

# **Afghanistan Water, Agriculture and Technology Transfer Program (AWATT)**

## **Fiscal Year Two (FY09) Plan of Work** (March 3, 2009 – March 3, 2010)

March 2009

## Executive Summary

The USAID Afghanistan Water, Agriculture, and Technology Transfer (AWATT) program being implemented by New Mexico State University (NMSU) provides technical assistance to improve and strengthen Afghan capacity to manage and utilize the country's scarce water and natural resources.

This document outlines the approach that will guide NMSU and its implementing partners as they execute specific programs designed to identify feasible and sustainable technologies that improve water management and agricultural production; that inform Afghan policy makers in formulating a legal framework for water and land; and that build internal capacity with regard to managing and researching Afghanistan's water, land, and natural resources. The ultimate purpose of these activities is to increase the efficiency and equity in the use of Afghanistan's water, land, and natural resources.

This work plan covers the period October 2008 through September 2009, the second year of a three year cooperative agreement between USAID and NMSU.

**Programmatic changes in AWATT:** A number of changes, suggested by the CTO and others, are being made in Year Two. Specifically, the Chief of Party (COP) will be changed to create 1) a more tightly developed vision of AWATT and 2) that vision and implementing strategies be communicated to USAID, the Afghans, and AWATT stakeholders more effectively than has occurred to date. Additionally, we will retain the current COP as DCOP and the current DCOP as a special projects coordinator.

Secondly, in addition to the COP, AWATT will add substantial expertise to the In-Country Team. Following Appendix A of the Cooperative Agreement, we will add in-country specialists in Policy Reform and Analysis, and in Land Resource Management, which will be in addition to the Water Specialist. These specialists are critical to the accomplishment of the AWATT vision and will be placed during Year Two. It is expected that the new COP will have water and/or land and natural resource expertise. Moreover, we intend to add Expatriate Specialists as Chief Financial Officer, Research and Technology Transfer Specialist, and a Special Projects Coordinator. To support these positions and provide mentoring opportunities for Afghans, we will add local expertise as support staff for the Expatriate staff, and in addition, will hire a Gender Equity Specialist, and a Monitoring and Evaluation Specialist from the local community. Not all of the above are unique. For example, the COP and DCOP may fill that role in addition to a specialist role.

AWATT is also refining its efforts to provide a focus that is heavily in the areas of Integrated Water Management and Policy and Institutional Frameworks as these areas leverage the expertise of NMSU and our university partners and are consistent with the Cooperative Agreement. Technology Transfer efforts will be driven by their connection

to water use and efficiency. While specialized commodities such as chile peppers and pomegranates are included in our efforts, our focus will be on appropriate water usage with these crops.

Greater integration with other USAID implementing partners will also be a primary area for effort this year. USAID / ADAG has been critical of AWATT's efforts to integrate with other USAID implementing partners. Year Two efforts seek to understand USAID programs more systemically, avoid duplication with other programs, and leverage the unique assets of NMSU and its partner universities to assure the greatest return on donor funds and for the Afghan people. NMSU's PI Roger Beck held meetings in January with representatives of other USAID programs including ASAP, A4, and PEACE. Efforts have been initiated throughout the Year Two plan to share work and expertise with these other partners.

**AWATT Integrated Approach.** It is important that a shared vision be found among all AWATT partners and participants. As defined in the Cooperative Agreement, NMSU/ AWATT is comprised of three components:

1. Integrated Water Resources Management (IWRM)
2. Technology Transfer
3. Policy analysis

All of the stakeholders involved in irrigated agriculture in Afghanistan have been working almost independently, while any intervention at the river/canal level has a direct bearing at the farm level and the income of the farmer. The proposed activities under water management at the canal/branch will study water availability – its reliability and distribution to the farmers at their farm level. The installation of gauges, monitoring water delivery and its variability along with an analysis of crop water requirements under the concerned system would show whether the existing water management practices at the upper level are appropriate or need improvement. Most of the technologies to be introduced at the farm level, i.e. laser land leveling, bed and furrow irrigation, drip and mulching, etc. are primarily water management and conservation technologies aimed at improving productivity of both water and land.

Simultaneously, the analysis of existing legal framework regarding water management, water allocation, water and land rights would identify the gaps to be filled for introducing more efficient water management practices and technologies at all levels from the main canal to the farm level. The overall goal of AWATT is to conserve and increase the productivity of the three vital endowments (water, land, and natural resources) of Afghanistan while concurrently improving the institutional and management capacities of the agencies involved in these sectors.

**Year Two Implementation Plan.** The following activities have been planned for understanding the above issues and finding locally suited solutions during Year Two.

1. Integrated Water Resource Management
2. Technology Demonstration at Badham Bagh, Kabul
3. Capacity Building for Water and Agricultural Best Practices
4. Capacity Building at Kabul and Regional Universities for Water and Agricultural Best Practices
5. Develop Teaching Laboratories in Soil, Water, and Plant Protection at Afghan Universities
6. Forage Improvement Demonstration and Technology Transfer
7. Enhancing capacity to assess the Economic Feasibility of Water Allocation
8. Economic Decision Tool Development and Training
9. Capacity Building for Natural Resource Management
10. Integrating Gender & Equity – Capacity Building for Afghan Women
11. Renewable Energy for Agricultural Productive Uses in Afghanistan

These activities support our three areas of focus identified above and also found in the Program Description in the Cooperative Agreement (Appendix B): Integrated Water Resources Management (IWRM), Technology Transfer, and Policy analysis. The IWRM activities are found in Exhibit 1, and in part of Exhibits 2-6. The technology transfer activities are summarized in Exhibits 2-6. Policy and related economics training and capacity development are found in Exhibits 7-9, while we review our activities related to Women in Exhibit 10 and our special projects related to water and natural resource conservation in Exhibit 11.

These eleven activities are presented as matrices that have columns related to Objectives, Activities, indicators and measure of success in Section C. Also, each activity is discussed in sections that give a greater flavor for the rationale for including an activity and their likely outcomes, as well as providing some additional institutional detail. We also indicate in the matrices where we think our work could be significantly enhanced with the addition of several subcontracts.

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## **AWATT Year Two Work Plan Matrices**

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## **A. Introduction**

The USAID Afghanistan Water, Agriculture, and Technology Transfer (AWATT) program being implemented by New Mexico State University (NMSU) provides technical assistance to improve and strengthen Afghan capacity to manage and utilize the country's scarce water and natural resources.

This document outlines the approach that will guide NMSU and its implementing partners as they execute specific programs designed to identify feasible and sustainable technologies that improve water management and agricultural production; that inform Afghan policy makers in formulating a legal framework for water and land; and that build internal capacity with regard to managing and researching Afghanistan's water, land, and natural resources. The ultimate purpose of these activities is to increase the efficiency and equity in the use of Afghanistan's water, land, and natural resources.

### **1. Project Focus**

As indicated in the March 1, 2008 Cooperative Agreement between NMSU and USAID, the main objective of AWATT is to increase the opportunity for Afghans to:

- Access information and knowledge on appropriate technology,
- Provide the tools and mechanisms for policy and institutional changes that would enhance the management of supply and demand of water resources, and
- Develop legislative frameworks for tenure and rights over private and common land in the rural areas.

The specific objectives of the AWATT program as listed in Appendix B of the Cooperative Agreement include:

1. To develop an institutional framework for effective supply and demand management of the country's limited water resources – from local watershed management to trans-boundary basins.
2. To determine and apply appropriate technologies that would increase the agriculture potential for areas that are subject to seasonal drought and high risks of land degradation, deforestation, and loss of biodiversity.
3. To develop the structure of an agriculture research system that would address;
  - a. The research needs of the country,
  - b. Effective dissemination of research results, and

- c. Strengthen the linkage of private sector / public sector research and Afghanistan and international research institutes
4. To catalyze policy reforms that would provide the mechanism for security in land tenure and ownership and in efficient use of water supply for agriculture (production and processing)
5. To provide the framework for a system of land security of ownership and tenure for agriculture and stewardship for forest, rangeland, and resources.

NMSU has designed the AWATT project around three strategic components as defined in Appendix B of the Cooperative Agreement. The contractual components are:

1. Technology Transfer,
2. Integrated Water Management, and
3. Policy and Institutional Frameworks

During the first (partial) year of operation, the NMSU led effort was primarily focused on administrative functions – establishing an in-country team, setting up bases of operation, assessing needs of the target clientele, and arranging for specialized services to be provided through subcontracted arrangements. In the second year of the program, NMSU and its implementing partners will move to more tightly focused interventions aligned with the stated strategic objectives of the program.

Multiple meetings in Kabul in January 2009 between NMSU and USAID helped NMSU to gain additional clarity on the needs and expectations of the USAID / ADAG needs and expectations. The directions offered by the USAID CTO have been incorporated into the Year Two Plan of Work.

## **2. Change of Project Fiscal Year**

This work plan covers the period October 2008 through September 2009, the second year of a three year cooperative agreement between USAID and NMSU. While the AWATT program formally began on March 2008, USAID-Afghanistan's Office of Alternative Development and Agriculture (ADAG) has requested that NMSU alter the period of the work plan to coincide with the federal fiscal year (FFY). NMSU concurs and subsequent reports both program and financial are consistent with this fiscal year timing.

### **3. Period of Performance and Approvals**

If NMSU/AWATT is to be effective in delivering results in Year Two, it is imperative that we move forward with the proposed programs. Thus, the AWATT teams will continue the proposed work pending ADAG approval of this POW.

