TECHNOLOGY NEEDS ASSESSMENT FOR CLIMATE CHANGE ADAPTATION IN AFGHANISTAN

TECHNOLOGY ACTION PLAN & PROJECT IDEAS

(AGRICULTURE AND WATER SECTORS)
Report- III

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TECHNOLOGY ACTION PLAN
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[AGRICULTURE AND WATER SECTORS] ADAPTATION TECHNOLOGIES

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FOREWORD

Technology Needs Assessment (TNA) is generally aimed at enhancing adaptation to climate change in Afghanistan. A national stakeholder consultation process, resulted in the selection of the agriculture and water sectors. The two sectors are closely linked since water availability in various forms support agricultural production and ensures food security. On the other hand, a well-managed agricultural system also supports water availability.

This report on 'Technology Action Plan/ Project Ideas' is a final output of the Technology Needs Assessment project, funded by the Global Environment Facility [GEF] and implemented by the United Nations Environment Program (UNEP) and the UNEP - DTU Partnership in collaboration with Asian Institute of Technology, Thailand [AIT]. This TNA process in Afghanistan is being undertaken since July 2019, with the National Environmental Protection Agency [NEPA] in lead.

In the TAP, four and six technologies were prioritized for each of the water and agriculture sectors respectively . For the water sector, the prioritized technologies are [1] Rainwater collection from ground surface,[2] Small dams and micro catchment,[3] Micro irrigation system efficient water use and management, and [4] Integrated water resource management. There were also six prioritized technologies for the agriculture sector namely [1] Introduction of plant varieties resistant to climate change, [2] Agro-forestry, [3] Conservative Agriculture, [4] Crop diversification and new varieties, [5] land use planning, and [6] Responsive agricultural extension.

After identifying the prioritized technologies, well-designed plans were proposed by stakeholders. These were target groups to receive the technologies.

In the water sector, stakeholders projected that the prioritized technologies will be deployed to 400 communities nationwide at an estimated cost of fourty seven million, two humdred and four thousand United States Dollars [$47,204,000].

With regards to the agriculture sector, it is planned that the identified technologies will be deployed to all 80 farmers in each of the 500 selected communities nationwide. The total estimated cost is seventy eight million, six hundred, eleven thousand and four hundred United States dollars [$78,611,400].The report is the result of a fully country driven, participatory process. Views and information in this report is the product of extensive discussions with technology expert team and stakeholders.

It is expected that the cost of the proposed technologies will not in itself constitute a barrier to the transfer and diffusion of the technologies and that, development partners, bilateral and multilateral donors, Green Climate Fund [GCF] and friends of Afghanistan will ensure enough resources for the TAP to be implemented.

Shah Zaman Maiwandi

Director General
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April, 2021

PREFACE

The TNA Project Team is immensely grateful to the Government of Afghanistan, the National Environmental Protection Agency NEPA and the United Nations Environment Program and Technical University of Denmark UNEP-DTU Partnership, and Climate Technology Centre & Network (CTCN) will play an effective role in the process significantly.

We also are grateful to Asian Institute for Technology (AIT) for their technical assistance, which guided the preparation of this report significantly. I am pleased to note that the entire TNA process from prioritizing sectors and technologies, setting preliminary targets for transfer and diffusion of technologies, identifying barriers and suggesting an enabling framework for overcoming the barriers and now Technology Action Plan (TAP)/ Project Ideas report in this final phase-III of the TNA project was country-driven.

We acknowledge the implementation role of UNEP and the funding that came from the GEF. I would like to thank the members of the TNA National Team and my colleagues in Government, National and international NGOs experts from the Adaptation Working Group for their invaluable contributions to the preparation of this report. This report marks an important milestone in the project implementation in Afghanistan and we are grateful to all organizations and individuals who assisted in its completion.

Dr. Mohammad Gulab Omari
Lead Expert
September, 2021

ABBREVIATIONS	
ADB	Asian Development Bank
AIT	Asian Institute of Technology
AMD	Afghanistan Metrological Department
ANAU	Afghanistan National Agricultural Union
ANTC	Afghanistan National Trust Commission
AWADE	Afghanistan Water and Agriculture Development Enterprise
BAEF	Barrier Analysis and Enabling Framework
BCM	Billion Cubic Metter
CA	Conservation Agriculture
CBEAs	Community Based Extension Agents
CBOs	Community Based Organization
CC	Climate Change
CANGO	Coordinating Assembly of NGOs
COP	Conference of the Parties
C&I	Criteria and Indicators
CTCN	Climate Technology Center and Network
DTU	Technical University of Denmark
EWS	Early Warning System
FAO	Food and Agriculture Organization
GE	Global Environment
GoA	Government of Afghanistan
HEIS	High efficiency irrigation system
HR	Human Resource
HRD	Human Resource Development
IEC	Information, Education and Communication
ICARDA	International Centre for Agricultural Research in Dry Areas
IFAD	International Fund for Agricultural Development
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
LID	Low Impact Development
LUP	Land Use Planning
IWRM	Integrated Water Resource Management
M&E	Monitoring and Evaluation
MAIL	Ministry of Agriculture, Irrigation and livestock
MCIT	Ministry of Communication and Information Technology
MPW	Ministry of Public works
MIC	Ministry of Industry and Commerce
MICT	Ministry of Information, Culture and Tourism
MOF	Ministry of Finance
MEW	Ministry of Energy and water
ME	Ministry of Economics
MRRD	Ministry of Rural Rehabilitation and Development
MPH	Ministry of Public Health

NEPA	National Environmental Protection Agency
NGOs	Non-Governmental Organizations
NWARA	National Water Affairs Regulation Authority
R&D	Research and Development
RAE	Responsive Agricultural Extension
RBM	River Basin Management
RWC	Rain Water Collection
PI	Project Ideas
SLM	Sustainable Land Management
TAP	Technology Action Plan
TNA	Technology Needs Assessment
ToRs	Terms of References
UNDP	United Nations Development Programme
UNEP-DTU	United Nations Environment Programme-Denmark Technical University
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
USAID	United States Agency for International Development
WB	World Bank
WAPDA	Water and Power Development Authority
WASA	Water Sanitation Authority

Weights and measures

BM^3	Billion Cubic meter
ha	Hectare
km^2	Square kilometre
$m^3/yr.$	Cubic meters per year
MAF	Million acre-foot
M^3	Cubic meter
Mh	Million hectares
mm/year	Millimetre per year

Contents

Executive Summary 1
Chapter 1: Technology Action Plan and Project ideas for the Water Sector of Afghanistan 3
1.1 TAP for Water Sector 3
1.1.1 Sector overview 3
1.1.2 Preliminary technology targets 4
1.1.3 Barriers at sector level and proposed measures to overcome barriers 5
1.1.4 Action Plan at sectoral level 5
1.2 Action plan for ground surface rainwater collection technology 6
1.2.1 Intoduction 6
1.2.2 Ambition for technology transfer and diffusion 6
1.2.3 Barriers to the diffusion of technology and the meaures 7
1.2.4 Action and Activities for inclusion of technology Action Plan 8
1.3. Action Plan for the Transfer and Diffusion of Small Dams and Micro Catchment 14
1.3.1 Intoduction 14
1.3.2 Ambitions for Technology transfer and diffusion 14
1.3.3 Barriers to the diffusion of technology 15
1.3.4 Actions and Activities Selected for Inclusion in the Technology Action Plan for small dam and micro catchment 16
1.4. Action Plan for the Transfer and Diffusion of Micro irrigation system for efficient water use and management 20
1.4.1 Intoduction 20
1.4.2 Ambition for the TAP 20
1.4.3 Barriers to the TAP 21
1.4.4 Proposed action plan for the Micro irrigation system for efficient water use and management 22
1.5 Action Plan for Integrated Water Resources Management 28
1.5.1 Introduction 28
1.5.2 Ambition for TAP 29
1.5.3 Barriers and Measures to Overcome Barriers 29
1.5.4 Selection of Actions and Activities for the TAP 30
1.6 Project Ideas for Water Sector 39
1.6.1 Brief summury of the project ideas for water sector 39
1.6.2 Specific project ideas for Rainwater Collection from ground surface 39
1.6.3 Specific Project Ideas for small dams and micro catchment technology 41
1.6.4 Specific project ideas for Micro irrigation system for efficient water use and management technology 43
1.6.5 Specific project idea for IWRM technology 45
Chapter 2: Technology Action Plan for the Agriculture Sector of Afghanistan 48
2.1 At sector level 48

2.1.1 Sector overview 48
2.1.2 Preliminary technology targets 48
3.1.3 Barriers at sector level and proposed measures to overcome barriers 49
2.1.4 Action plan at sectoral level 50
2.2 Action Plan for the Diffusion of Plant Varieties Resistant to Climate Change 51
2.2.1 Introduction 51
2.2.2 Ambition for TAP 52
2.2.3 Barriers and measures to overcome the barriers 52
2.3. Action Plan for the diffusion and transfer of Agroforestry technology 58
2.3.1 Introduction 58
2.3.2 Ambition for the TAP 58
2.3.3 Summary of barriers and measures to overcome barriers 58
2.3.4 Proposed action plan for agro forestry 59
2.4 Action Plan for Conservation Agriculture 62
2.4.1 Introduction 62
2.4.2 Ambition for the TAP 63
2.4.3 Summary of barriers and measures to overcome barriers 63
2.4.4 Action Plan for Conservation Agriculture 63
2.5 Action Plan for Crop diversification and new varieties 67
2.5.1 Introduction 67
2.5.2 Ambition for the TAP 68
2.5.3 Barriers and Measures to Overcome Barriers 68
2.5.4 Action Plan for Crop Diversification and new varieties technology 68
2.6 Action Plan for Land Use Planning Technology 78
2.6.1 Introduction 78
2.6.2 Ambition for technology transfer and diffusion 79
2.6.3 Barriers to the technology's diffusion 79
2.6.4. Proposed Action Plan for the Technology 80
2.7 Action Plan for Responsive Agricultural Extension 86
2.7.1 Introduction 86
2.7.2 Ambition for Transfer and Diffusion of RAE 86
2.7.3 Barriers to Promotion and Diffusion of RAE 86
2.7.4 Action plan for responsive agriculture 87
2.8 Project ideas for the Agriculture sectors of Afghanistan 90
2.8.1 Breif summury of project ideas for Agriculture sector 90
2.8.2 Specific project ideas for the Development and diffusion of plant varieties resistant to climate change 90
2.8.3: Specific project ideas for Agroforestry technology 93
2.8.4: Specific project ideas for Crop Diversification technology 94

2.8.5: Specific Project Ideas for Conservation Agriculture 95
2.8.6: Specific project idea for Land Use Planning technology 97
2.8.7: Specific project idea for Responsive Agriculture Extension (Increase awareness and promotion of modernize agriculture system in Afghanistan through demonstration plots and audio-visual information) 98
Chapter 3 Cross-cutting Issues 101
(A)Water and Agriculture sector: 101
(B) Gender: 102
(C) Stakeholders Coordination 102
(D) Barriers and Opportunities 103
(E)Technology Transfer 103
References 104
Indexes 106

Executive Summary

Technology Needs Assessments (TNAs) are a key component of the UNFCCC supported technology transfer framework, originated in Marrakesh Conference of the Parties (COP)-7 in 2001. The TNA is a set of country-driven activities that support developing countries Parties to the UNFCCC to determine their climate related technology priorities in order to mitigate or adapt to the adverse impacts of climate change.

Afghanistan started its TNA process in 2019. Extensive consultation processes with the sectoral stakeholder working group and other experts identified water and agriculture as the two most climate-vulnerable sectors along with ten prioritized climate adaptation technologies for both sector. Four top priority technologies for the water sector involved Rainwater collection from the ground surface, Small dams and micro catchment, Micro irrigation system for efficient water use and management and Integrated water resource management; for the agriculture sector, the prioritized technologies identified were six: Introduction of plant varieties resistant to climate change, Agro-forestry, Conservative Agriculture, Crop diversification and new varieties, land use planning, and Responsive agricultural extension. In the next step, technology barrier analysis was performed to identify different key barriers to the diffusion and replication of these prioritized technologies. Based on the findings, a framework for creating a technology-enabling environment was constructed and proposed. Subsequently, 'Technology Action Plan (TAP) and Project Ideas (PI)'- were developed for each technology under the prioritized sectors.

This report presents different TAPs & PIs for water and agriculture sectors of Afghanistan. TAP and PI represent the third and final phase of TNA cycle, and systematically suggests practical actions necessary to adapt or reduce technology related barriers identified in the earlier phases of the TNA cycle. In addition, the report proposes ten project ideas based on each of the prioritized technologies which may attract international donor financing for the implementation of any one, or all of these project ideas. A brief summary of TAPs, and PIs developed for the agriculture and water sectors of Afghanistan are given below:

The water sector in Afghanistan intensively relies on the rivers and its tributaries to meet the needs and growing demands of the various water-dependent sectors such as agriculture, energy, and industry and various domestic purposes. Agriculture is the major consumer using approximately 90 percent of the total available water especially, for irrigation purposes. Climate change is also expected to have long- term severe influences on water and food securities. The effect will very likely not be uniform in the country, but mainly defined by variations in demographics, agricultural practices and the nature and sustainability of fresh water sources.

In this report, Chapter-1 on Water Sector Technology Action Plan outlines a brief description of the sector followed by brief summary of the barricades and enabling measures to the four highlighted water sector technologies diffusion. The primary targets to attain the successful diffusion and transfer of these technologies in the country are as below:

i. Construction of 1,500 community and public-run ground surface rainwater collection reservoirs each with a capacity range of between 20,000 m^3 to 40,000 m^3 contingent on the water needs, vegetation type, slope, catchment area, soil type etc. By 2027, particularly in dry land (rain fed) areas of the country;
ii. Upgrading small dams and micro catchment substructures in10 main towns by 2024;
iii. Outline of low impact development (LID) substructure in 10 main towns as a tactic for urban storm water management by 2025;
iv. Building a groundwater recharge systems for groundwater situation improvement.
v. Setting up of drip/sprinkler irrigation system on around 0, 6 million hectors of agricultural land by 2025.

Afghanistan is mostly an agricultural country with the most number of the labour employed in this sector. The sector, however, is the most exposed to the impacts of climate change. According to climate model projections for the sector, the agricultural productivity will decline by 10-15 % by the year 2050.The Chapter-2 on the Agriculture Technology Action Plan in this report, summaries a brief description of the sector followed by a brief outline of the barriers and enabling measures to the prioritized agriculture sector technologies. The chapter also recognizes some primary targets to attain the successful diffusion and transfer of these technologies in the country. The proposed targets are:

i. Promotion and development and of new and high productivity drought tolerant varieties for the arid and semi-arid areas of the country by 2025;
ii. Fortify the organizational structure of the allied authority in the country and build capacity of crucial stakeholders especially, growers via providing drill on efficient technologies;
iii. Improvement of the extant agriculture R&D centers in each province.

Chapter 1: Technology Action Plan and Project ideas for the Water Sector of Afghanistan

1.1 TAP for Water Sector

1.1.1 Sector overview

The existing water resources in Afghanistan are under substantial stress due to rapidly growing population size, fast rate of urbanization and subsequent unplanned land use changes. The country has considerable water resources from rainfall on its mountains with more than 80% of the water originate from snowmelt in the Hindu Kush Mountains. In the country's eastern part having highest elevation, the snow buildup contributes to continual water resources storage (Ahmad and Wasiq, 2004).

The present valuations show that Afghanistan has 75 BM^3 (billion cubic meters) of water resources with 20 BM^3 groundwater and 55 BM^3 surface water (FAO, 2016). The estimated annual amount of water used in irrigation is 20 BM^3 , which is 99% of all the pumped water and the overall groundwater withdrawal volumes to about 3 BM^3 . Around 15% of the entire annually used water initiates from springs and groundwater aquifers while, 85% from streams and rivers. The contribution of the groundwater usage from deep wells is less than 0.5%. The per capita annual water availability is about 2,500M^3 , comparable with other countries, for example, with Iran (1,400) and Pakistan (1,200 M^3 per capita annually) (Qureshi, 2002).

The amount of water received in the country through precipitation (327 mm/year) is estimated to be around 213.5 km^3 per year (FAO 2016). According to current estimates, Afghanistan has 65.3 km^3 of potential water resources produced annually out of which 55.7 km^3 is surface water and 10.65 km^3 is groundwater. Out of the total surface water produced, about 18.18 km^3 is externally produced while 37.5 km^3 is produced internally.

The country's water sector conveys a multi-user profile that meets the water demands of agriculture and industry sectors as well as numerous domestic purposes. Presently, 3.9 million ha is cultivated land with 1.3 million and 2.6 million ha by means of rain-fed and irrigation practices, respectively. However, the possible irrigable area is about 5 million ha, double of the under-irrigation area. During the past 30 years of conflict, "about 4,850 irrigation networks were destroyed and do not work at all." Land under irrigation decreased from about 3.0 million ha before 1978 to only 1.5 million ha by 2002 (UNAMA, 2016).

The agriculture-based economy demands for the management and conservation of extant and potential water resources on sustainable basis for attaining a climate resistant growth according to the current climate projections of the country, specify cumulative doubt in spatial and temporal incidence of precipitation across the country.

Water availability for irrigation purpose is a function of the seasonal variation of stream flow and groundwater availability. The irrigation network in Afghanistan has a share of 88% unlined irrigation canals, which causes around 40% of the total water losses across the country (Qureshi, 2002).

However, having considerable water resources for crop irrigation and livestock, the country suffers from poorly maintained or spoiled extant irrigation systems and its overall poor performance (Torell & Ward, 2010). As for a long time, the country's agriculture relied on

irrigation, the war has caused in lack of information and 30 years isolation caused the water management technologies to be deficient (Groninger & Lasko, 2011).

Technological development and innovation could play a critical role to achieve food and water security targets of the country considering uncertain climatic conditions cast by climate change by the end of this century.

