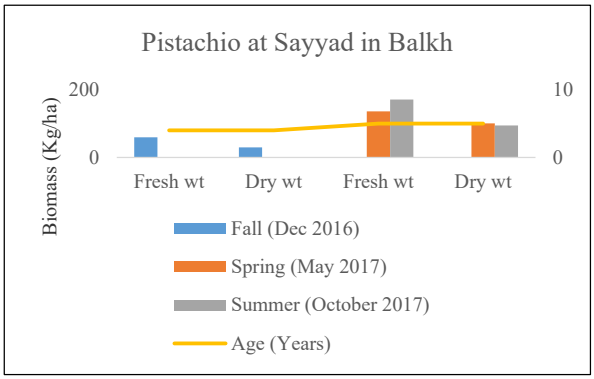
- Mulberry planted in Diamond at 4x4 spacing produced more biomass per ha.
- Mulberry with sub-surface irrigation strcture also produced more biomass per ha.

- *Atriplex homulus* planted at 4x4 spacing on plains produced more biomass per ha than *A. lentiformis* planted on plains and on hills.





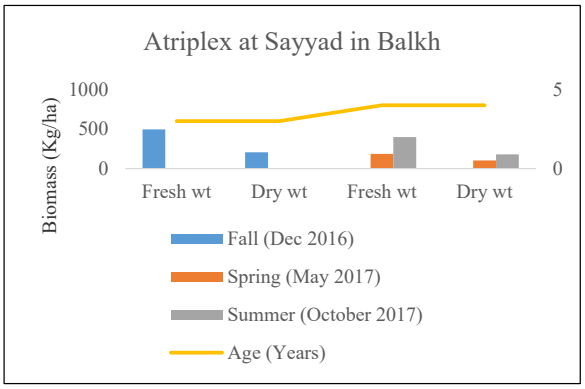


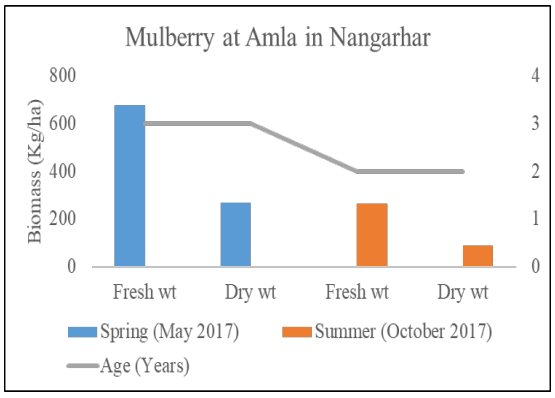


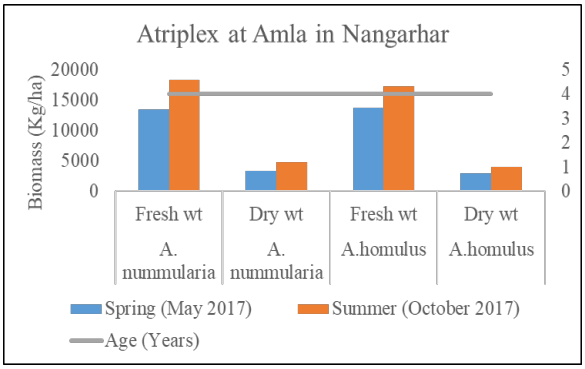
- Biomass production was more during Summer compared to Spring and Fall seasons for all crops

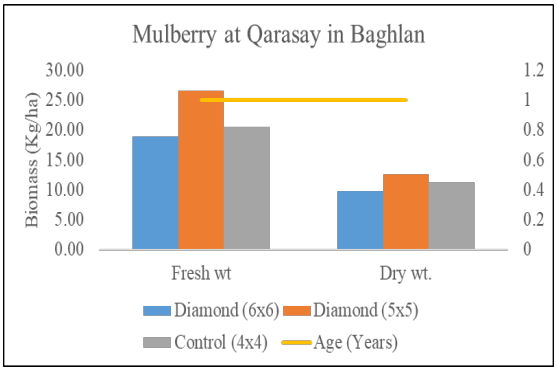
- Biomass from Pistachio and atriplex was more during Spring than during Summer.

Mulberry is managed by communities. Biomass during Spring was more than during Summer.

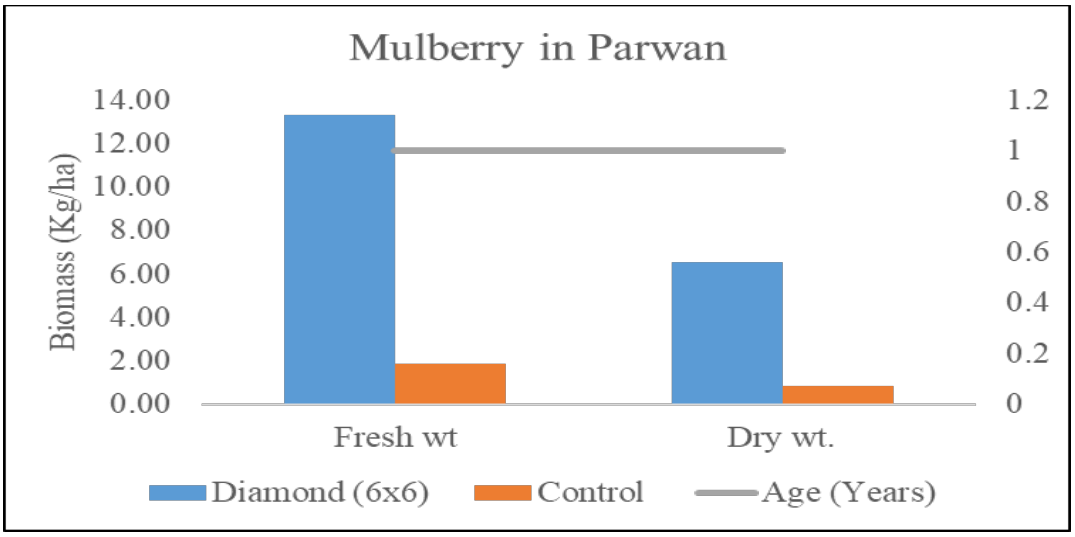








- Mulberry planted during 2016 was damaged due to grazing by Kuchi animals. Biomass from survived mulberry plants was estimated during Spring 2017.
- So another site in the same catchment was selected for planting mulberry saplings. During Summer 2017, biomass was estimated from this new site.



Based on demand from community and DAIL, Parwan, new catchment site was identified and diamond water harvesting structures with forage crop were introduced in 2017.

- *Atriplex nummularia* produced more biomass than *Atriplex homulus*.
- Biomass production was more during summer than in spring.

8.2 Capacity impacts – now and in 5 years

- The communities in project villages are now watershed-educated, and their capacity to foresee short term and long term benefits encourages them to participate in watershed activities; For example, 50% of the community contribution to make water storage water pond base and side walls concrete; water collected for irrigation as swimming pool in the khwaja alghor as sources of income for WSUA for future maintenance of the structure
- Various capacity building activities improved the community's knowledge of watershed, land degradation and drought factors, the infrastructures developed in the watershed project and their ownership and management. The community contribution in percolation tank in Qarasay to collect rain water for recharging underground water and use of this water for supplementary irrigation of mulberry trees.
- The exposure, training, and being able to see the results from structures in the research site in Badam Bagh (apart from out-country exposure) improved the community and policy makers' capacity to take participatory actions e.g. to decide on soil and water conservation measures for their village, pasture development and plantation in barren lands and forming community institutions to manage, operate and maintain various assets created (1865 persons including 267 women are directly trained).
- Convinced by the benefits of cultivating atriplex and asafoetida (also mulberry) in barren lands near the villages, the farmers under the project area have been adopting the research results from water harvest techniques in the cultivation of mulberry, asafoetida and atriplex. Female members in the community are very interested in engaging in the work and applying their increased capacity to manage fodder for livestock and plantation in barren lands
- Increased knowledge of multiple stakeholders has enabled them to foresee benefits and allows them to come together to create long-term structures in common or public lands under their management. Requests from DAIL, Parwan, Balkh and Takhar received for extension and scaled up of the project techniques to establish new watershed sites; the indirect outcome demand for new projects is due to increased knowledge, awareness about benefits of watershed interventions through training activities imparted.
- Since the beneficial impacts of the watershed are spreading from village to village, other villages requested ICARDA's assistance with implementing watershed activities in their villages. ICARDA advocates the community to develop their own capacities and work of their own, in dialogue with local government;
- WSUAs are formed, registered and made aware of the need to communicate and negotiate with government in matters related to soil, water and watershed development (WSUA regulations needed in the country; need a proper advocacy for institutionalize this important community group)
- Partners (like ActionAid) are trained and are adopting the cultivation of atriplex in their project sites as forage crops as well as their established unions trained in Goat rearing and diary processing is encouraged the women in watershed and livelihood promotion activities. Based on the research that Nigarime (eye brow or catch pit) is a good technique; due to this structures (diamond or nigarime) mulberry trees better tolerated the drought and survived at a higher rate.
- Community and stakeholders' knowledge and capacity is developed for subsurface irrigation and drip irrigation. This is supported by trainees and farmers. ActionAid will establish a unit of the drip irrigation in Balkh province as a demonstration, and ICARDA plans to plant mulberry with nigarime and subsurface

irrigation in Taluqan and the Parwan site project site. There is a change in the community sensitivity for water utilization by collecting them in ponds and irrigating the land when intended.

- In sayad the community were organized and trained in mint association and provided them a distillation unit of mint by the watershed project this association were reform and started their distillation of some medicinal crop and sold in market, and got good feedback from users via mobile telephone communication.
- The senior advisor of agriculture in the President's office staff have been visited the watershed site in Parwan and was encouraged to learn how to manage and harvest the raining water. They visited even to farmer doing hing (Asafetida); they advised this crop to the MAIL and NRM department.
- In established watershed site at Amla, the water is available from the spring to the crop lands in the uplands; the planted mulberry trees by WSP now benefited to water availability; the community cultivated their vegetable and Beans for their own consumptions;
- Community representatives of Chrbolak, Shadya and Alburz district requested ICARDA to provide facility and capacity regarding watershed, and hing cultivation in their districts it indicated the spreading of the watershed concepts and result in the existed site to the other communities.
- In coming 5 years, all watershed sites will have visible impacts in terms of vegetation (already seen), more crop productivity; the sites will be model sites for knowledge exposure to such sites in Afghanistan, than going to other countries;

8.3 Community impacts – now and in 5 years

Watershed projects encompass various activities and processes that requires participation by all stakeholders, and most importantly the community;

The community is rightly organized by this research project to form Watershed Users' Association (WSUA). This concept of WSUA has great impact in the community and for successful implementation and management of watersheds. The concept of WSUA well fits to regulations for Water Users Association; however, an advocacy is required to formalize the WSUAs and engage in watershed and NRM activities.

The watershed results have a great impact on the entire community- individually or in group, irrespective of affluence, gender or age. The conservation benefits due to watershed on the land, water and other natural resources is clearly understood more importantly in the community. It results in higher and more efficient agricultural production, creates labour employment opportunities, rejuvenates streams, waterbodies and forest and many more multi-faceted impacts that are discussed below. It is making the community to be involved in the project and own its operation.

8.3.1 Economic impacts

The water collected in the pond constructed by the community of Otran village enabled them to cultivate 28 hectares of additional land with second season maize crop than in previous years. Critical irrigation with collected water resulted in growing a maize crop with an estimated net income of USD 12500 from a 20 ha maize crop in two additional crop areas (USD 7200 in 2016-17, USD 5300 in 2015-16). Also the community cultivated wheat and harvested more than 20 Mt.

Economic impact, directly and indirectly, from to the project improves the livelihoods of the community in the watershed area. The community contribution in form of their labor in the implementation of project activities worth wage labor

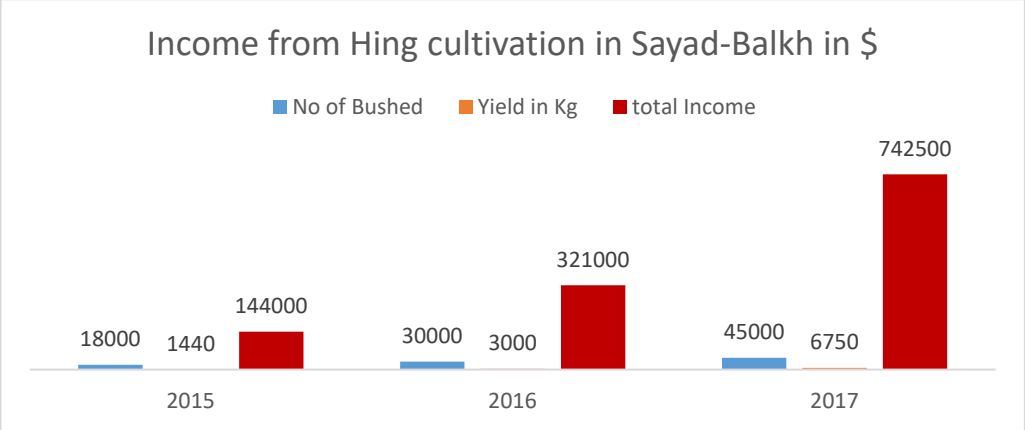
of USD 62000. Such contribution helped for creating much needed structural assets but also increased productivity of crop and livestock and food security of the community.

The impact on soil and water conservation, ground water and soil biomass and fertility etc. are indirect but imperative due to the project.

Economic benefit due to increased fodder for livestock due to integration of Atriplex as an efficient forage crop is realized by community and officials. Adoption of this practice by ActionAid and other partners is a good sign to ensure its out-scaling in the country. It will bring a good economic return from fodder for livestock in forthcoming years.

It is expected that plantation of Asafoetida in degraded lands which was initiated at a research scale has proved it efficient and need to be done in demonstration scale in various watersheds such as Khwaja-Al-Ghor and Saiyad catchments in Balkh province. The production will be realized from next year and would be out scaled to other locations. Community in Sayaad have earned more than 700,000 Dollar during 2017 from selling of hing.

Economic impacts, directly and indirectly from the project will improve the livelihoods of the communities in the watershed area. The communities' earnings directly from wage labor is nearly 1.1 mn Afs. This allowed the creation of much needed structural assets that will have regular and long-term impact on water regime in the area, influence the yield and production of crops and forages and impact the livelihoods and food security of the community and livestock. The impact on soil and water conservation, ground water and soil biomass and fertility etc. are indirect but imperative and will be measured in the project.



(cultivation of Asafetida in Sayad watershed site; income recived by the community)

the

8.3.2 Social impacts

Community contribution is of high percentage for rehabilitation and maintenance works compared to the structural works. Community mobilization and entry point activities improved the participation of community in developing their watersheds, and improving their livelihood through NRM and agricultural activities. The impacts are so obvious that community groups are coming together to do higher investment like doing concrete base for pond in Khwaja Alghor of Balkh province, and also then percolation tank in Qarasay and Amla villages.

Planting of the mulberry sapling in Project site (Aq masjid, Parwan, Qarasay and Amla by the community indicated that the project mobilized the community and bring them come together and planting 150 mulberries in their watershed site; many times they irrigated the sapling by collecting flash flood water collected in the percolation tanks ; they do only subsurface irrigation. They cultivated ing Hing and Pistachio as medicinal

and cash crops for their future economic empowerment. The Sayad watershed community harvested a good yield and earn good income for them.

Such social impacts happened due to increased understanding on watershed approach, and knowledge on good impacts. This happened due to

- Continuous persuasion and increasing awareness through cross-learning tours started bearing fruit in terms of community participation in project activities. At the outset of activity implementation at Qarasay, the community would not allow the initiation of the work with dry stone masonry. The project team engaged with the community explaining the advantages of such interventions. This changed the mindset of the community who were then persuaded to build the gully control and check dams.
- The community accepted to make utilisation of hilly barren lands for cultivation with atriplex and hing after seeing the results of the project which showed small scale cultivation of those crops using hilly barren lands available in the target communities in the catchments of Balkh. This also encouraged NGOs like Action Aid to scale up and train more community on cultivation of atriplex, hing and mulberry wherever suitable. Female participation in WUA, in training and capacity building program and taking up specific suitable activities like cultivation of asafoetida and managing pasture, etc. within the prevailing social system in Afghanistan has a great social impact of its own.
- The community in project and nearby villages now come together to reap the benefits of the projects. In three projects, the water user association formed has taken ownership of the project and benefit from the structures.
- On completion of the work, the project structures were delivered to the community by DAIL. For example, when ICARDA started the project in Qarasay the community did not allow the initiation of the work with dry stone masonry. The project team took time to engage with the community, explain the concept and science of the check dam and gully control to check and filter water and safely dispose water to areas where needed. A concrete structure to stop water is not a solution and is not desired. This understanding was vital to bringing a change in mindset and the social impact was paramount for the community opinion makers. The community decided to try the approach, participated and built the gully control and check dams. The capacity building is possible when we ensure the desired social change for that.
- Female participation in WUA, in training and the capacity building program and taking up specific suitable activities like cultivation of asafoetida and managing pasture etc. within the prevailing social system in Afghanistan has a great social impact of its own. For more involvement of the women in social affair three femal facilitator in Takhar , balkh and Nanagrahar were hired and working with women , their achievement is established literacy cources for their capacity building in Sayad , making subgroulp of women in WSUA for mobilizing and organizing women in their community common decision they are colelctign some small amount as fee from memebers and making loan for other women that their work and small business needed for fianical support.
- Increased food production, water availability and income opportunities would result in increased food security, good health, better education for children; and hence overall improvement in social welfare. Yiekding from Utran pond and land under its Irrgiation , amla site producing vegetable and beans as well as Sayad community earned more than nin hundred thousand USD during 2015- 2017

8.3.3 Environmental impacts

- ***Water impound and water harvest:*** Watershed projects mostly have positive impacts on the environment and also in this project. In 7 watersheds (Khwaja-alghor and Saiyad in Balkh, Otran and Amlah in Nangrahar, Badambagh in Kabul, Qarasay in Baghlan, and Aq-masjid in Takhar and Dashte Gawhar khan in Parwan), 139 check dams and gully control, and 12 percolation tanks/ponds were built with potential to harvest 28.63 mn liter water during each effective splash of rain/snow. This volume of water less ET would percolate to ground water. Pond, kanda (underground storage) and well would have immediate beneficial effect on ground water and growing forest/horticulture plantation (more fruit and forest trees would reduce soil erosion, conserve water and lower temperature in the micro-location apart from food, fodder and fuel wood production).
- ***Pasture and horticulture in barren lands:*** Pasture development in 28 ha (atriplex), advocacy for village forest protection in 900 ha through CFM and horticulture plantation in nearly 91 ha with pistachio, mulberry and grape has had a great impact on the environment. Assuming that this water is used for wheat production, the accumulated water would be sufficient to cultivate wheat in approximately 4 ha land resulting in production of 10 t. This would generate a gross income of USD 4,500.More than 42 Hectare land is covered by horticulture and pastures and 1820 hectares' mountain land is covered by forest established, and maintained that all have positive impact on Environment while this year is more effected by drought.
- ***Soil conservation:*** As per field estimates, 16 check dams in Qarasay collected a huge quantity of sediment. Nearly 600 cum soil sediment would develop a flat land of 600 sqm and would be used for cropping or plantation (the gully would be changed to arable land in the future). These sediments would otherwise have been deposited in crop fields, damaged the crops and flowed to the river, obstructing the free flow of water resulting in floods. The pond in Otran collects more water to cultivate 29 additional hectares of land than in previous years. More water in the pond would recharge more to ground water.
- ***Yield of water bodies increased:*** In Khwaja-Algjor, the water yield of a perennial spring has increased by 20% due to water conservation and construction of a storage structure. The spring has an increased water yield this year. The flow was 2 liters per second last year. This year it has increased to 2.5 lps, which is a 25% increase in water flow due to L&WM measures.
- ***No Negative externalities*****:** Negative environmental impacts like water logging is not observed in any project site and is not expected in Afghanistan. The water recharge and evaporation in low lands may lead to salinity issues in surface soils which is not yet a problem but needs to be assessed.