As written, there are a variety of demonstrations where we intend to use subcontractors to improve exposure and dissemination of technologies. Use of these subcontractors to perform these tasks also provides an understanding of technology performance in several agro-climatic zones. These proposed subcontracts are designed to deliver services and deliverables that contribute directly to and are tied with this Plan of Work. It is accepted by NMSU that execution of these pending subcontracts is contingent upon USAID approval.

### **4. Change of AWATT In-Country Leadership**

At the request of the AWATT CTO and with concurrence with this request, NMSU is in the process of replacing the Chief of Party (COP) in year two. Reasoning for this change are two: 1) a more tightly developed vision of AWATT is needed by the new COP working with NMSU, and 2) that vision and implementing strategies must be communicated to USAID, the Afghans, and AWATT stakeholders more effectively than has occurred to date. A COP position description was approved by NMSU and is being circulated in the international development community. The announcement is also being passed through informal networks of several international agencies. It is expected that the new COP will be announced by mid-March, 2009 and in Kabul ready to implement this work plan by the end of March, 2009.

### **5. Addition of Expertise to the In-Country Team**

In review of the work that NMSU and its partners have agreed to perform under the Cooperative Agreement, it has become clear that additional in-country expertise is required to perform AWATT activities. Appendix A of the Cooperative Agreement calls for specialists in Policy Reform and Analysis and in Land Resource Management in addition to the Water Specialist currently working in country as part of the AWATT team. These specialists are critical to the accomplishment of the AWATT vision and will be placed during year two. It is expected that the new COP holds water and/or land and natural resource experience.

Further, NMSU is strongly recommending to assure continuity and enhanced capacity that the Year One COP be designated to as Deputy Chief of Party (DCOP) and also be assigned as the in-country Policy Reform and Analysis coordinator.

In addition, for Year Two, NMSU has an agreement pending with Kabul University to add Ms. Rahima Noori to the AWATT team. Noori is an Afghan national holding a M.S. degree and will take a leave of absence as assistant professor at Kabul University. She will be paid with AWATT funds to assist AWATT in finding opportunities for Afghan women. Ms. Noori's Year Two work will include training women in the preservation of fruits, in home gardening, and in raising household poultry flocks.

Thus, in year two, NMSU will make substantial additions to the human capital available in country which will more directly contribute to improving Afghan capacity and improving in-country R&D, extension, and technology transfer efforts. This move will also improve the direct spending of dollars in Afghanistan.

The NMSU/AWATT in-country team is comprised of both expatriate specialists and local staff who support the expatriate specialists. The local staff mentor with the AWATT specialists with the expectation that they will acquire unique skills that create value and human capital accumulation for Afghans long after the AWATT program concludes.

During Year Two, NMSU's AWATT team will be comprised of the following;

#### Expatriate Specialists

- Chief of Party (COP)
- Deputy Chief of Party (DCOP)
- Water Specialist
- Land Resource Management Specialist
- Policy Reform and Analysis Specialist
- Chief Financial Officer or Finance Specialist
- Research and Technology Transfer Specialist
- Special Projects Coordinator

#### Local Expertise

- Gender Equity Specialist
- Agriculture and Technology Transfer Officer
- Accounting and Reporting
- Assistant to Water Specialist
- Assistant to Land Resource Management Specialist
- Assistant to Policy Reform and Analysis Specialist
- Monitoring and Evaluation Specialist

It is recognized that not all of the above are unique. For example, the COP and DCOP may fill that role in addition to a specialist role.

## **6. Focus on Water Programs / Tighter Integration with Subcontracts**

In the first year of operation of the AWATT program many recommendations were made as to the direction and programs that NMSU should implement in Afghanistan. The result was a series of programs and partnering contracts that initially may appear as somewhat disconnected. This gap is being corrected in this Year Two plan. NMSU has relied on the mutually signed by NMSU and USAID Cooperative Agreement to guide program and activity decisions. Year two will focus heavily in the areas of Integrated Water Management and Policy and Institutional Frameworks as these areas leverage the expertise of NMSU and our university partners.

Technology Transfer efforts will be driven by their connection to water use and efficiency. While specialized commodities such as chile peppers and pomegranates are included in our efforts, our focus will be on appropriate water usage with these crops. Through efforts with other USAID partners programs (A4, ASAP, ALP/S) and NGO's (ICARDA, JDA, PEACE) we will lend our expertise collaborating with these partners with regard to best practices; but, the AWATT focus is predominantly about water efficiency and distribution and practices that are influenced by proper on farm existing water application (e.g., leaching of fertilizer).

## **7. Greater Integration with Other USAID Implementing Partners**

USAID / ADAG has been critical of AWATT's efforts to integrate with other USAID Implementing Partners. Year Two efforts seek to understand USAID programs more systemically, avoid duplication with other programs, and leverage the unique assets of NMSU and its partner universities to assure the greatest return on donor funds and for the Afghan people. NMSU's PI Roger Beck held meetings in January with representatives of other USAID programs including ASAP, A4, and PEACE. Efforts have been initiated throughout the year two plan to share work and expertise with these other partners. The NMSU AWATT team will focus on our water expertise and seek advice as to commodity focus, existing markets, and farmer and extension needs from other USAID partner agencies with specific focus in these areas. We will also provide specialized expertise (such as chile peppers and pomegranate practices) where requested.

Beck also worked with several NGO's and international agencies to discuss how NMSU might be most effective in quickly exposing and disseminating water related technologies and practices. In year two, NMSU will accept proposed plans of work i.e, JDA, ICARDA, and IFDC to demonstrate practical technologies that improve water efficiency and enhance the returns per unit of irrigation water applied. These proposed work plans if approved by USAID can assist AWATT in implementing this work plan. Likewise, the NMSU team will coordinate efforts with A4 and with University research farms at Balkh and Kabul.

## **8. AWATT Integrated Approach**

As defined in the Cooperative Agreement, NMSU/ AWATT is comprised of three components:

1. Integrated Water Resources Management (IWRM)
2. Technology Transfer
3. Policy analysis

NMSU will work to the following objectives in its technology transfer activities;

- Determine and apply appropriate technologies that would increase the agricultural potential for areas subject to the seasonal droughts and high risk of land degradation, deforestation, and loss of biodiversity
- Set up a structure for an agricultural research system in Afghanistan to address the research needs of the country including a mechanism for effective dissemination of results to users and identification of funding sources
- Strengthen linkages among private/public sector research activities and Afghanistan international research institutions

The objectives of the integrated water management (IWRM) component are;

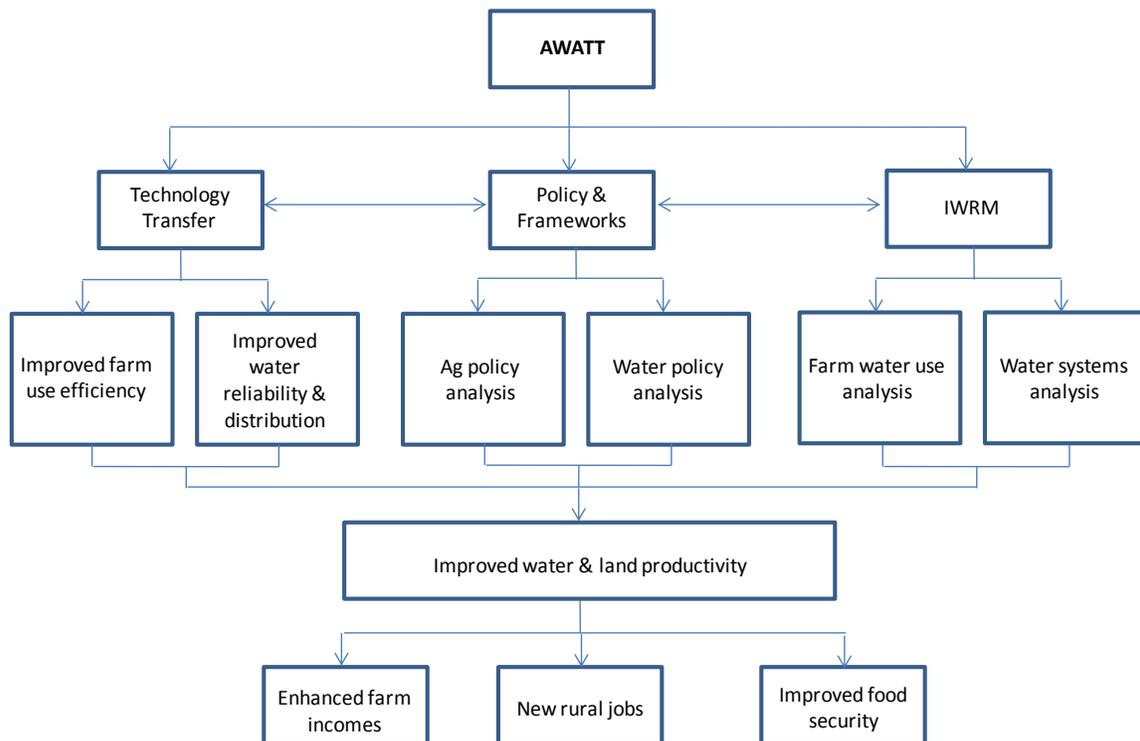
- To identify the water issues and gaps and develop activities that will address the needs of the rural sector
- To develop a clear water policy and strategic plan on appropriate water usage and water rights with the notion that water is not a free good but is a scarce resource that has value. Users should be appropriately charged and those individuals and communities responsible for the recharge areas (watersheds) should be aptly compensated for water use
- To develop a mechanism to effect dialogues for trans-boundary river basins