1.1.2 Preliminary technology targets

To ensure successful and sustainable adoption and transfer of these four technologies namely Micro irrigation system for efficient water use and management, Integrated water resource management, Small dams and micro catchment and Rain water collection from ground surface. This documents identifies and list a set of preliminary targets, actions and activities based on the country's necessities for the transfer and diffusion of these above-mentioned technologies in water sector. Due to pandemic conditions at the beginning of 2021, this was done via skype meetings as well as phone interview with the stakeholders (annex. 1). After discussions, they determined that it is dependant on availability of sufficient funds for implementation of such activities and targets, which are as below:

1. To build up approximately 1,500 public and community-run surface rainwater collecting tanks having capacity around 20,000- 40,000 m^3 by 2027.
2. To build and modernize the small dams structures of 10 main cities by 2024.
3. Setting standards for LID (low impact development) structure in 10 key towns as a tactic for rainwater management by 2025.
4. Construct efficient irrigation systems in dry regions and install micro (drip/sprinkler) irrigation system on around 0.6 million hectares of agriculture farmlands in the country's arid and semi-arid areas by the year 2025.
5. To deploy climate change adaptation measures for improving climate change adaptation and disaster resilience in all river basins to alleviate the risk of floods, storms and drought along with preventing soil erosion and maintaing the present fertility status of the soil.
6. Building the capacity of local persons for meeting the demand of technical assistance in the installation of micro irrigation technology country wide and demonstration project, and also micro irrigation system on 0.6 million hectares of land in the next 5 years.

To achieve these preliminary targets of transfer and diffusion of technologies in water sector, the relevant stakeholders and players have to get involved and play active role in the successful implementation of technologies. The important stakeholders include water sector policy makers, experts, relevant ministries of Water and Food Security and Research, Water and Power, Climate Change and its connecting departments at the provincial level besides National and Provincial Commission on Status of Women (as women and girls being the important stakeholders in this debate). Other players include technology dealers, technicians, and experts in water and irrigation sector. The implementers include NGOs and CBOs focusing on water issues, advocacy groups of women, youth and community leaders active at local and national levels.

1.1.3 Barriers at sector level and proposed measures to overcome barriers

This section looks into the barriers common to the diffusion of water sector prioritized technologies. An attempt has been made to find some common measures that would create an enabling environment for the sustainable diffusion and replication of these technologies in the relevant sector.

Table 1.1: Common barriers and measures to the diffusion of prioritized adaptation technologies in water sector of Afghanistan.

Barrier category	**Barriers**	**Measures to overcome barriers**
Economic & financial	-High capital and maintenance costs -Limited financial allocation -Inadequate donor funding	-Provision of adequate and dedicated funding -Provision of subsidy or loans -Attract more donor funding
Policy, legal and regulatory	-Lack of comprehensive cross sector policies for resource protection, development and management of water resources	-Approve water sector policy with consensus and government ownership -Devise and implement strong legislative and regulatory measures for surface and groundwater protections - Mainstream climate change considerations into relevant sector polices, plans and strategies
Information & awareness	Limited information and awareness on the existence and usefulness of the water sector prioritized technologies	- Run information and awareness campaigns particularly through social media -Strengthen and operationalize the technology stakeholders networks
Institutional and organizational capacity	-Limited institutional capacity -Limited human skills and training to maintain technologies especially at local level	Strengthen human skills through technical trainings

1.1.4 Action Plan at sectoral level

At the sectoral level, three broad priority actions are proposed:

i. Increasing the water storage capacity in the country in order to ensure water sustainability and the enhanced resilience of the local communities;

ii. Ensuring the sustainable use of water resources or aquifers so that the high abstraction in the country's over-exploited areas are controlled, recharged, and sustained for the benefits of economically essential sectors, communities, and individuals.
iii. Increasing the Improvement of micro irrigation systems and awareness at the community level.

1.2 Action plan for ground surface rainwater collection technology

1.2.1 Intoduction

Rainwater collection from ground surfaces (RWC) is basically a collection, diversion and storing of rainwater to supplement other formal setup of water collection and distribution system for a community for its later use during dry periods. Rainwater collected from ground surface is typically used for non-potable purposes, including irrigation, livestock and general domestic uses. From the last many decades, rainwater collection (RWC) is adopted in arid and semi-arid regions of Afghanistan, particularly in rain-fed zones as an important measure in dry land regions for controlling desertification in order to ensure the availability of water for irrigation, livestock and domestic purposes to the concerned communities.

Current irrigation methods irrigate 10% of the overall irrigated area in the country whereas, traditional irrigation methods by means of canal denote about 75% underground aqueducts (Karezes) while, the remaining 15 % of the country's irrigation water is supplied by springs and wells (Hussain *et al.,* 2008).

The technology offers many benefits during seasonal dry periods and droughts especially in the face of climate change that is projected to increase the variability and intensity of rainfall in the long run. Rainwater collection also helps to stabilize the depleting groundwater level, while the storage infrastructure can reduce land erosion and flood inflow to major rivers. It acts as a convenient source of stored water that could enhance agricultural productivity, decrease travel time for rural women to remote water resources, resulting in better health and time for social activities.

1.2.2 Ambition for technology transfer and diffusion

The main target group for this technology is those communities in dry land areas of the country with high risk of water shortages and face critical challenges in accessing clean water for domestic purposes, livestock and irrigation use. The preliminary proposed target for the transfer and diffusion of RWC technology is to construct 1,500 community and public-run surface rainwater collection from ground surface by 2025, each with a capacity between around 20,000- 40,000 m^3 depending on the water requirement of the community and other local physical conditions such as size of catchment area, slope angle, soil and vegetation types etc.

1.2.3 Barriers to the diffusion of technology and the meaures

Some key barriers to the adoption of the technology at local levels are various economic and financial challenges which include insufficient resources such as low program budget compared to high cost of feasibility study, and construction and maintenance of reservoirs. There is also an additional cost of maintenance and repair of water conveyance structures that are damaged during floods. Another important barrier category is associated with weak technical, institutional and organizational capacities of the national and local institutions involved in irrigation and flood management. This includes both government departments and line ministries, and farmers' organizations and water user groups working with the government organizations.

In case of indigenous flood irrigation systems, the local water and land ownership rights are quite ambiguous due to weak, or sometimes non-existent, regulatory and legislative statutes governing water management and distribution at the local levels. The absence of or low understanding of water rights directly translates into an inequitable distribution of water among farmers and other water beneficiary groups creating some serious conflicts among the community members. The concerned government departments and line ministries typically offer limited external support to the community water managers who already suffer from severe capacity issues.

To overcome these barriers, the following measures are proposed:

i. To offset high initial cost of construction of water channels, diversions and water reservoirs, the government should ensure sufficient funding for the concerned departments through dedicated budgetary allocations in provincial and district level and attracting some international donors funding;
ii. Design and implement various strong policy instruments to deal with various regulatory and legislative issues concerning RWC technology. A key starting point could be the review of and necessary amendments in water and land rights in order to support swift and sustainable technology adoption;
iii. Start awareness campaign on the future negative impacts of climate change on our water resources and how it would affect the productivity of key sectors of agriculture, energy and industry, and the resilience of individuals and the society in the long-term future;
iv. To improve ownership of the technology at the national and local levels, the participation and engagement of local community should be held mandatory during the key stages of decision-making processes by government officials;
v. Increase financial support to relevant R&D institutions in order to enhance their technical capacity.

It is expected that the successful implementation of the proposed technology action plan will help in its wider and swifter adoption and diffusion in the society, as well as would ensure easy access to water and improve the overall resilience of the households and communities in the face of climate change.

1.2.4 Action and Activities for inclusion of technology Action Plan

Coordination in evaluation and analysis as well as in improvement of relevant sectoral policies to support related sectors and sub-sectors of water with cooperative mechanism between related sections, local government and farmer association with Irrigation departments. Consciousness conception and capacity building, capacity needs assisment of key stakeholders based on awareness, behavior and trainings on climate change education. Studies on prioritization of areas requiring rain collecting reservoirs and to identify sites for construction of reservoirs and construction of rainwater collecting channels and reservoirs.

Table 1.2: Proposed action plan for ground surface rainwater collection technology

SECTOR: WATER							
Technology: Rainwater collection from ground surfaces							
Ambition: Construction of 1,500 community and public-run surface rainwater collection from ground surface by 2025.							
Benefits: Stabilize of depleting groundwater level while the storage infrastructure can reduce land erosion and flood inflow to major rivers.							
Action 1: Ensure sufficient yet dedicated supply of funding for the government departments involved in different key aspects of the technology.							
Sr. NO	**Activities**	**Efficiency**	**Responsible agencies**	**Time scale**	**funding source**	**Indicators of success and Risk**	**Budjet Per Activity** US$
1-1	Allocate dedicated funding in the annual development budgets, on priority basis for the construction of 1,500 water reservoirs	**High**	MAIL, NEPA, MRRD, NWARA, MEW	**0-10** years	ADB, WB, MOF, UNDP, WFP, IMF	Success: 10-30 % funding increase in the annual budget Risk: Lack of funding,	0.5. Million
1-2	Advocacy campaign targeting policy makers and legislators for gaining support on funding	**Low**	MAIL, NEPA, MRRD, NWARA, MEW	0-3 years	ADB, WB, MOF, UNDP, WFP, IMF	Success: Policy support on technology Risk: Poor campaign targets	30.000
1-3	Strengthen administrative mechanisms for attracting fund from donor agencies	**High**	MAIL, NEPA, MRRD, NWARA, MEW	0-5 years	ADB, WB, MOF, UNDP, WFP, IMF	Success: Strong administrative mechanisms. Risk: Change in policy or policy support	50,000

1-4	Provide financial and technical assistance on priority bases to farmers collecting RW	**Medium**	Provincial Agriculture and Irrigation Departments	0-5 years	ADB, WB, MOF, UNDP, WFP, IMF	Success: Number of farmers adopting technology on self-help bases Risk: Lack of funding	550,000
Action 2: Build and strengthen the institutional capacity of the responsible organizations to undertake pre-feasibility studies and site selection.							
2.1	Enhance financial support to R&D institutions for enhancing their capacity	**High**	MAIL, NEPA, MRRD, NWARA, MEW, ME	0-3 years	ADB, WB, MOF, UNDP, WFP, IMF	**Success**: Availability of well-trained qualified professionals **Risk:** Human and technology performance risk	2 million
2.2	Arrange prioritization of regions in dire need of rainwater collecting reservoirs and identification of potential sites.	**High**	MAIL, NEPA, MRRD, NWARA, MEW, ME	0-5 years	ADB, WB, MOF, UNDP, WFP, IMF.	**Success:** Availability of well-documented Feasibility studies. **Risk:** Human performance risk	1.0 million

2.3	Arrange trainings on need-based manner and also skills of researchers though training /workshops and foreign visits	**High**	MAIL, NEPA, MRRD, NWARA, MEW	0-5 years	ADB, WB, MOF, UNDP, WFP, IMF.	**Success:** Availability of well-trained qualified professionals **Risk:** Low quality of training programs	200,000
2.4	Adopt flexible Communication strategy to promote interagency coordination	**Medium**	MAIL, NEPA, MRRD, NWARA, MEW	1-3 years	ADB, WB, MOF, UNDP, WFP, IMF	**Success:** Increased coordination. **Risk:** No appreciable risk	100,000
2.5	Promote transfer of knowledge (specifically indigenous one) through building research collaborations among experts at regional and international organization working on the same issues	High	MAIL, MEW,	1-5 Years	ADB, WB, MOF, UNDP, WFP, IMF	**Success:** Increased research collaboration. **Risk:** No appreciable risk identified	300,00 0
Action 3: Raising knowledge on operation and management practices of rainwater harvesting systems through involvement of local communities.							

3.1	Awareness creating on good operation and management practices and change in water use behavior by organizing campaigns to raise awareness on importance of rainwater collection, water saving and efficiency	**High**	MAIL, NEPA, MRRD, NWARA, MEW, MCIT	**2-4** years	ADB, WB, MOF, UNDP, WFP, IMF	**Success:** Number of awareness programs Risk: No appreciable risk identified	400,000
3.2	Ensure participation of local communities in all stages of decision making process trough committees to ensure sustainability of Technology	Medium	DAIL	**0-5** years	ADB, WB, MOF, UNDP, WFP, IMF	**Success:** Communities active participation Risk: Lack of political/ administrative support	400,000
3.3	Encourage communities to establish reservoirs. operator organizations.	Medium	DAIL, NEPA	**0-3** years	ADB, WB, MOF, UNDP, WFP, IMF	**Success:** Communities active participation Risk: Lack of political/ administrative support	400,000
Action 4: Design appropriate legislation/regulation regarding rainwater collection policy							

4.1	Develop and implement technology support policy and necessary regulations.	High	MEW, MAIL, NEPA, MRRD, NWARA, MEW	**1-3** years	ADB, WB, MOF, UNDP, WFP, IMF	**Success:** Development of technology supporting regulations Risk: Lack of political and administrative support	250,000
4.2	Develop regulation on the role and responsibilities of stakeholders in management, utilization and operation of rainwater reservoirs.	Medium	MAIL, NEPA, MRRD, NWARA, MEW	0-3 years	ADB, WB, MOF, UNDP, WFP, IMF	**Success:** Development of technology supporting regulations Risk: Lack of political and administrative support	150,000
Total cost: US$							6,330,000

1.3. Action Plan for the Transfer and Diffusion of Small Dams and Micro Catchment


1.3.1 Intoduction

Although small dams and micro-catchment are low cost, low tech adaption options and have been implemented in Afghanistan, the implementation of these technologies remains a challenge due to a number of reasons. The investment cost is a significant obstacle if funding is not available, especially when a community based approach is selected. Based on a study in Northern provinces (Dany and Vuthy 2011), local investments were available for construction of sub canals only in selected locations. Operation and maintenance of the system also requires budget and good organization of water user groups.

A micro dam is a small reservoir, which can be lined with clay or concrete and used for storage of water for agricultural irrigation. It was selected to provide an alternate source of water for farmers who have to rely on rainfall to grow vegetables. Runoff is captured and stored in the dam, which could also help to reduce flooding. It could be constructed on a hillside as well as on flat terrain.

As the rainfall becomes more erratic the demand for irrigation has been growing. A micro dam provides a reliable access to irrigation water and acts as a buffer to the variability of the rainfall regime and increases resilience against dry spells during the rainy season, as well during the dry season.

A micro dam can help farmers to adapt to water shortages brought about by climate variability and change by providing them with a reliable supply of water. It has the potential to allow farmers to grow a wider variety of vegetables especially during dry season providing farmers with an increase in income and increased food security.

While initial cost of constructing a micro dam is high especially if it is lined with concrete there are several benefits. They include a reduction in the use of potable water for nonpotable purposes, reduced river abstraction resulting in the maintenance of the ecological flows in rivers especially during the dry season and improvement in the livelihood of farmers.

Because these technologies are collective assets, collective action would be required to operate and maintain the systems. To enable the diffusion of these technologies, the following action plan is proposed.

1.3.2 Ambitions for Technology transfer and diffusion

7. According to the water deficit map, the country receives the least amount of rainfall and generally rely on irrigation to grow fruits and vegetables in the dry season but more recently

irrigation is required almost year-round in order to grow fruits and vegetables. The target is to construct micro-dams micro catchment for the country as a source of irrigation water for vegetable and fruit production year round program for the country, including a demonstration project, and to develop a cadre of local persons trained and certified in the design and construction of the small dam hence, it is aimed to build around 100 small dams structures in 10 main cities by 2024.

1.3.3 Barriers to the diffusion of technology

Some key barriers to the adoption of the technology at local levels are various economic and financial challenges which include insufficient resources such as low program budget compared to high cost of feasibility study, Limited investment Lack of access to financial capital, and construction and maintenance of small dams and micro catchments. There is also an additional cost of maintenance and repair of water conveyance structures that are damaged during floods. Another important barrier category is weak technical, institutional and organizational capacities of the national and local institutions involved in agriculture irrigation and flood management. This includes both government departments and line ministries and farmers' organizations along with water user groups working with the government organizations.

In case of indigenous flood irrigation systems, the local water and land ownership rights are quite ambiguous due to weak, or sometimes non-existent, regulatory and legislative statutes governing water management and distribution at the local levels. The absence of or low understanding of water rights directly translates into an inequitable distribution of water among farmers and other water beneficiary groups at the community level creating some serious conflicts among the community members. The concerned government departments and line ministries typically offer limited external support to the community water managers who already suffer from severe capacity issues.

To overcome these barriers, the following measures are proposed:

1. To balance high initial construction cost of micro dams, the government is to ensure funding to concerned departments through budgetary allocations in provincial and district level and attracting some international donors funding;
2. Design and implement various policy instruments dealing with several regulatory issues regarding the technology. A vital first step could be the review of and essential amendments in water and land rights to support sustainable technology adoption;
3. Initiate consciousness movement on the adverse effects of climate change on water resources in the future and its effects on the of agriculture, energy and industry sectors' productivity, and the resilience of individuals and the society in the long-term future;
4. To improve ownership of the technology at the national and local levels, the participation of local community should be held obligatory during the vital stages of decision-making by government officials;
5. Rise financial support to pertinent R&D organizations for enhancing their technical capacity.

It is expected that the successful implementation of the proposed technology action plan will help in its wider and swifter adoption and diffusion in the society, as well as would ensure easy

access to water and improve the overall resilience of the households and communities in the face of climate change.

1.3.4 Actions and Activities Selected for Inclusion in the Technology Action Plan for small dam and micro catchment

The actions and activities for inclusion were selected from the measures identified to overcome the barriers to the diffusion of the technology. The barriers were identified using the Problem Tree methodology, while the measures were identified using the Solution Tree methodology. The actions and activities were prioritized for inclusion in the TAP.