8.3.4 Policy impact

- Change in knowledge and skill of community, DAIL, MAIL and policy makers towards watershed management is a major outcome due to the project as a result of various capacity building activities of the project. Policy makers and academicians' awareness and exposure on watershed contributed in NRM strategy/policy formulation and its successful implementation in the country.
- Improved awareness of policy makers, staff of different stakeholders encouraged to standardize NRM strategies and approaches for Afghanistan to help as a guide to scale-up the initiative; Now in each province, there are DAIL representatives on watershed and drylands development.
- Acknowledgement of DAIL officials to discuss and adopt the Watershed and NRM strategy prepared for Otran watershed at government level is an important outcome of project activities. DAIL and WUA is directly interacting, planning and implementing

at the community and province level. The dryland farming law and NRM strategy is finalized and will be issued soon.

- Developing operation Manual for NRM strategy by NRM directorate with contribution of partners and ICARDA.
- Continuous project efforts by ICARDA are continuing for training and capacity building of all stakeholders on watershed approach, watershed planning, implementation, management, and operation and maintenance of watershed structures. The change in community understanding led to their coming together and form WUAs. A crucial social institution resulting from the project efforts, to own NRM efforts in Afghanistan.
- Dry land farming strategy is drafted and still it is in progress.
- For DLF proposal DFAT funded institutional capacity building to the DLF unit of MAIL

8.4 Communication and dissemination activities

The project engaged different stakeholders to plan, obtain timely approvals for implementation of activities, enhance awareness about project activities, have more access to target communities and have on ground support for monitoring and implementing project activities at catchments.

Stakeholder engagement strategy was reviewed and added DDA and DoWA in M&E training in Delhi in month of September; well applied during reporting period that for all meetings the representative of Dept of women affair and District Development Authority were invited and shared the project activities and get their support.

The project established effective linkages with MAIL, ARIA and other institutes such as Universities (Nangarhar, Kabul, Balkh, Baghlan), Department of Extension through agreements and MoUs necessary for implementing different activities planned at catchments. Efforts to enhance awareness about watersheds and different activities undertaken at catchments, were made through cross learning tours, sharing of different reports such as project annual reports, TWG meetings, POG, etc.

During the reporting period, the project participated in the Program Oversight Group meeting and Midterm review of project activities where donor representatives and policy makers in GIRoA participated., plan activities and also provided an important opportunity to take suggestions and recommendations for better implementation of project activities. In addition, the project also participated in provincial level meetings to share the technological interventions for different catchments and for planning effective implementation.

With the support of DAIL and Extension department, the project met shuras, communities, lead farmers for establishing Watershed Users Associations to discuss and introduce different interventions. In consultation with and involvement of watershed users' association members, different technological interventions were planned and implemented for the target catchments.

Both out-country (6), in-country (45) training activities and Six field days were provided to different stakeholders to increase the skills of 1865 persons including 267 females (community persons and project staffs, policy makers, students, and farmers are involved). In addition, communication materials such as two brochures on "Watershed project" and "Build the Capacity and make the Outcome Sustainable" were published in English. Four publications in local languages were printined (watershed management booklet on watershed information and techniques Goat rearing , Diary processing , Potato production). A research and review publication on 'Watershed Development in Afghanistan: Lessons from South Asia' is in the final stages of publication. Such efforts resulted in out scaling of watersheds in Afghanistan in other provinces. DAIL Parwan requested the project team to establish a pilot research extension site of watershed at Dasht Gohar Khan was completed during 2017.

To take advantage of NGOs such as Action Aid, which has a strong provincial extension network, the project formalized an MoU to promote soil and water conservation technologies in Balkh and Bamyan, provided technical backstopping in establishing demonstration plots and trained their staff on watersheds, water harvesting technologies and Farmers Field School methodology.

ICARDA is consistent in effective training and capacity building of its partners such as GIRoA, ministry and departments, and other implementation partners such as AAA, AKF, UNEP, CBOs and in addition the community. The training covers all aspects including project planning, site selection, community mobilization, implementation and M&E. DAIL are involved in watershed site selection and prioritizing watershed sites as per criteria. Practical training activities are very effective to identify proper sites, decide and implement suitable activities and also deliberate on issues of post-project sustainability and ownership.

Partner staff and communities are given various technical training activities (ToT & FFD) (Appendix – 11.5). 57 training activities and FFDs, 45 in-country training activities with 1336 including 234 femla , 6 out country trainingswith 85 participant including 6women & 7 FFDs with 444 participant including 27 women , imparted building capacity of (1866 individuals including 267 females. This involved 722 Male and 123 female from community and project staff, and 1143 males and 144 female from counterparts. Agriculture graduates and policy makers participated in six out-country training activities/internships (4 in India i.e. 2 in ICRISAT, Hyderabad, 1 in Punjab Agricultural University, Ludhiana one in Delhi M&E) and 2in Jordan.

In-country Training activities:

The in country training activities cover subjects of watershed management and water harvesting, forage development, project management, monitoring and evaluation. ICARDA delivers TOTs to its staff, partners' staff, ministry and department, faculties, students and community link persons. The subjects cover practical discussion on watershed, catchment, water conservation, infiltration, percolation, recharge, harvesting, project implementation interface with community and government, forage, watershed, seed production, demonstration plot, FFS, micro-irrigation, pasture management, animal feeding, and project M&E tools.

Total 45 in-country trainings were conducted for 102 male and 234 female (1336 persons) from Project, ICARDA, MAIL, DAIL and NGOs as counterparts to attend the trainings.

Out-country Training activities:

Policy makers' training and exposure in India had a positive effect on the watershed policy dialogue, field visit and review of watershed policy. This opened up the idea of policy makers/stakeholders to devise a suitable NRM/Watershed policy back in Afghanistan. Training on watershed (watershed approach and activities), training of graduates on soil analysis (soil property (physical and chemical), soil fertility and analysis, and internship of students on watershed management (watershed, pedology and irrigation, L&W conservation etc.) gave a good academic exposure and learning to build skilled human resources in Afghanistan.

There were 6 out-country training and policy dialogue in which 79 male and 6 female participated from project, MAIL, university and other counterparts of ICARDA.

Field days:

The field days involved the farmers, students from faculty of agriculture, and also the local officials and other NGO partner staff. The field days discussed varying important issues like rain fall, run off, erosion, watershed measures, percolation tank vs. pond, check dams, semicircle/ nigarime for mulberry plants, atriplex cultivation, agriculture, pasture and horticulture plantation. ICARDA uses field days as real training venues to transfer thematic knowledge to community, local government officials and other partner NGO staff. Still seven FFD were conducted last years involving 417 male and 27 female involving farmers, students etc.

9 Conclusions and recommendations

Since Afghanistan has bounded in dry area and climate faced may year drought and shortage of water for irrigation, even in this year for drinking water and population is growing explode, uses agriculture land for residential area and urbanization is expanded so the shortage of Agriculture land is realized, pasture declining and desertification is increasing yearly, there for dry land farming is recommended through water harvesting and catchment management. the watershed concept is very broad aspect including Meteorology, Hydrology, Agronomy, forestry and pasture development, and there is need for extension cervices for expansion of the water catchment and Irrigation management.

9.1 Conclusions

Field-specific adaptation activities are carried out utilizing project techniques that include the harvesting of rain water and to enrich ground water. The field research and learning suggest the suitable dimensions of various structure and suitable locations – e.g. to limit the check dam to less than 5 meters, especially where the slope is greater than 15-20% to address irreparable damage due to flash floods. Data on the infiltration rate, runoff, sedimentation load is assessed. Macro/micro-water harvesting technologies are integrated into the design of structures. The vegetation (e.g. shrubs and bushes plantation) alongside these structures add to their strength and efficiency. The project is integrated with other ICARDA projects e.g. forage project of ACIAR and CLAP project of IFAD - to improve production and productivity of water, land, agriculture, and livestock.

There are a lot of evidences from the project to suggest that the project is generating economic, social, policy and environmental impacts (e.g. wage and ancillary employment, agriculture wellbeing, reducing soil and water erosion, policy and research advocacy, and environmental safety). Direct wage employment due to man-days created through WSP activities though negligible, the long-term benefit from assets created and soft skills imparted is very high and sustainable. The project, has significant impacts on the WS R&D information, training policy makers and other stakeholders apart from water recharge, soil fertility improvement, environmental and a range of ancillary benefits.

The project upon its completion is highly appreciated by community, government and donors; there is a charged environment in the policy level to out scale the best practices in the country; to share the impacts and the practical experience on watershed implementation processes with ministry and other donors. DFAT/AusAID are preparing to take it forward under DLFS strategy, and USAID under climate resilient production approaches apart from possible talks with EU, WB and US Naval Agency who is to implement Afghanistan Reconstruction project. Discussions are underway with AECOM-USAID (under ongoing SWIM project). The project did extensive capacity building of the community, MAIL, DAIL and other stakeholders for transfer of best bet knowledge so that they become capable to sustainably manage the watershed structures and assets created, and also to develop more watersheds in the locality using appropriate technology.

The project implementation process and its impact is very significant, and can be concluded that the project has been successful to achieved the much or more than that was envisaged in the initial project formulation stage.

9.2 Recommendations

- Extension and expansion of the watershed small scale project in most of the provinces of Afghanistan
- To put more resources in this area and support of Dry land strategy with government
- Diversification and Medicinal crop extension in the suitable area
- Flood control by huge waters harvesting activities and recharge of underground water

- The country should, similar to learning from evaluation of watershed/NRM policies in other countries, develop and enact the Afghanistan Watershed Policy. Learning from this project serves as a guide for this vital action by the local government. The project standardizations of different aspects as below should guide the NRM policy

  (a) standardization of L&WM measures and designs for hilly slopes and uplands, such as in-situ rain water conservation and ground water recharge; through construction of percolation tanks and gully control structures; this reduced run-off water volume down the slopes, reduced erosion and sand cast in valley lands;
  (b) standardized treatment measures for middle and low lands, e.g. for water collection, spreading and storing mostly through check dams, WHS, storage structures, and ponds (with diversion weirs and canals as per potential for water diversion for domestic and irrigation uses);
  (c) screened improved plantation species and techniques for the region e.g. mulberry and asa fetida plantation with catch-pit (nigarime) techniques in 6x6 sqm plots;

  Nigarime gives good results in 6x6 m^2 plots in mild slopes of about 5-10% (not more than 25%)

  (d) Mulberry trees plantation using Nigarime with subsurface irrigation have good survival then without supplementary Irrigation96.3 and with only nigarim pit have 60 % and control without WH technique have 22 % survival;
  (e) Catch pit technique for water harvesting around the plants improved the growth of the plant such as in 6x6 have 48.32 Cm branches growth as average and in 4x4 have 34.87 and in control without catchpit have 7.63 Cm growth of branches. The plantation in 6x6 m2 plot has good growth with more branches;
  (f) New fodder crop introduction in pasture and barren lands e.g. atriplex plantation in pasture lands as alternate fodder crop, and Hing (asa fuetida) plantation in dry barren lands which would bring a good economic return where nothing can be planted as in Sayad Community earned more than 9000 USD in 2017.
  (g) Loose stone/boulder check dams facilitate infiltration of water and filters sediments coming in run-off. It lowers wash-out force of flood water. Stone structures are low cost while being effective and made of local material without using cement-iron like external material. post project maintenance by community is easier instead of cement wire mesh gabion structures would be more appropriate
  (h) Pond/percolation tanks help in water harvest and reserve; linked to gully and check dams, it is very effective for flash flood control, and soil erosion control;
  (i) Check dam should not be more than 6 meters long, along with gabion structures it has a good result. For check dams, the project suggests adopting a new design of wider berm up-stream, extended stone pitched bed, sloping inward, downstream ending with elevated bund to maintain a low depth of standing water to act as a cushion and reduce eroding force of spill over water.
  (j) The field research and learning suggests to limit the check dam or gully control structure of width <5-6 meters especially where the slope is high than 15-20% to save from flash floods.
  (k) Field-specific adaptations are made in project techniques like harvest of rain water in Saiyad allowing gravity flow to irrigate plantation instead of pumping of water from stream points by solar pumps which involved energy and cost.
  (l) Agronomic measures (e.g. shrubs and bushes) add to the strength and efficiency of check dams and other structures. New data is generated on the infiltration rate, runoff, and sedimentation load. Macro/micro-water harvesting technologies are suggestive of changes in design of check dam down stream flow bed. It would be 1-2% inward sloping, stone pitched with a 1-1,5 ft berm in the end and will create a water pool and reduce erosion of flowing down water given the poor soil conditions.
  (m) Convergence as an effective method to bring successes - The project activities are to be integrated with other programs similar to integration with other ICARDA projects (e.g. forage project of ACIAR and CALP project of IFAD to improve production and productivity of water, land, agriculture, and livestock).

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10 References

10.1 References cited in report

Watershed Development in Afghanistan (2016): Lessons from South Asia; V. Ratna Reddy, Y. Saharawat, S. Tavva, B. George, C. Biradar;

FAO (2013); "Afghanistan Water Report 2012"; http://www.fao.org/nr/water/aquastat/countries_regions/afg/index.stm).

Goud Vinod (2005), Institutionalising Participatory Approaches in Integrated Watershed Management Programme of Andhra Pradesh-A Case Study of Chittoor District, Un-published Ph. D. Thesis, Dr. B. R. Ambetkar Open University, Hyderabad.

10.2 List of publications produced by project

The project MoU are developed and signed with the relevant partner. The MOU inscribes the mandatory strictures on IPR and is careful enough for adherence to it. The donor terms and conditions are duly respected and abide by in the IPR terms in the MOU. Knowledge sharing among all stakeholders are governed by IPR norms.

An MoU has been signed between ActionAid and ICARDA for implementing the project activities in partnership. The discussions are in an advanced phase with AKF, UNEP and CARE for developing further MoUs. The Director General for extension at MAIL has asked for better cooperation between watershed activities and extension department of MAIL and further discussions are in pipeline. Similar discussions are in initial phase with AAEP.

In this year the following publication are printed with due consideration of acknowledgement and IPRs.

1- Baseline survey report (in English)
2- Stakeholder and policy makers dialogue in Hyderabad (in English)
3- Statistical analysis (English language)
4- Watershed booklet in Local language
5- Internship for Senior student of the Agriculture university in PAU (In English)
6- Project summary (English and Local language)
7- Project impact (English and Local both languages
8- Sayad Case study (in both local and English languages
9- Sayad Case study in local language
10- Manual on watershed is (local language)
11- Watershed review report (English)
12- Dairy processing in local language
13- Goat rearing in local language
14- Potoato productin in local language
15- Watershed book let second edition for more demond of counterpart
16- Case study from Khwaja Ighor balkh province, Aqmasjid of Takhar , Gowharkhan of Parwan and Amla of Nangrhar were printed in local languages

Problem:

The only potential problem that shadows other manageable problems is the security concern, which restricts field operations. Other problems are illiteracy, a closed social system limiting the participation of women in activities, and low government patronage for the program. There is also a lack of watershed educated and trained manpower at the community, academic institutions and policy-making bodies. The project has made a good effort to make policy makers aware and train agriculture students in the concept. This is expected to substantially change the scenario in the near future.

Drought is also a major problem on the way of the project greenery part

Social conflict in Surkhdara in Bamian led to loss of lot of our effort and time for community meetings, survey, work plan, budget estimate and lot of meetings with DAIL officials.

Opportunities:

Opportunities are many for watershed and NRM intervention in the country.