And the objective of the policy component is to;

- Address gaps in the micro-level sector policies in Afghanistan

All of the stakeholders involved in the irrigated agriculture of Afghanistan have been working almost independently of each other while any intervention at the river/canal level has a direct bearing at the farm level and the income of the farmer. The proposed activities under water management at the canal/branch will study water availability – its reliability and distribution to the farmers at their farm level. The installation of gauges, monitoring water delivery and its variability along with an analysis of crop water

requirements under the concerned system would show whether the existing water management practices at the upper level are appropriate or need improvement. Most of the technologies to be introduced at the farm level, i.e. laser land leveling, bed and furrow irrigation, drip and mulching, etc. are primarily water management and conservation technologies aimed at improving productivity of both water and land. Simultaneously, the analysis of existing legal framework regarding water management, water allocation, water and land rights would identify the gaps to be filled for introducing more efficient water management practices and technologies at all levels from the main canal to the farm level. The overall goal of AWATT is to conserve and increase the productivity of the three vital endowments (water, land, and natural resources) of Afghanistan while concurrently improving the institutional and management capacities of the agencies involved in these sectors. The following figure shows a simple linkage among these components to show how one can affect another and ultimately how AWATT will create impact for the Afghan people.



The Afghan water sector is confronted with several serious challenges and issues. Water management and its use is inefficient at all levels – from the farm up to the canal and river level. Measurement of available water supplies and monitoring its equitable distribution among various user is absent in the formal as well as the informal irrigation systems. There are no records of river water diversions to different irrigation systems and its distribution among users. Most of the irrigation systems have been constructed by water users and are being operated and maintained by them (informal systems). The absence of proper hydraulic and flow control structures for efficient water delivery and

distribution coupled with large conveyance losses due to poor alignment, neglected or deferred maintenance make the issue even worse. The rural “Mirab” organizations have deteriorated during the last few decades, which has adversely affected water delivery and distribution by denying water to the farmers of the downstream sections of the irrigation systems. At the same time, human capacity of the concerned government departments and water users has also deteriorated.

At the farm level, inefficient water application methods result in significant water losses, especially where land has not been precisely leveled which is the case in most of Afghanistan. Over and frequent irrigation is common in the canal irrigated areas. New technologies like laser land leveling, bed and furrow irrigation and drip irrigation are yet to be introduced to the farmers causing much lower than potential water and land productivity. Similarly, the education, research and extension system in water management is too weak to produce quality manpower for an efficient and productive irrigated agriculture sector.

## **B. Year Two Implementation Plan**

In the following sections NMSU/AWATT activities for Year Two are described. Each group of activities is further detailed in Section C where individual matrices have been developed showing the objectives, activities, and measurement metrics. Many of these activities are already underway as continuations of work begun in Year One. Others are inputs to larger objectives that will be accomplished in the activities for Year Three.

The following activities have been planned for understanding the above issues and finding locally suited solutions.

### **1. Integrated Water Resource Management**

This group of activities is designed to identify the water issues and gaps and develop activities that will address needs of the rural sector. The specific activities to be conducted and the indicators are detailed in Exhibit 1.

While water used for irrigating agricultural crops and supporting livestock competes with that used for drinking water, other organizations are addressing these issues. These organizations will be consulted as we begin to develop optimization and policy models where competing uses of water must be considered in terms of demand.

The first group of activities focuses on eliciting the water issues and gaps for farm households in irrigation systems and rural agricultural areas. Workshops / training will be conducted for Ministry staff in performing diagnostic analysis. The team will, in

concert with the trainees, conduct diagnostic assessments through meetings and field visits to various watersheds. Initially, the watersheds regions will be in Balkh, Nangarhar, and Kapisa Provinces. Other provinces may be added as opportunities arise.

The outcome will be a report on the water issues identified for irrigation conveyance, use and the irrigated agricultural areas visited and a plan for resolving the water conveyance problems in these regions. Reports and plans will be made available to stakeholders and will provide a valuable template for future diagnostic assessments conducted by those who participated in the training and their mentees and students.

Utilizing the findings from these outputs, customized trainings will be developed specific to the found needs. As the data and information obtained above is analyzed, we will then develop some policy guidelines related to water rights of users and an efficient and productive use of scarce water resources. This work will be done in the third year of the project. While somewhat independent of the first two objectives mentioned we will also begin to develop a mechanism to affect dialogs for trans-boundary river basins. Trans-boundary issues will be addressed in the third year of the project.

A second group of activities will teach area Mirabs and water user association representatives, as well as Ministry staff (MAIL and MEW), in measuring and managing water to assure more equitable distribution and water use at the farm. These trainings will be conducted for two levels of water distribution – the main and branch canal systems, and for the farm level. The AWATT team will identify, procure, and install flow measurement equipment (current meters and cutthroat flumes). Hands-on training will be conducted in the design, installation, and use of this equipment. The training materials will be provided to trainees for reference and for use in future trainings offered by Ministry personnel.

The activities both at the irrigation canal level as well as at the farm level have been planned in consultation with the MAIL and MEW authorities during two workshops held on November 30, 2008 and January 28, 2009 in Kabul. The implementation of these activities will take place in close collaboration of these two ministries where their concerned staff in Kabul, Balkh, Nangarhar and Kapisa provinces will be carrying out these activities with technical support from the AWATT team.

Training is being organized on discharge measurement in irrigation canals, water losses measurements, daily monitoring of water availability and distribution and operation and maintenance of irrigation systems in April-May 2009. Another important part of the capacity building is that two Afghan students doing their MS in Ag. University, Peshawar, Pakistan will be doing their research work on assessing irrigation system performance and water use efficiency at the farm level in Nangarhar during this period. Another two Afghan students from the same university will be doing their internship during summer with the AWATT project in Balkh. Local students from the four local universities are also being encouraged for involvement in project activities.

After equipment installation, interviews will be conducted by AWATT staff to assure that the equipment is being used properly and to offer additional assistance. We will seek records as evidence of equipment use in the regions where equipment is installed. In addition, we will conduct interviews with trainees to gather lessons learned as the methods were implemented. These lessons learned will be cataloged and shared so that they may be incorporated into future trainings offered by AWATT or Ministry staff. Trainees will also be queried as to any instruction they provided about measurement and where any additional diffusion of the technology has been seen.

## **2. Capacity Building for Water and Agricultural Best Practices**

One of the strengths NMSU and its partner Universities bring to the AWATT project is teaching expertise in water, agriculture, and natural resources. We will offer a variety of courses and trainings in Year Two that target elevating the capacity of Afghan professionals (see Exhibit 2). While we will primarily focus on building capacity with professional staff at MAIL and Extension, and the faculty and students of agriculture universities (Balkh, Nangarhar, and Kabul), we also intend to train and consult with private sector representatives like those affiliated with the Ag Depot program developed through ASAP. Meetings with input suppliers during Year One indicated interest on the part of at least one private sector vendor.

In March and April of 2009, AWATT will present courses for MAIL and University personnel in Integrated Water Resource Management and in Soil and Fertility. These are week-long courses designed to educate Afghan professionals who can either directly apply the knowledge at the farm level or who have access to other interested parties (e.g., staff and students) and can transfer their knowledge.

Eventually, the courses offered will capitalize on the research and demonstration trials AWATT will have in place either on research farms or on individual farms in Balkh, Nangarhar, and Kabul. For example, the AWATT team will be involved with selected variety trials through subcontracted agreements with NGO's and other USAID supported programs such as A4. JDA has already requested chile seed from NMSU for planting this year in Balkh. Faculty from NMSU's Chile Institute are currently engaged in discussions with A4 about variety trials. Other varietal trials include oil seeds, vegetable crops, and forage. We are additionally focusing on technologies and methods for improving irrigation efficiencies with these crops as well as with stone fruits and pomegranates. These experiments and trials will allow rich learning environments for MAIL research and extension personnel, university faculty and their students, and private sector employees.

Another approach to capacity building within MAIL will focus on the working level "people-in-the-trenches" segment of the Ministry's Extension Department. Most field

level extension staff are trained in Vocational Agriculture High Schools. Steps taken by AWATT to improve the pre-service training of this group will result in the delivery of more appropriate and up-to-date technology to farmers and village level clients. Our efforts to upgrade a selected few schools in this network of 13 high schools will begin with the curriculum and instruction component of these rather modest institutions. Given that AWATT is conducting an assortment of workshops and training programs on various topics, the instructional materials that are used for these capacity building efforts will be shared with staff at these high schools along with assistance in adapting these materials to their ongoing instructional programs. We will develop these curricula for Vo Ag Ed concurrently as we develop courses for MAIL, Extension, and the Universities. These efforts will be facilitated by the working relationship that AWATT has established with the Faculties of Agriculture at Kabul University and the regional / provincial universities. A “big brother” or “quality control” type of relationship does already exist between these universities and many of the Vocational Agriculture High Schools. This relationship is the avenue through which AWATT will approach and legitimize the capacity building and upgrading activities that are directed toward improving the quality of education received by the front-line, field-level extension staff.