Table 1.3: Action Plan for Small-Dam and micro catchment Technology

Sector: Water							
Technology : Small Dams and micro catchment							
Ambitions: Construction of micro-dams micro catchment as a source of irrigation water for production including a demonstration project, and to develop a cadre of local persons trained in the design and construction of the small dam.							
Benefits: Year round vegetable and fruit production; Increase in farmers income, water availability during dry season and food security; Reduction in risk of flooding.							
Action 1 Construction of demonstration small dam							
Activities	**Efficiency**	**Sources of funding**	**Responsible body and focal point**	**Time frame**	**Risks**	**Success criteria**	**Budget per activity** US$
Activity 1.1 Selection of site for micro dam	**High**	GoA, WB,ADB,Climate change funds	NWARA ,MAIL,NEPA,MEW	3 months	Farmers are not available	Site selection completed	60,000
Activity 1.2 Procurement of consultancy services	**Medium**	GoA, WB,ADB,Climate change funds	NWARA ,MAIL,NEPA,MEW	3 months	Delay due to administrative procedures	Consultant hired	40,000
Activity 1.3 Design and costing of micro dam	**Medium**	GoA, WB,ADB,Climate change funds	NWARA ,MAIL,NEPA,MEW	3 months	Delays in data requested	Design and costing completed	70,000
Activity 1.4 Procurement t of goods for construction of micro dam	**High**	GoA, WB,ADB,Climate change funds	NWARA ,MAIL,NEPA,MEW	3 months	Implementation delays	Receipt of goods	350,000

Activity 1.5 Construction of micro dam	**Medium**	GoA, WB,ADB,Climate change funds	NWARA ,MAIL,NEPA,MEW	One month	Delays due to extreme weather events	Completed micro dam	250,000
Activity 1.6 Development of operations, management and maintenance plan	**Medium**	GoA, WB,ADB,Climate change funds	MAIL,NEPA,MEW, NWARA	3 months	Delays in the review of draft document	Final draft of plans	70,000
	Action 2 Conduct training program in micro dam construction						
Activity 2.1 Procurement of consultancy services	**Medium**	GoA, WB,ADB,Climate change funds	Ministry of MAIL, MEW	3 months	Delays due to administrative procedures	Consultant awarded contract	30,000
Activity 2.2 Sensitization session on microdam	**Low**	GoA, WB,ADB,Climate change funds	NWARA ,MAIL,NEPA,MEW	1 month	Difficulty scheduling due to competing activities	Session conducted	20,000
Activity 2.3 Conduct training course in the design and construction of the micro dam	**High**	GoA, WB,ADB,Climate change funds	NWARA MAIL	6 months	Disruption due to severe weather Participants inability to commit due to planting season	Training conducted	80,000
Activity 2.5 Development of a data collection	**High**	GoA, WB,ADB, Climate change funds	NWARA	1 month	Lack of capacity to support	Program developed	30,000

pregame					program me development		
	Total cost US$						1 million

1.4. Action Plan for the Transfer and Diffusion of Micro irrigation system for efficient water use and management

1.4.1 Intoduction

Owed to climate alteration threats and resultant water scarcity, it is most important to use the water balanced and efficiently which is attained via water saving technologies usage. The micro-irrigation denotes the unhurried application of water as incessant distinct drops, minute spray above, below or on the soil by subsurface and surface trickle as well as sprinkler systems and is applied thru emitters linked to a water conveyance line via low conveyance pressure.

This irrigation system protects the environment by conservation of fertilizer, water and soil resources, maximising crop output, and raising the grower revenue. Though, most of the developing countries small-scaled landholders are disadvantaged of this technology owing to its no-adoptability and high cost. Yet, it is unaffordable and also expensive for poor families as well as too large for very small land plots.

High efficacy irrigation systems *i.e.,* drip irrigation practice is the best technology of water saving for irrigation which is a suitable technology with rising demand and positive effects on crop yield, revenue and food safety. This is a method of supplying water to the specific point of crops typically to the base of the plant. This system comprises a pipes network ended with emitters which deliver water to the roots of plants. This method is most suitable for vegetables, orchards and cotton. Through this pressurized irrigation system /drip irrigation system by means of better homogeneity and higher efficiency; maximum yields can be achieved.

Micro-irrigation technology refers to technology, which employ water emitters with tiny apertures that deliver water at a low flow rate. The reduction in water use is beneficial to the environment especially the rivers which would be able to maintain environmental flows. Micro-irrigation technology is useful as an adaptation measure as the country prepares to cope with the projections of a drier climate. Micro-irrigation would allow farmers, especially vegetable farmers to grow their crops all year round instead of only in the rainy season which result in an increase in income for farmers and food security for the country. The use of water-efficient technologies reduces the pressure on surface water, which is the main source of water for Afghanistan.

1.4.2 Ambition for the TAP

The target is to build the capacity of a team of local persons for meeting the demand of technical assistance in the installation of micro irrigation technology country wide and to install a

demonstration project, and also to install drip/ sprinkler irrigation system on 0.6 million hectares of land in the next 5 years.

1.4.3 Barriers to the TAP

A key barrier identified is a presence of short-term, in-consistent, and conflicting policy outlook resulting in legal and regulatory issues surrounding technology adoption and replication, and consequently its market development and expansion.
Market failure and imperfection is identified as another key barrier to the diffusion of HEIS in the country. The current domestic HEIS market is small, under-developed, and non-competitive resulting in high technology cost and low efficiency. Due to this small market size, there are only a few large technology suppliers in the market, but mostly they are concentrated in some specific regions of the country and therefore it becomes difficult for them to meet the growing demands of local markets located outside their supply and distribution networks. Considering the supply chains, in particular, it is fragmented and highly inefficient due to many factors, including low scale of production and quality issues, capacity of technology suppliers and dealers, efficiency and sophistication of business processes in the country, and poor access to technical information. The result of this inefficient market performance is the high cost of technology, which is generally unaffordable by small landholders.

Likewise, limited institutional capacity is identified as one of the key barrier to the HEIS technology diffusion in. The barrier includes many important factors such as: lack of trained technical staff to design and install or supervise technology installation in the field, low availability of credible information on the optimum technology performance under various climatic situations, weak coordination among technology handling organizations, and poor communication policies and mechanisms among the involved government agencies and private actors.

Lastly, the existing social, cultural and behavioral practices, attitudes and faith promote risk-aversion behavior among farmers when it comes to water conservation technologies such as HEIS. The farmers generally bear a false perception of having low crop productivity and hence income, should they adopt the technology. An underlying reason under this behavior is lack of credible technology performance information in different agro-ecological zones of the country. As such, this barrier creates a false and unrealistic perception of risks associated with HEIS adoption in the field and masks both the socio-economic and the environmental benefits of technology to the farmers.

The following measures are proposed to address these barriers:

Develop long-term, nationally committed and consistent policy frameworks that would create a conducive enabling environment for technology diffusion and replication; Increase private investment in the market, offer various incentives such as subsidy, low tariff rates etc.; Invest in R & D activities and programs, build and strengthen both the horizontal and vertical linkages of key organizations to improve coordination and communication mechanisms focused on highlighting the benefits of technology to the farmers and to improve functioning of technology dissemination networks at national, regional and local levels.

1.4.4 Proposed action plan for the Micro irrigation system for efficient water use and management

In view of providing an enabling environment to encourage public and private actors to adopt and promote micro-irrigation to improve efficient water use and overall agricultural productivity, it is important to take the following actions:

Table 1.4: TAP for Micro Irrigation System for efficient water use and management

Sector: Water							
Technology: Micro Irrigation System for efficient water use and management							
Ambition: Building the capacity of local persons for meeting the demand of technical assistance in the installation of micro irrigation technology country wide and demonstration project, and also micro irrigation system on 0.6 million hectares of land in the next 5 years.							
Benefits: Improvement of food security, livelihood and resilience of vulnerable communities using efficient water conservation technology to counter the effects of climate change in the country.							
Action1: Introduce various economic and financial incentives for the technology users.							
S.No	**Activity**	**Efficiency**	**Implementing Agency**	**Time Scale**	**Funding Sources**	**Indicators of Success and Risk**	**Budjet Per Activity** US$
1.1	Facility of financial incentives in the form of subsidy/ soft loan to assist farmers in the successful adoption of the HEIS technology.	High	MAIL, MRRD, MOE	0-10 years	UNDP, WB, ADB, MOF,	Success: Rate of technology adoption Risk- Lack of funding &high dependence on subsidies	3000 per hectare
1.2	Investment in agricultural research and on-farm pilot projects for field demonstrations of the technology	Medium	MAIL, MRRD, MOE, MCI	0-5 years	UNDP, WB, ADB, MOF,	Success: Rate of technology adoption capacity Risk- Lack of funding & insufficient institutional capacity	50,000
Action 2: Design and implement formal water policies with complete ownership from the government and other stakeholders across various sectors and governance levels.							

2.1	Build consensus among various catalytic organizations and actors to earn support on policy formulation and implementation	High	MAIL, MRRD, MOE, MCI, MEW	0-1 Years	MOF	Success: -Revised policy and strategies enacted, Reduced Import duties. Or improved access to material or equipment Risk: Lack of political will - Unavailability of funding	200,000
2.2	Review and upgrade various sector policies or programs for conflicting development goals, priorities or actions that would undermine sustainable food production and water security in the nearby future. It includes,water rights, canal water pricing system, energy pricing etc.	High	MAIL, MRRD, MOE, MCI, MEW	0-2 Years	MOF,		150,000
2.3	Review import policy to reduce taxes on imported equipment and materials used in various types of high efficiency irrigation systems	Medium	Ministry of Finance	0-2 years	MOF		10,000
Action 3: Build a strong, competitive and diversified domestic market for technologies with inclusion of rural markets							

3.1	Upsurge public- private partnership to increase investment in the water technology market	High	Provincial Irrigation Departments, Finance Departments	0-5 years	MOF, WB, ADB, WFP, UNDP	Success: The amount of investment in the market -Increase in product sale compared to baseline sale figures -Quality control standards established and enforced -Certification facilities are set up	2 million
3.2	Provide lucrative financial incentives to technology developers, suppliers, and investors to build their capacity and ultimately the product supply chains	Medium	Provincial Agriculture / Irrigation Departments, Finance Departments	0-5 years	MOF, WB, ADB, WFP, UNDP		3.5 million
3.3	Design, implement and maintain the quality of technology products through the use of product standards, codes, certification, and annual licensing system etc.	High	Provincial Irrigation Departments	0-5 years	MOF	Risk: - Limited incentives for private investors to participate - Limited number of technology manufacturers and suppliers	0.5 million
Action 4: Build the capacity of catalytic actors and organizations through exchange of information, training programs, and investment in research and development activities							

4.1	Fortify institutional capacity of government agencies involved in monitoring in terms of human resources and technical expertise. Capacity building of agriculture extension staff, drip and sprinkle technology suppliers and dealers to serve farmers efficiently, via clever training programs on drip and sprinkler irrigation techniques.	Medium	Provincial Irrigation Departments	0-5 years	MOF, UNDP, UNoPS	Success: - Increase in number of trained technicians, and staff, -Increased research facilities for research. Risk: - Scarce funding - Low quality training programs	5 million
4.2	Increase investment in public R&D institutions	Medium	MOF, MCI	0-10 years	National / Foreign Funding		1.5 million
Action 5: Design and implement effective technology information and awareness programs for the technology users							
5.1	Conduct technology demonstrations, field demonstrations, and workshops on the efficacy of the technology at the local and national levels with special focus on the inclusion of rural districts and farmers	Medium	Provincial Agriculture, Irrigation and Livestock Departments	0-5 years	Government and private funds	Success: - Number of trainings, workshops, Exhibitions, field demonstrations, TV and radio talks. -Number of persons trained - Number of	200,000

5.2	Develop technology use manuals, and fact sheets in local languages; Demonstration of on farm free local technology distribution and related documents	Low	NWARA	0-3 years	Government and private funds	documents developed Risk: -Inadequate funding -Lack of support from policy and decision makers.	150,000
5.3	Conduct electronic media talks with focus on successful case studies from various regions of the province.	Low	Agriculture Universities/ Faculties	0-3 years	Government and private funds		100,000
Total cost US$							133,630,00

1.5 Action Plan for Integrated Water Resources Management

1.5.1 Introduction

The integrated water resources management (IWRM) is crucial for enhancing climate change adaption and disaster resilience in a river basin. In the country, the IWRM is much important to promote the coordinated development and management of water, land and related resources, reduce water catastrophe, enhance climate change adaptation and disaster resilience so that maximize the economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. The increasing population and economic growth are triggering a cumulative demand of freshwater in many communities around the world due to increased water consumption rate (more than twice) than previous century. Even though there is no worldwide water scarcity so far, approximately 2.8 billion people, i.e. over 40 % population of the world, residing in river sinks have some kind of water shortage and over 1.2 billion of them are breathing in physical water scarcity environments as result of more than 75 % flows withdrawn of the river (UNDESA, 2012). The water demand of these areas will hurriedly increase to surpass the usual supply in absence of an improved sustainable policy for integrated water resource management (IWRM).

In order to increase resilient and adaptive measurements of catastrophic risks management, damage and loss in a river basin, IWRM is essential and it is “a practice of promoting the harmonized management and development of correlated resources (land, water, etc.). To maximize the subsequent social and financial wellbeing in a balanced way without any compromise on vital ecosystem’s sustainability”, in other words IWRM is a procedure that help countries in the efforts of dealing with water problems in a sustainable cost-effective manner. The ADB declared its Water Funding Program 2006-2010 for serving its participant countries to undertake IWRM in 25 river basins of the Asia-Pacific region in March 2006. The designation of IWRM suggests, “An inter-sectoral tactic, illustration of all investors, corporeal aspects of water sources along with ecological consideration and sustainability” (Savenije *et al,* 2000).

The International Meeting held in Dublin (1992) on the Environment and Water, set off four supervisory concepts related to water use as below:

1. Fresh water is a susceptible and finite resource, essential for development, the environment and a sustained life.
2. Water management and development should be based on a participation including policy-makers, planners and users at all levels.
3. Women perform a dominant role in the water management, safeguarding and provision.

4. As water has an economic value in all its rival usages, it should be recognized as an economic good.

The approach of IWRM assists in developing and management of water resources in an equitable and sustainable manner including economic, social and environmental welfares. The combined process synchronizes the management of water resources across interest groups and subdivisions at all levels from international to local. Evidently, climate alteration, economic growth, demographic fluctuations and population growth exert serious influences on water resources.

Similarly, water resources also exert substantial effect on health and livelihoods, national security, economic growth and production. In case of increasing pressures on water resources, the proper management of renewable freshwaters is essential but, it is ever more complex to manage the water as societal and demographic fluctuations, poverty reduction efforts and economic growth rise the water demands for energy generating, goods and facilities availability as well as food production support.

1.5.2 Ambition for TAP

The overarching goals of the IWRM is to ensure adequate quantity and quality of water supply for consumption and hygiene, socioeconomic development, environmental and ecosystems protection, climate change adaptation and minimization of water related conflicts and disastrous risks and impacts in all river basins, as mention at the beginning of the TAP for the water sector.

For this TAP, the goal is to deploy IWRM and climate change adaptation measures to improve for climate change adaptation and disaster resilience in river basins, water channels, water streams etc. to alleviate the risk of floods, storms and drought at Kabul, Harirode, Ammo, Kunar, Murgahb, Farah rode and other rivers along with preventing soil erosion and maintaing the present fertility status of the soil.

1.5.3 Barriers and Measures to Overcome Barriers

Seven critical barriers to IWRM were identified as a result of the BAEF. Two of them are economic barriers which are including inadequate budget and investment in IWRM, especially for climate change adaptation and disaster risk management and unclear financial models to sustainably finance IWRM, and five are non-financial barriers including unclear legal framework on IWRM and development including water allocation, right, ownership, tax ineffective laws (water, forest, land etc.) enforcement limited knowledge and skills on IWRM, climate change adaptation and disaster risk management, polarization and conflicts of interests on the uses of river basin resources, IWRM is a timing and resources intensive Inadequate information about water resources including hydrology, water demand and supply, discharge and balance, hazards and disaster resilient technologies and best practices of all aspects of IWRM.

Some measures are actionable, while others were breakdown sub-measure or actionable measures as below:

Increase budget and investment in IWRM; Maintain or increase the budget for the extension; Enhance resources mobilizations, cooperation and access to external financial supports;

Promote investment of the private sector; Improve the public budgeting including international aids effectiveness; R&D and promote cost-effective technologies and practices, Improve the clarity of the financial models to sustainably finance IWRM, Improve the clarity of the legal framework on IWRM and development including water allocation, right, ownership, tax, Improve laws (water, forest, land etc.) enforcement effectiveness, Increase knowledge and skills on IWRM, Improve committee, cooperation and harmony of the river basin resources uses, R&D and deploy practical and cost-effective methods for IWRM including climate change adaptation and disaster resilience, And increase R&D of information about water resources including hydrology, water demand and supply, discharge and balance, hazards and disaster resilient technologies and best practices of all aspects of IWRM (technical, legal, organizational and financing, Develop and implement sustainable IWRM.

1.5.4 Selection of Actions and Activities for the TAP

Overall, the actions to be included in the TAP were conducted through review and assessment of the barriers and measures identified in the Barriers Analysis and Enabling Framework (BAEF) report. The actions to include in the TAP were chosen from the measures through assessment and prioritization of the measures against five criteria namely effectiveness, efficiency, impact, cost-benefit and sustainability. Following sections provided details about the actions and activities selection, respectively. Selection of the actions for inclusion in the TAP based on the barrier and measures outlined BAEF as well as the section above. Actions were chosen from the measures through stakeholders' assessment of its relevance, effectiveness, efficiency, impact and sustainability and prioritization. The assessment results however revealed that all the measures had about the same score or importance. Selection of activities for implementing actions was carried out through a stakeholder consultation process. The activities were firstly identified by the TNA project team, and then they were consulted, elaborated and agreed with the stakeholders during focus group and consultation meeting in March and November 2020, considering effectiveness efficiency, impact, sustainability and relevance of activities to the actions

The timeframe of the action plan implementation is five years, which is perceived to be suitable and sufficient time for technical and financial preparation including demonstration before full operation. The timeframe is divided into two phases. The preparation phase is 3 months, which shall be commenced following approval and during dissemination of TAP to stakeholders. This means the preparation phase would be between March to May 2022. The implementation phase would start from May 2022 and until December 2025.