- The government is very sensible and acts quickly for developing watersheds to build water and irrigation infrastructure in the country and develop agriculture and livestock which is the backbone of the national economy
- Trainable manpower by project and government agencies; watershed training modules, and watershed research sites developed;
- Low rainfall and highly permeable soil; hence great scope for total rainfall retention (100% rain water harvest)
- Women and youth are enthusiastic and encouraged to watershed and dryland farming as it immediately shows impact on production and livelihoods security, women engagement is getting higher thea last year because of mobilization activities by community female facilitators

11 Appendixes

11.1 Project Collaborators

A. Donor: ACIAR (Australian Center for International Agricultural Research)

Program overseen by: ACIAR-South and West Asia Division
Research Program Manager (Land and Water Resources), ACIAR - Dr. Evan Christen
ACIAR-South and West Asia Division, New Delhi - Dr. (Ms.) Kuhu Chatterjee
ACIAR-Afghanistan Impact Manager- Mr. Sayed Hussain Mousawi

B. Afghanistan Government

Program partnership with: Ministry & Department of Agriculture (MAIL & DAIL)
ARIA and other Afghanistan provincial agriculture universities, colleges and departments

C. ICARDA Staffs involved in Watershed project

I. ICARDA Afghanistan:

ICARDA-Afghanistan Country Program Manager- Dr. Y.S. Saharawat,
Watershed/water scientist - Dr. N. Swain,
Socio-economist - Dr. S. Tavva,
National Coordinator (Watershed) - Mr. Md. Sharif Sharifi,
Senior Agriculture Advisor - Mr. A.R. Manan,
Watershed Field Technician - Er. S. Zahadi,
M&E Officer – Mr. Saifullah Amiry,
Balkh Province IC - Md. Navin Safi,
Baghlan/Takhar Province IC - Abdul Haq Farhang,
Nangrahar Province IC - Noorul Haq Hakimi,
Parwan Province IC - Khalil-ur-Rahman,
Watershed field supervisor (Takhar), Faiz Mohamamd,

II. ICARDA Headquarter/other country offices:

Geo-informatics Division, Head- Dr. C.S. Biradar,

(There are several head office support staffs, field coordinators, technical staffs, and animators engaging with the community, departments and local partners for better implementation of the programs)

D. NGO Partners (implementation partner)

Action Aid, Kabul, Afghanistan and AA partners such PAC, OHW, PADCO, CAHPO etc
Aga Khan Foundation, Kabul, Afghanistan
UNEP, Kabul, Afghanis

11.2 Watershed site details

Province	District	WS Sn.	Watershed Name	Physical works[2]	No of Villages	Village	Total HH	Total population	HRI Image	Hydrosheds developed	Watershed Area (ha)
Kabul	Kabul	1	Badam Bagh WS	Completed	1	Badam bagh	0 (research site)	0	Yes	Yes	220
Balkh	Khulm	2	Khwaj Alghor WS	Completed	1	Khwaj Alghor	28	200	Yes	Yes	2947
		3	Sayad WS	Completed	1	Sayad	250	1750	Yes	Yes	332
Nangarhar	Dar-e-Noor	4	Otran WS	Completed	3	Otran, Sutan, Machgandoi	800+1000+600 = 2400	16800	Yes	Yes	2634
		5	Amlah WS	Completed	1	Amlah	300	2400	Yes	Yes	500
Baghlan	Pole-Khomri	6	Qarasay WS	Completed	1	Qarasay	60	420	Yes	Yes	1000
Takhar	Talaqoan	7	Kharuti WS	Dropped	1	Kharuti	20 (drop)	150 (drop)	Yes (drop)	Yes (drop)	72 (drop)
		8	Aq-Masjeed WS	Completed	1	Aq-Masjeed	1500	10500	No	Yes	543
Bamyan	Bamyan Center	9	Khoskak	Dropped	1	Khoskak	70 (drop)	510 (drop)	Yes (drop)	Yes (drop)	2270 (drop)
		10	Qul Roba	Dropped	1	Hyderabad	200 (drop)	1400 (drop)	Yes (drop)	No (drop)	1886 (drop)
Parwan	Jabaluseraj	11	Dasht Gowhar Khan	Completed	1	Gowhar khan	150	1100	No	Yes	545
7 provinces	**7 districts**	**11**	**11**	**C- 8, TS-0, Plan-0, Drop-3**	**C-10, TS-0, Plan-0, Drop-3**	**C-10, TS-0, Plan-0, Drop-3**	**C-4538, TS-0, Plan-0, Drop-290**	**C-32070, TS- 0, Plan-0, Drop-2060**	**-**	**-**	**C/OG- 7633, TS-545, Plan-0, Drop-4228**

C- Completed, OG - Ongoing, TS- Work to start, Drop- Site identified but dropped due to security reasons

[2] *-Physical works completed; training and capacity building done O&M, institution building, facilitation/convergence*

11.3 Watershed Users' Association (WSUA) Member details

Province	District	WS Sn.	Watershed Name	Village names	Status	WSUA Member- Male	WSUA Member- Female	WSUA Member – Total
Kabul	Kabul	1	Badam Bagh WS	Badam bagh	Completed	-	-	-
Balkh	Khulm	2	Khwaj Alghor WS	Khwaj Alghor	Completed	10	2	12
		3	Sayad WS	Sayad	Completed	9	12	21
Nangarhar	Dar-e-Noor	4	Otran WS	Otran, Sutan, Machgandoi	Completed	12	1	13
		5	Amlah WS	Amlah	Completed	15	1	16
Baghlan	Pole-Khomri	6	Qarasay WS	Qarasay	Completed	10	1	11
Takhar	Talaqoan	7	Kharuti WS	Kharuti	Dropped	-	-	-
		8	Aq-Masjeed WS	Aq-Masjeed	Completed	11	12	23
Bamyan	Bamyan Center	9	Khoskak	Khoskak	Dropped	-	-	-
		10	Qul Roba	Hyderabad	Dropped	-	-	-
Parwan	Jabaluseraj	11	Dasht Gowhar Khan	Gowhar khan	Completed	12	5	17
Total						**34**	**79**	**113**
						30%	**70%**	**100%**

11.4 Watershed wise Key Activities

Sn.	Watersheds	Contour Trench/Bund				Gully Controls			Check & Diversion weir			Pond/collection tank				
		Numbers	Length (mtrs)	Surface area (sqm)	Volume of earth & stone work (cum)	Numbers	Length (mtrs)	Volume of earth & stone work (cum)	Numbers	Length (mtrs)	Volume of earth & stone work (cum)	Numbers	Perimeter (mtrs)	Surface area (sqm)	Storage volume (cum)	Volume of earth & stone work (cum)
1	Khwaj Alghor (Balkh) (2900ha, 1 vil, 28hh)	8	80	80	40				5	213	310	1	28	50	120	150
2	**Sayad (Balkh)** (330ha, 1 vil, 250hh)	10000	60000	60000	29400							1		64	21000	
3	**Qarasay (Baghlan)** (500ha, 1 vil, 60hh)	8	80	80	40				27	260	327					
4	**Utran (Nangarhar)** (6000ha, 3vil, 2400hh)											1	124	1360	2500	1200
5	**Amla (Nangarhar)** (2630ha, 1 vil, 300hh)								1	5	15					
6	**Badam Bagh (Kabul)** (217ha, Research site)								1	40		1	100	600	2100	2800
7	**Dasht Goher khan (Parwan)** (500ha, 1 vil, 60hh)	300	1500	3000	1443.75	26	88	113	13	95	322	1	52	168	104	150
8	**Aq-Masjid (Takhar)** (500ha) 3vil, 100hh)	200	1000	2000	900	36	138	176	31	194	500					
Total		**10516**	**62660**	**65160**	**31823.75**	**62**	**226**	**289**	**78**	**807**	**1474**	**5**	**304**	**2242**	**25824**	**4300**

Sn.	Watersheds	Percolation tank					Diversion Canal				Springs		Terrace/ Land development			Semicircles		
		Numbers	Perimeter (mtrs)	Surface area (sqm)	Storage volume (cum)	Volume of earth & stone work (cum)	Numbers	Length (mtrs)	Surface area (sqm)	Volume of earth & stone work (cum)	Numbers	Volume of earth & stone work (cum)	Hectares	Surface area (sqm)	Volume of earth & stone work (cum)	Numbers	Surface area (sqm)	Volume of earth & stone work (cum)
1	Khwaj Alghor (Balkh)						2	15	30	7						225	900	233
	(2900ha, 1 vil, 28hh)																	
2	**Sayad (Balkh)**	1	24	136.32	58	120	1	15	30	7								
	(330ha, 1 vil, 250hh)																	
3	**Qarasay (Baghlan)**	1	74	360	400	495	2	390	390	180						225	1950	233
	(500ha, 1 vil, 60hh)																	
4	**Utran (Nangarhar)**						1	30		22								
	(6000ha, 3vil, 2400hh)																	
5	**Amla (Nangarhar)**	1	76	432	540	612	1	75	75	67			1	10000	1100			
	(2630ha, 1 vil, 300hh)																	
6	**Badam Bagh (Kabul)**	1	50	1200	1000	450	1	70		70						600	4800	900
	(217ha, Research site)																	
7	**Dasht Goher khan (Parwan)**	2	112	440	540	1600	1	200	400	65	4	219	0.25	1400	600	300	4000	283
	(500ha, 1 vil, 60hh)																	
8	**Aqmsjed (Takhar)**	2	120	480	600	816	4	40	40	40								
	(500ha) 3vil, 100hh)																	
Total		**8**	**456**	**3048.3**	**3138**	**4093**	**13**	**835**	**965**	**458**	**4**	**219**	**1.25**	**11400**	**1700**	**1350**	**11650**	**1649**

Sn.	Watersheds	Diamond (Nigarime)			V shape pits			Protection wall		Forest			Pasture			Horticulture		
		Numbers	Surface area (sqm)	Volume of earth & stone work (cum)	Numbers	Surface area (sqm)	Volume of earth & stone work (cum)	Length (m)	Volume of earth & stone work (cum)	Hectares	No of plants survived	volume of earth & stone work (cum)	Hectares	No of saplings	Volume of earth & stone work (cum)	Hectares	No of plants planted	Volume of earth & stone work (cum)
1	Khwaj Alghor (Balkh)									5	2000	380	1.3	300		1	500	16
	(2900ha, 1 vil, 28hh)																	
2	**Sayad (Balkh)**									50	8000	1250	20	5000		50	8000	800
	(330ha, 1 vil, 250hh)																	
3	**Qarasay (Baghlan)**	120	4320	190	100	1200	250			0.5	120	22	1.25	273		1	105	16
	(500ha, 1 vil, 60hh)																	
4	**Utran (Nangarhar)**												4	450				
	(6000ha, 3vil, 2400hh)																	
5	**Amla (Nangarhar)**									1	350	80	4			6	1000	96
	(2630ha, 1 vil, 300hh)																	
6	**Badam Bagh (Kabul)**	172	2192	360									1.00	250		5	1000	80
	(217ha, Research site)																	
7	**Dasht Goher khan (Parwan)**	70	2520	114	22	200	10			0.25	500	20	1	250		0.3	120	4.8
	(500ha, 1 vil, 60hh)																	
8	**Aqmsjed (Takhar)**	120	4320	190				102	485	12	6000	20	3	1000		1	150	16
	(500ha) 3vil, 100hh)																	
Total		**482**	**13352**	**854**	**122**	**1400**	**260**	**102**	**485**	**68.75**	**16970**	**1772**	**35.55**	**7523**	**0**	**64.3**	**10875**	**1028.8**

11.5 Training on watershed management

Training type	Sn.	Date	Year	Training title	Location	Total		
						Male	Fem	Total
In-country	1	9, Jan	2013	Training on Baseline Survey	Kabul	3	0	**3**
	2	25-28, Feb	2014	Watershed management approaches	SLMH, Kabul	149	7	**156**
	3	15, Dec	2014	Soil health training	Kabul	68	2	**70**
	4	11-14, May	2015	Watershed management and water harvesting	Kabul	23	3	**26**
	5	14-16, Jun	2015	Watershed management and water harvesting	Kabul	10	0	**10**
	6	9, Aug	2015	Watershed management and water harvesting	Balkh	8	0	**8**
	7	16, Aug	2015	Watershed management and water harvesting	Nangrhar	12	0	**12**
	8	8-10, Mar	2016	Training conducted for Action Aid trainees	Balkh	12	2	**14**
	9	19-22, May	2016	Training conducted for Action Aid trainees	Bamyan	13	2	**15**
	10	25, May	2016	Watershed management, Forage crops husbandry	Balkh	14	0	**14**
	11	23, May	2016	Watershed management, Forage crops husbandry	Jalalabad	16	0	**16**
	12	24, May	2016	Watershed management, Forage crops husbandry	Dara-e-noor, NGR	18	0	**18**
	13	1-5, May	2016	Project Management, and M&E	Kabul	6	4	**10**
	14	26-27, Jul	2016	TOT for project staff and interns	Nangrhar	7	0	**7**
	15	23, Aug	2016	Training on Micro and Drip irrigation methods	Balkh	9	2	**11**
	16	24, Aug	2016	TOT on watershed management	Balkh	14	0	**14**
	17	30, Nov	2016	TOT on Watershed and Forage crops	Amla, Daranoor, NGR	36	0	**36**
	18	21-22, Jan	2017	TOT for Staff and Interns on Watershed management	Taluqan	30	4	**34**
	19	24-25, Jan	2017	TOT for Staff and Interns on Watershed management	Baghlan	31	6	**37**
	20	8-9, Feb	2017	TOT for Staff and Interns on Watershed management	Parwan	45	20	**65**
	21	14, Mar	2017	Lecture on Watershed Technologies	Kabul University	32	3	**35**
	22	20-22, Mar	2017	TOT for DAIL & ICARDA Staff on Watershed Development	Bamyan	52	6	**58**
	23	10-18, Apr	2017	Village based training on Watershed approach	Dara-e-noor, NGR	25	0	**25**
	24	1-3, May	2017	TOT on Micro Irrigation methods	Bamyan	24	11	**35**
	25	3-4, May	2017	Village based training on Watershed approach	Aq-masjid, Takhar	25	0	**25**

	26	25, May	2017	Village based training on Watershed approach	Qarasai, Baghlan	35	0	**35**
	27	31, Jul	2017	Farmers training on L&W management, Dryland Farming	Otran, Nangrhar	20	0	**20**
	28	3, Aug	2017	Farmers training on L&W management, Dryland Farming	Balkh sayad	43	0	**43**
	29	14, Aug	2017	Farmers training on L&W management, Dryland Farming	Nangrhar Amla	23	0	**23**
	30	7-9, Aug	2017	TOT on Milk processing, Gender capacity building	Bamyan	7	24	**31**
	31	14-16, Aug	2017	TOT on Milk processing, Gender capacity building	Balkh	16	21	**37**
	32	18, Sep	2017	Village based training on Watershed approach	Parwan	25	0	**25**
	33	2-4, Oct	2017	TOT on Farmer Field School, Vaccination calendar	Balkh	13	4	**17**
	34	8-10, Oct	2017	TOT on Farmer Field School, Vaccination calendar	Bamyan	10	15	**25**
	35	24, Oct	2017	Training of WSUA and villagers on WS Management	Balkh	19	0	**19**
	36	15, Oct	2017	Lecture on Watershed Technologies	Kabul University	30	0	**30**
	37	22, Oct	2017	Lecture and field exposure to watersheds	Kabul	15	0	**15**
	38	6-7, Nov	2017	Conservation Agriculture Training	Parwan	52	8	**60**
	39	26-27, Dec	2017	Watershed best practices training	Kabul	39	9	**48**
	40	29-30 , Jan	2017	Potato production technology	Bamyan	22	11	**33**
	41	18, Mar	2018	Lecture on ICARDA & Watershed Dev in Afghanistan	Kabul University	23	7	**30**
	42	26-28, Mar	2018	Business Development training for AA staff	Kabul	28	8	**36**
	43	10, Apr	2018	Women mobilization for social development	Aq-Masjid	0	11	**11**
	44	18, Apr	2018	Watershed and water harvesting techniques	Aq-Masjid	0	22	**22**
	45	23, Apr	2018	Climate change, Environment, Sanitation	Aq-Masjid	0	22	**22**
				Subtotal		**1102**	**234**	**1336**
Field day	1	4, Apr	2013	Field day in Sayad (pistachio crop management)	Sayad, Khulm, Balkh	38	0	**38**
	2	29, Oct	2015	Filed day for farmers from AKF, Baghlan	Kabul, Badambagh	14	0	**14**
	3	1, Nov	2015	Filed day for students from faculty of agriculture	Kabul, Badambagh	49	3	**52**
	4	31, May	2016	Filed day for students from faculty of agriculture	Kabul, Badambagh	176	24	**200**
	5	11, Jul	2017	Filed day on watershed activities	Nangrhar, Amla	61	0	**61**
	6	10, Oct	2017	Exposure visit to model watershed activities	Takhar, Aq-Masjid	45	0	**45**
	7	6, Jul	2018	Field day in Sayad (pistachio crop management)	Sayad, Khulm, Balkh	34	0	**34**
				Subtotal		**417**	**27**	**444**
Out-country	1	27 Sep - 4 Oct	2015	Policy makers training (L&W Dev Policy) in India	Hyderabad, India	11	1	**12**

	2	5-11, Oct	2015	Stakeholders training on Watershed Management	Hyderabad, India	26	1	**27**
	3	21-25, Feb	2016	Soil Analysis Training	Jordan	10	1	**11**
	4	15 Feb - 31 Mar	2016	Internship of 10 Graduate students on WS Management	PAU, Ludhiana, India	9	1	**10**
	5	26-28, Sep	2016	Training on Program Monitoring & Evaluation	Delhi, India	17	2	**19**
	6	9-13, Apr	2017	Training on GIS applications in watersheds	Jordan	6	0	**6**
				Subtotal		**79**	**6**	**85**
Total						**1598**	**267**	**1865**

Sn	Training/CB types	Location	Total Nos.	Male	Female	Total	% female participants
1	In-country Trainings	Afghanistan	**45**	1102	234	1336	17.51
2	Out-country trainings	India, Jordan	**6**	79	6	85	7.06
3	Field days	Afghanistan	**7**	417	27	444	6.08
	Total		**58**	**1598**	**267**	**1865**	**14.32**

11.6 Names of Graduate Students for Internship on Watershed Management

Sn.	Name	University	Sn.	Name	University	Sn.	Name	University
1	Hashmatullah	Balkh	5	Farid	Kabul	9	Asadullan	Nangrahar
2	Murtaza	Baghlan	6	Mutahar	Kabul	10	Rohullah	Nangrahar
3	Humayon	Baghlan	7	Kahtera	Kabul			
4	M. Wali	Kabul	8	Anwarulhaq	Nangrahar			