AWATT will also provide needed tools for enhancing Ministry staff productivity. AWATT will provide AutoCad software to the MAIL irrigation engineers who are now drafting and designing systems by hand.

### **3. Technology Demonstration at Badham Bagh, Kabul**

NMSU/AWATT will expand the research and demonstration facilities at the ASAP’s Badham Bagh farm in Kabul to include irrigation, crop water management, and high-value crop production (see Exhibit 3). The technologies introduced at Badham Bagh (and elsewhere under the Year Two POW) are being filtered to assure that when implemented by farmers, they result in net economic gains for the farm household. We seek to demonstrate technologies on value added crops that have market potential conferring with the ASAP, ALP/S and other USAID funded partners to assure that those markets exist. The technologies proposed also have been used successfully in other countries under similar environmental conditions.

During Year Two, AWATT will study and demonstrate such methods as land leveling for agriculture production and water management. We will measure water application for several crops resulting in the recommendation of crop water requirements. At Badham Bagh, we will research and demonstrate water conserving tillage systems. We will demonstrate flood, furrow, sprinkler, and drip irrigation methods. We will teach irrigation scheduling and on-farm water measurement methods. We will assess crop yields under a variety of irrigation regimes. We will also offer training to demonstrate soil, water and plant protection analysis and how to do soil moisture testing.

The production methods for high-value crops (sweet corn, cherry tomatoes, strawberry, and chile) will be demonstrated. And, water measurement and irrigation technology demonstrations for grapes and pomegranate will be conducted.

As indicated earlier, AWATT perceives all of its research and demonstration activities as opportunities for hands on, experiential learning. Thus, the Badham Bagh farm offers substantial opportunities for training, education, and mentoring.

The establishment of this demonstration will provide a foundation for initiating a series of educational opportunities offered throughout the year. AWATT intends to utilize the demonstrations to build Afghan capacity. Events will be conducted such as farmer field days, short-term and longer-term trainings, and outreach presentations of field results through publications and other media.

In addition to the work at Badham Bagh, demonstrations of on-farm irrigation methods will be conducted in Balkh, Kabul, and possibly Kapisa and Nangarhar during Year Two. These include demonstration of flood, furrow, sprinkler, and drip irrigation. Farmers, MAIL and University staff, Extension personnel, and input suppliers will also be exposed to methods of on-farm water measurement, irrigation scheduling processes, and water conservation practices. These technologies will be demonstrated both on University research farms (Balkh, Kabul, and Nangarhar; MOU's pending) as well as in field trials associated with pending JDA and ICARDA subcontracts. Eventual plans call for farmer demonstrations supported by NGO partnering and through work with the private sector or with other USAID implementing partners such as the Chemonics ASAP program.

#### **4. Capacity Building at Kabul University for Water and Agricultural Best Practices**

The activities to be conducted at Kabul University in concert with the A4 project primarily target the faculty, staff, and students of Kabul University (see Exhibit 4). The Agronomy Farm of Kabul University offers a setting where University faculty can work cooperatively with AWATT and A4 researchers to generate much needed primary research data and publications to advance their careers. The farm also offers opportunities for these professors to involve their students in field level research and in learning how to design and conduct research.

AWATT scientists will demonstrate and provide instruction in methods such as soil and water analysis. We will conduct research in irrigation methods and measurement at the student farm as well as demonstrating production techniques in high-value crops. We will instruct and assist in the research design for experiments related to irrigation methods and best agronomic practices. We will work cooperatively with faculty and students on their research projects and the analysis and presentation of collected data.

The objective is to build long term capacity through our instruction. To improve the probability of the perpetuation of this knowledge, we will design and supply training materials that can be repurposed for the classroom. We will also conduct follow up interviews with trainees to collect lessons learned about how the training is being utilized and what additional unmet demand for training or mentoring still exists.

## **5. Develop Teaching Laboratories in Soil, Water, and Plant Protection at Afghan Universities**

As a result of the previous 30 years of conflict, the agricultural laboratories at Afghan Universities are in a depleted condition. Students wish to learn practical methods that supplement their classroom textbook examples. Hands on learning without exception leads to an overall superior education. It is time that the laboratories are upgraded and in some instances created from a vacuum.

As part of the mandate of AWATT, we plan to equip, maintain, educate technicians and develop lab manuals for at least two agricultural laboratories during the next year. These activities will not take place in isolation, nor will the equipment arrive in crates to be unpacked by university staff and set up without AWATT technical assistance. AWATT has developed good relations with the Deans of the Agricultural Universities and with their guidance and assistance and in collaboration with the A4 project a plant protection lab will be set up at Balkh University in the next year. At Nangarhar University a similar lab will be set up and maintained. Using the land grant model, these labs will be used primarily for teaching purposes, and some limited applied research plus some short courses for the extension agents operating in the province. Exhibit 5 indicates the objectives and measurable outcomes of these activities.

## **6. Forage Improvement Demonstration and Technology Transfer**

An extensive forage program has been proposed for Balkh province (Exhibit 6). Variety trials will be conducted in Year Two at plots rented by AWATT in collaboration with JDA pending approval of the subcontract with JDA by USAID.

The AWATT team will evaluate several varieties of forage and other livestock feeds based on the recommendations of NMSU and CSU scientists. Through subcontractor arrangements we will demonstrate different varieties of crops such as alfalfa, sorghum, and millet. By involving several subcontractors we can more broadly test and demonstrate these forage crops under several climatic conditions. We will monitor water use in all of the tested varieties seeking those crops with the best returns to the

unit of applied water. Ultimately, we will look at the economics of these new varieties to determine if they make business sense as a cash crop for farmers.

Several farmer field days will be held at the research farms and at farmer-owned sites. Practical training will be provided for farmers interested in forage production.

## **7. Enhancing the Capacity to Assess the Economic Feasibility of Water Allocation**

NMSU and its AWATT university partners have had long experience in developing analytical tools and evaluating the performance of water allocation policies and practices in both developing and developed countries. Capitalizing on this expertise, Exhibit 7 has an objective to enhance capacity to assess economic feasibility of alternative water allocation and storage development measures for increasing irrigated farm income. The capacity to use current methods and understand relevant topics in policy analysis will be mainly developed with Afghan counterparts in MAIL and MEW through a series of collaborative research and training activities. A well-functioning policy unit is our target for the end of the LOP.

One of the main objectives will be to set in motion on-going support for the anticipated river basin and sub-river basin councils. River basin and sub-basin councils will be established after the new water law is passed by the Afghan Parliament, expected in the coming months. The existing structure of water management at the provincial and irrigation system level will be disbanded by the new councils based on river basins (there are five river basins and forty one sub river basins in Afghanistan). They will be comprised of water users, government agencies and other stakeholders in river basins, and will be established under the Ministry of Energy and Water (MEW). They will have activities related to AWATT policy work that will be done better with more effective policy analysis.

Examples of the councils' charges are likely to include: Prepare water resources management strategy for its basin in accordance with the national water policy upon considering the conditions and needs of the basin; Regulate and supervise the exercise of rights and use of water; Solve disputes related to water distribution and use in its basin and make decisions on imposing and collecting of fines in accordance with the law. We will develop this effort in concert with the Supreme Water Council and other interested parties and donors.

A key part of our policy analysis will be the development of a prototype integrated hydrological, agronomic, and economic framework that identifies reservoir storage and water allocation practices that increase net farm income. These will be used in training documents to aid counterpart MAIL and MEW analysts to understand key aspects of

policy analysis. To create this framework, we will assemble data on stream flows above and below major irrigated areas, identify historical data on irrigated land in production by major crop and adapt existing crop enterprise data assembled by Chemonics for major crops in the chosen watersheds. The AWATT team will also coordinate with the US Geological Survey, US Army Nangarhar PRT, and US Army Corps of Engineers to calculate the cost of developing additional reservoir storage. These and other related data will be packaged into a series of Watershed Perspectives including agronomic, hydrological and economic data sources, which will be used to begin a dialogue with various stakeholders on the development potential in selected watersheds. To fully specify these Watershed perspectives, we will work with USGS on a current subcontract, install water measurement devices in selected watersheds, and explore the possibility of a further USGS contract to undertake farm surveys and other community interviews.

The framework should permit analysts to examine outcomes with regard to cropping patterns, water use, irrigated land, and farm income under current and varied reservoir storage, water supply conditions, water rights regimes, efficiencies of water use, crop prices and costs of production. Furthermore, with an added subcontract with USGS, we will add perspectives on risk associated with uncertain prices, yields and rights as related to water.

The measurement of AWATT's progress in creating impacts related to these activities will be based on the usefulness several documents and analytical tools, training sessions and interviews with stakeholders to see the effects and uses of example policy analyses. With regard to documents and tools, we hope to produce a series of Watershed Perspectives for three selected watersheds to illustrate the potential of alternative water allocation approaches and mechanisms, and we will create the prototype framework discussed above and present it two seminars to relevant stakeholder groups. Most training will be to add to add policy analysis capacity in MEW and MAIL, and the universities where interest and at least initial capacity might exist. We will also implement follow-up interviews and surveys at regular time periods after the training and development of policy analyses to see use and impact of these efforts.

## **8. Economic Decision Tool Development and Training**

The eventual outcomes of the AWATT project include improving farm incomes and expanding job opportunities for rural Afghans. These objectives can't be achieved without some understanding of the economic and business aspects of agriculture. The economic and farm planning decision tools will help build this capacity with professional staff and with owners and operators of agribusiness ventures (Exhibit 8).