1.5.5 IWRM Action Plan for Adaptation

Based on the previous sections, the action plan for the IWRM for Adaption could be summarized in Table 2.5. This summary TAP includes the actions and activities, funding sources, responsible organizations, timeframe, risks, success criteria and indicators for M&E and budget for the TAP implementation. This TAP calls for US$ 26.511 million for strengthening institutional and staff capacity of MAIL and relevant organizations to develop some models for resilient and sustainable IWRM and best practices and mobilize and access to financial resources for expanding the resilient and sustainable IWRM models through the country.

Table 1.5: Proposed action plan for IWRM

Sector: Water							
Technology: IWRM							
Ambition: To deploy climate change adaptation measures for improving climate change adaptation and disaster resilience in all river basins to alleviate the risk of floods, storms and drought along with preventing soil erosion and maintaing the present fertility status of the soil.							
Benefits: Aliviation of the risk of floods, landslide and drought at all water resources.							
Action 1: Increase the public budget and resources mobilization for IWRM							
Action	**Activities**	**Funding Sources**	**Responsible body**	**Time-frame**	**Risks**	**Success criteria**	**Budjet Per Activity US$**
Activity 1.1	Develop river basin development plan including financial needs assessment for all river basins	MOF. WB, ADB, UNDP, UNoPS,	NWARA, MAIL,MEW, MRRD, MPW	6 months	Not inclusive due to insufficient resources, research and information	Comprehensive and practical strategy and action plan for each river basin put in place and proved effective	25 0.000,0
Activity 1.2	Conduct financial assessment (to identify funding sources and feasibilities)	MOF. WB, ADB, UNDP, UNoPS,	NWARA, MAIL,MEW, MRRD, MPW	6 months	Incomplete information due to inaccessible to donor information	Inclusive information about funding sources and feasibilities made available and useful for financial planning and resources mobilization	65.000
Activity 1.3	Develop financial sources or donor directory	MOF. WB, ADB, UNDP,	NWARA, MAIL,MEW, MRRD, MPW	3 months	Incomplete information due to inaccessible to donor information	Donors/funding sources directory including profiles put in place and useful for financial planning,	6,000

		UNoPS, ME				resources mobilization and	
Activity 1.3	Develop financial sources or donor directory	MOF. WB, ADB, UNDP, UNoPS, ME	NWARA, MAIL,MEW, MRRD, MPW	3 months	Incomplete information due to inaccessible to donor information	Funding sources directory including profiles put in place and useful for financial planning, resources mobilization and cooperation	6,000
Activity 1.4	Develop resource mobilization and engagement plan	MOF. WB, ADB, UNDP, UNoPS, ME	MAIL,MEW, MRRD, MPW	11 months	Not inclusive and practical due to insufficient information about funding sources	A comprehensive and practical resource mobilization and engagement plan put in place and early results are promising to increase technical and financial support	12,000
Activity 1.5	Develop and submit financeable project proposals	MOF. WB, ADB, UNDP, UNoPS,	MAIL,MEW, MRRD, MPW, NEPA	6 months	Insufficient information or resources to develop financeable proposal	At least 1 or 2 project proposals accepted and funded projects between 2022-26	80,000
Activity 1.6	Improve pubic and foreign aids data management system, M&E implementation of	MOF. WB, ADB, UNDP, UNoPS,	MAIL,MEW, MRRD, MPW	4 months	Not inclusive due to ineffective coordination and	Complete, effective and transparent financial aids management system set up and helpful for	6,000

	partnership agreement including the roundtable meeting				information sharing	M&E and improvement of cooperation and aids	
Action 2 Develop financial models on IWRM							
Activity 2.1	Conduct financial needs and mechanism assessments	MOF. WB, ADB, UNDP, UNoPS,	MAIL,MEW, MRRD, MPW, ME	6 months	Insufficient resources and information to develop impractical models or mechanism for financing	Financial needs and mechanism information made available and be useful for financial planning and support	90,000
Activity 2.2	Develop a sound effective or sustainable financial model (based on activity 2.2, 3.1 and 3.2)	MOF. WB, ADB, UNDP, UNoPS,	MAIL,MEW, MRRD, MPW, ME	4 months	Insufficient capacity and research	An effective or sustainable financial model and mechanism put in place and proved to be promising for improving IWRM financing	70,000
Activity 2.3	Pilot the financial model including M&E and redefining more effective or	MOF. WB, ADB, UNDP, UNoPS,	MAIL,MEW, MRRD, MPW, ME, NEPA, NWARA	11 months	Insufficient or impractical models or mechanism for financing IWRM	An effective or sustainable financial model put in place, promising and being model for financing IWRM	4,000,000

	sustainable financial model						
Action 3 Improve polices and enforcement							
Activity 3.1	Review law enforcement on the contributions of water users to sustainable IWRM	MOF. WB, ADB, UNDP, UNoPS,	MAIL, NWARA	8 months	Insufficient capacity and research	Gaps and best practices on law enforcement identified, clarified and useful for	60,000
Activity 3.2	Develop policies on the water allocation, right, minimum and maximum water discharge, and tax or fee	MOF. WB, ADB, UNDP, UNoPS,	MAIL, NWARA	5 months	Insufficient capacity and research	Practical policies or decree put in place and proved to be effective	150,000
Action 4 Increase knowledge and skills on IWRM							
Activity 4.1	Improve human resource development (HDR) system including capacity development plan, staff knowledge, building learning culture and commitment	MOF. WB, ADB, UNDP, UNoPS,	MAIL, NWARA, NEPA	6 months	HRD and capacity building is not in line with the plan and system	More effective HRD system put in place and effective for HRD	110,000

Activity 4.2	Building capacity of national, local authorities and communities on IWRM and adaptation in water resources sector through professional trainings	MOF. WB, ADB, UNDP, UNoPS,	NWARA , MAIL,MEW	6 months	HRD and capacity building is not in line with the plan including capacity needs	Staff receive sufficient trainings and have sufficient technical knowledge and Skills	900,000
Activity 4.3	Increase field extension staff to assist IWRM and adaptation at local levels	MOF. WB, ADB, UNDP, UNoPS ,	NWARA , MAIL,MEW	3 months	Could not mobilize the resources and sustain volunteers and activities	Volunteers receive sufficient trainings and be able to support IWRM	300,000
Activity 4.4	Improve climate change and adaptation and disaster education and research in higher education	MOF. WB, ADB, UNDP, UNoPS	NWARA, MEW, NEPA	4 months	Insufficient resources, experiences, information and guidelines	Practical IWRM curriculum including teaching materials and research put in place and proved effective	110,000
Activity 4.5	Promote network, think-tank and civil organization and information exchanges on	MOF. WB, ADB, UNDP, UNoPS	NWARA, MEW, NEPA	6 months	Insufficient resources, participation and promotion of civil organization	IWRM Network, think-tank and civil organization and information exchanges platform established and	70,000

	climate change adaptation					Active	
Action 5 Increase R&D of information on water resources, hazards, technologies and best practices							
Activity 5.1	Survey and develop profile on socioeconomic, water resources including ecosystem services and water related hazards of all river basins and sub-basins	MOF. WB, ADB, UNDP, UNoPS	NWARA, MEW,	2 months	Insufficient resources for survey and development	Comprehensive river basins and water resources profile made available for technical and financial planning	3500,000
Activity 5.2	R&D best practices on sustainable water resources management including financing, organizational arrangement, cooperation, law enforcement, water allocation and tax, disaster resilient infrastructure etc.	MOF. WB, ADB, UNDP, UNoPS	NWARA, MEW, NEPA	6 months	Unavailable or undefinable best practices. Insufficient resources for R&D	Best practices for sustainable water resources management made available and promising for stimulating application of IWRM for adaptation	90,000

Activity 5.3	Improve and disseminate information about water related hazards, quality and quantity, biodiversity and ecosystem	MOF. WB, ADB, UNDP, UNoPS	NWARA, MAIL,MEW, NEPA	6 months	Insufficient and budget, information, and best methods for awareness raising	Increased awareness and promotion of IWRM for adaptation	90,000
Action 6: Pilot deployment of infrastructure and best technologies for adaptation in the river basins							
Activity 6.1	Develop reservoirs and water storage facilities within or between river basins and reservoirs for enhancing drought resilience	MOF. WB, ADB, UNDP, UNoPS	NWARA, MAIL,MEW, NEPA	3 months	Delay or insufficient resources for survey and development	Effective reservoirs and water storage facilities put in place, and early results proved promising to increase drought resilience	6400,000
Activity 6.2	Develop drainage, water gate and facilities within or between river basins and reservoirs for floods mitigation and control	MOF. WB, ADB, UNDP, UNoPS	NWARA, MAIL,MEW, NEPA	6 months	Delay and underdeveloped due to insufficient resources for survey and development	Effective drainage, water gate and facilities put in place, and early results proved promising to increase floods resilience	225,000

Activity 6.3	Develop infrastructure and facilities for prevention and control of landslide and erosions along the rivers and areas that are risk of landslide	MOF. WB, ADB, UNDP, UNoPS	NWARA, MAIL,MEW, NEPA	6 months	Delay and underdeveloped due to insufficient resources for survey and development	Effective infrastructure and facilities for prevention and control of landslide and erosions put in place, and early results proved promising	7690,000
Activity 6.4	Identify and develop floods and drought EWS including monitoring and forecast, communication system and emergency response plan	MOF. WB, ADB, UNDP, UNoPS	NWARA, MAIL,MEW	6 months	Delay and underdeveloped due to insufficient resources for survey and development	Effective EWS put in place, and proved to be effective warnings and reduce loss and damage	100,000
Total US$							26,511million

1.6 Project Ideas for Water Sector

1.6.1 Brief summury of the project ideas for water sector

The project ideas are concrete actions supporting the realization of the overall target indicated in the Technology Action Plan for the sector. Project ideas were identified by stakeholders after discussion and deliberations at stakeholder workshops. At workshops, the stakeholders presented about a successful projects which received praise within the country to have achieved both environmental and socio-economic goals improving lives of communities in the area. There was majority consensus amongst stakeholders that the TNA should use these projects as examples when developing TAPs for the technologies. Soon after stakeholders felt the need for these technologies was paramount in the country to help people improve access and storage of water as an adaptation measure. The consultant took suggestions and developed the TAPs for the water sector technologies. The project ideas for water sector helps it to achieve its goals of water savings and conserving water resources.

1.6.2 Specific project ideas for Rainwater Collection from ground surface

1.6.2.1 Introduction and rationale

Afghanistan is a semi-arid country with the most of the areas receiving less than 200 mm annual rainfall, except for the high altitude northern mountains. Water therefore is a precious commodity and the most critical factor in determining the source of livelihood for the people in dry arid and semi-arid areas of the country. The country has the largest indigenous rainwater collection system as the spate irrigation system. The system irrigates approximately all of the cultivated land in the country. To sustain and expand the system, there is a need to ensure water security through conservation and utilization of rainwater.

There are many barriers to the transfer and diffusion of the technology *i.e.,* high construction and maintenance cost, scarce technical capacity, absence of policy and regulatory support. The purpose of this project is to address some of the key barrier elements and through implementation of various activities, create an enabling environment to diffuse and transfer this technology successfully in climate vulnerable areas of the country.

1.6.2.2 Purpose and objectives

The core objective of the project is the improvement of the water availability all year round for households and other water beneficiary groups *viz.*, farmers specially, in drought vulnerable areas of the country. The project will also contribute in promoting consciousness on climate change and importance of water conservation for a sustained livelihood in the future.

1.6.2.3 Project deliverables

Once implemented, it is expected that project will deliver the following items;

i. 1500 rainwater harvesting reservoirs are built within the life of the project, each with a capacity of 20,000 m^3 to 40,000 m^3 ;
ii. Increase in local crop production resulting in 25-40 % increase in income of farmers;

iii. A communication strategy is created and implemented for improved collaboration of irrigation departments with other key stakeholder groups;

1.6.2.4 Project benefits

The technology offers many benefits during seasonal dry periods and droughts especially in the face of climate change that is projected to increase the variability and intensity of rainfall in the long run. Rainwater collection helps to stabilize the depleting groundwater level while the storage infrastructure can reduce land erosion and flood inflow to major rivers. It acts as a convenient source of stored water that could enhance agricultural productivity, decrease travel time for rural women to distant water resources that would result in better health and time for social activities. There is some other additional benefits such as socio-economic uplift of the local communities due to increased employment opportunities, and diversification of cropping pattern in the area. Increase ground water recharge through rain water harvesting. The collaborative linkage built with various other public institutions will help community members and households to increase their participation in decision-making processes during the life of project.

1.6.2.5 Project scope and possible implementation

The project scope is national but it target arid and semi-arid areas particularly those affected by drought in the past few decades. The project has link with some other ongoing water conservation initiatives in the dryland areas so the concerned departmental staffs already exhibits a fair level of skill and knowledge in water reservoir construction and maintenance. In the past, the former efforts also had focused on creating, and activating farmer organizations specifically with stress on the participation of women in water conservation efforts. So, as a whole, it is expected that the combined collaborative efforts of the various key stakeholders and consumer groups may contribute towards sustainability and success of this project.

1.6.2.6 Activities

1. Improve policy integration and coordination Review and analysis of respective sectoral policies to support water related sectors and sub-sectors such as agriculture, industry, household. Develop a collaborative mechanism between provincial Irrigation department with related sections, local government and farmer association.
2. Awareness creation and capacity building; Assess capacity needs of key stakeholders such as government departments, technology suppliers and users. Arrange need-based trainings on climate change education, awareness and behavior.
3. Feasibility Studies; Prioritization of regions needing rain collecting reservoirs; Feasibility studies to identify feasible catchments and sites for construction of reservoirs.
4. Reservoirs construction; construction of rainwater collecting channels and reservoirs.

1.6.2.7 Timeframe and Budget

The estimated time for the successful implementation of the technology is expected to be 2-5 years with the implementation budget of US$ 6,330,000.

1.6.2.8 Relevant responsible agencies

The responsible agencies for the implementation and evaluation of the technology are; MAIL, MEW, NEPA, MRRD, NWARA.

1.6.2.9 Project challenges

Potential challenges for achieving targets are lack of a national water policy, continuous war and insecurity, lack of support on this technology or political intervention in decision-making, specifically in the silting of the reservoirs. Another challenge could be the climate related factor such as prolonged drought in the project areas, which will potentially impact the level of rainwater available to the communities and households.

1.6.3 Specific Project Ideas for small dams and micro catchment technology

1.6.3.1 Introduction

This is the process of water storage in reservoirs for later application when needed to mitigate dry spells. Water storage is varied from macro to micro system based on the size of the catchments and transfer distances. The study therefore, recommends that the modeling of micro catchments models should not only deal with hydro-climatic challenges but also looks on the social economic for efficient and equitable distributions of resources from micro-catchment. It is a system which consists of a catchment area command area, transfer infrastructure (channels, gullies, hard surfaces) diversion method and storage structures.

Small growers with rain fed agriculture mostly dominate the agriculture sector. Only a limited number of growers are practicing agriculture irrigation and a slighter number is collecting water for farm-scale irrigation.

1.6.3.2 Objectives

Increasing the adoption of micro-dams and Micro catchment and to build capacity in the technology usage.

1.6.3.3 Outputs

The outputs of the project would be a trained persons with the capacity to design and construct small-dams and micro catchment and to design and install technologies.

1.6.3.4 Relationship with sustainable development priorities

The project is reliable with the Sustainable Development Goals, the Afghanistan National Development Plan 2017-2021 water availability and food security priority areas and the National Climate Change Policy 2017-2021 objectives and policy framework.

1.6.3.5 Deliverables Value/Benefits/Messages The main deliverables are as follows:

Two demonstration projects,

- A credit scheme to provide an incentive program for growers to adopt the small dam and micro-catchment technologies
- A cadre of trained persons who could design and construct small dams and design and install micro catchment technologies.

1.6.3.6 Institutional framework to support irrigation

The project is seeking to adopt a participatory approach with the training of growers in the design and construction and installation of a micro dam. This is intend to break with the past belief that growers are unable to understand technical matters and therefore cannot make a contribution to technical matters. Growers would therefore been involved in the planning process from the conception of the project idea and would be involved throughout the project.

1.6.3.7 Project scope and possible implementation

The scope of the project is national but priority would be given to are, which have been identified and water deficit and to growers.

Activities:

- Agro-meteorological data Collection
- Water quality monitoring
- Study of the demand for irrigation water and infrastructure. This study would include a baseline on existing irrigation systems
- Credit scheme
- Construction of small dams and micro catchment
- Conducting training programs

1.6.3.8 Timelines

The training and demonstration projects are planned to take place over a one-year period while the credit scheme is planned for a period of at least three years. This would allow for the demonstration projects to become operational and produce results, which would convince growers in technologies adoption.

1.6.3.9 Budget/ Resource requirements/funding options

Training is required for growers and other private professionals in the design and installation. US$1 million is the estimated budget for the credit scheme and grant funding. This amount is to provide access to funding for construction of infrastructure and technical assistance.

1.6.3.10 Challenges

The key constraint the project could face is insufficient institutional support services from the MAIL due to inadequate staff. There is also the possibility of implementation delays due to the large number of climate change funded projects being implemented at the same time. The project could also confront a challenge with the scarce commitment by growers to activity related to record keeping.

1.6.3.11 Responsibile agencies

The MAIL, MEW, NEPA, MRRD and NWARA would be responsible for the implementation of the project in collaboration with the economic and technical cooperation department.

1.6.4 Specific project ideas for Micro irrigation system for efficient water use and management technology

1.6.4.1 Introduction

Agriculture sector is one of the most vulnerable sectors of the country to the impacts of climate change. The rainfall, however is highly variable both in spatial and temporal domains, with some areas facing extreme precipitation events while other suffering from drought. This change in climate has serious bearing on the productivity of the agriculture sector. Research studies for the country show that by increase in temperature from 0.5°C–1°C, the agricultural productivity will decline by 8 -10 % by 2035. In case of major crops, 6 % reduction in wheat and 15 -18 % for fine-grain rice yields will occur in all agro-climatic zones of the country except in the northern areas where temperature rise is projected to be the highest by the end of the next century (Hassan *et al*., 2015).