11.7 POG/ TWG/ PMC/ Review/ Other Meetings (date and location)

Year	POG, PMC, TWG Meeting	Baseline/ Review etc.
2013	POG-1, 2013, India	-
	POG-2, 2013, Jordon	-
2014	POG-3, Dubai, 3-6, March, 2014	Baseline Study (started)- Oct, 2014
2015	POG-4, Dubai, 28-29 March, 2015 - Approval of Variation document - Suggestion for elaborate Results Framework and PIP pathway	Baseline study (completed)- Feb, 2015 MT Review Report
	POG-5, New Delhi, India, 16-18 Nov, 2015	12 Oct – 30 Nov, 2015, Kabul, Afghanistan (MTR Presentation in POG-5 in New Delhi)
2016	POG-6, New Delhi, India, 29 Mar – 3 April, 2016	Annual Planning Meeting, New Delhi, 1-4, Mar, 2016
	TWG-2, Kabul, 1 June, 2016	-
	PMC meeting, ICARDA – Kabul, 2 November, 2016	-
	POG Meeting, New Delhi, 6-7, November, 2016	-
2017	Transition Strategy Workshop, ICARDA Kabul,10 – January, 2017	-
	Coordination Meeting and Review by Dy. Minister, MAIL Office of Dy. Minister, MAIL, Kabul, 1 June 2016,	-
2018	TWG meeting , Hotel Kabul SERENA, Kabul, 08 Aug, 2018	

11.8 Results Frame Work and Project Impact Pathway

Impact Pathway Analysis for LWR/2008/047**. Note:** Read from the bottom up.					
R4D Program outcome	**Afghan communities living in water restricted areas benefit from improved and sustainable food security and agricultural productivity**				
Long term outcome	Livelihoods of men, women and youth farmers in watershed and catchment project areas improved				
End of Project Outcomes	GoAF agencies leading research, extension and management actions in watersheds	Project WUA watershed farmers have adopted more sustainable and productive crop, fodder and water management systems	Project WUA and members are managing project watersheds		
Intermediate Outcomes					
Group or institutional practice change	GoAF Ministries are more aligned to providing ongoing support for soil and water productivity improvements in watersheds	Farmers in project watersheds have improved land and water management on a watershed basis	WUA members including women and youth are participating in watershed management decisions and actions		
Key individual practice change	Key individuals from MAIL are supporting watershed management and implementation	Leading farmers have adopted new varieties (Wheat, Maize, Forage) and introduced NRM options			
Confidence, skills knowledge change	Stakeholders capability and confidence to conduct watershed research extension is increased	WUA incl. women youth members knowledge, skills, confidence in watershed management have increased	Stakeholders are sharing knowledge of water and soil conservation technologies		
Access to information	Information on crop variety improvement, forage shrub options and water harvesting techniques is accessible				
Outputs and activities					
Outputs	Farmers received extension advice on soil water conservation.	Gender responsive plans developed for activities	Topographic survey and geo-referenced map, catchment plans produced	Research to Delivery Business model in target catchment sites developed	Training, engagement plans developed
	Scaling up potential of successful watershed management approaches identified	Water and soil, crop and forage options assessed and reported for project watersheds	Instruments to improve adoption according to the watershed site developed		
	Review report on watershed management in Afghanistan published	Capacity building of young workforce watershed management interventions	Baseline and comparison research project undertaken		

Activities	• Topographic survey, geo-referenced map, catchment plans produced and Micro/macro catchment technologies identified • Research and testing of farming, land and water system based approaches conducted	• In-country and out-country training for stakeholders conducted • Post graduate fellowship established and 2-3 months graduate fellowships to internship at project watershed sites. • Study tour and field trips held MAIL officials undertaken study abroad	• Innovative ICT tools for faster communication used • Collecting sex disaggregated data on participation responses	• CBOs and SHGs disseminate and sustain the best bet practices in project watersheds with farmers • WUAs supported in project watershed with information about interventions • Key farmer and women farmers identified to plan and test systems • Project watersheds and communities identified, agreed with lead women, youth and men farmers
Inputs	ACIAR Funding	Project management and coordination, project implementation plan	Relevant stakeholder research and extension services accessed.	
Getting Ready	Proposal, Partnerships and working groups formed.	Contracts signed, Engagement, communications, monitoring And evaluation, governance and training plans developed	Partnerships and relationships established	

11.9 PIP assumptions, intended Outcomes, Users

ASSUMPTIONS INHERENT IN THE PROJECT DESIGN

When building an impact pathway it is vital to be explicit about the assumptions underpinning the steps in the impact pathway. An assumption can be defined as '*a condition that needs to exist for the program to be successful*'. Some assumptions will be a 'stop/go' condition. Assumptions can provide the basis for risk assessment or lead to further research to potentially validate (or otherwise) the project's theory of change. An assumption is typically worded: "*For this program to be successful it is assumed that xxxxx".* The assumptions developed in the Dubai workshop are provided in Table below. Those with the highest number of votes represent the greatest risk to project success.

Assumptions Implicit in the Project Impact Pathway

Assumptions implicit in the project impact pathway: Integrated catchment management and capacity building for improving livelihoods in Afghanistan. For these outcomes to be achieved it is assumed that[3]:	
Project Outcomes	Security is not getting bad XXXXXXXX Ownership of project and technologies by national system XXXXX Capacity built remains available at watershed sites to continue to achieve XX Normal rainfall and no natural disasters X There is potential for out scaling
Intermediate Term Outcomes	
Group or institutional practice change	The project is linked to the overall national strategy of livestock industry development XXXXXXXXXX Partners apply an integrated approach XXXXX The right partnerships are established XXXXXXXXXXX Sustained cooperation between partners occurs for development of policies XXXXXXXXX

[3] *Number of X's represents a ranking of priority allocated by workshop participants.*

Assumptions implicit in the project impact pathway: Integrated catchment management and capacity building for improving livelihoods in Afghanistan. For these outcomes to be achieved it is assumed that[3]:	
Key individual practice change	Women farmers can be involved and have control over making decisions on their income XXXXXXXXX Women, youth and men farmers feel the changes will make a difference in their lives XXXXXX Wheat seed is available in an ongoing way XXX That women, youth and men farmers agree and adopt the techniques/technologies introduced in the watershed project XX
Confidence, knowledge & skills change	Extension services have capacity, time and resources to promote project outputs XX Dissemination and scaling up/out approaches happen XXXXX
Access to information	Extension agencies will support the project XXXXXX
Initial Outcomes	
Outputs	Techniques work XXXX Forages better than existing can be identified XX Cereal production packages work X
Activities	Ecologically sound practices are timely developed and tested X Spatial data acquisition has no limits Target groups/farmers are identified appropriately. X Sufficient technical skills are available. X
Inputs	Exchange rate and ACIAR Funding stays stable XXXXXX Project inputs occur in a timely fashion Partners commit resources planned for project
Getting Ready	There is credible commitment by partners Arrangements made for project management, engagement of staff and partners and resourcing are appropriate

11.10 Users & uses of project information (who wants to know what about the project):

Consider the users and their uses that are relevant to you and your broader stakeholders when you are implementing your part of the project and when you are reviewing and implementing the Monitoring and Evaluation Plan. Make sure that you are confident that their needs will be met by the data and information that will be collected.

Who wants to know what about the project and how the project is progressing.How will the users use the information? Listed below are the users and uses as identified in the project workshop in Dubai.

Users and uses of project information. X denotes priority votes	
Users: **Who wants to know what about what we are doing and how we are progressing with the project?**	**Uses:** **What information do they want?** **How will the user use the information?** **What will they do with the information?**
Community	
Women Farmers, rural women and youth XXXXXXXXXXXXXXX	Clear and simple messages supporting; • Understanding risks to trying the technology; • Inclusion of information into women's literacy programs and general capacity building programs; • Demonstration of proven options and how the technologies may increase women, youth and men farmers' income; • Increasing adoption through participation in testing; • Identifying time savings in adoption of technology; • Innovation in farming; and • Sharing of knowledge and experiences with other farmers and comparing performances with other farmers.
Communities XXXXXXXXX	
Farmers XXXXXXXXX	

Funders, Donors, Resource providers	
1. MAIL, NARS, Government of Afghanistan, ICARDA, ARD Cluster XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Information dissemination processes to support actions by government and other agencies. To support; • Development of watershed policies based on project results; • Continuing alignment of project investments from donors, funders and departments; • Sharing of key benefits for women, youth and men farmers across partners; • Out scaling and upscaling of technologies to improve livelihoods and security; • Replication of information to other regions; • Improvement in research process; and • Project management learning.
ACIAR/ DFAT Australia XXXXXXXXXXXXXXXXX	Briefings and interactive and formal exchanges of information. To support; • Ministerial and diplomatic briefings; • Production of project reports, Departmental reports; • Demonstration that the project is on track and achieving results; • Project management learning; • Demonstrating the quality and quantity of project products; and • Successful partnerships that have been developed and that can be built on.
2. NGOs, CBOs, XXXXX Water user groups	Information dissemination processes to support further actions flowing from; • Demonstration and documentation of successful and reliable technologies that work in the field that are available for women, youth and men farmers; and • Policy developments needing support to facilitate adoption of watershed technologies.
Project Team	
3. Project team: a. Project Management Team; and b. Project working groups.	Data and monitoring information. To; • Monitor contracts; • Communicate key findings; • Engage participants; • Building capacity of participants; • Inform partners Monitoring And Evaluation systems; • Contribute to continuous improvement in project delivery through use of monitoring information by managing groups;

	• Support the project's Monitoring And Evaluation plan to build annual and half yearly reports and reviews; • Inform post project impact assessments and project final reviews; • Inform future investment; and • Publish findings.
Private Sector	
4. Private Sector Market players XXXX	Data and monitoring information. To; • Communicate project results; • Demonstrate the need for ongoing commercial activity in seed distribution and crop processing; • Build capacity of market to ensure seed and seedling supplies delivery and availability to farmers; and • Engage commercial businesses in providing products and advice to farmers for wheat, maize, forage and watershed structure production technologies.

11.11 Key Stakeholders, and Engagement and Communication Action Template

Identification of Key Stakeholders and Engagement and Communication Actions Template								
Scale	**With whom do you need to engage?**	**What do you want from this group?**	**Why?**	**How will you engage?**	**What actions are needed by you?**	**Importance 1. Control 2. Influence 3. Concern**	**When are actions needed?**	**Who does it**
Local	WUA	Manage site development	Participate in implementation offsite specific interventions	WUA to organised activities	Facilitate, communicate and help WUA plan activities	Control	ASAP and ongoing	Project team members, field team members, lead farmers
	Lead farmers	Participation and leadership	To have real farmers test the techniques particular from the women farmer perspective	Directly liaise with them	Identify them and engage them first	Control	ASAP and ongoing	DAIL Project team
	Head of Village	Motivation of WUA	Moderate the project activities	DAIL facilitate meetings	Support the develop mint relationship	Control	ASAP and ongoing	DAIL Project team
	NGOs/DAIL	Extension activities	Extension and on ground support	By negotiation between organisations	Invite DAIL to participate and jointly implement actions	Control	ASAP and ongoing	Project team
Provincial	NGOs	On ground help	More access to communities	Project team to meet and plan activities	Planning to include NGOs and scheduling of activities	**Influence**	ASAP and ongoing	Project team
	DAIL	Extension expertise and relationship building	Relationships and communication channels	Project team to include DAIL experts	Linking communities and project team	Control	ASAP and ongoing	Project Team and MAIL/DAIL agreements
	Universities	Technical support	Local interpretation and local technical advice	MOU and partnership developments	Collaboration by project team on activities planned	Influence	ASAP and ongoing	Project team
National	Agency/Ministry MAIL/ARIA	MOU and program support	Access to resources and approvals	ICARDA/MAIL/ARIA agreement	Develop MOU	Control	ASAP	Project team
	Department extension	MOU and program support	HR support	ICARDA/MAIL agreement	Develop MOU	Control	ASAP	Project Team
	Ministry of MRRD	MOU and program support	HR support	ICARDA/MAIL/MRRD agreement	Develop MOU	Control	ASAP	Project team
International								
	ACIAR	Funding and expertise	Improve livelihoods of farmers	**Contract**	Monitoring, compliance, implementation, reporting	Control	ASAP	**Project team leader**
	ICARDA	Implementation, expertise and resources	Additional expertise and strategic relationships	**Contract**	Monitoring, compliance, implementation, reporting	Control	ASAP	**Project team leader**

11.12 Watershed selection and implementation criteria

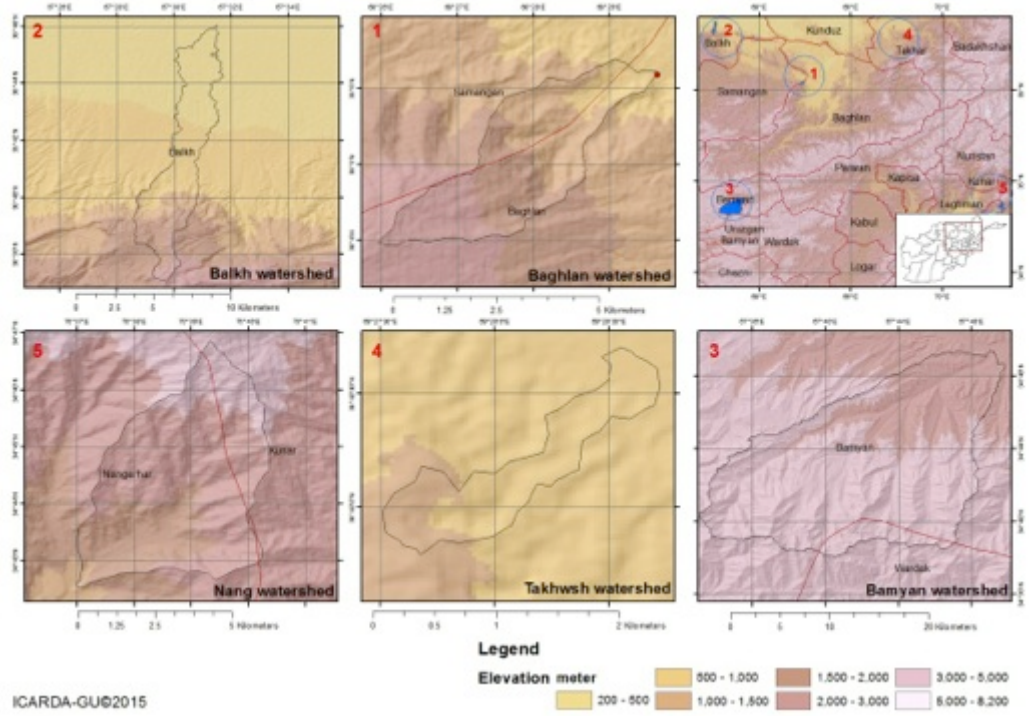
In reference to the POG suggestion March 2014, the variation document was developed to implement watershed management activities in five different provinces of Afghanistan. The project will be managed by the International Center for Agricultural Research in the Dry Areas (ICARDA) and will work with MAIL through its Agriculture Research Institute of Afghanistan (ARIA), the Dryland Farming Unit (DLF) and DAIL offices in Baghlan, Balkh, Bamyan, Nangarhar, and Takhar provinces; and through DAIL Bamyan with Solidarités International, and the Sustainable Land Management Institute (SLMI) at Bamyan University; and with Baghlan, Balkh, Nangarhar and Kabul Universities. The project is being implemented in close collaboration with United Nations Environment Program (UNEP), International Maize and Wheat Improvement Center (CIMMYT), Actionaid, Agha Khan Foundation and CARE.

The selection of target provinces is based on the area under rainfed agriculture, suitable catchment, and cultivated area with minimal potential for watershed development, low crop productivity, accessibility and the security situation. The six ongoing and two newly proposed community-based rainfed catchment benchmark sites in selected provinces of Baghlan, Balkh, Bamyan, Nangarhar, Takhar, and Parwan including a satellite site the Badam Bagh Research Station of MAIL, located in Kabul City, Kabul province. The area and other details are given in aneexure-2 above. The formers are community-based development initiative expected to benefit more than 3,000 farmers and locals, while the latter is developed as a demonstration site that is easily accessible and used predominantly for data generation, practical knowledge sharing, capacity development and for awareness-raising. Due to its location and adequate security, Badam Bagh is suitable for organizing visits for farmers, policy makers and donor representatives who, due to security concerns, are not able to visit other provinces.

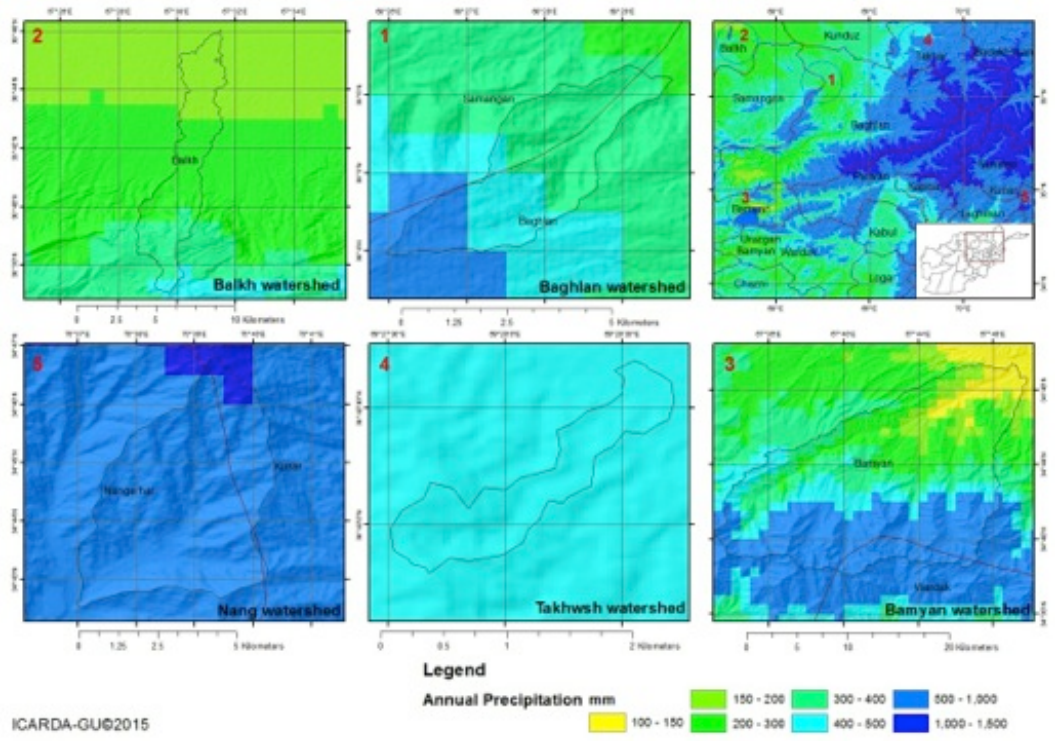
Activities on evaluation and dissemination of soil and water conservation technologies, local capacity development and improving agricultural productivity is being conducted in Baghlan, Balkh, Bamyan, Takhar, Kabul and Nangarhar provinces in collaboration with MAIL/ DAIL, UNEP, ActionAid, AKF, CARE and SLMI.