One type of decision tool, farm cost and return estimates, plays an important role as an input to several other AWATT activities.

First, cost and return estimates are a central component in determining the economic feasibility of water allocation (discussed in the previous section). In Year Two the AWATT team will develop these estimates for the agricultural enterprises found in the watersheds targeted in the water allocation model – Balkh and Kabul. Cost and return estimates will be formulated for different regions based on three stratifications – headwaters, mid-regions, and tail waters – as microclimatic differences, water quantities, and the timing of available water within those stratifications all impact farm-level cropping decisions. While templates for cost and returns were developed under the RAMP project, the AWATT team will need to build these estimates to be representative of the target region. In addition, no costing of water was included in the RAMP / Chemonics budgets. Thus, we will need to integrate the crop water use data to our developed budgets and, in the first phase of this work, develop some mechanism for pricing water.

Second, cost and return estimates are also an important input in our decisions with regard to demonstrating and promoting irrigation technologies and other agronomic practices that we will recommend to farmers. We will develop estimates of profitability to assure that the economic returns are sufficient to rationalize the risk of incorporating new technologies or new crops.

In both cases, the need to develop these cost and return estimates, offers an opportunity for training Afghan professional staff in the approach. In May 2009, we will offer multiple day workshops at Kabul University, and then at Balkh University, on collecting farm-level cost and return data using the farmer panel method. The panel approach will be taught on the first day, students will gain field experience on the second day, and a third day will review the findings and lessons learned. These trained persons will be employed and will collect the data for future estimates. Training materials will be provided to university, extension, and private sector personnel.

We will also offer courses during the summer to university faculty and students, extension personnel, NGO staff, and employees of input suppliers in the budgeting process and in other farm planning and decision tools. The developed training materials and curriculum will be provided and will serve as a foundation for extending the learning beyond those initially trained. Over the LOP we will make periodic contact with those trained to determine how these tools are being diffused and if new demand for additional training exists. One of the expected outcomes is that these activities will impact more Afghan women because the universities have larger numbers of women enrolled in these areas of study. Another expectation is that as the tools taught become used we will see evidence as Afghan professionals begin assessing the economic impacts of agricultural decisions – including the addition of new crops and the feasibility of agribusiness ventures.

## **9. Capacity Building for Natural Resource Management**

The forest lands and rangelands shared by Afghans are important in providing resources and income opportunities. However, without proper management of these common lands, degradation will continue. Degradation not only impacts the availability of important resources (e.g., firewood, nut crops, and grazing land) but also impacts watershed health as, for example, runoff increases and top soil is lost reducing the land capacity and silting in other places.

During Year Two AWATT scientists will offer multiple workshops designed to enhance the natural resource management capacities of Afghan professional staff as well as those working at the field level (see Exhibit 9). Workshops will capitalize on the natural resource expertise of NMSU/AWATT subcontractor Southern Illinois University Forestry Department. Workshops will initially be conducted in Balkh, Herat, Nangarhar, and Kabul Provinces although attendees will be solicited from throughout Afghanistan.

Workshops will be conducted on the use of woody plants for both income generating opportunities and in land conservation. Additional workshops will be provided on using vegetation to protect riparian areas and in techniques for soil conservation in grazing lands. Targeted participants include the staff of MAIL and other Ministries. The Afghan Conservation Corps (ACC) is also an especially important target population for the trainings. However, others such as the research staff of A4, those working with the PRT's, and various NGO's may also benefit from the curricula offered. All materials will be provided in the appropriate languages for reference and as vehicles for training others.

While in the short term these workshops are capacity building events designed to transfer knowledge and skills, the longer term impacts are expected to be substantial. As seen with other AWATT trainings conducted, the materials are expected to be used in training other Afghan professionals and in classroom training of students. It is projected that the ACC will utilize the skills taught to be more effective in their efforts in reforestation and in employing jobless Afghans. Longer term, the results of these capacity building efforts (in combination with other AWATT activities such as policy) will be more successful reforestation, improved soil retention, and a restoration of watershed health. While it will be difficult to directly determine to what degree these efforts specifically contribute to these longer term results, we will seek evidence of the incorporation of the methods and approaches taught as evidence of their diffusion through interviews conducted later in Year Two and during Year Three with those who attended the training.

## **10. Integrating Gender and Equity – Capacity Building for Afghan Women**

USAID has long placed gender and equity considerations as a critical cross-cutting issue. And, the integration of men and women into any development work simply makes it more effective. Therefore, AWATT is committed to providing increased opportunities for women to access and benefit from improved natural resource management and biodiversity conservation.

The AWATT staff headed by the newly hired gender specialist will seek to encourage relevant women groups, civil society partners, and community leaders to include men, women, and the poor from rural areas in decision making about natural resource use, to ensure that decisions reflect their input, and encourage them to use and manage natural resources in a sustainable manner for their own benefit. To have lasting effects, integrating gender and equity considerations requires creative initiatives and committed project staff. Efforts will be made to mainstream gender and equity considerations seamlessly into all stages and aspects of the AWATT plan of work, including but not limited to the community-based resource management program. Following a gender and equity assessment, the AWATT gender specialist will be invited to facilitate a workshop with key AWATT staff and field team members, on gender and equity considerations relevant to biodiversity conservation and natural resource management in Afghanistan. During this workshop, AWATT team members will work together to produce a set of gender and equity goals, guidelines and indicators to which they will adhere during the AWATT project period and beyond.

The gender specialist will work with the AWATT team to formulate specific indicators related to gender and equity as part of the AWATT performance monitoring plan. These indicators will provide the foundation for gender-disaggregated M&E of AWATT activities. Quantitative and qualitative baseline data will be derived from the initial gender and equity assessment. The AWATT staff will then ensure that these or similar indicators are included in the monitoring plans of small grants.

## **11. Renewable Energy for Agricultural Productive Uses in Afghanistan**

Renewable energy has an important role to play in the future modernization of the Afghan agricultural sector. Afghanistan has one of the lowest electrification rates in the world with only ten percent of the population with access to electricity, mostly in urban areas like Kabul. Most Afghan provinces have limited access to electricity, with the vast majority of rural areas not electrified. As rural villages are widely scattered, often across rugged terrain, extending the conventional electric grid to most villages of Afghanistan is impossible. Renewable energy is often the most viable and economical energy solution

for rural Afghan villages, especially for agricultural applications such as water pumping, cold storage, crop drying, food processing, etc.

Afghanistan is rich with indigenous renewable energy resources. The country has excellent solar energy resources, averaging over 300 days per year of sunshine with a daily solar insolation average 5.5 kWh/m<sup>2</sup>. There are also excellent hydro in northeast Afghanistan and commercial grade wind resources available in the western part of the country.

Demonstrating technologies consistent with the AWATT mission that utilize renewable energy to improve Afghan livelihoods is part of this work plan. State of the art renewable energy technologies are assessed for appropriate application in Afghanistan and included when that application test warrants inclusion. Potential applications include economically feasible productive use activities such as water pumping and crop drying. AWATT plans to host a workshop on the use of renewable energy for agriculture that presents technologies and possible applications inviting discussion from participants. Solar energy applications and possibly wind pumping will be demonstrated at a half dozen selected sites in the northern parts of the country. This work will be conducted in cooperation with JDA and MAIL. Two water pumping projects are planned for implementation in Balkh Province in association with JDA, and the rest will be with MAIL mostly for livestock (e.g., with Kuchi herders). Other productive use renewable energy projects that will be added in Year Two after assessments include solar crop drying for women's associations in Parwan Province in collaboration with MEDA.

Given the typically small size of Afghan farms, renewable energy technologies are a good fit for such small farm operations. AWATT will develop several pilot projects incorporating renewable energy technologies into on farm operations for productive agricultural uses. Project design will include development of site selection criteria, technical standards, standardized design, system development, and operations and maintenance that can be funded from the increased economic productivity. AWATT will use existing Afghan renewable energy providers as much as possible to help strengthen the local renewable energy industry. Each farmer or association will be expected to provide a reasonable direct or in-kind contribution for any project established.

Upon completion of each renewable energy system, the farmer or association will accept, in writing, the ownership of the system. A copy of the document will be provided to the Renewable Energy Department of MEW. For approximately one year after community acceptance of the system, AWATT will provide periodic technical assistance to support any potential operation and maintenance issues that may occur (e.g., lightning strike damaging electronics). Long term system maintenance will be provided by the original Afghan installation company and funded by the increased economic productivity of the farmer.

Training will be developed to build local capacity on renewable energy systems applied

towards end-users and service providers on the design, construction, operation and maintenance (O&M) of renewable energy systems for agriculture. This will help ensure proper long-term system operation (e.g., battery maintenance, etc.). Battery recycling will also be established to ensure the safe disposal and re-use of batteries. To the extent possible, AWATT will attempt to cluster the renewable energy systems in order to focus local capacity building efforts.

Improved access to modern energy services will result in improved agricultural production at the village level, which in turn will benefit women and improve their living conditions. AWATT will work directly with women's groups in Parwan province on improved crop drying through active solar drying. In addition, AWATT will ensure the collection of gender disaggregated data to assess programmatic impact; pay attention to gender-based constraints and issues and inform USAID of such issues and the measures taken to address them; and analyze any specific gender issues which merit consideration and outline appropriate actions that should be undertaken to address these issues.