Afghanistan heavily relies on canal irrigation system for its expansion to ensure food security for its fast growing population but the water losses from the system is quite high. Likewise, a major part of the country is arid to semi-arid with little available water. Water conservation and management therefore emerges as the top most need of the country to help the farmers to adapt to the negative impacts of climate change.

HEIS were introduced in around early 90s and since then have been tested and implemented in all provinces with a heavily subsidized support by all the provincial governments. Despite their long history of use, HEIS are still not a will adopted technology by the farmers. The research on barriers to the technology's transfer and rapid replication has indicated many challenges, such as the underdeveloped market with a fragmented supply chain, policy and institutional capacity issues along with little awareness and information on the benefits of technology, particularly in the context of climate change. HEIS are in high demand in all parts of the provinces that are either under irrigated canal systems or rain-fed agriculture. Climate change impacts on the country are real and it has already seeing some of its negative consequences threatening water security of the country. The implementation possibility is quite high as HEIS projects have been constantly part of resource development and management projects and programs in all the provinces in the past few decades.

1.6.4.2 Purpose and Objective

This project aims to create an enabling environment in the country for the successful diffusion and transfer of the technology for improving the resilience of the sector against impacts of climate change in the medium and long-term future.

The project carries the following objectives:

i. Improve access of farmers, particularly smallholders to low cost and good quality HEIS technology;

ii. Augment information and consciousness on climate change impacts on food and water security and the role of HEIS to achieve these objectives;
iii. Build and increase efficacy, quality and variety of HEIS market through regulating market;
iv. Achieve the capacity building of key catalytic actors and institutions in the country.

1.6.4.3 Project deliverables

It is expected that the project will deliver the following outcomes:

i. HEIS is installed on around 5,000 small landholders farmers, with special consideration to rain-fed and dryland areas;
ii. Under the capacity building activities, 4500 farmers and 200 local government extension departments staffs are trained in the different aspects and use of technology;

1.6.4.4 Project benefits

The project will improve food security, livelihood and resilience of vulnerable communities using efficient water conservation technology to counter the effects of climate change in the country. The activities designed will also help in creating a stable, functional and competitive HEIS market in the country that would have the capability and capacity to expand the traditional HEIS market beyond their original boundary or sector such as from agriculture to urban setup, natural and built green spaces, etc. It is also expected that the market would develop robust supply chains to target specific market segment with specific products while maintaining a high product quality or brand reputation. Project will also benefit farmers, and other technology users to learn about climate change adaptation and improve their resilience scale while increasing the institutional capacity of the catalytic actors. In the long term, the project would create more jobs, skilled labor forces, and a well-functioning dynamic domestic HEIS market.

1.6.4.5 Monitoring and evaluation

Project implementation would be supervised and closely monitored by the Project Steering Committee jointly chaired by the TNA National Coordinator and Representative of respective MAIL. Other members would include representatives from relevant government institutions, NGOs, development partners and project beneficiaries. Project manager would be required to submit quarterly progress report to the steering committee. This would provide an opportunity to keep a track on progress made in relation to project objective set and to make necessary adjustment where necessary. A mid-term and final project evaluation will also be undertaken to assess its efficacy that will form a basis for lesson learnt and its replication.

1.6.4.6 Activities

1. Expand capacity of relevant stakeholders: Identify the training needs of beneficiaries in the subject areas of water management, technology operation and maintenance, and climate information. Increase R & D and training facilities. Improve coordination and information sharing among stakeholder organizations.

2. Improve financial incentives: Enhance availability of financial resources such as grants, subsides, loans or other forms of assistance to install and maintain HEIS Improve investment risk insurance.
3. Market strengthening and expansion: Conduct market situation analysis. Design and implement HEIS product certification and quality assurance procedures. Design and implement a HEIS product manufacturing training programs. Support enforcement of product monitoring and regulation policies, laws and regulations.
4. Improve policy coordination to build resilience of the sector: Review and analyze respective national policies to support related sectors. Integration of climate change component into national budgeting and planning processes. Generate new climate information and increase awareness on the impacts of climate change on the country.

1.6.4.7 Timeframe and Budget

The time for the successful implementation of the technology is expected to be about 5 years along with the cost around US$ 13,363,000.

1.6.4.8 Responsible Agencies

MAIL and DAIL, Ministry of Finance and NEPA, MCI, MEW, MRRD MOE and NWARA are the responsible agencies for implementation of the project.

1.6.4.9 Possible Challenges

The key challenges in the implementation of this project could be:

i. In the absence of financial incentives, the high cost of these systems may result in limited adoption by the framers;
ii. Low cost of irrigation water leading to its dishonest use and little attraction for investment in water saving technologies;
iii. Low interest in joining the training programs by local trade owners may be leading to weaker human capacity;
iv. Resistance of local trades to quality control certification programs may lead to the supply of low quality HEIS in the market;
v. Operative risks including weak technical design of the project that could later threaten project sustainability.

1.6.5 Specific project idea for IWRM technology

1.6.5.1 Introduction

An arrangement of land use change, water developments projects including hydropower, water supply systems and irrigations in all main water resources and climate change could potentially cause unexpected impacts on all water resources and difficult for monitoring and forecast of disasters resulted from these three factors. Presently, information, development scenarios and capacity NEPA, MEW, MAIL and other pertinent organizations are far limited. Studying and improving info about 1) hydrology, water resources, demand and supply or balance, 2) land use

change, 3) hydropower, irrigations and other water development projects, 4) hazards and 5) water scenarios in the main water resources are expected to provide useful information and best practices for better and sustainable IWRM.

1.6.5.2 Objective

To study and develop integrated maps including water resources, demand and supply or balance, land uses, hydropower and irrigation development for design and planning water management and development for floods and drought resilience in the major water resources as well as studying and developing an integrated water resources development map for climate resilient and sustainable IWRM.

1.6.5.3 Key beneficiaries

All water users and communities at risk of floods, landslide and drought at all water resources.

1.6.5.4 Main component of activities

Component 1: Study and improve information about a) hydrology, water resources, demand and supply or balance; b) land use change; c) hydropower, irrigations and other water development projects; d) hazards and e) water scenarios and IWRM best practices in the main water resources.
Component 2: Organize forum on the water demand and supply, floods and drought and integrated land use mapping for sustainable IWRM including climate change adaption.
Component 3: Capacity building on the application tools for the integrated mapping and planning for climate change adaption and sustainable IWRM.

1.6.5.5 Time frame and cost

The time for the implementation of the project is to be 2022-2025 along with the cost of US$ 26.511 million.

1.6.5.6 Executing Agency

NEPA, MAIL,NWARA, ANDMA, MRRD, MEW are responsible for successful implementation of the technology.

1.6.5.7 Project activities

1. Study and improve info about hydrology, water resources, demand and supply or balance, land use change, hydropower, irrigations and other water development projects, hazards and water scenarios and IWRM best practices.
2. Improve the technical working group on water resources and form the study team
3. Conduct studies about hydrology, water resources, demand and supply or balance, land use change, hydropower, irrigations and other water development projects, hazards and water scenarios and IWRM best practices in the key water resources.
4. Organize forum and dialogue on the water demand and supply, floods and drought and integrated land use mapping for sustainable IWRM.

5. Organize forum and dialogue on water resources and climate change adaptation, water and energy, IWRM and sustainable development.
6. Capacity building on application tools for the integrated mapping and planning for climate change adaption and sustainable IWRM.
6. Organize workshops and trainings on the use of GIS for IWRM including hazards mapping.
7. Organize workshops and trainings on climate change adaptation including susceptibility valuation and adaptation planning in the water resources sector.
8. Organize workshops and trainings on hydrological modelling and water demand and supply valuation including water evaluation and planning (WEAP) system.

1.6.5.8 Project monitoring and evaluation (M&E)

The project management team will be responsible for project implementation M&E. Monitoring will be conducted on regular basis, which include meeting and reporting of monthly and quarterly progress, mid-term and annual review. The evaluation will be conducted mid-term and final project completion by internal and external evaluator. In addition, financial audit will also be performed by internal and external auditor.

Chapter 2: Technology Action Plan for the Agriculture Sector of Afghanistan

2.1 At sector level

2.1.1 Sector overview

The sector of agriculture is the backbone of the economic growth and development in the country. The sector is essentially central to the growth and development of the national economy, but also one of the most; vulnerable sectors in the country to the impacts of climate change due to its susceptibility to changing weather and climate, and also because mostly rural population is engaged in agriculture where poverty is higher than the urban population.

In 2015, the sector contributed in about 60 % of the total national export. Agrarian production is strictly related to climate that makes it one of the highest climate-sensitive of all fiscal segments, the climate risks to the agriculture sector are important problems as most of the rural residents are directly or indirectly reliant on agriculture for their livings. The current forecasts of climate variations in agriculture sector show temperature rise, variations in rainfall, wind and solar radiation with adverse effects on crop production as well as imminent threat to the national food improvements security. The Government of Afghanistan (GoA) , finds numerous challenges and issues to accomplish the sustained development via water and food security with the most vital challenge in development of the sector *i.e.*, slow rate of high-tech inventions owing to restricted adoption of advanced agricultural systems. Thus, the adoption of environmentally sound technologies is essential in agriculture sector in order to move towards climate resilient progress path and to handle the severe climate change influences.

Apart from economic impacts on the farmers' income, it is predicted that indirectly various socioeconomic and agronomic factors will also play role in enhancing the vulnerability of the sector. These factors include water availability, pesticides, labor supply, the household characteristics, and their experiences of the past extreme events (Gorst *et al*., 2015).

Afghanistan acknowledges the introduction of technological innovations in the national and sectoral development plans and programs. The National Climate Change Policy, for example, recognizes the role of technology in improving the resilience of water and agriculture sectors with emphases on high efficiency water technologies, drought tolerant crops, and various risk management schemes including crop insurance for the farmers. Likewise, the Policy suggests establishing a strong institutional support system for accessing international climate finance and its use in strengthening the local climate actions and programs.

During the early technology identification and assessment phase of TNA, the seven technologies were identified and prioritized in agriculture sector.

2.1.2 Preliminary technology targets

This documents identifies and list a set of preliminary targets, actions and activities based on the country's essentialities for the transfer and diffusion of these technologies in agriculture sector. Due to pandemic Covid-19 at the beginning of 2021, this was done through skype meetings as

well as phone interview with the stakeholders (annex. 1). After discussions, they determined that it is important to provide satisfactory subsidies for the implemintantion of such targets and activites in the agriculture sector which are given below:

1. Advanced and encouraged use of tolerant varieties capable of growing in drought.
2. Providing the farmers with trainings of effective management methods *i.e.* proper sowing method, water, fertilizers and pest management.
3. Upgrading the present centers of agriculture R&D in apiece province.
4. Modernization and upgrading of the country's climate monitoring and predicting system.
5. Agrarian cooperatives, organizations and family farmhouses expansion combined with market via intensive technologies application.
6. Population food security and farming produce supply to the processors on a sustainable basis via faithful benefits combination of national food security and comparative advantages of foreign trade.
7. Up-surging agricultural gross product via enhanced labor efficiency, decreasing the number of agriculture workers and usage of excess labors in agrarian and non-agrarian sectors thru trainings.
8. Processing the significant agricultural products in the processing amenities of the communities developed by means of medium and small enterprises development.
9. Self-sufficiency of the vital foods, high food security level of the population, decreased rural immigration and poverty.
10. Raising consciousness and declarations on climate responsive agriculture.
11. Crop pattern modification, usage of various varieties and cropping almanac including planting and harvesting dates.

3.1.3 Barriers at sector level and proposed measures to overcome barriers

Based on the individual technology barrier analysis techniques and tools utilized during the technology barrier identification phase, an attempt was made to identify the common barriers to the prioritized technologies of the agriculture sector of Afghanistan. It is expected that the existence of harmony like these technology barriers would allow policy and decision makers to find some common measures to eliminate or reduce these barriers that would ultimately create an enabling environment for the diffusion and mass replication of these technologies in the agriculture sector.

Table 2.1: Common barriers to the diffusion of prioritized adaptation technologies in the agriculture sector of Afghanistan

Barrier category	**Barriers**	**Measures to overcome barriers**
Economic & financial	High capital, operation and maintenance costs	- Provide adequate financing in the form of subsidy, soft loans etc. to technology users

Information & awareness	Limited information and awareness about the existence and usefulness of the technology Weak communication networks and linkages among technology supplier, developer, dealers and users impeding an efficient market information exchange	Launch Information and awareness campaigns on the usefulness of technologies through media and workshops; Build effective and efficient communication networks among technology stakeholder groups
Institutional and organizational capacity	Limited institutional capacity	Invest in firming governance structures and capacity building of stakeholders
	Limited R&D capacity	Invest in trainings, exchange programs, and joint-research ventures with other regional and international research Organizations
Market imperfection	Small underdeveloped market, weak supply chain and distribution mechanisms	Encourage private-public partnerships, provide loans, subsidies, build and expand information networks to improve market functioning

2.1.4 Action plan at sectoral level

Up surging agricultural research funding: Currently, the allocated budget for agricultural research in the country is very low. Particularly in the face of climate change challenges, country needs to upsurge agricultural research funding in order to make national agriculture climate resilient.

2.2 Action Plan for the Diffusion of Plant Varieties Resistant to Climate Change

2.2.1 Introduction

The introduction of improved crop varieties is a technology aimed at enhancing plant productivity, quality, health and nutritional value and building crop resilience to diseases, pest organisms and environmental stresses. Such technology will be applied mainly in arid and semi-arid zones of the country. Assessment of vulnerability should be provided in areas with the highest risk to negative impacts of climate change (FAO. 2014). Agricultural research institutions must be involved in the process in order to provide analyses and experiments with new species. During the preparation of TAP, measures have been assessed taking into account their priorities, time scale, related stakeholders, key indicators for measuring implementation and funding resources.

Subsidy mechanisms are effective tools to promote and stimulate application of the technologies. At the same time, this measure is a significant tool in overcoming financial barrier to technology deployment. There is a positive example of stimulation of Afghanistan initiatives using specific subsidy, mostly applied in the agricultural sector. Similar mechanisms, with different features adjusted to the type of adaptive technology, could be developed by the government to stimulate initiatives in related fields.

Capacity building measures include activities related to awareness raising and increase of knowledge and skills of all related stakeholders *i.e.,* decision-makers, technology users, and service providers of the applied technology. These activities include organization of round-table discussions, training sessions, workshops, seminars and study tours during the project implementation period.

Information campaign on the benefits of applied technology is the measure used to address the barrier “Low level of consciousness of economic and ecological advantages”. It is an effective tool to raise consciousness level on the advantages of the technology. This includes dissemination of information on technology advantages along with current opportunities for national and local decision makers and technology users through mass media, publications, organization of workshops and seminars.

2.2.2 Ambition for TAP

The aims are to meet the demand of, and improve access to affordable and good quality tolerant crops through firming the variety development programs in the public research institutes. The project also focuses on the development of potential drought tolerant varieties, its testing, registration, and wide dissemination in the country. The project puts strong emphasis on leveraging and capitalizing on current public-private partnership networks existing among international and national research organizations and other stakeholders for the implementation of program.

2.2.3 Barriers and measures to overcome the barriers

The key barreiers in the project may be:

i. The high cost of these new seeds and crops varieties may result in limited adoption by framers in the absence of attractive financial incentives;
ii. Limited technical institutional or human capacity to develop climate resilient varieties may affect the achievement of project objectives;
iii. Capacity building of all the stakeholder groups may be a challenge for the implementing agency or department, if it has severe capacity issues;
iv. Possible delays in the implementation of the pilot projects due to administrative and technical capacity issues.

The measures to overcome these barriers are:

i. Development of drought tolerant crop varieties especially for the rain-fed ecologies to improve food security in the face of climate change, locally;
ii. Improve access of the farmers to improved drought tolerant crop varieties, particularly in rain-fed, and drought prone areas of the country and its availability at the affordable price;
iii. Awareness among farmers, and policy makers on tolerant crop varieties;

2.2.4 Proposed action plan for Plant varieties resistant to climate change

Based on the identified barriers and proposed measures, the following action plan is proposed to stimulate the adoption and diffusion of drought tolerant crop varieties in Afghanistan.