For the selection of watershed sites, field visits were conducted with DAIL, WSAs, community leaders and other stakeholders. The local community in the catchment site was interviewed to collect the basic characteristics of the watershed site. Based upon the inputs from local community and further discussions with all stakeholders, three sites were demarcated from each province. The secondary data on site elevation, soil type and long-term climate (annual precipitation; potential evapotranspiration; and minimum, maximum and mean temperature) was collected from ICARDA Geo-informatics unit to study the long-term rainfall and other climatic

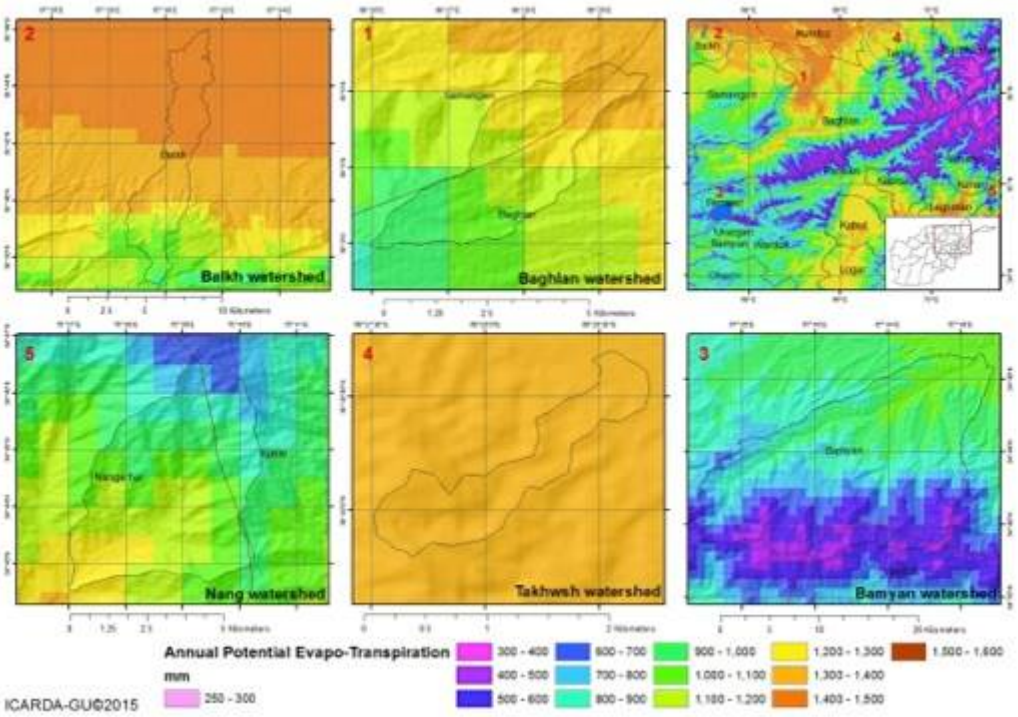
parameters with soil type and elevation due necessary for selection of the site (figures as given below).



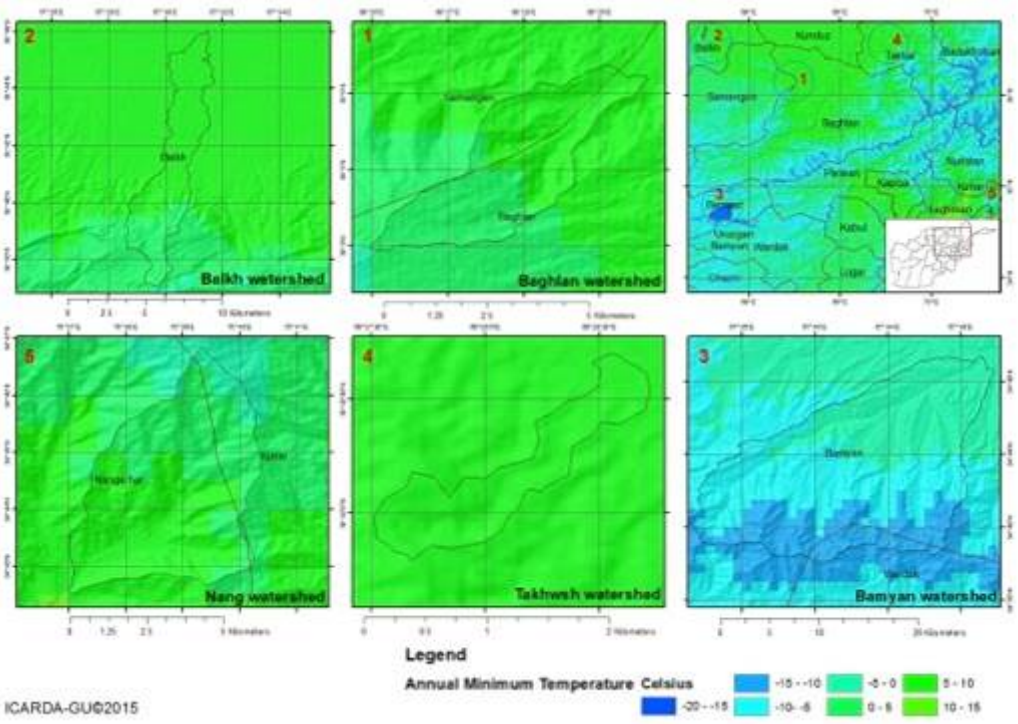
Elevation of different watershed above sea level



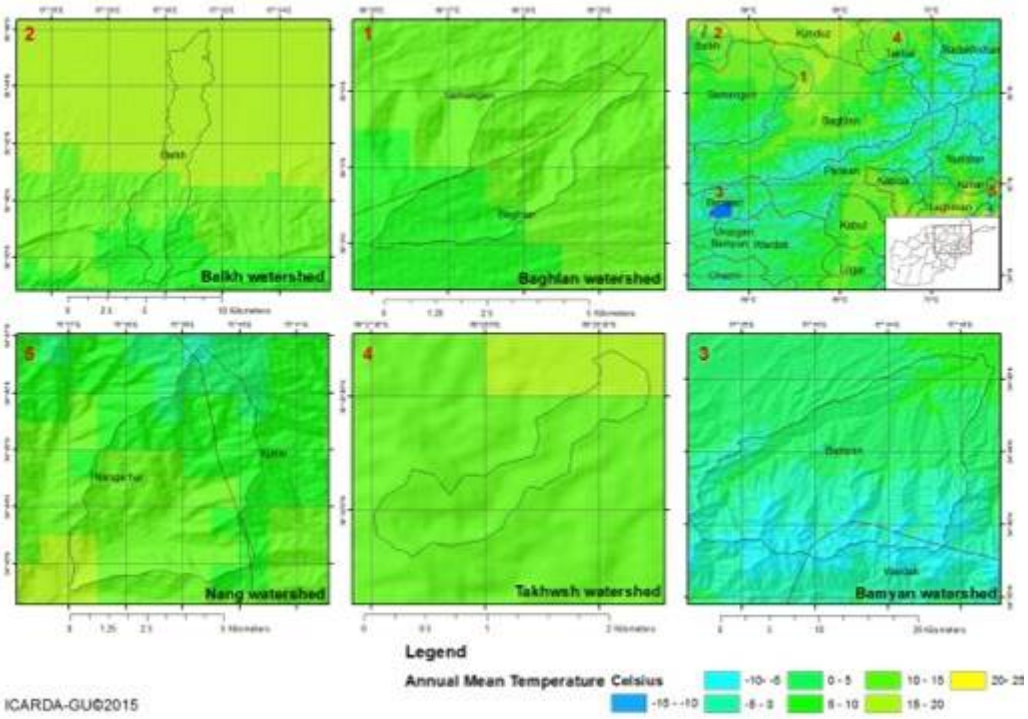
Annual precipitation of different watershed above sea level



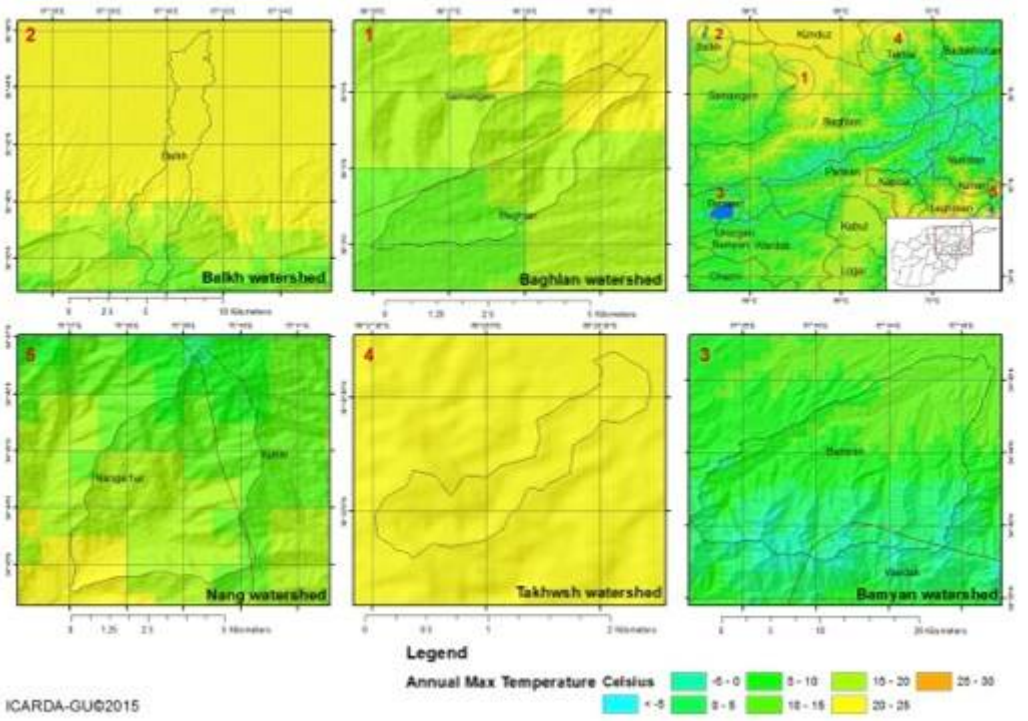
Annual potential evapotranspiration of different watershed



Annual minimum temperature Celsius of different watershed

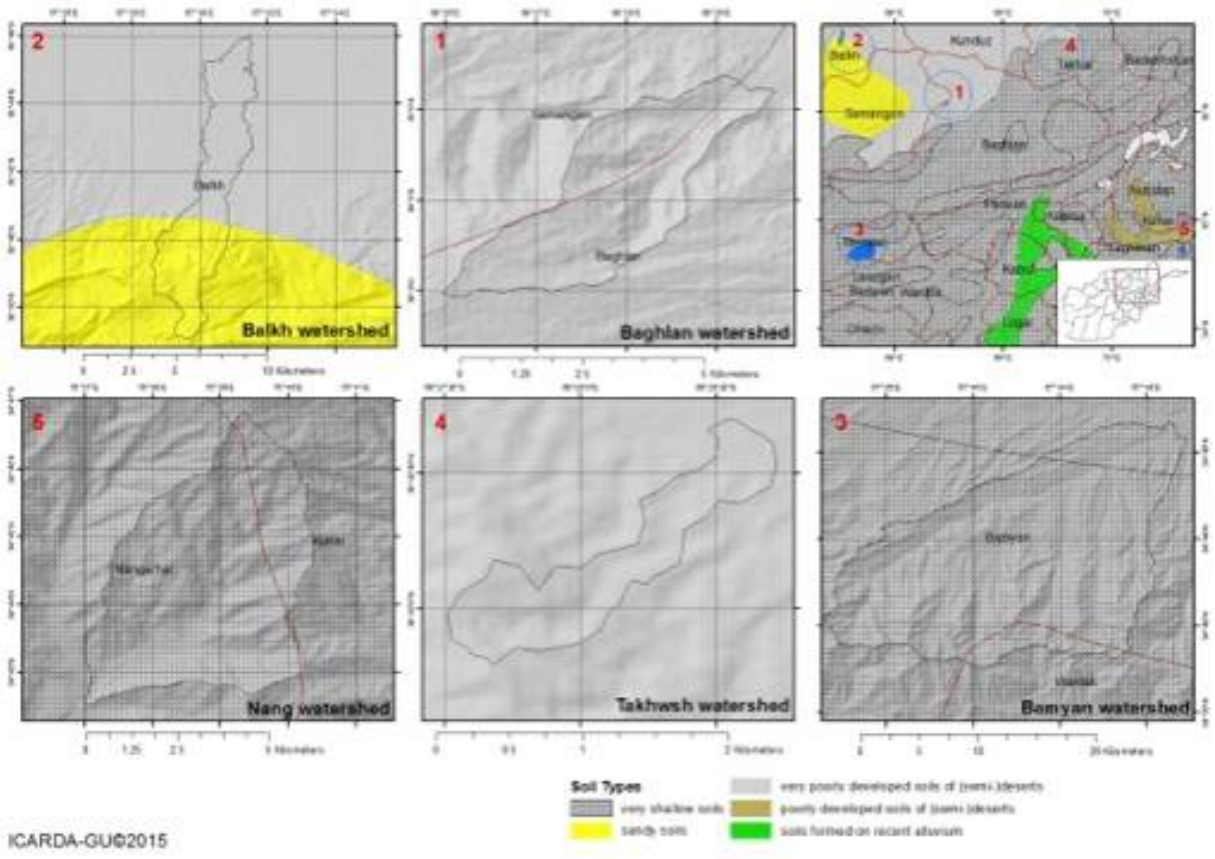


Annual mean temperature Celsius of different watershed



Annual maximum temperature Celsius of different watershed

Soil type of different watershed



The detailed characterization of individual site is given in Appendix below.

11.13 Watershed wise characteristics, key activities

Badambagh Watershed

Province **: Kabul**

District **: Kabul**

Area **: 220 ha**

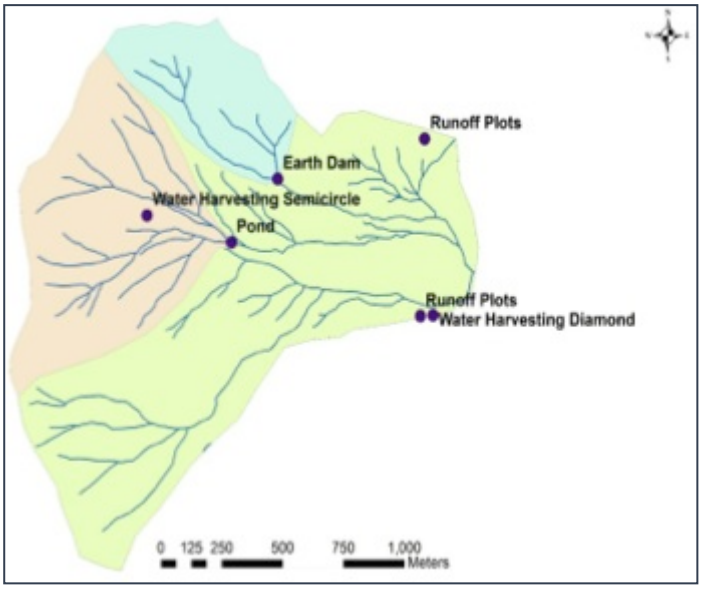
Research site **: 1 (Badam Bagh)**

Households **: (A research site, no villages, household or population)**

Status **: All activities completed (refer Appendix - 11.4)**

Location **:** Badam Bagh watershed is located within an area that extends from the highlands of the Western mountains of Kabul city, to Eastern low landside.

- Located between 34º54" - 34 º56" North to 69 º09"-69 º11" East
- Catchment is 1.88 km long
- Width 0.7-1.8 km
- Covers about 220 ha (2.2 sq km)
- Elevation 2220m to 1840m
- General direction of drainage area is towards east. The drainage pattern of the area consists of two parallel tributaries in the upper reaches, which unite at the lower part of the catchment to form the main stream of Badambagh. There are 5 stream branches with total length of 18 km connecting to the main stream.



Existing Cover: Currently, a thin population of pine trees cover 65 ha, whereas 5 ha are urban. Other parts of the watershed consist of bare soil, rock and rangeland; cover 147 ha at the upper part of watershed. The pine trees are planted on contour bund with a distance of 3m between the trees and a row-to-row distance of about 4-5 m. Currently pine tree are irrigated by tanker supply irrigation, and some water harvesting technique implemented to collect maximum or rainfall, and reduce the quantity and time of supplementary irrigation.

Envisioned Activities Implementation of water harvesting

Overall four sites have been selected to implement different water harvesting techniques. Two sites for runoff plots for measuring the runoff and sedimentation.

Watershed model for display and training

A watershed model in mud, plaster and other material is prepared for general display and understanding of the community person visiting to site for training and capacity building. The model was displayed in AgFair in March 2016, at Kabul which was visited by lot of students, farmers, common man, women, NGOs, officials and department and ministry people. This model displayed the kind of treatments we do in a watershed and the impact of such treatments. The model was very highly acknowledged by government, department officers, partners, community and other visitors,

Macro-catchment, pond water harvesting

The pond has been constructed on sub-watershed with a catchment area of 62 ha, and capacity of 1700 cubic meters. The pond serves the main purpose for supplementary irrigation, collecting water from runoff and snowmelt.

Storage pond

Pond view with inlet and outlet

Macro-catchment, earthen pond water harvesting

The pond has been established on sub-watershed with an area of about 27 ha and capacity of about 200 cubic meters at high slope and in rocky area. The pond collects runoff and snowmelt; reduces runoff in the downstream. The stored water is later used for supplementary irrigation (figures as given below).

	
Catchment view of WHS (Percolation Tank)	WHS (Percolation Tank)

Micro catchment, Semicircle water harvesting technique

In an area of about 4.5 ha, semicircle water harvesting structures have been implemented with varying design (distance) for in-situ water harvesting. The designs include, 42 semicircles with distance of 5m x 4m; and 92 semicircles with distance of 4m x 3m between the rows. Sites have been planted with Atriplex shrubs, to study plant growth and other parameters under different designs in the catchment (as given below figure). The data collected on survival rate, biomass productivity, vegetation cover, and soil moisture.