## **C. AWATT Year Two Work Plan Matrices**

## Exhibit 1. Integrated Water Resource Management

Objectives	Major Activities Planned	Indicators	Measurement
<p>Identify water issues and gaps in irrigation systems and in rural agricultural areas.</p>	<ol style="list-style-type: none"> <li>1. Conduct a diagnostic analysis and training workshop with staffs of MAIL &amp; MEW.</li> <li>2. Meetings with engineers, extension officials, &amp; Afghan faculties to gain an understanding of the concerns &amp; problems facing local agriculture.</li> <li>3. Determine issues related to water capture, conveyance, use &amp; distribution among users.</li> <li>4. Collect data on water availability, distribution, losses and requirements in selected systems</li> <li>5. Determine what improvements and technologies would increase the efficiency of irrigation water use.</li> </ol>	<ol style="list-style-type: none"> <li>1. Training of Afghan Ministry staff in the diagnostic analysis of water systems &amp; their integrated management.</li> <li>2. Field visits to record the current situation of the water management.</li> <li>3. Meeting with “Mirabs” &amp; water users.</li> </ol>	<ol style="list-style-type: none"> <li>1. 12 Ministry staff trained &amp; helping ministries to assess water systems throughout Afghanistan resulting in strategic plans for system management.</li> <li>2. 5 field visits conducted. Meetings with Mirabs &amp; water users conducted. Field notes of findings posted.</li> <li>3. Report on water issues identified for the irrigation conveyance, use &amp; irrigated agriculture areas.</li> <li>4. Report on current water management and use.</li> <li>5. Plan of activities to diminish these concerns in the water sector.</li> <li>6. Schedule of activities and selection of workshop topics for future trainings and workshops.</li> </ol>

Objectives	Major Activities Planned	Indicators	Measurement
<p>Implement a water measurement &amp; management program at irrigation water conveyance level (main &amp; branch canal systems)</p>	<ol style="list-style-type: none"> <li>1. Identify and procure flow measurement equipment.</li> <li>2. Assemble a counterpart working group of staff from Afghan Ministries (MAIL, MEW).</li> <li>3. Train the group in design, installation and use of the equipment.</li> <li>4. Install water measurement equipment in sample canals (main and distributaries system)</li> </ol>	<ol style="list-style-type: none"> <li>1. Equipment procured &amp; placed.</li> <li>2. Cooperation of the Afghan Ministries.</li> <li>3. Training course and course evaluation.</li> <li>4. Monitoring of periodical flow measurement in main and distributaries canal systems.</li> </ol>	<ol style="list-style-type: none"> <li>1. Presence of flow measurement devices (current meters and cutthroat flumes).</li> <li>2. Presence of participants to start the training.</li> <li>3. Manuals prepared &amp; training delivered to 15 Afghans.</li> <li>4. Flow measurement devices given to the engineers and officials in Afghanistan.</li> <li>5. Records from trained personnel on flow data received from regions where equipment was installed.</li> <li>6. Methods being diffused through trained persons showing others as reported by trainees.</li> <li>7. Report of lessons learned in installation of equipment &amp; in collection of flow data.</li> <li>8. Indication of diffusion of methods by requests from Afghans for additional AWATT training or advanced training.</li> </ol>

Objectives	Major Activities Planned	Indicators	Measurement
<p>Implement a water measurement and management program at the farm level.</p>	<ol style="list-style-type: none"> <li>1. Identify and procure flow measurement equipment.</li> <li>2. Assemble a group of water users and “Mirabs”</li> <li>3. Train the group in design, installation and use of the equipment.</li> <li>4. Install water measurement equipment in on-farm irrigation areas (turnout areas)</li> <li>5. Assess water application efficiency in different areas.</li> </ol>	<ol style="list-style-type: none"> <li>1. Equipment procured &amp; installed.</li> <li>2. Cooperation of the farms and Afghan Ministries.</li> <li>3. Training course and course evaluation.</li> <li>4. Monitoring of periodical flow measurement in turnout areas</li> </ol>	<ol style="list-style-type: none"> <li>1. Presence of installed flow measurement devices (current meters and cutthroat flumes).</li> <li>2. 20 Mirabs &amp; water user association representatives trained.</li> <li>3. Training curricula &amp; materials delivered to participants &amp; to Ministries and University staff.</li> <li>4. Curricula &amp; material employed via extension trainings &amp;/or classroom instruction at Universities.</li> <li>5. Data collected at Mirab &amp; WAU level. Indications of data use &amp; lessons learned through follow up visits with trainees.</li> <li>6. Report on current water use at the farm level.</li> </ol>

## Exhibit 2. Capacity Building for Water and Agricultural Best Practices

Objective	Major Activities Planned	Indicators	Measurement
Capacity building training for MAIL research & extension staff, University faculty, NGO's & farm input suppliers.	<ol style="list-style-type: none"> <li>1. Provide training on the following topics:               <ol style="list-style-type: none"> <li>a. Optimal water application &amp; crop rotation.</li> <li>b. Soil &amp; fertility management.</li> <li>c. Cropping system &amp; irrigation management.</li> <li>d. Agronomic practices to improve water &amp; soil conservation.</li> <li>e. Efficient water management systems for high-value crops.</li> <li>f. Water measurement &amp; irrigation technology for horticulture.</li> <li>g. Pest management methods</li> </ol> </li> <li>2. Working through University faculty, develop curriculum for Vo Ag Ed schools in irrigation management, IWRM, NRM, soil &amp; fertility management, &amp; pest management.</li> <li>3. Provide AutoCad to MAIL engineers.</li> </ol>	<ol style="list-style-type: none"> <li>1. Training conducted on water conservation &amp; agricultural production topics.</li> <li>2. Research methodology &amp; technology shared with extension officials, university faculty &amp; students.</li> <li>3. Training in irrigation technology.</li> <li>4. Training in plant protection</li> <li>5. Course needs for Vo Ag Ed programs determined &amp; curriculum developed.</li> <li>6. AutoCad provided.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fifteen (15) faculty, researchers, extension staff, agricultural input suppliers, students, trained in each of the topics.</li> <li>2. Training materials developed &amp; delivered to MAIL.</li> <li>3. Follow up contact with trainees to determine diffusion of concepts through teaching or field application &amp; desire for additional assistance.</li> <li>4. Curriculum &amp; materials for Vo Ag Ed programs developed &amp; delivered to Kabul University Ag Dean. Developed courses added in at two Vo Ag Ed schools.</li> <li>5. AutoCad being used in irrigation design at MAIL.</li> </ol>

### Exhibit 3. Technology Demonstration at Badham Bagh, Kabul

Objective	Major Activities Planned	Indicators	Measurement
<p>Expansion of research &amp; demonstration farm at Badham Bagh, Kabul for assessing irrigation efficiency, crop-water management, &amp; high value crop production.</p>	<ol style="list-style-type: none"> <li>1. Research &amp; demonstration of on-farm irrigation &amp; water management.</li> <li>2. Crop water requirements for specific crops.</li> <li>3. Demonstration of irrigation methods (flood, furrow, sprinkler &amp; drip).</li> <li>4. Irrigation scheduling, on-farm water measurements &amp; adaptation of water conservation technologies.</li> <li>5. Assessment of crop yield under different field condition (leveled or non-leveled) vs. irrigation practices.</li> </ol>	<ol style="list-style-type: none"> <li>1. Installation of water measurement equipments at farm (hydro-flume/current meters) to measure the total applied irrigation.</li> <li>2. Developed field for high value crop production.</li> <li>3. Training conducted for staff, students, &amp; faculty during the growing season on topics of water use efficiency &amp; crop production technologies.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fifteen (15) of University faculty &amp; students, MAIL research &amp; extension personnel, Ag input supplier trained on water efficiency &amp; agronomic practices.</li> <li>2. Indication of adoption through addition or techniques to University curriculum &amp; use at farm level via follow up visits / survey with trainees.</li> <li>3. Report of lessons learned from trainees as to how adoption could be increased &amp; lessons learned in the adoption process.</li> <li>4. Crop production &amp; water conservation practice guide, fact sheets &amp; manuals published in local language. Distributed to trainees, MAIL research &amp; extension personnel, &amp; supplier community</li> </ol>

Objectives – continued	Major Activities Planned	Indicators	Measurement
	<ul style="list-style-type: none"> <li>6. Land leveling, soil nutrition &amp; fertility management.</li> <li>7. Crop trials &amp; selection (sweet corn, cherry tomatoes, strawberry &amp; chile pepper).</li> <li>8. Water measurements &amp; irrigation technology demonstration for grapes &amp; pomegranate.</li> <li>9. Assessment of soil moisture, time &amp; depth of infiltration relative to crop &amp; irrigation methods.</li> <li>10. Assessment of environmental impacts of irrigation practice, fertilizer use.</li> <li>11. Developing strategy &amp; management for harvesting of high value crop &amp; post-harvest management.</li> <li>12. Mentoring farmers, extension staff, input suppliers &amp; agribusiness entrepreneur through a provision of linkage with on-farm technology demonstration.</li> </ul>	<ul style="list-style-type: none"> <li>4. Demonstration of conservation tillage, land leveling &amp; preservation of crop residues to conserve water.</li> <li>5. Workshops conducted by AWATT horticulture experts on pomegranates, IPM, &amp; high value crops.</li> <li>6. Coordination with USAID funded programs; A4, ASAP, PEACE for training their stakeholders on Irrigation &amp; water management.</li> </ul>	<ul style="list-style-type: none"> <li>5. Two (2) field days held for provincial extension officials, faculties, &amp; farmers.</li> <li>6. Twenty (20) total attendees at field days representing stakeholder population.</li> <li>7. Two (2) workshops conducted with 20 persons attending.</li> <li>8. Assessment &amp; recommendation of crop water requirements.</li> <li>9. Data collected &amp; reported to stakeholders from irrigation water use (yield/unit of water).</li> <li>10. Outreach presentation of field results to stakeholders.</li> <li>11. Outreach materials developed &amp; distributed to stakeholders.</li> <li>12. Five persons mentored by AWATT staff.</li> </ul>