Table.2.2: Proposed action plan for Plant Varieties Resistant to Climate Change

SECTOR: AGRICULTURE							
Technology: Plant varieties resistant to climate change							
Ambition: Meeting the demand of, and improved access to affordable and good quality tolerant crops through firming the variety development programs in the public research institutes. Create consciousness on tolerant crop varieties among farmers, and policy makers.							
Benefits: Contributing to livelihood, nutrition and food security of growing communities in the rain-fed ecologies; Increasing the share of tolerant varieties market in the country; Firming of institutional and technical research institutes involved in tolerant varieties production; Supporting the development and diffusion of new technologies enabling spill over to other crops facing climate change related problems							
Action 1: Design and adopt effective economic and financial tools and instruments to address the seed market needs and demands							
S.No	**Activity**	**Efficiency**	**Implementing Agency**	**Time Scale**	**Funding Source**	**Indicators of success and Risk**	**Budjet Per Activity US$**
1.1	Review the current subsidy and taxation plan for the agriculture sector and make a detailed cost estimation for development, transfer and diffusion of the climate tolerant varieties with inclusion of subsidies and low taxes instruments	High	MAIL, MOF	0-2 years	Government and Development funding partners	Success: Readily available cost estimation for the technology. Risk: Inadequate funding	0.15 million
1.2	Provide subsidy to the price of the input services for transfer and diffusion of the technology	High	MAIL	0-5 years	Government and Development funding partners.	Success: Readily available subsidy Risk: Inadequate funding	1.0 million

1.3	Review and increase budgetary allocation for agricultural research to R&D centers for the development of hybrid crop varieties	High	Ministry of Finance & Provincial Finance / Agriculture Departments	0-10 years	Government and Development funding partners.	Success: Readily available seeds varieties Risk: Inadequate funding -Human & technical capacity	4.5 million
	Action 2: Develop and strengthen the domestic seed market with special attention to the varieties resistant to climate change						
2.1	Develop necessary legislation and regulations to support and regulate varieties market	High-to-Medium	MNFSR & Provincial Agriculture Departments	0-2 years	Government and Development funding partners.	Success: User-friendly laws and regulations. Risk: Lack of political and administrative support and inadequate stakeholders consultations.	100,000
2.2	Encourage participation of private sector in building and expansion of market through reducing cost of doing business	Medium	MAIL, NEPA	0-3 years	Government and Development funding partners	Success: Increase in investment amount by private sector Risk: Lack of political will and legislative support, Frequent changes in economic and monetary policies.	250,000
Action 3: Improve and fortify policy and regulatory environment in the country to promote resistant crop adoption and replication							
3.1	Review and update varieties laws and acts to make them more	Medium	MAIL/ DAIL	0-3 years	Government and Development	Success: Consumer friendly laws and regulations.	10,000

	consumer friendly and protect the rights of small farmers				funding partners.	Risk: Lack of political and administrative support, Inadequate stakeholder consultations	
3.2	Strengthen the role of varieties certification authority to monitor and evaluate the quality in market	Medium	MAIL	0-3 years	Government and Development funding partners.	Success: Availability of quality seeds Risk: Lack of trained staff, Lack of or inadequate legislative support	500,000
Action 4: Create and promote info and consciousness about the necessity and advantages of the resistant varieties , in particular, drought tolerant crop varieties in water stressed and dry land areas							
4.1	Design and strengthen extension education to boost farmer's awareness of climate change and benefits of adaptation technologies	High	DAIL including Extension Wings, Public Research Institutions	0-5 years	Government and Development funding partners.	Success: Increase in demand and share of resistant varieties market, Increase in land area under these crop cultivation, Risk: Programs not designed to the needs of farmers, Weak policy support	100,000
4.2	Design and conduct field demonstration under different agro-ecological zones in the country	High	DAIL including Extension Wings, Public Research	0-5 years	Government and Development funding partners.	Success: Number of field-testing projects implemented during five years.	400,000

			Institutions, Private companies			Risk: Limited funding to do required pilots in different agro ecological zones; Demonstration projects do not work because of mismatch between variety and agro-ecological zones	
Action 5: Fortify the capacity of agriculture research organizations in terms of building research infrastructure, human resources, and knowledge transfer Strengthening R&D Institution's human and technical resources							
5.1	Hire additional technical experts in relevant key R&D institutions	High	MAIL, Agriculture Universities/ Faculties, ICARDA, FAO	0-5 years	Government and Development funding partners.	Success: Increase in number of varieties, Risk: Lack of funding, retention of experts for a longer period, lack of technical resources	500,000
5.2	Up-grade research laboratories with latest technologies	High	MAIL, NEPA Agriculture Universities/ Faculties	0-3 years	Government and Development funding partners.	Success: Availability of art labs. Risk: Technology performance risks & lack of funding.	800,000
5.3	Build technical capacity of local staff development through specialized training and workshops	Medium	NEPA, MAIL, Agriculture Universities/ Faculties	0-10 years	Government and Development funding partners.	Success: Availability of trained staff. Risk: Low	400,000

						Quality training programs & lack of funding.	
5.4	Promote knowledge transfer through collaboration and expert exchange programs with national and International research institutions	Medium	NEPA, MAIL, ,Public research institutions	0-5 years	Government and Development funding partners.	Success: Increase in collaborative initiatives and programs Risk: Non supportive organizational culture, Human performance risks & lack of funding	400,000
5.5	Survey the current status of varieties storage houses, and build new if necessary	Low	NEPA, MAIL, Agriculture Universities / Faculties	0-3 years	Government and Development funding partners.	Success: Sufficient storage capacity. Risk: Lack of political and administrative support	100,000
Total cost: US$							9.21million

2.3. Action Plan for the diffusion and transfer of Agroforestry technology

2.3.1 Introduction

Agroforestry helps restore agro-ecosystems degraded due to lack of organic matter from agricultural intensification and poor ecosystem management. It is a land-use practice that encompasses planting trees and crops and keeping livestock in the same field. This practice helps improve soil fertility. Generally, agroforestry systems can be categorized into three types *viz.*, agro-silviculture (trees with crops), agri-silvipasture (trees with crops and livestock) and silvo-pastoral (trees with pasture and livestock) systems. Agroforestry practices include alley cropping, boundary plantings/living fences, multi-strata and scattered farm trees. Agroforestry can improve the resilience of agricultural production to current climate variability as well as long-term climate change through the use of trees for intensification, diversification and buffering of farming systems. Trees have an important role in reducing vulnerability, increasing resilience of farming systems and buffering agricultural production against climate-related risks. Trees are deep rooted and have large reserves and are less susceptible than annual crops to inter-annual variability or short-lived extreme events like droughts or floods. Thus, tree-based systems have advantages for maintaining production during wetter and drier years.

2.3.2 Ambition for the TAP

The ambition for this technology deployment and diffusion is to scale up agroforestry through an agroforestry program for training 2,000 farmers and providing free seedlings by 2022. The training should be conducted by MAIL. The target is for agroforestry technology to be up scaled following the training model of training famers which was done by Forestry Department of the Ministry of Agriculture and Extension Officers from the Ministry of Agriculture and found successful. This involves training farmers on intercropping, improved fallow, alley planting, live fence/hedge row planting/wind breaks, fodder production and woodlots. The training will be conducted as a package with class room training, site visits and providing ten seedlings per farmer after the training to implement this technology in their farms.

2.3.3 Summary of barriers and measures to overcome barriers

There is limited adoption of agroforestry in Afghanistan, although some programs promote it and are gaining momentum. However, stakeholders felt that the technology needs to be scaled up. They identified the following barriers:

1. Farmers think of short-term benefits and agroforestry only benefits in the long term. This mindset needs to be changed through training and consciousness.
2. Extension agents are not promoting agroforestry enough. This could be due to knowledge gap or lack of impetus. Rolling out an agroforestry program will involve extension agents in providing training to farmers and may give the impetus to promote the technology.

2.3.4 Proposed action plan for agro forestry

Based on the identified barriers and proposed measures, the following action plan is proposed to stimulate the adoption and diffusion of drought tolerant crop varieties in Afghanistan.

Table 2.3 :Detailed action plan for the transfer and diffusion of agro forestry

Sector: Agriculture						
Technology: Agroforestry						
Ambition: Scaling up agroforestry through a program for training 2,000 farmers and providing free seedlings by 2022.						
Benefits: Enhanced livelihoods for growers and a greener landscape. Trained growers and consciousness of agroforestry via raising methods.						
Action: meetings to plan the project with relevant stakeholders, recruiting a consultant to develop proposal for funding and develop a training for agroforestry in all regions of the country in partnership with extension officers and conducting monitoring and evaluation.						
Activities	**Responsible Agencies**	**Time frame**	**Source of funds**	**Success indicators**	**Risk indicators**	**Estimated cost (US$)**
1. Production of training materials	DAIL for solving project site related issues, MAIL and MOF for fund mobilization and allocation	1 year	MOF, Local banks, WB, FAO, UNEP, ADB	Training material are available	Poor content of the training material	50,000
2. Organize and conduct training sessions for agro extension agents	MAIL, NEPA, FAO	1 year	FAO, UNEP, ADB,WB	One agro extension agent per sector is trained about the development and functions of integrated agro forestry systems	Absence of trained agro extension agents	400,000
3. Provision of support to the rehabilitation of existing agro forestry research sites	MAIL, MRRD, NEPA	2 years		At least three existing agro forestry research sites are rehabilitated	None or not all existing agro forestry research sites are rehabilitated	150,000

4. Production of awareness raising materials	MAIL, MRRD,NEPA, MCIT	1 year	FAO, UNEP, ADB,WB	Awareness materials are produced	Non or incomplete awareness material are produced	50,000
5. Installation of agro forestry demonstration sites	MAIL, MRRD,NEPA, FAO, ICARDA	5 years	FAO, IFAD UNEP, ADP,WB	Existence of at least one well developed agroforest demonstration site per province (country wide)	None or some of the proposed agro forestry demonstration sites are installed	500,000
6- Organizing and directing farmers study tours	MAIL, MRRD,NEPA	2 years	MOF, FAO, UNEP, UNDP,ADB, WB	All farmers associations/coo operative leaders have at least visited one successful agro forestry site	None or very few farmers study tour are conducted	100,0000
7. Creation of tree seed stands in every district	MAIL, MRRD,NEPA,FAO, ICARDA	5 years	MOF, FAO, UNEP, UNDP, ADB,WB	Existence of one tree seed stands in every district	None of very few seeds stands are created	200,0000
8. Production of seedlings	MAIL, FAO, ICARDA, NGOs	4 years	MOF, FAO, UNEP, UNDP,ADB, WB	Existence of one agro forestry nursery per sector in rural areas	Nurseries for agro forestry trees do not exist in all rural sectors	100,0000
Total cost: US$						5,105,000

2.4 Action Plan for Conservation Agriculture


2.4.1 Introduction

According to FAO (2017), Conservation Agriculture (CA) is an approach to managing agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment. CA is characterized by three linked principles *viz.,* 1) Continuous minimum mechanical soil disturbance; 2) Permanent organic soil cover; and 3) Diversification of crop species grown in sequences or associations.

Agriculture alters land forms and using tillage disturbs soil and may contribute to increased runoff and erosion. Tillage of the soil stimulates microbial decomposition of soil organic matter, which results in emissions of carbon dioxide to the atmosphere. Therefore, minimizing the amount of tillage promotes sequestration of carbon in the soil, increases water retention and reduces erosion. Thus, it has consequences for both climate mitigation and adaptation. With rising temperatures in terms of climate change, there will be higher need for water for agriculture and this technology helps in water retention in soil, thus aiding in adaptation. In the CA, the soil should remain permanently covered by crop residues from previous cash crops or green manure cover crops and most of these residues will remain undisturbed on the soil surface after seeding. Maintaining soil fertility, reducing runoff and erosion will have positive climate change adaptation values for agriculture. Climate change will also cause more weed growth and pest infestation and this technology reduces growth of weeds and pests thus, helps in adaptation.

The principles of CA can be applied to all agricultural landscapes and land uses with locally adapted practices. Very little external inputs such as agrochemicals and plant nutrients of mineral or organic origin are needed. CA facilitates good agronomy, and complemented by other known good practices, including the use of quality seeds, and integrated pest, nutrient, weed and water management, it is a base for sustainable agricultural production intensification. It also allows for integration of production sectors, such as crop-livestock integration and the integration of trees and pastures into agricultural landscapes. Stakeholders prioritized this technology as an adaptation measure for the country. CA increases the ability of soil to store or sequester carbon, enrich the soil, improve soil surface stabilization, reduce leaching of nutrients, decreases evaporation and hereby improve water retention, increase yield and reduces the need for tractors to pass on farm thus, reducing use of fossil fuels. Furthermore, CA reduces labor by up to 30%. In this technology burning crops and residue is avoided and it is a truly sustainable technology.

2.4.2 Ambition for the TAP

The ambition of the TAP for CA technology is scaling-up the technology through setting up CA demonstration sites to be used for training farmers and providing 200 mechanized planters to farmers through the Government tractors hire system and create awareness of this technology.

2.4.3 Summary of barriers and measures to overcome barriers

The major financial barrier identified by stakeholders was that the too high cost of mechanized planter and farmers wanted to take advantage of the Government's tractor schemes (where farmers can rent tractors for their use as subsidized rates) and use planters to reduce labor along with increased production. This is due to high interest rate (around 10%) to borrow money from bank and cost of importing from other countries. According to Manyatsi and Mhazo (2014) hardly any CA equipment is manufactured in Afghanistan, they are all imported.

The next barrier noted by stakeholders is the low consciousness and many growers are yet to take up this technology. Furthermore, capacity building needs to be done for extension staff and ways to mechanize CA using mechanized planters is suggested. Creating consciousness amongst growers through setting up demonstration sites and conducting site visits to demonstration plots will help in improving awareness.

2.4.4 Action Plan for Conservation Agriculture

The summary TAP (Table 2.4), following previous sections, sums up actions and activities, funding sources, responsible organization, timeframe, budget for the implementation, risks and C&I to improve and deploy Conservation Agriculture in next five years as the first stage for climate change adaptation and disaster resilience.

Table 2.4 Actions and Activities selected for inclusion in the TAP

Sector : Agriculture							
Technology: Conservation Agriculture							
Ambition: Scaling-up the technology through setting up CA demonstration sites for training farmers and providing 200 mechanized planters to farmers and create awareness regarding technology.							
Benefits: Enhancing resilience of crop production and commercialization through pilot project.							
Action: Improved farming methods resilient to climate change, improved yields and food security capacity building of farmers and extension staff.							
Action 1: 200 mechanized planters provided to the Government's Tractor pool for hire by farmers.							
Activities		**Funding Sources**	**Responsible bodies**	**Time frame**	**Risks**	**Success criteria**	**Budget per activity US$**
Activity 1.1	Project planning meetings held with MAIL, CANGOs for development	ADB, WB UNDP, IMF , MOF	MAIL	2 months	Disinterest of stakeholders ToRs may not be well developed.	Participation of stakeholders (number of attendees at meeting)	20,000
Activity 1.2	Recruitment of consultant for proposal development	ADB, WB UNDP, IMF, MOF	MAIL, MOF, ME	5 months	Recruitment process may take longer	Contract signed with consultant	20,000 (advertisement cost 5,000 , consultant fee 15,000)
Activity 1.3:	Present the proposal to development partners and raise funds for mechanized planters	ADB, WB IMF, UNDP, MOF	MAIL, MOF, ME	5 months	Afghanistan cannot access the LDC funding	Proposal funded	0

Activity 1.4:	Procure hand operated mechanized planters, through inviting tenders, reviewing and selecting supplier.	ADB, WB UNDP, IMF, MOF	MAIL, MOF, ME, MPW	11 months	Procurement process may take long	Mechanized planters arrive on site	$567,400
	Distribute mechanized planters to Government tractors pool	ADB, WB UNDP, IMF, MOF	MAIL, FAO	5 months	mismanagement of tractors	Mechanized planters arrive at Government tractors pool	25,000
Action 2 : Set up two CA Demonstration sites.							
Activity 2.1	Meetings (at least two) with local farmers	ADB, WB UNDP, IMF	MAIL, FAO	2 months	Farmers may resist the technology	Good participation of farmers	10,000
Activity 2.2	Set up demonstration sites, provide farm inputs to farmers	ADB, WB UNDP, IMF, MOF	MAIL	6 months	Farmers may resist the technology	Good participation of farmers	45,000
Action 3: Create awareness through IEC materials and site visits							
Activity 3.1	Develop IEC materials	ADB, WB UNDP, IMF, MOF	MAIL, MCIT	12 months	Media may not prioritize this	Good participation of media partners	70,000

Activity 3.2	Organize awareness sessions for communities via road shows where IEC materials such as brochures would be distributed	ADB, WB UNDP, IMF, MOF	MAIL, MCIT, MRRD	27 months	Response to technology may not be high	Good number of farmers show interest to register for site visits	50,000
Activity 3.3	Organize at least five site visits for farmers	ADB, WB UNDP, IMF, MOF	MAIL, FAO	27 months	Response from farmers may not be enthusiastic	At least five site visits conducted to CA demonstration farms	7,000
Total cost: US$							814400

2.5 Action Plan for Crop diversification and new varieties

2.5.1 Introduction

Crop diversification refers to the development and introduction of crops verities and production systems in a farming system so that it enhances, apart from value-added agriculture system and conservation of plant diversity, resilience to climate variability, hazards including pest and disease outbreak. The majority of crop diversification is in the form of integrated and rotation farming systems, agroforestry, and home garden. Currently introduction of new crop varieties such as flood and drought resistant wheat verities are also practiced. However, in overall, crop diversification is not effectively or fully developed and deployed for climate change adaptation. Climatic variations intensify the crops loss owing to destitute soil moisture content as a consequence of destitute rainfall and lengthy dry periods. Drought lenient and early maturing crop varieties preferment assists in the reduction of the crop loss risk and improve the resistant to harsh climatic circumstances, pest organisms and disease. These crop varieties have varied advantages with the key one of shorter maturity period/growing season in comparison to traditional varieties. In addition, they improve yield quality, health, nutritional value and plant productivity via building resistant to pest organisms, diseases and environmental stresses. Improved diversities of crops are resilient to water stresses and heat throughout the wet and dry climatic conditions, respectively. Sustainable and ecofriendly agricultural practices are emphasized (no/minimum chemical fertilizers application) once new varieties are made known to the growers.

The crop modification (diversification) denotes the addition of new crops to agricultural products on a specific farm, considering the different benefits from the crops with matching opportunities of marketing. The technology offers optimum circumstances for food safety and allows growers to produce excess products for market, so increase the revenue to meet additional requirements of family welfare. The application of this expertise positively lines with the financial, societal and environmental development primacies of the country as well as it contributes to the priority of food safety via increased production and to the diversification policy of the economy via augmented weight of agriculture sector within the financial system ultimately, results in increased rural populations' income.

2.5.2 Ambition for the TAP

Crop diversification, especially introducing verities of crops and integrated farming systems, is applied appropriately to increase net benefits of at least 20% as value-added to existing and newly developed farming systems.

2.5.3 Barriers and Measures to Overcome Barriers

There are six critical barricades, which have been perceived as crucial point for development and deployment of crop diversification. Three of them are financial and economic, and three are nonfinancial barriers, and to overcome the barriers, six measures were identified accordingly.