Diamond water harvesting technique

One site with area about 2.5 ha had been developed with diamond shape techniques having with different distances, i.e. 100 diamonds with 4 x 4m, and 30 diamonds with 6m x 6m (see figures as given below). The site will be used to evaluate the Mulberry plantation in the catchment area. The data well be collected on survived rate, total length of plant growth.

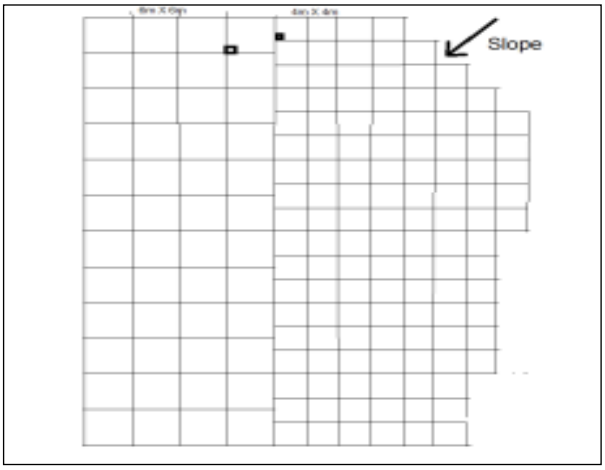


Diagram of Diamond

General view of diamond

Experiments and demonstrations for general data collection

Following data is being collected at the watershed site i.e. runoff, sedimentation, and infiltration rate for characterization of watershed.

Runoff and sedimentation: A governing principle of land management is that changes in land cover result in commensurate changes in watershed condition and hydrologic response. Rainfall-runoff relationships within a watershed are the result of the interplay of many factors, but are driven primarily by the interaction of climate, land cover, and soils. Watershed response in the form of runoff depth and peak discharge can therefore be used as indicators of condition and as predictors for the ramifications associated with land cover change.

Surface runoff, or overland flow, occurs when the soil is no longer capable of absorbing rainwater, nor removing it via the processes of transpiration, infiltration, and sub-surface runoff. Overland flow depends on the simultaneous action of a multitude of factors which can be classified into two groups: 1) abiotic factors: relief and geomorphological characteristics, parent rock and soil composition, and climate (primarily the intensity and amount of rainfall), and 2) biotic factors: vegetative cover of the slope, land use, anthropogenic factors, etc. Vegetation cover represents one of the most powerful factors influencing the runoff regime, since it modifies and moderates many others. Annual and storm discharge are very important indicators of the runoff regime in a watershed, necessary in research and projects aiming at reclamation, water supply, hydropower, etc.

The purpose of this research is to assess the effects of land cover and rainfall spatial variability on runoff response based on a different soil type and land cover system.

Runoff plots design in two different sites, each site has different characters (slope, soil depth, soil type, and different vegetation covers). At each site, two plots have been developed 2m x 4m length to study the runoff). The data for season 2015/2016 was collected. For the last year the runoff ranged between 2 to 16 mm, depending on time, duration and density of storms, in general the runoff about 16% of rainfall. Sedimentation also varied between 0.03 to 0.50 t/h with total of 0.72 t/ha for 5 different storm with total precipitation of 153 mm.

Infiltration Rate: Infiltration is the movement of water into a soil profile. The inherent properties of the soil, the level of soil saturation controls the rate at which infiltration occurs. The infiltration rate was measured at two sites, having different topography and soil properties (figure). The measured infiltration rate was 30mm/h at the upstream area i.e. in sandy loam soil. While at downstream infiltration rate was 72 mm/h, i.e. in clay to clay loam.

Khwaj-Al-Ghor Watershed

Status : **All activities completed (refer Appendix - 11.4)**

Province : **Balkh**

District : **Khulm**

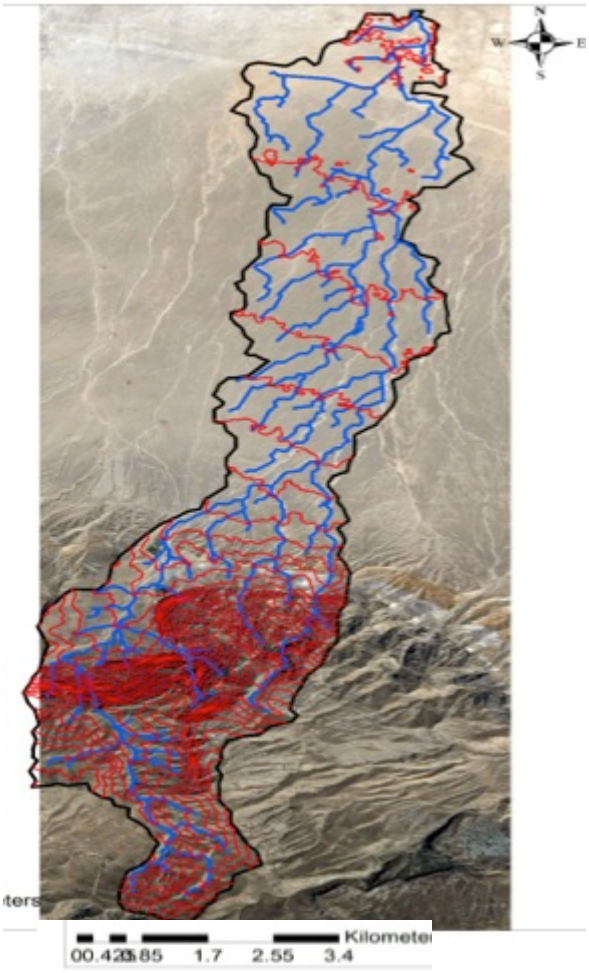
Area : **2947 ha**

Villages : **1 (Khwaj-Al-Ghor)**

Households : **28 (200 people)**

Location: Village located about 50 km East of Mazar-e-Sharif, with a following specification:

- Coordination 67.48-67.53 E and 36.62-36.76 N
- Length 16 km, directed South to North, and Width 1-3 km
- Elevation 300–2400 m above sea level
- Slope, the watershed divided into two sites, upstream characterized by rocky mountain, shallow soil, and slope of 25%. Downstream characterized by deep soil and slope of 4%. In general average watershed slope about 12%.
- Annual precipitation 150-500 mm,
- Annual potential evapo-transpiration 1000-1500 mm,
- Annual minimum temperature Celsius -10 to 5, Annual maximum temperature Celsius 10 to 25, and Annual mean temperature Celsius 0 to 20



The village located at watershed is named as Khowja-Al-Ghor, with 28 households and population about around 200 people. The population is primarily dependent on agriculture and animal husbandry for their livelihood. As per the discussions with community, the village covers around 50 ha area and a small ruminant's population of 500 sheep and goats. The horticultural crop in 50 ha area include Apricot, Almond, Mulberry trees. The community depends on the four existing springs from their drinking water, agriculture and livestock purpose. Two springs are used for drinking water and for animal. The other is closed and need to be rehabilitated.

Problems:

The watershed site is having serious problems as:

- Land degradation (Soil Erosion, Overgrazing, Winter flooding)
- Mismanagement of Land and Water resources
- Shortage of water during summer period
- Low agricultural productivity
- Low animal productivity
- Poverty in the village

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<td>Topographic map of watershed, include intervention and suggestion site</td>
<td>Topographic map of watershed, include intervention and suggestion activities</td>
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Activities implemented:

- 5 check dams constructed with storage area of 1.25 ha.
- 1 pond constructed (1.6 x 8 x 6 = 76.8 cubic meter
- Pasture development with atriplex- 1.25 ha (273 bushes planted)
- Pistachio planted in 5 ha of land
- Hing (Asa foetida) plantation in 6 ha land
- 1 student sent as intern to study watershed management in PAU, Ludhiana, Punjab, India
- WUA formed with 12 members, registered; training activities done on WUA roles and responsibility
- Various training activities given on watershed approach, construction of check dam, pond, gully control structures, agriculture, pasture, livestock, WUA formation etc.

Saiyad Watershed

Status : All activities completed (refer Appendix - 11.4)

Province: : Balkh

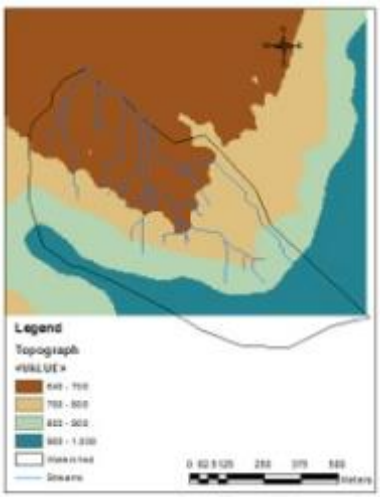
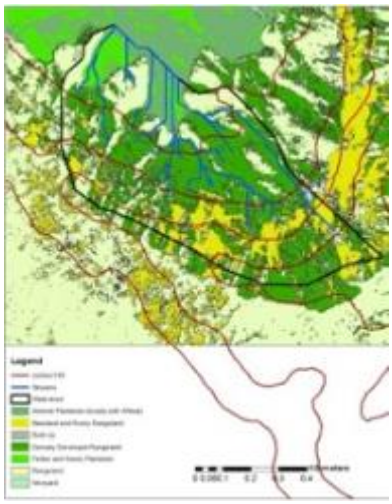
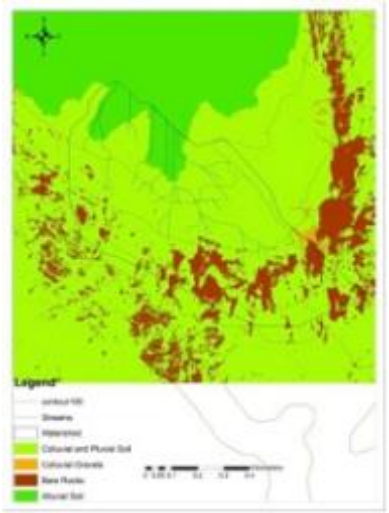
District: : Khulm

Villages : 1 (Saiyad), Household- 250, Population- 1760

Location:

Saiyad watershed is located in Southeast mountain area of Khulm district of Mazar–e- Sharif province.

- Watershed area is located between 36 º57" -36 º59" North to 67 º75"-67 º77" East
- The catchment is 1.5 km long
- Width 0.5-1.2 km
- Covers about 332 ha (project target area is 55 ha) (33.2 km^2)
- Elevation within the catchment is highly variable (650-1100m)
- General direction of drainage is towards north. The drainage pattern of the area consists of five parallel tributaries in the upper reaches, which unite at the lower part of the catchment to join the river stream.
- Topographic map (about 1: 5000) has been created based on the GDEM (Global Digital Elevation Model, 30 m resolution) and GPS measurements in the field by referring to the satellite imagery. GPS altitude data from the field were employed as a complementary source. It is considered rational to combine GPS data for such topographic mapping. By referring to the satellite imagery, the altitude of the peak and valley points of a ridge was determined from the GDEM and GPS data, to compose a series of iso-lines of the same altitudes, or rather contours with an elevation interval of 10 m from one to another. These contours were used to produce a new DEM, which is much closer to the real landform of the study area. The topographic map was derived from this new DEM, with specification of Map Datum: WGS84, Projection: UTM Zone 42N, Pixel size: 5 m, and Scale: 1: 5000
- Currently, the irrigated area is planted with orchard covering about 5.3 ha
- Rangeland cover about 18 ha, developed rangeland about 24 ha, and about 7 ha bare land and rock,

		
Saiyad map, includes elevation, streams, and boundary of watershed.	Different land covers of Saiyad watershed map	Different soil type of Saiyad watershed map

These maps were derived from the Pleiades satellite imagery. The imagery consists of both multispectral (MS: 2.5 m resolution) and panchromatic (Pan: 0.6 m) bands. After fusion, the resolution of MS bands was increased to 0.6 m. Geo-referencing using ground control points (GCPs) from GPS measurements and Google Earth was conducted on the Pan-fused MS bands before land cover classification. Training (sampling) areas of the identified land cover classes were selected on the image composite in terms of the field observation. After classification and reclassification, a post classification processing including combination/merge of the similar classes, and mask operation was followed. The mask operation was intended to reallocate the misclassified pixels (either committed or omitted) to the classes to which they should belong.

Soil type: Soil type was determined based on their geomorphological distribution and origin. According to the field observation, soil type is mainly alluvial soil in alluvial plain around Saiyad village and cover about 77ha, colluvial and pluvial soil on the slope cover about 218 ha. Colluvial gravels and bare rocks cover about 32 ha. The soil mapping was conducted on the land use/cover map by combining the classes with similar soil features together into one soil class. In total, 4 soil classes were classified out (village built-up, river and road are not included). The overall accuracy of the final soil map against the ground truth regions of interest (sampling/training areas) is 99.04% and the Kappa Coefficient is 0.984, with specification of Map Datum: WGS84, Projection: UTM Zone 42N, Pixel size: 0.6 m, and Scale: 1: 2500.

Key Activities implemented:

- 1 kanda (underground) storage structure of 21000 liter volume and 3 percolation tanks
- 1 open well constructed in valley near village location
- 1 reservoir of 5x3x3 = 30 cum made in valley region
- Pistachio plantation in nearly 50 hectare land along contour trench in around 200 ha (Contour trench is done in earlier project by other agency)
- Hing (asa foetida) plantation - 18.5 kg seed sown;
- Pasture developed in 1 patch of nearly 20 ha land (5000 saplings and 5 kg seeds)
- NRM strategy document developed approved in community meeting
- Training on land and water management, agriculture, pasture and livestock – 7 persons
- WUA formation meeting with 18 persons (WUA not formed)

Qarasay Watershed

Status : All activities completed (refer Appendix - 11.4)

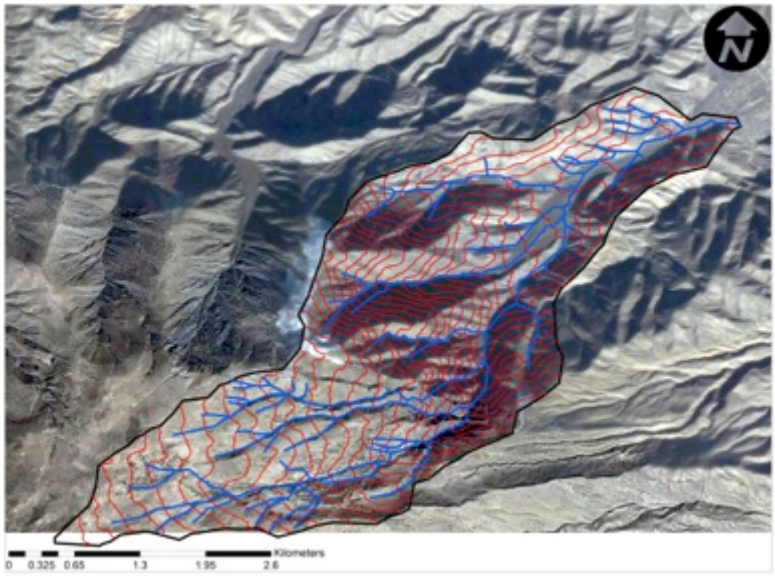
Province : Baghlan

District : Pol-Khomri

Villages : 1 (Qarasay), 60 Households, 420 population

Location : The village is located about 50 km north of Pul-I-Khumri, with a following specification

- Coordination 68.43-68.31 E and 36.108-36.06 N
- Area 1000 ha (10 sq km)
- Length 6.8 km, directed West to East,
- Width 0.5-2 km
- Elevation 750 – 2550 m above sea level
- Slope: watershed divided into three, upstream characterized by shallow soil, and slope of 26%. Middle stream characterized by Rock Mountain and slope of 42%, and downstream characterized by deep soil, and slope of 16%.



In general average watershed slope about 25%

- Annual precipitation 300-1000 mm
- Annual potential evapo-transpiration 1000-1400mm
- Annual minimum temperature Celsius -5 to 5
- Annual mean temperature Celsius 5 to 15
- Annual maximum temperature Celsius 5 to 25

The watershed site village houses 60 households with a population of 420 people. The livelihood is dependent on agriculture and animal husbandry. They have about 2000 head of sheep and goats. One spring is used for drinking water and for animals. Few scattered forest trees especially pistachio and oak are as a native plant.