#### Exhibit 4: Capacity Building at Kabul University for Water and Agricultural Best Practices

Objective	Major Activities Planned	Indicators	Measurement
<p>Research &amp; capacity building for Kabul University faculty &amp; students of Agriculture in irrigation efficiency &amp; crop-water management</p>	<ol style="list-style-type: none"> <li>1. Research at University student farm (A4 project) &amp; Agronomy farm of Kabul University.</li> <li>2. Soil, water &amp; plant protection analysis &amp; control ( A4 Botanical Garden)</li> <li>3. Appropriate technology adoption &amp; irrigation measurement for research farms.</li> <li>4. Evaluate irrigation methods from an economic perspective using cost &amp; return estimations.</li> <li>5. Irrigation methods (flood, furrow &amp; drip) &amp; Irrigation amounts assessment at student farm:               <ul style="list-style-type: none"> <li>• Optimization of crop-specific irrigation requirement</li> <li>• Soil moisture testing</li> <li>• Efficient water conveyance (reduce losses)</li> </ul> </li> <li>7. Demonstration of high-value crop production at student farm.</li> <li>8. Research plot design &amp; deficit irrigation research for the faculty &amp; student research at Agronomy farm at Kabul University.</li> </ol>	<ol style="list-style-type: none"> <li>1. Irrigation &amp; water conservation trial experiments are established in student trial plots &amp; at the agronomy research farm at Kabul University.</li> <li>2. Training conducted on water conservation &amp; agricultural production practices for faculty &amp; students.</li> <li>3. Data collected &amp; research trials established for deficit irrigation research for Agronomy &amp; water management research for Kabul University.</li> <li>4. Training on research design management.</li> </ol>	<ol style="list-style-type: none"> <li>1. Number of student plots established.</li> <li>2. Two faculty &amp; 40 students with courses completed.</li> <li>3. Training manuals for Afghan University &amp; Extension officials.</li> <li>4. Adaptive research established on deficit irrigation, crop water requirements, &amp; irrigation scheduling.</li> <li>5. Optimization of drought tolerant crop varieties in the face less water evaluated, results published &amp; distributed to stakeholders.</li> <li>6. Sharing of research &amp; technology adoption approaches with other Afghan Universities.</li> <li>7. Follow up with those trained indicates methods are being taught or in application.</li> </ol>

### Exhibit 5: Develop Teaching Laboratories in Soil, Water and Plant Protection at Afghan Universities

Objective	Activities	Indicators	Measurement
<p>Developing soil, water &amp; plant protection labs in Afghan Universities (Kabul, Balkh, Herat, &amp; Nangarhar) to strengthen research &amp; extension activities.</p>	<ol style="list-style-type: none"> <li>1. Establish soil, water, and plant protection laboratories at two universities.</li> <li>2. Make these established labs available to MAIL extension staff, &amp; farmers.</li> <li>3. Make soil &amp; water kits available for MAIL extension use.</li> <li>4. Conduct training on soil &amp; water equipment use &amp; results analysis of different testing.</li> <li>5. Conduct training on accessing knowledge of plant diseases &amp; crop protection.</li> </ol>	<ol style="list-style-type: none"> <li>1. Educate faculty, students, extension officials &amp; input suppliers.</li> <li>2. Provide resources to assist in access the new knowledge &amp; research.</li> <li>3. Maintain the labs and develop lab manuals for continued productive use of the labs</li> </ol>	<ol style="list-style-type: none"> <li>1. Train three (3) faculty &amp; students at each university in soil &amp; water testing diagnostic &amp; analysis &amp; plant protection skills.</li> <li>2. Use the laboratory to train local extension agents ( at least 20) &amp; input suppliers ( up to 5) in understanding the use of the generated test results.</li> <li>4. Develop &amp; distribute training manuals. (soil, water, and plant protection)</li> <li>5. Conduct follow up interviews with all trainees to determine degree of use, competence in analysis &amp; follow up instruction</li> <li>6. From interviews, document lessons learned &amp; outcomes.</li> <li>7. Modify lab manuals and lab procedures as needed</li> </ol>

### Exhibit 6: Forage Improvement Demonstration & Technology Transfer

Objective	Major Activities Planned	Indicators	Measurement
<p>Increase forage production by farmers in semi-irrigated &amp; irrigated areas.*</p> <p>*This goal conditional upon subcontractor participation, i.e., ICARDA, JDA.</p>	<ol style="list-style-type: none"> <li>1. Determine best forage &amp; other livestock feeds from NMSU/CSU that can lead to production of forage as a cash crop.</li> <li>2. Determine best summer forage sorghum &amp; millet varieties.</li> <li>3. Determine optimal NPK &amp; seed rates for alfalfa, selected sorghum &amp; millet production.</li> <li>4. Establish on-farm demonstration plots of alfalfa, sorghum &amp; millet varieties.</li> <li>5. Monitor irrigation water use in forage crops</li> </ol>	<ol style="list-style-type: none"> <li>1. Trials established at research farms &amp; on-farm locations.</li> <li>2. Farmer field days held AWATT's forage activities at research farms &amp; on-farm demonstration sites.</li> <li>3. Irrigation &amp; other water use monitored &amp; data collected.</li> <li>4. Provide practical training for farmers in forage production</li> </ol>	<ol style="list-style-type: none"> <li>1. Data sets from trials published, translated, &amp; distributed to MAIL &amp; Universities.</li> <li>2. Twenty (20) farmers attending farmer field days at research farms &amp; on-farm demonstration sites.</li> <li>3. Report of results from trials with appropriate recommendations for varieties, seed rates, fertilizer rates, cutting regimes, hay making, etc.</li> <li>4. In-vitro nutritional value determined by PEACE project.</li> <li>5. Data from irrigation water use (yield/unit of water) published &amp; distributed to MAIL &amp; Universities.</li> <li>6. Economic assessment returns under implemented technologies.</li> </ol>

## Exhibit 7. Economic Feasibility of Water Allocation

Objectives	Major Activities Planned	Indicators	Measurement
<p>Enhance capacity to assess economic feasibility of alternative water allocation and storage development measures for increasing irrigated farm income *</p> <p>*These activities will be enhanced with subcontractor participation from USGS and/or Purdue University. See Exhibit 8.</p>	<ol style="list-style-type: none"> <li>1. Assemble data on streamflows above and below major irrigated areas in the chosen watersheds.</li> <li>2. Identify historical data on irrigated land in production by major crop in the chosen watersheds.</li> <li>3. Adapt existing crop enterprise data assembled by Chemonics for major crops in the chosen watersheds.</li> <li>4. Coordinate with the US Geological Survey, US Army Nangarhar PRT, and US Army Corps of Engineers to calculate the cost of developing additional reservoir storage.</li> <li>5. Provide perspectives on risk associated with uncertain prices, yields and rights as related to water*</li> <li>6. Develop a prototype integrated hydrological, agronomic, and economic framework that identifies that reservoir storage and water allocations that</li> </ol>	<ol style="list-style-type: none"> <li>1. Cropping patterns, water use, irrigated land, and farm income under current reservoir storage with forecast water supply conditions, water rights regimes, efficiencies of water use, crop prices and costs of production.</li> <li>2. Adjusted cropping patterns, water use, irrigated land, and farm income made possible with modified reservoir storage and water use patterns under forecast water supply conditions, water rights regimes, efficiencies of water use, crop prices and costs of production</li> <li>3. Trained Afghan counterparts in MAIL and MEW in policy analysis methods and topics</li> <li>4. Capacity in policy analysis in ministries and universities initiated, and contacts made with newly formed sub-river basin councils</li> </ol>	<ol style="list-style-type: none"> <li>1. Agreement in principle to add policy analysis capacity in MEW and MAIL</li> <li>2. Watershed Perspectives analyses produced in concert with MAIL and MEW input</li> <li>3. Watershed Perspectives series produced for three selected watersheds/catchments</li> <li>4. Prototype model developed and presented in two seminars to relevant stakeholders</li> <li>5. Four potential MAIL/MEW water policy analysts given two initial training courses</li> <li>6. Four potential university professors with interests in water policy analysis given two initial training courses</li> <li>7. Follow interviews and surveys to see use of selected tools and analyses</li> </ol>

	<p>increase net farm income.</p> <ol style="list-style-type: none"><li>7. Train Afghan counterparts in MAIL and MEW in policy analysis methods and topics</li><li>8. Encourage long term development of capacity in policy analysis in ministries and universities, with intent to provide on-going support to sub-river basin councils</li></ol>		
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### Exhibit 8. Economic Decision Tool Development and Training