1. Financial and economic: Limited financial resources for promotion and management of crop diversification and Limited access to finance.
2. Institutional capacity and human skills: Scarce technical including climate change adaptation, financial and economic knowledge and skills on crop diversification.
3. Information and awareness: Inadequate information on optimal, reference projects and best practices on crop diversification for climate change adaptation and Majority of the stakeholders have limited awareness about crop diversification and climate change adaptation.
4. Legal framework: Insufficient policies to define clear definition, principles, guidelines, promotion and responsible organizations on crop diversification.Technical: Inadequate reference projects and best practices.

In Order to overcome these barriers, the following measures are proposed;

1. Improve financial resources for promotion and extension, Maintain or increase the budget for the extension, Enhance resources mobilizations, cooperation and access to external financial supports, Promote investment of the private sector, improve the public budgeting including international aids effectiveness *e.g,* R&D and promote cost-effective technologies and practices and Expand access to finance.
2. Improve facilities for research and technical including adaptation, financial and economic knowledge and skills on crop diversification (adaptive crop varieties and systems). R&D information on optimal crop diversification for climate change adaptation and disaster resilience including cost-effective and best practices as well as increase awareness of the stakeholders on crop diversification.
3. Improve policies, especially clarifying definition, principles, guidelines, promotion and responsible organizations on crop diversification.Develop reference projects and best practices

2.5.4 Action Plan for Crop Diversification and new varieties technology

The summary TAP (Table 3.5), following previous sections, sums up actions and activities, funding sources, responsible organization, timeframe, budget for the implementation, risks and C&I to improve and deploy crop diversification in next five years as the first stage for climate change adaptation and disaster resilience. This TAP will be implemented by MAIL, the primary stakeholders, in coordination with NEPA, with the total cost of around US$ 10,432 million.

Table 2.5: Action action plan for Crop Diversification and New Varieties.

Sector: Agriculture							
Technology: Crop Diversification and New Varieties							
Ambition: Introducing verities of crops and integrated farming systems to increase net benefits.							
Benefits: Socio-economic benefits to growers and environment, provide improved yields and thereby greater incomes.							
Action1: Increase public investment and enhance resource mobilization to invest in crop diversification promotion and development							
Activities		**Funding Source**	**Responsible Bodies**	**Time frame**	**Risks**	**Success criteria**	**Budjet per Activity**
Activity 1.1	Develop strategy and action/ business plan for each crop diversification system including financial and economic assessment	MOF UNDP, ADB, WB, FAO	MAIL, ME, MCI	10 months	Insufficient information about hazards risks, vulnerability and resilience of crop production systems inclusions varieties, or insufficient financial and human resources to improve information and develop the strategy	A comprehensive and practical strategy and action plan for each crop diversification system is put in place and proved to be useful for increase effective and sustainable crop diversification development including technical and financial support	12,000
Activity 1.2	Conduct financial assessment and identify funding sources	MOF UNDP, ADB, WB, FAO JICA,	MAIL, ME, MCI	10 months	Responsible organization's staff have neither sufficient skills, nor budget for research and information improvement	Clear and comprehensive information about financial needs, funding sources and feasibility are available and prove to be useful for planning on resources	10,000

						mobilization and access to financial support	
Activity 1.3	Develop resource mobilization plan	MOF UNDP, ADB, WB, FAO , JICA	MAIL, ME	10 months	Insufficient information about funding sources, and unclear responsibility on the resources mobilization among organizations	Comprehensive resource mobilization or financial access plans are put in place and proved to be useful for access to technical and financial support including cooperation	9,000
Activity 1.4	Develop and submit project proposals for funding the crop diversification	MOF UNDP, ADB, WB, FAO JICA,	MOF, NEPA, MAIL, ME	9 months	Insufficient human resources and information to develop good proposals	At least 2 project proposals accepted and funded projects within 5 years (2021-2026)	105,000
Activity 1.5	Develop funding donor directory	MOF UNDP, ADB, WB, FAO	MAIL, NEPA, FAO	6 months	Inaccessible to detailed financial or donor aids information	A clear and comprehensive information about funding sources including opportunities are available and useful for planning for cooperation and access to technical and financial support	6,000

Activity 1.6	Improve public and foreign financial aids data management system including M&E and feedback mechanism	MOF UNDP, ADB, WB, FAO	MOF, MAIL,	6 months	1).Ineffective one door service including coordination and information sharing. 2) Difficult to define financial flow at the sector or technology level	Complete, effective and transparent financial aids data management system is put in place and prove to be useful for tracking financial flow, M&E and improvement of supports and budget disbursement rate	20,000
Action 2: Expand access to finance							
Activity 2.1	Study, identify and enhance cooperation between domestic and regional financial institutes (to expand domestic financial markets and increase favorable loans and access of agribusiness)	MOF UNDP, ADB, WB, FAO	MAIL, NEPA, ME, MPW	10 months	Delayed due to 1) Limited capacity know how to facilitate to access to 1) finance of the governmental organizations in charge and cooperation between public and private sector including Financial institutes. 2) Low return on investment and high risk of agribusiness	Favorable loans are available and accessible for agribusiness including crop diversification and climate change adaptation	60,000

Activity 2.2	Research and develop the agriculture development fund including decree on the agriculture fund	MOF, UNDP ,ADB, WB, FAO	MOF, MAIL	10 months	Ineffective due to unclear responsibilities of organization in charge, and limited experiences and budget	Agriculture development fund, and available budget put in place and proved to be effective in promotion resilience of agriculture production and businesses	15,000
Activity 2.3	Increase financial capacity and readiness and of entrepreneurs through trainings and exchanges	MOF, UNDP ,ADB, WB, FAO	MAIL, MIC, NEPA	8 months	Delayed due to limited resources and information	1. Entrepreneurs are strengthened and capable to access to finance. At least 2. crop diversification projects/business plans are financed	90,000
Activity 2.4	Organize crop diversification forum including financial access dialogues	MOF, UNDP ,ADB, WB, FAO	MOF, MAIL, NEPA, FAO,	5 months	Limited resources for research and information, and limited participation of the important policy makers and private sector/ financial	The forum on crop diversification is proved to be useful for fostering crop diversification research, development, deployment and diffusion	65,000
Action 3: Increase organizational capacity and human resources (HR)							
Activity 3.1	Improve HR development system including HR and capacity development plan, staff knowledge management, self-learning mechanism	MOF,U NDP, ADB, WB, FAO	MAIL, MOF, MPW, NEPA, MIC	12 months	1).Changes of organizational structure and staff movement. 2).Mismatched HR supply and demand side or ineffective coordination between	Responsible organizations have capacity to promote and deploy crop diversification for increase agricultural production and business including resilience	70,000

	of relevant organizations (e.g., MOF, MCI/NEPA)				educational institutes and MOF etc. 3).Limited organizational and staff self-learning and commitment.		
Activity 3.2	Building capacity of national, local authorities, entrepreneurs and communities on crop diversification through trainings and exchanges	MOF,UNDP, ADB, WB, FAO	NEPA, MAIL, NGOs	8 months	1). Limited financial and resource person to facilitate capacity building and following up. 2).HRD and capacity building plan is not yet improved or in place, leading to delay or mismatch between training and capacity needs. 3).Limited organizational and staff self-capacity building.	Staff receive sufficient trainings and have sufficient knowledge and skills to promote and deploy crop diversification for increase agricultural production and business including resilience to changing climate and hazards	135,000
Activity 3.3	Increase technical capacity of field staff and mobile team	MOF,UNDP, ADB, WB, FAO ,	MAIL	12 months	Insufficient resources and incentives to mobilize and sustain field staff, mobile team and activities	Field extension staff and mobile team received sufficient trainings and be able to support entrepreneurs and farmers to deploy and expand crop	120,000

						diversification for climate change adaptation	
Activity 3.4	Promote network, think-tank and civil organization and information exchanges	MOF, UNDP ,ADB, WB, FAO JICA	MAIL, MCIT	3 months	Insufficient resources and effective mechanism/model to promote development and sustain the think-tank, networking and exchanges	Think-tank, networking and exchange platform are put in place and proved to be useful for boosting crop diversification R&D, deployment and expansion	60,000
Activity 3.5	Improve crop diversification study in education and research institutes	MOF, UNDP ,ADB, WB, FAO JICA	MAIL, NEPA	2 months	Insufficient resources including human, and information to develop practical and comprehensive curriculum and research	More practical crop diversification curriculum including educational materials are put in place and promising for both short and long-term crop deployment and diffusion for climate change adaptation	90,000
Action 4: Research and develop information and best practice guideline s							
Activity 4.1	Improve crop diversification research Facilities	MOF, UNDP ,ADB, WB, FAO JICA	MAIL, NEPA, FAO, ICARDA	3 months	Delayed or not inclusive due to limited resources and information	Crop diversification research facilities are put in place and useful for R&D of crop for climate change adaptation	520,000

Activity 4.2	Re-assess the resilience of the capacity of existing crop production systems, develop land suitability map and land use plan in disaster risk areas, and identify an optimal adaptive crop varieties and systems for adaptation and commercial production including financial analysis of each system	MOF, UNDP ,ADB, WB, FAO	MAIL NEPA	3 months	As 4.1 above	Optimal crop diversification systems are available for deployment to enhance crop production to be more resilient to changing climate	110,000
Activity 4.3	R&D best practices on the optimal crop diversification systems to address productivity reduction due to 1).erosion and landslide, 2).drought and water use deficiency,	MOF, UNDP , ADB, WB, FAO	MAIL, ICARDA, FAO	5 months	As 4.1. above	Optimal and best practice guidelines on crop diversification systems are put in place and deployed for coping with the 6 problems	500,000

	3).floods, 4).extreme climate, 5).soil degradation or nutrient deficiency, 6).pest and insect epidemics						
Action 5:Improve policies, especially y clarifying definition, principles, guidelines, promotion and responsible organizations on crop diversification							
Activity 5.1	Develop an overall policy on environmentally friendly including climate change adaptation and disaster resilient Technology	MOF, UNDP , ADB, WB, FAO	NEPA, MAIL, MRRD, ME, MUDL, MCI	12 months	Limited resources, information and skills on the policies about environment friendly and climate change adaptation technology	Inclusive and practical policies on the environmentally friendly including technology for climate change adaptation are put in place and proved to be useful for crop diversification development, promotion and management	20,000

Activity 5.2	Develop a specific policy or guidelines on the development, deployment and diffusion of the environmentally friendly and adaptation technology in the agriculture sector	MOF, UNDP, ADB, WB, FAO JICA	MAIL, NEPA, MCI, MUDL	1 month	As 5.1 above	Inclusive and practical guidelines on the environmentally friendly including climate change adaptation technology are put in place and proved to be useful for crop diversification development, promotion and management	15,000
Action 6: Pilot an optimal crop diversification system f or adaptation and commercial production							
Activity 6.1	Pilot crops varieties and integrated agriculture production systems to enhance adaptation capacity as well as coping with 6 problems mentioned in activity 4.3	MOF, UNDP, ADB, WB, FAO JICA	MAIL, NEPA, FAO, ICARDA, WFP	3 months	Delayed due to insufficient resources and best practices	Piloted crop diversification systems proved to be good models promising and helpful to promote climate resilient agricultural production and businesses	8,400,0
Total coast: US$							10,432,000

2.6 Action Plan for Land Use Planning Technology

2.6.1 Introduction

Afghanistan experiences a variety of land degradation problems of different intensities across the agro-ecological zones due to the combination of many factors. These factors are high population density, low per capita land availability and about 30% of the land being hilly and mountainous terrain with steep slopes and narrow valleys. The latter is the area highly susceptible to land degradation with high rates of soil loss *i.e.,* around 53 tons/ha/yr in the hill country on sloping lands under intensive cultivation of vegetables and potatoes, poorly managed seedling tea and shifting cultivation. Land use planning (LUP) technology meant at a wide range of activities tha direct the future use of land with the aim to ensure optimal land use within a political, social, environmental, cultural and economic context. In this context it meant the reinstating of degraded land and maintaining healthy soil in the country to ensure food safety, alleviate rural hunger and poverty and build resistance to foremost environmental problems. The objective of LUP is to concentrate on degraded land restoration and stop further degradation of any natural land to confirm sustained ecosystem functions and health. LUP covers the economic, socio-cultural and ecological proportions of sustainable development and it encompasses land use designing and planning of as well as land development as a process.

As demand for manifold ecosystem services and land uses rises, competition for land also increases. Technologies for the LUP practices' adaptation, application, acceptance and distribution rely on methods of empowering and enabling people to this end. The issues of emerging carbon markets, renewable energy and food security are generating signals of prices for agricultural land conversion and other usages *i.e.,* biofuels and reforestation. This take place analogously with additional rising demands for land systems such as biodiversity conservation, mining, services, suburbanization and food production whereas, land use alteration might rise the supply of some eco-services and existences of trade-offs with other amenities. Management of increased competition for these facilities' supply and various investors' benefits, necessitates LUP for effectual land allocation that encourages sustainable land use choices Land use efficiency: anticipating future demand for land-sector greenhouse gas emissions abatement and managing trade-offs with agriculture, water, and biodiversity. LUP affects the environmental conditions as its application might exert some negative and positive influences on the ecosystem.

2.6.2 Ambition for technology transfer and diffusion

Target identified here, in the Technology Action Plan for LUP is restoration of the most problematic agrarian land within 10 years and maintaining the present fertility status of the remaining non-degraded land allocated to food production.

2.6.3 Barriers to the technology's diffusion

Eight key barriers to technology transfer and diffusion in the context of climate change have been identified through a stakeholder consultation and expert inputs. Seven of them ranked as highly significant while the following economic and financial barriers were found to be the most critical.

1. High cost of Implementation and slow return from LUP practices.
2. High economic cost of conservation practices and social constraints in small land holdings.
3. Low public and private investment on research and development.
4. High dependency on land for livelihoods resulting in high land pressure.
5. Insecure Land Ownership and inadequacy and poor enforcement of Policies, laws and regulations.
6. Inadequate knowledge on appropriate land management techniques and new challenges to sustainable management.
7. Poor coordination among stakeholder organizations and low public and private investment on research and development.
8. Poor relevance of broad-spectrum techniques due to diversity of land, weather, soil, terrain, size, land formation and land use and high dependency on land for livelihoods resulting in high land pressure.

Only the education and consciousness rising without providing some assistance cannot encourage small-scale landholders to undertake suitable LUP practices. The LUP practices are usually expensive in comparison to crops cultivation cost and the paybacks of these practices are usually attained in more than a few years and not instant as well. Thus, small-scale landholders are unable to accept such follows without some assistance to reimburse the associated charges.

Some of the LUP practices requires funding and further support from the State as they cover a variety of off-site societal paybacks such as wide-ranging ecological amenities allied with LUP doings *viz.,* erosion control, silting prevention of civic water-bodies, water conservancy, recharge of ground water, etc. In order to overcome the above barricades, the following measures are proposed;

1. Cumulative affordability and returns to LUP acceptance;
2. Increasing affordability of LUP follows and reducing societal limitations in smallholdings;
3. Rising private and civic investment on development and research;
4. Reducing livelihoods reliance on land to reduce pressure on land;
5. Securing Land Possession;
6. Introduction and implementation of LUP rules, regulations and policies;
7. Increasing knowledge on suitable LUP practices and new challenges;

8. Confirming appropriate care to conservancy in non-agricultural land uses and Encouraging cooperative land planning measures.

2.6.4. Proposed Action Plan for the Technology

The priority actions to assure LUP are categorized under 22 sub actions (Table 2.6). Some of the land management measures are actions that take a long time to implement with long payback period. This long-term nature causes some constraints requiring support over an extended period when compared with production activities. Ensuring adoption of various LUP practices by cultivators require raising awareness on the importance of the practices, supporting actions with low-cost funds or grants, as well as assuring returns to investments by granting ownership rights.

Nature of LUP practices are such that it calls for interventions in a complete or a large part of the respective watersheds thus requiring spatial planning units that comprise of multiple holdings. Planning and designing LUP practices in a manner that facilitates coordination and participation of multiple operators are suggested.

Recognizing shortcomings in the area of enforcement of laws and regulations pertaining to land management, actions to strengthen legal remedies are suggested. Other supporting actions comprise of strengthening R&D in the LUP technologies and improving coordination among key stakeholder groups concerned with implementation. Recognizing the need to lessen the pressure from intensive utilization of land as a source of livelihood by sacrificing its long-term sustainability, remedial actions are suggested. The Proposed Action Plan for LUP is provided in (Table 2.6).