Existing Problems

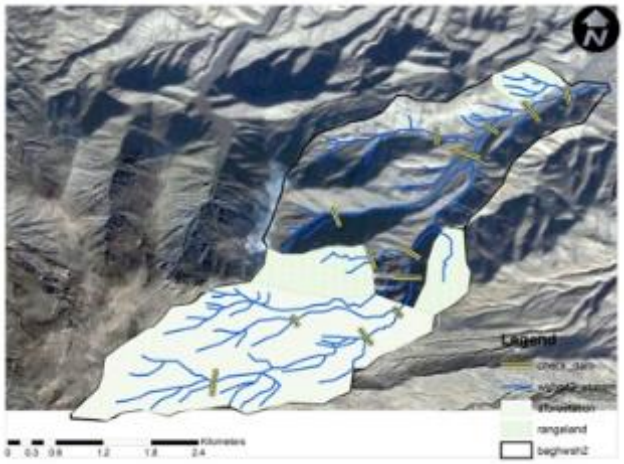
The watershed site is having serious problems such as:

- Land degradation
  - Soil erosion
  - Over grazing
  - Stone rolling in runoff process
- Mismanagement of

Water resources

Wadies and downstream full of sand and stone

- Shortage of water during summer period
- Low agricultural productivity



Activities

- Build wide stonewall crossing main stream and on rift wadis, to decrease soil erosion and increase the water harvesting
- Construct concrete water tank for snow melt storage and water harvesting to store the water and distributed for a village people for drinking.
- Improve and develop the vegetation cover

Key activities done in the project:

i. Check dams – 26 numbers of 179 metre of check dam width

Check dams have a pondage area of nearly 1.5 hectare. Heavy silt and run-off have damaged 10 check dams which the community would repair this year. 374.25 cum soil sediment would develop a flat land of 600 sqm and would be used for cropping or plantation

ii. Atriplex plantation in pasture (273 plants in 1.25 ha)

iii. Training of JFM committee for 200 ha old forest protection; FMC committee has 11 members

iv. WUA formation and meeting for 11 members, WUA formed and registered

Otran Watershed

Status : All activities completed (refer Appendix-11.4)

Province : Nangarhar

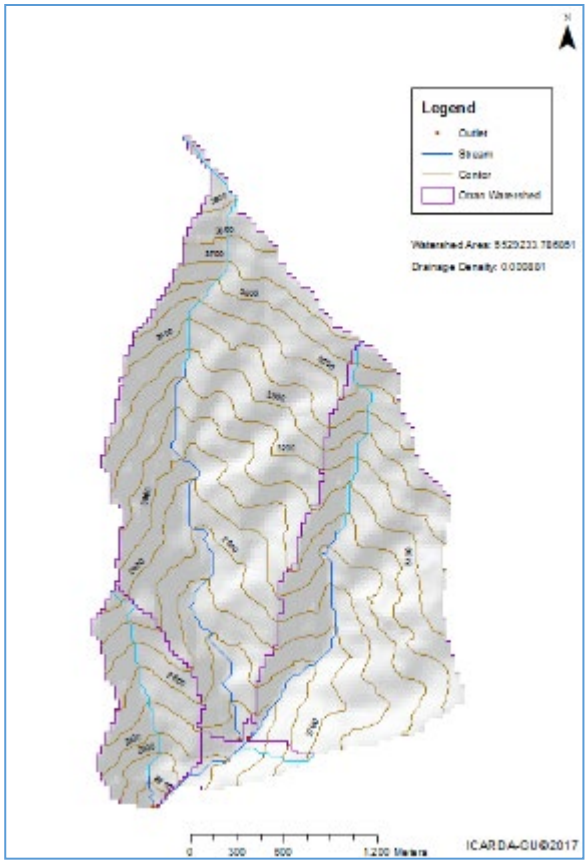
District : Dara-e-Nur

Area : 2634 ha.

Villages : 3 (Otran, Sutan, Machgandoi)

Household : 2400

Population : 16800



Location : The watershed and project villages has the following location details and specifications

- Coordination: 34.6, 34.7 N and 70.6, 70.67 E
- Area: 2634 ha (27 sq km)
- Length 9 km
- Width between 0.7-5 km
- Slope, the average of watershed slopes about 31%
- Elevation 1400 – 3950 m above sea level
- Annual precipitation 500-1500 mm
- Annual potential evapo-transpiration 600-1300 mm
- Annual minimum temperature Celsius -10 to 5
- Annual mean temperature Celsius 5 to 20
- Annual maximum temperature Celsius 5 to 25

The watershed has good potential as the upstream area is covered with forest trees and shrubs. Downstream has irrigated area and planted with different cereal crops. Most of cultivated area has terrace design. Surface water as rainfall and snowmelt are the main source of water. The soil is deep in downstream and moderately shallow at upstream.

Existing Problems

The watershed site is having serious problems such as:

- Land degradation
  - Soil erosion
  - Over grazing
  - Stone rolling in runoff process

- Mismanagement of

  Runoff of good quality water during winter and early summer from rain and snow melt
- Shortage of water during summer period

Envisioned Activities:

- Check dam construction on upstream of wadi, to protect the agricultural land by reducing the runoff speed, increase water harvesting, and protect the downstream farms
- Build pond at downstream, to store the excess rainwater and snowmelt, and channelizing for supplement irrigation of orchards or vegetable crops and for animal during summer.
- Develop the rangeland by planting different varieties of forage shrubs and forest tree.

Key activities done in the project:

i. 1 gully stabilization
ii. 1 pond of 34m x 37m x 2m (2516 cubic meter)
iii. Diversion canal of 20 meters
iv. Meeting and capacity building of 1 JFM with 12 members protecting 700 ha old forest in hills
v. Training on land and water management, agriculture, pasture and horticulture management to 18 farmers
vi. WUA formed involving 13 members, registered
vii. WUA formation training for 13 members

Case study:

Source of the water for the village is snow melting during spring; this leads to seasonal water shortage from Jun to September. Shortage of the water also affects agriculture in the village. Based on DAIL and MRRD suggestion, ICARDA planned to construct a pond half constructed by national solidarity project. ICARDA visited the site in Otran village and did construction activities after being sure of harvest of water effectively mainly from snow melting. The snow melt flows through a stream to benefit farmers for cropping. But normal water flow in stream was below the agricultural lands, not accessible for irrigation under gravity flow. So it required water lifting to irrigate crops.

ICARDA completed the work in December 2015, ICARDA involving a local construction company. The community got 367500 Afs as wage labour. After the completion of the pond the community started the cultivation in land lower than the pond. The pond collected water of snow melt. Now the pond irrigates 20 hectare of land covering three villages. Apart from saving rainy season wheat crop of nearly 130 ha, the water is supporting 20 ha of second crop of maize. The water is adequately pure to support for drinking water.

Amlah Watershed

Status : **All activities completed (refer Appendix - 11.4)**

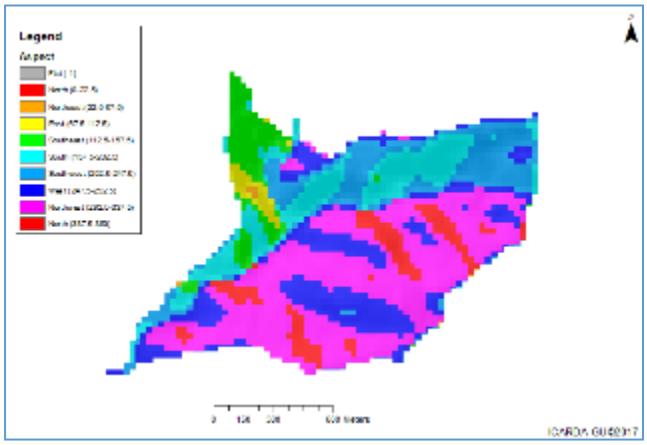
Province : **Nangarhar**

District : **Dar-e-Noor**

Villages : **1 (Amlah), Household- 300, Population- 2400**

Status : **On-going**

Area : **500 ha**



Activities performed:

- 6 ha plantation of horticultural crops
- 12 farmers sent on an exposure visit
- Training on watershed activities, agriculture, horticulture and pasture management
- WUA formed with 14 members, registered

Work plan:

After exposure visit and training activities, the community understanding has increased. Detail watershed activity plan made in participatory discussion and site visit involving DAIL and local partners.

The HRI and drainage map suggests

- 3 percolation tanks in the source point of 3 active drainage lines
- 10-15 series of gully control structures
- 3-4 check in dams in gully confluence points
- 1-2 pond in the valley points near to habitation
- A contour guide bund above one drainage line may be tried as a research action

All activities successfully implemented.

Aq-Masjid Watershed

Status : **Completed (in replacement of Kharuti ws in Takhar province)**

(For activities completed, refer Appendix - 11.4)

Province: : **Takhar**

District: : **Talaqoan**

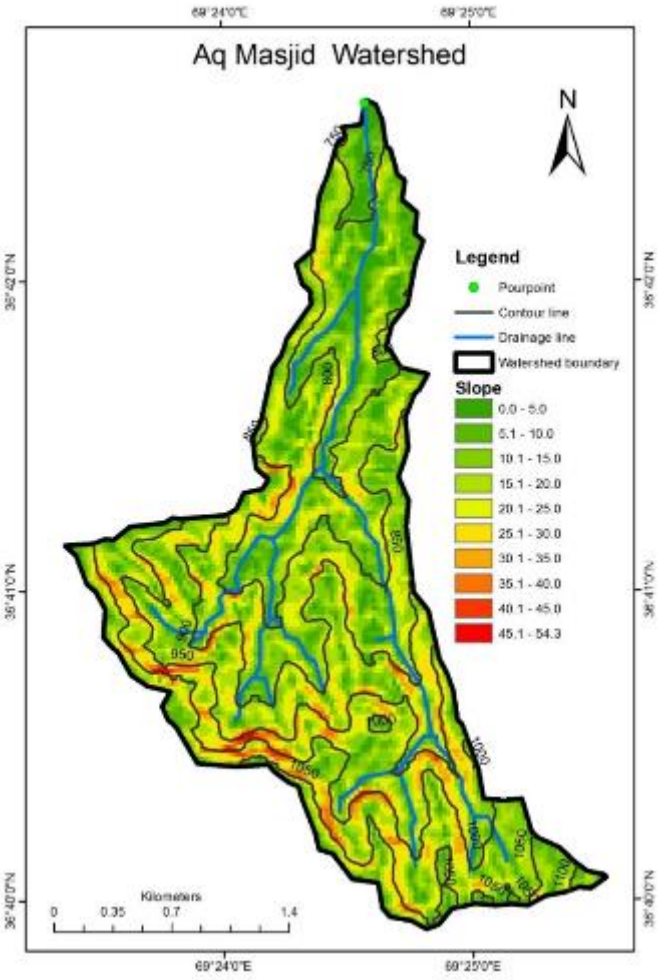
Villages : **1 (Aq-Masjid)**

Household : **100**

Population : **730**

Area : **543.08 ha**

The watershed is selected in discussion with community and MAIL officials.



High resolution images of watershed with drainage pattern is prepared. Subsequent map is developed

Data Collection

A comprehensive collection and compilation of the hydrologic data done to model watershed systems from following data.

- A land use map of the watershed was prepared using Landsat imageries. The map consisted of two distinct classes.
- A 90m spatial resolution Shuttle Radar Topographic Mission (SRTM) Digital Elevation Model.
- Soil map of Takhar Watershed.
- Climatic data obtained from re-analysis data.

All activities successfully implemented.

Hyderabad (Qul-Roba) Watershed

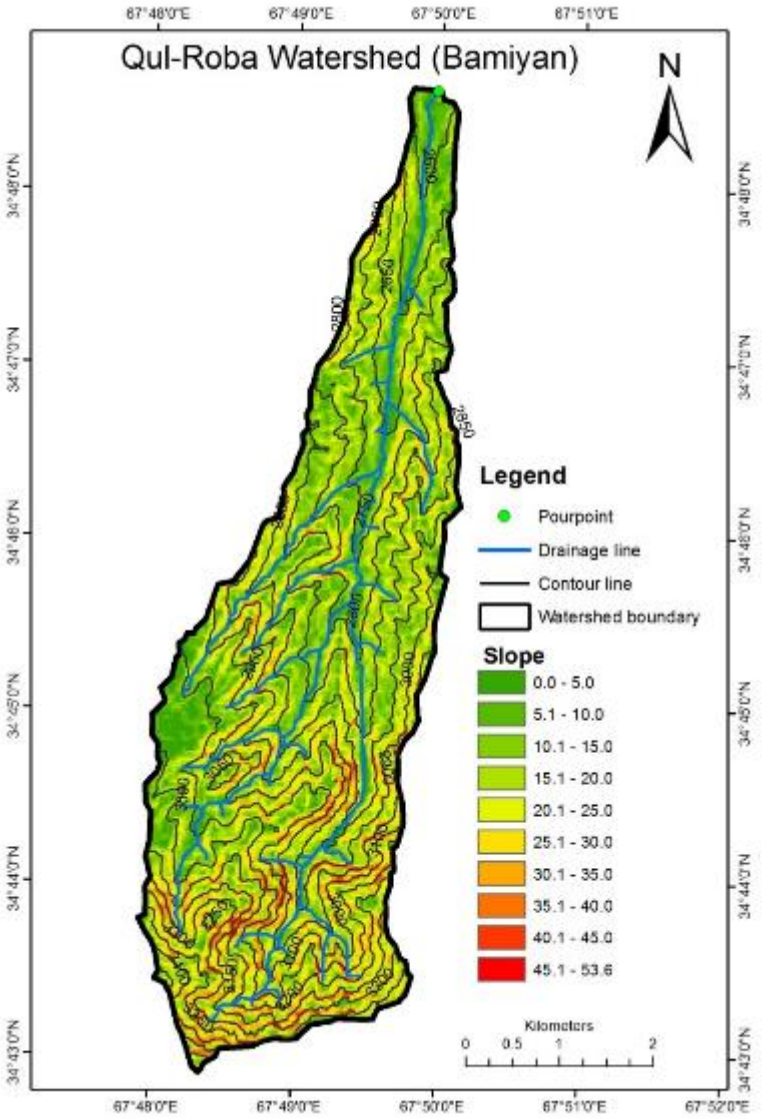
Status : **Dropped**

Province : **Bamyan**

District: : **Bamyan center**

Area : **1885.74 ha.**

Villages : **1 (Hederabad)**



High resolution image, drainage map developed, field check of the map is done.

Topographic feature, climate data, hydrological analysis, treatment plan to be done.

Community meeting and watershed concept is discussed in presence of MAIL/DAIL officials

Watershed dropped after microplanning – due to conflicts during implementation.

Dasht Gohar Khan Watershed

Status : **All activities completed (refer Appendix - 11.4)**

Province: : **Parwan**

District: : **Jabaluseraj**

Villages : **1 (Gohar khan)**

Household : **150**

Population : **1100**

HR image analysis, climate data, hydroshed analysis, activities planned and implemented successfully (refer Appendix - 11.4)

Khurati Watershed

Status : **Dropped due to poor security situation**

Province : Takhar

District : Taluqan

Villages : 1 (Khurati) (20 hh, Population- 150)

Location : The village located about 50 km East of Taluqan, with a following specification

- Coordination 69.456-69.482 E and 36.71-36.665 N
- Area 72 ha, (1.0 sq. km)
- Length 2 km, directed West-South to North-East
- Width 0.2 to 1 km
- Elevation 750 – 1200 m above sea level.
- Slope: divided into two, upstream characterized by deep soil, and slope of 22%, and downstream characterized by deep soil, and slope of 8%. In general average watershed slope about 15%
- Annual precipitation 300-500 mm
- Annual potential evapo-transpiration 1200-1400 mm
- Annual minimum temperature Celsius -5 to 5
- Annual mean temperature Celsius 5 to 20
- Annual maximum temperature Celsius 15 to 25

Around 20 households with a population of more than 150 people are dependent for livelihood on Khorat watershed. The watershed dependent population is poor and works as labour on other farms that have irrigation facility. Wheat and barley are the main rainfed crops of the site.

Existing Problems:

The watershed site is having serious problems such as:

- Land degradation
  - Soil erosion
  - Over grazing, and
- Mismanagement of
  - Water resources
- Shortage of water during summer period
- No availability of drinking water and people use salty ground water
- Low agricultural productivity
- Extreme poverty in the village

Envisioned Activities

- Develop water-spreading/channelizing water harvesting techniques
- Develop Marrab (water spreading and storage) in the wadi for alternative agricultural, and livestock
- Three cisterns to be built, which can be filled by rainwater and used for drinking
- Develop the rangeland by planting different varieties of forage shrubs

Khoskak Watershed

Status : Dropped (due to security reasons)

Province : Bamyan

District : Bamyan Center

Area : 2270 ha

Villages : 1 (Khoskak) (70 households, 510 population)

Location: Coordination: 34.71, 34.83 N and 67.79, 67.85 E.

- Area: 22.7 sq km
- Length 13 km
- Width between 0.7-2.8 km
- Slope, the average of watershed slope about 8%
- Elevation 2500 – 3500 m above sea level
- Annual precipitation 200-1000 mm
- Annual potential evapo-transpiration 400-1000 mm
- Annual minimum temperature Celsius -20 to 0
- Annual mean temperature Celsius 0 to 15
- Annual maximum temperature Celsius 5 to 20

The vegetation is poor at high altitude and good in the wadies with few trees, shrubs and grasses cover. There is enough snow melt for water harvesting and supplemented irrigation and downstream is partially irrigated.

Envisioned Activities

- Constructing pond for water harvesting and snow melt
- Enhance vegetation cover (orchard, cereal, vegetable) on the deep soil and downstream area
- Enhance rangeland cover (forage shrubs) in high areas

11.14 Watershed Baseline Study – Key Findings

To record the benchmarks for the identified indicators of the ACIAR funded "Integrated Catchment Management and Capacity Building for improving Livelihoods in Afghanistan" project, to improve livelihoods of men, women and youth farmers in watershed and catchment project areas, baseline surveys were carried out in Baghlan, Bamyan, Mazar, Nangarhar and Takhar provinces covering five districts and 23 villages (200 households) that were accessible for data collection. The main objective of the survey was to establish benchmark indicators for the project activities against which changes will be measured throughout the progress being made during the course of project implementation.

- On an average, about 66% hhs in catchments in all target provinces are below poverty line as per FAO definition of 1 USD per capita per day, and this is extreme for Mazar followed by in Baghlan, Bamyan and Nangarhar hhs. Majority hhs in Takhar catchment site are above poverty line.
- Agriculture is the major livelihood source for the households of Takhar (87%), Baghlan (63%), Bamyan (38%) and while livestock and hiring out labor for non-farm activities are the livelihood sources for Nangarhar (43%) and Mazar (57%) households respectively.
- Less than 20% households practice NRM practices with differences across provinces.Per cent households that have been practicing different NRM technologies at the catchment sites were the highest in Baghlan and Bamyan (16%), Takhar (14%), Nangarhar (12%) and the least at Mazar catchment site.
- Among different NRM technologies, zero tillage is practiced by 19% hhs with the highest at Takhar (78%) and Baghlan (18%) sites; Sloping land technologies practiced by 55% hhs at Bamyan site followed by Baghlan (13%) and 3% hhs each of Nangarhar and Takhar sites; Supplemental irrigation is practiced by 43% hhs of Nangarhar, 10% hhs of Baghlan and 3% hhs of Takhar; Erosion control bunds are used by only hhs of Baghlan (23%) and Bamyan (10%); Use of weir/check dams was reported by hhs of Baghlan (13%), Takhar (8%) and Bamyan (3%). This indicates the huge knowledge gap of hhs at catchment sites in using NRM technologies for the betterment of their livelihoods. The project needs strong and concerted efforts to minimize this gap so that natural resources can be better utilized.
- Technological (64% hhs) followed by institutional (53% of hhs) and economic (47% hhs) constraints are more relevant in the adoption of different technologies at catchments. Technological constraints such as non-availability of site specific dry land technologies, poor knowledge of soil and water conserving technologies, non-availability of high yielding varieties of cereals and legumes, and skills in growing these crops and varieties with good agricultural practices; Institutional constraints such as lack of infrastructure facilities (roads and transport facilities), week extension services and insufficient programs for enhancing awareness of technologies; Economic constraints such as lack of access to market information networks about prices of inputs and outputs, high cost of inputs such as quality seed of improved varieties, etc.; and Social constraints such as poor literacy and knowledge of hhs, risk perception of communities about different technologies are indicated relevant. Poor literacy levels of head of hhs as well as their spouse (primary education with less than three years of schooling) has an impact on adoption/transfer of technologies.
- About 61% hhs are part of one or another community groups (water association, seed association, etc.) in target provinces except in Mazar catchment where respondents indicated their non-association with any community association. These social networks help the hhs at catchments to

establish/improve linkages with NGOs for improving their livelihoods through participation in their development programs. Existence of social networking tendency among the hhs in the target provinces can be used suitably in the implementation of project interventions.