Objective	Major Activities Planned	Indicators	Measurement
<p>Build cost &amp; return estimates for representative basins in Balkh and Kabul (stratified by headwaters, mid-waters, &amp; tail waters), to be used in 1) <i>water basin &amp; land use models</i>, 2) <i>informing micro-level policy decisions</i>, &amp; 3) <i>assessing the economic viability of proposed on-farm irrigation technologies</i>.</p> <p>* Acquisition of data at the farm level on yields, prices, &amp; input costs will partially be collected through survey conducted by AGS enumerators under subcontract to NMSU.</p>	<ol style="list-style-type: none"> <li>1. Locate cost &amp; return estimates completed to date &amp; acquire from producing agencies.</li> <li>2. Work with implementing partners &amp; private sector partners to collect input cost &amp; market prices for Balkh &amp; Nangarhar representative regions.</li> <li>3. Produce representative cost &amp; return estimates for preliminary basins by stratification.</li> </ol>	<ol style="list-style-type: none"> <li>1. Budgets acquired.</li> <li>2. Table(s) of input costs &amp; commodity prices.</li> <li>3. USGS/AGS survey data from farm households on commodity yields, prices, &amp; input costs.*</li> <li>4. Cost &amp; return estimates used as inputs in water &amp; land models.</li> <li>5. Cost &amp; return estimates used as inputs in recommending irrigation technologies.</li> </ol>	<ol style="list-style-type: none"> <li>1. Existing budgets acquired &amp; assembled at AWATT SharePoint site.</li> <li>2. Tabled inputs &amp; commodity prices at AWATT SharePoint site.</li> <li>3. Cost &amp; returns data collected using farmer panels.</li> <li>4. Farm household level data on ag production from USGS/AGS survey work cataloged at AWATT SharePoint site.*</li> <li>5. Cost &amp; return budgets for key crops grown in preliminary regions specific to different locations w/in the basin provided to stakeholders.</li> </ol>

Objective	Major Activities Planned	Indicators	Measurement
<p>Transfer methods in the development &amp; use of economic decision tools to university, extension, &amp; private sector personnel.</p>	<ol style="list-style-type: none"> <li>1. Train extension &amp; private sector personnel in data collection using farmer panel approach.</li> <li>2. Train University staff in budgeting process with focus on assessing irrigation technologies &amp; practices.</li> <li>3. Workshop/training sessions (Summer 2009) at agricultural universities in Afghanistan &amp; MAIL on farm/business decision making:               <ol style="list-style-type: none"> <li>a. preparing cost &amp; return estimates</li> <li>b. farm planning &amp; decision tools</li> <li>c. application of farm decision tools to an Afghan household making decisions regarding land &amp; water use</li> <li>d. application of farm decision tools to managing a regional watershed in Afghanistan</li> </ol> </li> <li>4. Develop curriculum materials illustrating farm decision tools applied to Afghan farm households &amp; regional watershed planning in consultation with MAIL, agricultural universities of Afghanistan, ASAP &amp; A4</li> </ol>	<ol style="list-style-type: none"> <li>1. 10 extension, private sector, &amp; university persons trained in data collection via farmer panels.</li> <li>2. Workshops in farm/business training for Kabul, Nangarhar, Herat, &amp; Balkh University staff, students, &amp; extension staff.</li> <li>3. 16 total staff &amp; students trained at Nangarhar, Kabul, Herat, and Balkh Universities in economic decision tools. Training materials &amp; curriculum developed &amp; translated.</li> <li>4. Trained university staff are developing cost &amp; return estimates assisted by AWATT staff.</li> <li>5. Decision tools methodologies are added to course instruction in university courses.</li> </ol>	<ol style="list-style-type: none"> <li>1. 10 persons trained in farmer panel data collection methods by gender.</li> <li>2. Data collected by trainees using farmer panels.</li> <li>3. 4 persons trained (at each University – Nangarhar, Balkh, Herat and Kabul) in cost &amp; return methods &amp; feasibility analysis. 20 students trained. All by gender.</li> <li>4. In cooperation with AWATT, trained university personnel engaged in the budget development process.               <ul style="list-style-type: none"> <li>• New crop budgets are being produced by trained staff.</li> <li>• New feasibility assessments are being produced by trained staff.</li> </ul> </li> <li>5. From interviews post training, Balkh, Nangarhar, Herat, &amp; Kabul University students being instructed in cost &amp; return &amp; feasibility assessment methodologies.</li> <li>6. Four (4) workshops conducted in farm/business decision making.</li> <li>7. 40 total participants in attendance at workshops by gender.</li> <li>8. Interviews of workshop participants indicate tools being used for farm/business decisions.</li> </ol>

### Exhibit 9: Capacity Building for Natural Resource Management

Objective	Major Activities Planned	Indicators	Measurement
Enhance natural resource management practices in Afghanistan	<ol style="list-style-type: none"> <li>1. Workshops/training in the use of woody crops for income generation, land conservation and forest management. Work with MAIL and other appropriate ministries or projects including A4, ACC, ICAMOD, and PRTs.</li> <li>2. Workshops/training in vegetation systems to protect riparian areas &amp; irrigation systems. Work with MAIL &amp; other appropriate ministries or projects including A4 &amp; Afghan Conservation Corps (ACC).</li> <li>3. Workshops/training on soil conservation in grazing lands. Work with MAIL &amp; other appropriate ministries or projects including A4 &amp; ICARDA.</li> </ol>	<ol style="list-style-type: none"> <li>1. Workshop/training sessions in Balkh, Herat, Kabul &amp; Nangarhar</li> </ol>	<ol style="list-style-type: none"> <li>1. Twenty (20) participants at each conducted workshop.</li> <li>2. Evaluation of workshop materials &amp; translation of appropriate materials into native languages</li> <li>3. Participants develop strategic plan to extend demonstration areas planned for future</li> <li>4. Post workshop interviews showing strategic plan implementation &amp; development of new strategic plans</li> <li>5. Evidence of methods taught being employed.</li> </ol>

### Exhibit 10. Integrating Gender and Equity – Capacity Building for Afghan Women

Objective	Major Activities Planned	Indicators	Measurement
<p>1. Assess need and appropriate mechanisms for incorporating Afghan women in natural resource conservation decision making</p> <p>2. Collaborate with NGO’s such as MEDA to design and implement programs in selected districts as pilot areas that focus on and lead to benefits for Afghan women.</p> <p>3. Engage rural women in income generating activities in those selected districts</p>	<p>1. Training of women in the preservation of fruits &amp; vegetables.</p> <p>2. Training women in home gardening.</p> <p>3. Training women in raising poultry.</p> <p>4. Training women in more efficient irrigation methods for home gardening.</p> <p>5. Based on assessments and recommendations from NGO’s, focus on implementing natural conservation programs that benefit Afghan women and the natural resources in a sustainable way.</p>	<p>1. Women involved in decision making concerning programs that benefit them and their families</p> <p>2. Income enhancing programs for women and their families designed and implemented with AWATT and NGO assistance</p> <p>3. In the home gardens, irrigation techniques adopted that save water and produce more food for the family</p> <p>4. Women engaged in the programs that use fruit and vegetable preservation methods, raise poultry, and other family income generating activities</p>	<p>1. Sixty (60) women trained in income generating activities in provinces of Balkh and Nangarhar.</p> <p>2. Via interviews with those 60 women, natural resource conservation awareness is elevated.</p> <p>3. Again using these 60 women as information generating subjects, the majority believe that as a result of program intervention their self esteem has increased and their families have benefitted from the interventions.</p>

### Exhibit 11. Alternative / Renewable Energy for Agricultural Productive Uses in Afghanistan

Objective	Major Activities Planned	Indicators	Measurement
<p>Capacity building for MAIL MEW, MRRD, extension professional, university faculties, NGOs on renewable energy for agriculture applications.</p> <p>Increase forage production for farmers in non-irrigated areas in Balkh Province through water pumping.</p> <p>Increased forage production for herders through water pumping of subsurface water in arid regions.</p> <p>Increased markets for high value Afghan crops using solar crop drying for fruits and vegetables with Afghan women’s agricultural groups.</p>	<ol style="list-style-type: none"> <li>1. Training on productive uses of renewable energy for agricultural development in non-electrified regions of Afghanistan.</li> <li>2. Establish forage production through water pumping from tube wells in areas that cannot be irrigated via canals.</li> <li>3. Establish forage production through water pumping from tube wells in areas used by herders to improve forage for livestock.</li> <li>4. Installation of more efficient solar crop drying for fruits and vegetables and solar market branding with MEDA Afghan women’s groups.</li> </ol>	<ol style="list-style-type: none"> <li>1. Training conducted on diverse economically productive use applications of renewable energy for agricultural production in Kabul.</li> <li>2. Drip irrigation of forage crops in drylands through the installation of water pumping systems using solar and/or wind energy in Balkh</li> <li>3. Drip irrigation of forage crops in Balkh drylands through the installation of water pumping systems using solar and/or wind energy</li> <li>4. Production of high quality dried fruits and vegetables in Parwan province.</li> </ol>	<ol style="list-style-type: none"> <li>1. Workshop on renewable energy technologies for agriculture and count of number of participants and summary of course evaluations.</li> <li>2. Two solar/wind water pumping systems installed. Assessment of economic impacts on farmer productivity.</li> <li>3. Installation of 4 solar/wind water pumping systems for forage production. Assessment of economic impacts on herder productivity.</li> <li>4. One solar crop dryer installed and measurement of economic impacts for Afghan women’s agricultural groups.</li> </ol>