- Wheat/Barley-Mungbean is the important cropping system. Other crops grown at the catchment sites of target provinces are rice, potato, tomato, mungbean, clover and alfalfa.
- About 17% yield gap in irrigated wheat and 23% yield gap in irrigated mungbean were recorded at the catchment sites which need to be addressed through different project activities. Possible reasons for this yield gap are differences in adoption of Good Agricultural Practices (GAP), NRM practices across crops and provinces.
- There is a lot of scope to demonstrate the importance of Good Agricultural Practices for different crops as overall adoption of GAP in the cultivation of crops is very low to low. Correct adoption of recommended fertilizer use for different crops (29% less use of urea and 14% less use of DAP for wheat with differences across provinces; 2% excess urea and 31% less DAP for Potato; 45% less urea and 21% less DAP for Tomato; 34% less urea and 23% less DAP for rice; 60% less urea and 40% less DAP for barley and 375% excess urea and 17% less DAP for mungbean) and seed rate (5% excess seed in wheat; 131% excess seed in rice; 6% less than recommended seed rate in barley; 19% less than recommended seed rate in potato; 55% excess tomato seed; 215% excess mungbean seed) and varieties need to be improved in all target catchment sites.
- Labor demand is more from November to December and again during April to July corresponding to planting and harvesting activities of many crops. Demand for labor in Bamyan from December to March is considerably less due to limited crop cultivation in harsh weather.
- Female labor participation on own farms is most common while hired female labor is observed in Nangarhar only. The role of women and children in the integrated crop-livestock production systems and natural resource management did not come out prominently within the survey. Due to cultural restrictions, male enumerators could not administer surveys with women. Survey responses on questions related to women were the opinion of male headed household members. This highlights one shortcoming of this survey and the need for a clear follow-up in terms of a better understanding of gender as well as in the uncovering of options and opportunities.
- Decision making power for most of the decisions on majority of issues vests with males/husband while few decisions are taken jointly. Therefore it is necessary to involve male members invariably in order to engage women in project activities as it is the male member who takes most of the decisions both at household level and at the community level.
- The majority of watershed catchment households at Bamyan (85%) and Mazar (100%) do not have knowledge about extension workers while the majority of Baghlan (46%) and Takhar (34%) households adopted advice from extension workers.
- The majority sell (Crops and Livestock) through buyers directly or through traders.
- Considering the poor/limited knowledge base of hhs at catchments on the natural resource management and use of GAP, a young trained work force is necessary to be developed by the Project for effectively filling the knowledge gaps about GAP in crops and in managing natural resources.

11.15 Summary of TWG Review and Suggestions

Important Queries by TWG	Necessary clarification by Project Implementation Team
1. Why the check dam is made from stone without cement?	❖ Loose stone/boulder check dams facilitate infiltration of water and filters sediments coming in run-off; ❖ It lowers wash-out force of flood water; stone structures are low cost while being effective; made of local material without using cement-iron like external material; post project maintenance by community is easier; ❖ Project is adopting new design of wider berm in up-stream, extended stone pitched bed, sloping inward, in downstream ending with elevated bund to maintain a low depth of standing water to act as a cushion and reduce eroding force of spill over water; ❖ Instead of cement wire mesh gabion structures would be more appropriate;
2. What was the success of mulberry plantation in Badam Bagh with different plot sizes?	❖ Mulberry trees plantation using Nigarime (catch pit) technique for water harvesting around the plants increased the survival rate of plantations; survival is high in 36 sqm plot (77%) than in 16 sqm (60%); in control plot the survival is less than 50%) ❖ The plantation in 6x6 m^2 plot has more survival, good growth with more branches; and now the tress produced fruits
3. Why mulberry is selected for planting?	❖ Because, it is a drought resistant plant and had a number of economic uses
4. Did you plant local mulberry or bring some new variety?	❖ It was local variety, because they are drought resistance
5. How the project tries to minimize consumption of water in the fields?	❖ Many irrigation methods followed sub-surface irrigation (pitcher pot/bottles), furrow irrigation, drip irrigation, catch-pit (nigarime) etc. for effective use of rain and irrigation water
6. Dara-e-noor pond: how many months can it keep water for irrigation?	❖ The pond stores 2000 Cum water; it has an outlet for surplus water as well as to release water for irrigation. It can discharge to full dry level and irrigate 200 hectare of area for successful crop harvesting.
7. Efforts to increase production horizontally?	❖ Project had a lot of effort on increasing the yield of the farmers vertically for each crop using new variety, water and nutrient conservation technology. ❖ Now we are trying to expand the land area under agriculture through dry land farming. ❖ By both of these methods, yield and production at HH level will be increased.
8. Do you have any web site that we can see your activities?	❖ Yes. ICARDA has facebook ID in social media; one can look for ICARDA Afghanistan there and can see ICARDA's work progress there
9. There is a meteorology station in Badam Bagh established by ICARDA; but it is not in use?	❖ Yes, it is there and should be operated by Meteorology section of Badam Bagh. If there is any need of support to know how to use it, ICARDA will support them. ICARDA team will visit and check for it.
10. Handover of assets	❖ To complete the process before Sep, 2018r; to discuss and officially communicate to relevant authority for hand over;
11. Sustainability and convergence	❖ All TWG members advised for proper arrangements for scale up the best practices under DLFS or NRM/Climate change projects ❖ The ongoing discussion and negotiation with DLFS (DFAT), SWIM/USAID, and DG-NRM would be crucial.

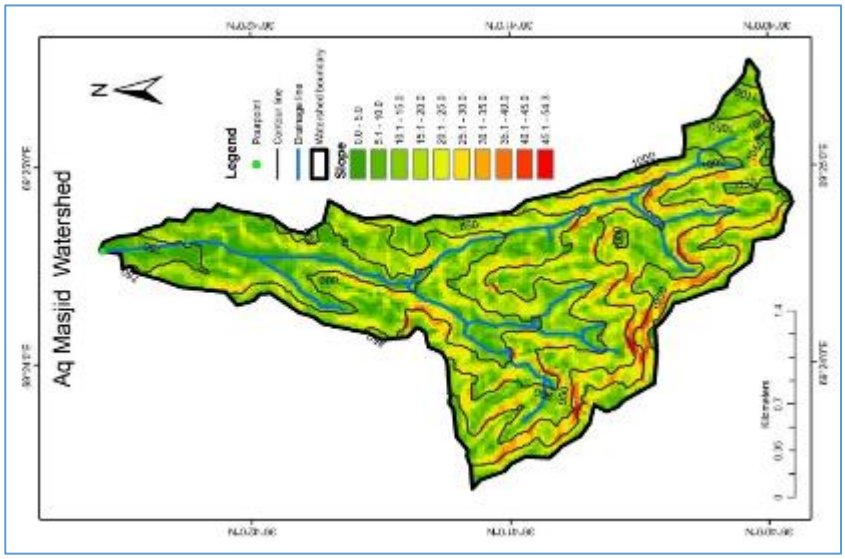
11.16 Watershed Project Process Gallery (Delineation – Implementation – Capacity Building - Handover – Appreciation)

Integrated Catchment Management Program (ACIAR – MAIL – ICARDA)

Project Implementation Process Gallery

Province	Takhar
Watershed Name	Aq-Masjid

Watershed delineation



Treatment Photo(1)Pond for spring water collection in Khwja Alghor of Balkh province

Treatment photo (2)

Land Terracing and mulberry sapling planted in mountain area in Amla

Treatment photo (3)

Mulberry Sapling planted in Diamond catchment (Nigarm) in Qarsay Baghlan

Training/CB photo

Women training and demonstration on irrigating Nursery in Sayad WS, Balkh

Treatment photo (3)

Protection wall construction in Aqmasjid of Takhar province

Handover to community and DAIL, Qarasay WS, Baghlan

Works completion certificate for Gawharkhan villagea watershed in Parwan province

ICARDA

Certificate

This is to certify that (Kaifyat Alli) Construction Company has completed (ICARDA) contracted watershed project in Dasht-e- Gowher Khan Village of Jabal e Seraj District of Parwan Province, The project delivered during ceremony conducted on August 29/2017 to the community through DAIL/ICARDA office, ICARDA wishes the community for useful utilization of the project assets and proper maintenance in the future.

Appreciation letter, Baghlan University Chancellor

Islamic Republic of Afghanistan
Ministry of Higher Education
Baghlan University

جمهوری اسلامی افغانستان
وزارت تحصیلات عالی
دانشگاه بغلان

Appreciation Letter

تقدیرنامه

To ICARDA Office

Recognition of Meritorious Services and your Cooperation with Baghlan University we give you a letter of appreciation and hope to continue your valuable cooperation we wish for you much Success in the life from almighty Allah

به نفتر محترم ایکاردا،
به پاس خدمات شایسته وهمکاری های شما باداشگاه بغلان این تقدیرنامه برایتان اهدا میگردد به استمراربهمکاری های ارزشمند جناب عالی موفقیت های روزافزون شما را ازخداوند متعال آرزومندیم

ریاست دانشگاه بغلان

Baghlan University Chancellor

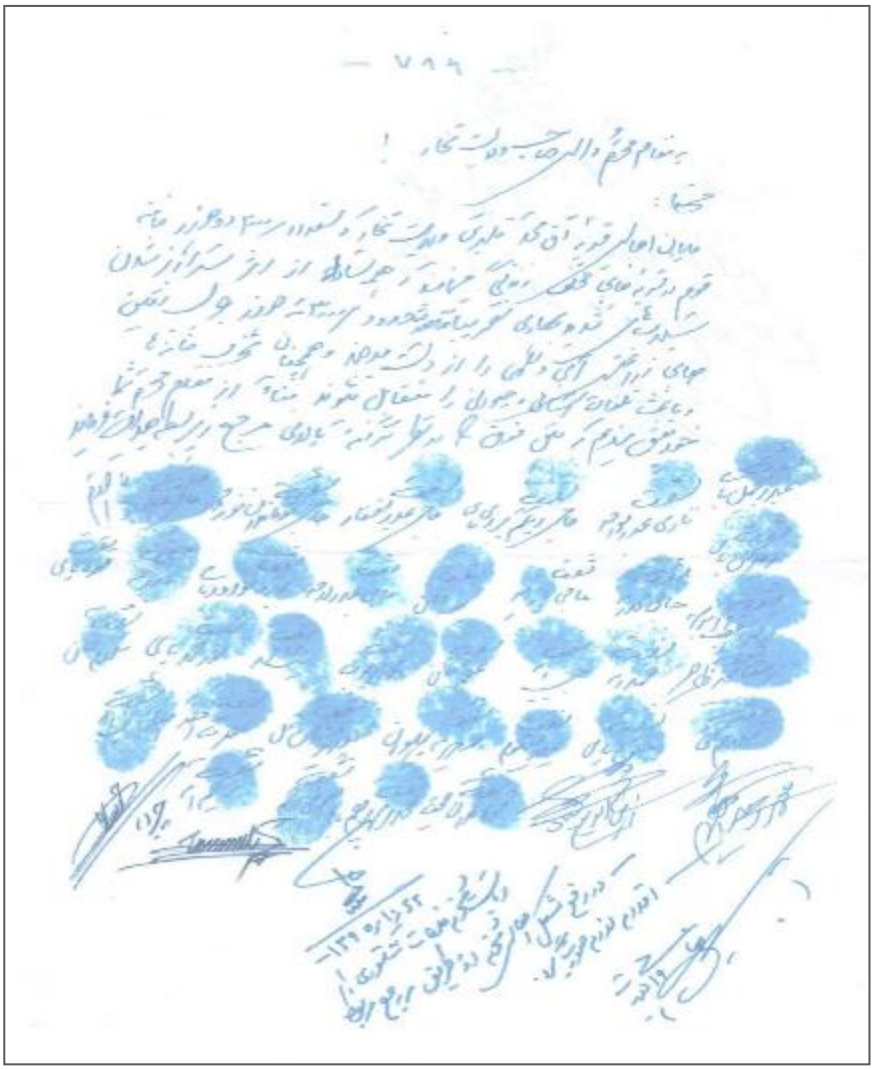
An Appreciation letter from Parwan DAIL and DDA to ICARDA for excellent watershed works in Parwan

ICARDA

Certificate

This is to certify that (Kaifyat Alli) Constriction Company has completed (ICARDA) contracted watershed project in Dasht-e- Gowher Khan Village of Jabal-e- Seraj District of Parwan Province, The project delivered during ceremony conducted on August 29/2017 to the community through DAIL/ICARDA office, ICARDA wishes the community for useful utilization of the project assets and proper maintenance in the future.

Community Petition to Governor of Talkhar (from Qulbaras village) requesting for watershed project



11.17: Letter from Advisor to the Governor of Takhar to the DAIL director

جمهوری اسلامی افغانستان
اداره مستقل ارگانهای محلی
ولایت تخار
ریاست خدمات تخنیکی وسکتوری

د افغانستان اسلامی جمهوریت
د سیمه ایزو ارګانونو خپلواکه اداره
د تخار ولایت
د خدمات او تخنیکي ریاست

Islamic Republic Of Afghanistan
Independent Directorate of Local Governance
Province Of Takhar
کارشناس مبارزه باحوادث ومحیط زیست

شماره: ۸۵۵ / ۹۴۰
تاریخ: 1395/10/23

اولویت : عادی ( ) مستعجل ( ) فرض انگاری ( )

به ریاست محترم زراعت،آبیاری ومالداری.

فشرده : درمورد درموردتحکیمات زمین های زراعتی.

ضمیمه صـــــــادره هذایکورق درخواست اهای محترم قلبرس مبنی برتحکیات زمین های زراعتی شان به شمارسال شد، بادرنظرداشت متن درخـــواست جهت فراهم نمـــودن قناعت ایشان ورفع مشکل در هماهنگی موسسات محترم اقـــــــــــدام نمـــــاید.

بالحترام
مصطفی "رسولی"
رئیس خدمات تخنیکی وسکتوری

کاپی به:
ریاست محترم احیاوانکشاف دهات.

23.10.95

آدرس مقام ولایت منزل دوم ریاست خدمات سکتوری شهرک محمد غازی - خانی کارشناس مبارزه باحوادث ومحیط زیست. شماره تماس:0796585870

11.18: Letter from Takhar DAIL Director to ICARDA for implementing Watershed in Quilbaras village

دافغانستان اســـــلامی جمهوریت
جمهوری اســـــلامی افغانستان

دکرهنې ، اوبولګونو او مالداری وزارت
وزارت زراعت ،آبیاری و مالـــداری

Islamic Republic of Afghanistan
Ministry of Agriculture, Irrigation and Livestock

ریاست زراعت،آبیاری ومالداری ولایت تخار
آمـــــریت منابع طبیعی
مدیریت جنگلات طبیعی

شماره ۴۲۶ .....

تاریخ ۱۱/۳ /1395

بدفترمحترم ایکاردا مقیم کابل!

مکتوب نمبر 640/855 مورخ 1395/10/23 کارشناس مبارزه باحوادث ومحیط زیست مقام ولایت ازعرایض اهالی قراء آق مسجد وقلبرس تالقان ازتخریب خاک وسرازیر شدن سیلاب های مدهش شکایت داشته اند
قابل یاد آوری میدانیم دفتر محترم ایکاردا قبلاً درساحه متذکره پروژه تنظیم آبریزه ها داشته مردم محل راضی بوده خواهان تمدید پروژه متذکره گردیده اند
امید است روی همکاری همیشه گی تان درپلان سال 2017 خویش درنظر گرفته این اداره همکاری خواهند نمود

با احترام

انجنیرمحمد عالم "عالمی"
رئیس زراعت آبیاری ومالداری

کاپی :بمقام محترم ولایت

11.19: Letter from Balkh DAIL Director to DLFS to implement watershed projects for strengthening Dry Land Farming Systems

جمهوري اسلامي افغانستان
دافغانستان اسلامي جمهوريت

وزارت زراعت، آبياري و مالداري
د کرهڼي، اوبولګولو او مالدارۍ وزارت

Islamic Republic of Afghanistan
Ministry of Agriculture Irrigation & livestock
ریاست زراعت، آبیاری و مالداری ولایت بلخ
امریت امور زراعتی

شماره : ـــــ

تاریخ ۱۳۹۴/۱/۸

به موسسه محترم (ایکاردا)مقیم مزارشریف :

ریاست زراعت ،آبیاری ومالداری ولایت بلخ با در نظر داشت اقلیم واندازه بارنده گی در ساحات شمال کشور بالخصوص ولایت بلخ میداند که اکثر ساحات کاملا للمی بوده ازین جهت دهاقین در کشت للمی آسیب پذیر بوده واز طرف دیگرکمبود آب وتغیرات اقلیمی زراعت را در این حوزه به چالش ها مواجه کرده است .هر چند پروژه ابریزه های دفتر ایکاردا یک اقدام نیک وموثر برای دهاقین این ولایت بحساب میآید این ریاست با ابراز سپاس وتقدیر از فعالیت هاودست آورد های پروژه مذکور خواهان ادامه همچو فعالیت ها در عرصه زراعت در زمین های خشک که درپلان طویالمدت وزارت زراعت ،آبیاری ومالداری جمهوری اسلامی افغانستان گنجانیده شده است بوده واز دفتر محترم ایکاردا وتمویل کننده گان پروژه های شان تقاضا ی حمایت تخنیکی وعلمی را خواهان است

با احترام

سراج الدین (سهرین)

رئیس زراعت ،آبیاری ومالداری