Table 2.6: Proposed Action Plan for the Land Use Planning

Sector: Agriculture						
Technology: Land Use Planning						
Ambition: Restoration of the status of the most problematic agrarian land within 10 years and maintaining the present fertility status of the remaining non-degraded land allocated to food production.						
Benefits: Improving info. about balanced land use, land use change, cultivation and other water development projects, hazards, and best practices for better and sustainable land use.						
Action 1: Increasing affordability of land use planning						
Activities	**Efficiency**	**Funding Sources**	**Responsible Agencies**	**Time frame**	**Indicators of success and risk**	**Budjet per Activity (US $)**
i. Introduce & implement subsidies (input & output subsidies)	V. High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, MPW, ME, MCI, ANDMA	0-10 years	Introduction of land development subsidies/incentives within two years Amounts disbursed under land development subsidies	10 Million
ii. Awareness Creation on long term benefits of sustainable LUP	V. High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, MPW, ME, MCIT	0-10 Years	20 of the planned sessions held per year Over 25 of the planned posters/ leaflets distributed/year Over 20% of the planned TV programs/year	1 Million
Action 2: Securing Land Ownership rights						
i. Enhance the clear ownership rights of land	V. High	MOF, WB, ADB, UNDP, WFP	MAIL, MUDL, MRRD, ME,	0-5 years	Over 25% of the planned titles to land issued annually Amendments to land law to permit long-term leases within four years	0.05 Million

Action 3: Increasing affordability of conservation practices and reducing social constraints in small land holdings						
i. Set up incentives targeted to small land parcels	V. High	MOF, WB, ADB, UNDP, WFP, UNoPS	MAIL, NEPA, MUDL, , MRRD, MPW, ME	0-10 years	Over 85% of incentive schemes targeting small land parcels 15% of funds per year disbursed under each scheme	2.5 Million
ii. Introduce water-shed level conservation methods	V. High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, MPW, MEW, ME, NWARA	5-10 years	Over 85% of planned appropriate conservation techniques introduced	1 Million
Action 4: Introducing and enforcing land management policies, laws and regulations						
i. Reform and enforce the relevant policies, laws and regulations	V. High	-	MAIL, NEPA, MUDL, MRRD, MPW, ME, NWARA	0-5 years	85% of planned amended/revised legislations introduced within five years	No cost
ii. Independently monitor enforcement	V. High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, MPW, ME	5-10 years	100% of offenders taken legal action	0.5 Million
Action 5: Raising Knowledge on appropriate land management techniques and new challengers						
i. Develop & maintain long term benchmark sites with appropriate LUP techniques in different agro-ecological zones	V. High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, ME, FAO, NWARA	0 – 10 years	Over 85% of planned benchmark sites established in each agro-ecological zone. Benchmark data on fertility status of land compiled within ten years Data on land productivity improvement within ten year	2 Million

ii. Awareness creation on best practices available	V. High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, MPW, MCIT	0-5 years	25% of beneficiaries participated per year Over 25% of programs conducted per year Over 20% of people/ community adopted proper land management practices per year	0.5 Million
iii. Capacity strengthening of community/local agents for LUP	High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, MPW, ME	0-10 years	Percentage of target group capacity developed annually	0.5 Million
Action 6: Ensuring proper attention to conservation in non-agricultural land uses						
i. Identify land conservation as a national priority in all land uses	V. High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, MPW, ME, MOH	0-5 years	EIA Procedures amplified to include land related issues within two years	1.5 Million
ii. Identify potential prime agricultural lands and reserve for agricultural purposes.	High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, MPW, ME,	0-5 years	80% of planned land use zonation maps prepared based on potentials and limitations.	2 Million
iii. Revise land use policy and legislation	High	-	MAIL, NEPA, MUDL, MRRD, MPW, ME, MOH	0-2 years	Revise within two years	No Cost
Action 7: Improving coordination among stakeholder organizations						
i. Strengthen interagency	V. High	-	MAIL, NEPA, MUDL, MRRD,	0-2 years	Activate an Inter-Ministerial Committee on Land Management and arrange	No Cost

coordinating mechanisms			MPW, ME, MOH		meetings twice a year	
ii. Set up land use planning and monitoring system	V. High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, MPW, ME, MOH	0-10 years	Land use planning and monitoring system set up and upgrade annually	0.5 Million
Action 8: Raising public and private investment on research and development						
i. Increase public investment for R & D aimed at generating scientific data and collecting Technical information	High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, MPW, ME, MCI	0-10 years	Over 75% of planned research grant schemes for land use studies Funds disbursed for land use R&D	5 Million
ii. Facilitate private investment on land use research	Medium	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD,	0-10 years	Tax credit and no of matching grants for land use research	4 Million
Action 9: Promoting collective land management measures						
i. Develop and promote collective conservation efforts	High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD, NGO,s	0-10 years	Land area under collective conservation schemes within two years	1.5 Million
ii. Introduce catchment and watershed management	High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD,	0-10 years	Land area under common catchment management within two years	1.5 Million

iii. Promote social responsibility through remedial measures	Medium	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD,	0 – 5 years	Over 20% of the planned of remedial measures introduced by the stakeholder groups per year	0.5 Million
Action 10: Improving relevance of land management techniques under diverse land, weather, soil, terrain, size and land Formation						
i. Develop and implement site-specific technologies for different land classes and environments	High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD,	0-10 years	Over 50% of planned of technologies developed & introduced within five years 85% of land groups covered by new recommendations Over 80% of planned pilot sites set up for demonstration/study	4 Million
Action 11: Lessening dependency on land for livelihoods to reduce pressure on land						
i. Promote diversification of land-based livelihood activities	High	MOF, WB, ADB, UNDP, WFP	MAIL, NEPA, MUDL, MRRD,	0-10 years	Over 25% of farmers adopting alternative off-farm livelihoods per year 75% of planned innovative solutions introduced	1.5 Million
Total Cost US $						40.05 million

2.7 Action Plan for Responsive Agricultural Extension


2.7.1 Introduction

The Responsive Agricultural Extension (RAE) is a rural agrarian extension model based on the idea of providing specialized and intensive technical training to identified people in living rural communities to promote a variety of technologies and offer technical services with support and review from an extension organization. The RAE is a demand driven model that provide opportunity for farmers groups or community to contact the service provider for specific information and related services. The community based extension model can contribute to climate change adaptation through the training of service providers in climate data collection, analysis and dissemination within their areas of operation to enable communities select appropriate response strategies. The RAE model was introduced in the country to complement the efforts of agricultural services in addressing farming products along with livestock health problems in the absence of adequate qualified staff. The practice has since been expanded to include other technical areas including crop agronomy. It is also being used to promote climate change adaptation in parts of the northern region by ICARDA, an NGO. The use of the model however remains on pilot basis with limited coverage.

2.7.2 Ambition for Transfer and Diffusion of RAE

The action plan targets the enhancement of extension service up to 450 communities in selected districts across the country. It is intended that the transfer and diffusion of the technology will be done within a five-year period beginning from 2022 to 2026.

2.7.3 Barriers to Promotion and Diffusion of RAE

Inadequate extension service to farmers resulting in non-application of improved farming practices is the base problem, which the RAE technology addresses. The direct result of these is low productivity and production resulting in household food insecurity, poverty and general low standards of living in rural communities. There are the usual economic and non-economic barriers.

The economic and financial barrier to the smooth promotion and diffusion of this technology revolves around lack of motivation for available personnel. Closely associated with this is the inadequacy of financial benefits for the job that agents do within their communities and absence of tools and equipment to enable them perform their duties satisfactorily. The above are as a result

of lack of budgetary allocation to support RAE because it is not identified as an integral part of the national extension structure as a result of the existing national agriculture extension policy.

The main barrier is the absence of trained personnel as a result of lack of qualified persons to be trained, which is a direct result of poor quality of educational within rural communities. Rural-urban migration is also identified as a cause of non-availability of required personnel for training. Non-appreciation of role of community based extension agents is a major barrier because of poor perception among community members due to low consciousness about the importance of RAE among rural communities which is also due to high dependence on regular extension service from national extension organization. Institutionally, limited support from the national extension service was also identified as a barrier. This is as a result of lack of budgetary allocation because RAE is not an integral part of the national extension service delivery mechanism.

Measures to Address Barriers

Measures for improving the promotion and diffusion of RAE were identified through, BAEF and stakeholder consultation as well as fine-tuned by consultant using own knowledge based on local experience. The measures were initially identified for each category of barriers and regrouped into economic and financial and non-financial measures.

Central to addressing economic and financial barriers is the need to review current extension system to enable integration of RAE into the national extension structure to enable budgetary allocation to support its implementation. In addition, this could be a mechanism for engaging with not-for-profit organizations (NGOs, Relief Agencies, Faith Based Organizations, Farmer-Based Organizations, etc.) to support the role out of the technology specific locations in collaboration with the local administration structure. There is the need to provide necessary tools and equipment and establish a clear modality for providing remuneration to trained personnel. Additionally, resources including training facilities should be provided for continuous training of personnel.

There is the need to undertake sustained consciousness creation on the benefits of RAE among rural communities to remove misconceptions and encouragement of non-formal education among the adult population.

There is the need to review current extension structure and delivery mechanisms to include RAE to enable its recognition and prioritization as major step towards addressing the wide gap between growers and available extension staff. The national extension service should develop a comprehensive action plan for rolling out and supporting RAE in rural communities complete with training actions.

2.7.4 Action plan for responsive agriculture

The predicted action plan for the transfer and diffusion of the RAE encapsulates a program with the government partnering multi and bilateral agencies to promote extension services in the farming communities through the RAE. This is summarized in Table 2.7 below.

Table 2.7: Proposed Action Plan for RAE

Sector: Agriculture						
Technology; Responsive Agriculture Extension						
Ambition: Enhancement of extension service in selected districts across the country. The transfer and diffusion of the technology within a five-year period beginning from 2022 to 2026.						
Benefits: The massification of demonstration plots and transmission of audio-visual information that create awareness for promoting the technology and its benefits which will increase the possibility of its use. This will enhance acceptance and mainstream adoption of the technology across the country.						
Action: Increase awareness and promotion of modernize agriculture system in Afghanistan through demonstration plots and audio-visual information						
Activities	**Responsible bodies**	**Time**	**Funding Source**	**Indicator of Success**	**Risks**	**Budjet Per Activity US$**
Enhancing extension service to 450 communities in selected districts recruitment of staff, budgetary support for implementation, logistics (e.g. vehicles, motorbikes and bicycles)	MAIL, MPW, MRRD, NEPA	2022 2026	FAO, MOF, WFP, ADB, UNDP	Extension services delivered to at least 450 communities nationwide	Cooperation of the MAIL and MOF in the project implementation	5,000,000
Capacity building for extension officers and other staff for the 450 communities	MAIL, MRRD, MPW, NEPA	2022 2026	FAO, MOF, WFP, ADB, UNDP	About 100 extension officers trained	Commitment of the extension officers and other staff.	2,000 per each extension officer/ staff Total - 1,000,000
Training of average 10 community agents in 450 communities	MAIL, MRRD, MPW, NEPA, NGOs, FAO	2022 2026	FAO, MOF, WFP, ADB, UNDP	450 community agents trained	Availability and commitment of the 500 community agents	1,000 per community agent Total - 5,000,000

Training of farmers by community agents in 450 communities	MAIL, MRRD, MPW, NEPA, NGOs, FAO	2022 - 2026	FAO, MOF, WFP, ADB, UNDP	20 farmers trained in each community by the agents	Willingness of the farmers to learn from the CBEAs	4,000 per community in 450 communities Total 2,000,000
Total cost US$						13,000,000

2.8 Project ideas for the Agriculture sectors of Afghanistan

2.8.1 Breif summury of project ideas for Agriculture sector

The project ideas are concrete actions supporting the realization of the overall target indicated in the Technology Action Plan for the sector. Project ideas were identified by stakeholders after discussion and deliberations at stakeholder workshops. This project idea was conceived in a brainstorming session at the TAP stakeholder's workshop and later developed by the Consultant. Economic Analysis information provided in the BAEF report helped make some of these decisions. It is expected that the actions proposed in the project idea will help farmers and in general the agriculture sector effectively adapt to climate change.

2.8.2 Specific project ideas for the Development and diffusion of plant varieties resistant to climate change

2.8.2.1 Introduction

Climate change, particularly heat and drought stress, will continue to reduce the performance of staple crops worldwide (Challinor *et. al*., 2014). Economists project that by 2050 in the absence of unprecedented coordinated measures to raise productivity, consumers will pay 50 % more for cereals in real terms, and climate change is also predicted to add another 60 million hungry people to the world (Wiebe *et. al.,* 2015). Wheat, which provides 20 % of food calories globally, must increase productivity by more than 60 % in this timeframe in order to match demand. This represents a major challenge to food security globally, and particularly in Asia, where more than half of the developing world's wheat crop is planted. Scientists across different disciplines have argued that the opportunity exists to improve the leverage of knowledge, expertise, and physical infrastructure to achieve greater returns on investment from biotechnology and breeding (Reynolds *et al*., 2016).

Plant response to physiological stresses such as drought is very complex phenomenon, the research shows it could be enhanced through improving crop selection efficiency through various conventional breeding and genetic tools (Barnabas *et al*., 2008). Drought tolerant crop varieties are rather a less researched area in the country due to a relatively low priority placed on dryland agriculture. In the past few decades, some prolonged occurrences of drought have been noted across the country, which has seriously affected the crop production capacity even in the irrigated agriculture zones of the country. It is therefore, important to consider developing and disseminating drought tolerant crop varieties that offer food and livelihood security to the millions of small farm holders in Afghanistan.

Climate change resilient crop varieties are a less-researched area in the country; little information is available on these varieties in general and drought tolerant crop varieties in specific, including its market share and size. Nevertheless, in general, it remains small in size, fragmented and mostly unregulated in Afghanistan. The use of these varieties are only 15 % among the farming community, and most of the farmers either use this technology with unknown quality or depends

on their own indigenous varieties. The data and information on the share of market occupied by the drought tolerant crop varieties in the national seed industry is almost non-existent. According to the future climate change projections for the region, with a rise in mean annual temperature under different scenarios by the end of this century expected a wider region of the country could be affected by drought. This issue demands a serious attention of policy and decisions makers to tolerant crop varieties to ensure food & livelihood securities of households and individuals in the future.

2.8.2.3 Purpose and Objectives

The project aims to meet the demand of growers to good quality and improve access as well as affordable drought tolerant crops varieties via firming the variety development programs in the public research institutes. The project also focuses on the development of potential drought tolerant varieties, its testing, registration, and wide dissemination in the country. The project puts strong emphasis on leveraging and capitalizing on extant public-private partnership networks present among international and national research organizations and other stakeholders for the implementation of program. Some common objectives of the project are:

- Develop new local drought tolerant crop varieties especially for the rain-fed ecologies to improve food security in the face of climate change;
- Improve availability of, and access to the improved drought tolerant crop cultivar by farmers, particularly in rain-fed, and drought-prone areas of the country, at the affordable rate;
- Create consciousness on tolerant crop varieties among farmers, and policy makers;

2.8.2.4 Project deliverables

After the implementation of the project, the following deliverables are expected:

i. Certified varieties of important cereal crops and vegetables are released and available to the farmers in the domestic market;
ii. Tolerant crop (cereal and vegetables) are cultivated on most of land in the country;
iii. Independent verities act enforcement wings, with all requisite infrastructure, are established and operational at provincial levels.

2.8.2.5 Project benefits

The following benefits are expected:

i. Contributing towards livelihood, nutrition and food security of growing communities in the rain-fed ecologies;
ii. Increasing the share of tolerant varieties market in the country;
iii. Strengthening of institutional and technical research institutes involved in various steps of tolerant varieties production;
iv. Supporting the development and dissemination of new technologies, also enabling spill over to other crops facing climate change related problems;

2.8.2.6 Monitoring and evaluation

The implementation of the project would be supervised and closely monitored by a Project Steering Committee led by TNA National Coordinator. Other members would include representatives from pertinent government institutions, NGOs, development partners and project beneficiaries. Project manager would be required to submit quarterly progress report to the steering committee. This would provide an opportunity to keep a track on progress made in relation to project objective set and to make necessary adjustment where necessary. A mid-term and final project evaluation will also be undertaken to assess its effectiveness that will form a basis for lesson learnt and its replication.

2.8.2.7 Activities

1. Capacity building of the staff of existing plant breeding and genetic engineering institutes, concerned certification and registration departments, varieties multiplication agencies at the federal and provincial levels.
2. Dedicated funding grant for the research institutes involved in the development of tolerant crops varieties.
3. Establishment of strong partnership with public and private companies, Community based organizations, NGOs and national extension systems.
4. Provision of incentive to large companies to accelerate the commercialization of tolerant varieties.
5. Provision of subsidies to ensure easy and cost-effective availability of these varieties to farmers.
6. Farmers' awareness raising and sensitization programs about the usefulness of these improved varieties.
7. Strengthen federal and provincial seed councils to develop and commercialize improved varieties at affordable prices.
8. Capacity building of private sector companies and public sector inspectors to improve overall quality and marketing processes.

2.8.2.8 Timeframe and Budget

The expected time for the successful implementation of the technology is to be 5 years and the budget of the implementation is US$ 9.21 million.

2.8.2.9 Relevant Implementing Agencies

FAO, NEPA, MAIL, DAIL and ICARDA, Universities, Departments and companies, NGOs, and Agriculture Extension Services are the responsible agencies for the successful implementation of the project.

2.8.2.10 Possible challenges

The key challenges in the project may be:

i. The high cost of these crops varieties may result in limited adoption by framers in the absence of financial incentives;

ii. Inadequate technical institutional or human capacity to develop varieties may affect the achievement of project objectives;
iii. Capacity building of all the stakeholder groups may be a challenge for the implementing agency or department, if it has severe capacity issues;
iv. Possible delays in the implementation of the pilot projects due to administrative and technical capacity issues.

2.8.3: Specific project ideas for Agroforestry technology

2.8.3.1 Introduction

The technology was prioritized by stakeholders to improve the resilience of agricultural production to current climate unpredictability and long-term climate change. Planting trees for intensification, diversification and buffering of farming systems will help growers raise incomes and improve their land. In the past, there has been limited training to growers on this technology and according to stakeholders this technology needs to be scaled up.

2.8.3.2 Objectives

The objective of this project is to train 2,000 growers in agroforestry and as part of the training package provide them with free seedlings. This type of project has been somewhat implemented and found successful and wise use of funds as it is inexpensive technology. The training should be conducted by Department of Forestry and MAIL's extension officers, as one challenge was the scarce participation of extension officers in agroforestry work.

2.8.3.3 Outputs

The outputs expected are 2,000 growers trained and provided with free seedlings and consciousness of agroforestry raised via consciousness raising methods. The project is in alignment with the National Development Strategy and Vision 2022 which emphasizes conserving genetic resources as well as improved food security. Furthermore, it aligns aligns with national Climate Change Strategy and Action Plan, Nationally Determined Contribution and sectoral plans that emphasise the necessity to make agriculture more climate resilient. Agroforestry practices allow growers to have alternative income if crops fail.

2.8.3.4 Project Deliverables

The values accrued from this project will be across agriculture, forests and biodiversity sectors. Deliverables include 2,000 trained growers and consciousness on agroforestry. Greater values will be improved genetic diversity conservation in the long run, enhanced livelihoods for growers and a greener landscape.

2.8.3.5 Project Scope and Possible Implementation

The scope of the project is to have training in agroforestry provided to 2,000 growers across the country and they be provided with free seedlings. The project will involve extension officers who will be providing the training and will be the implementers of the project essentially.

2.8.3.6 Project activities

Project activities include having meetings to start and plan the project with relevant stakeholders, recruiting a consultant to develop proposal for funding and develop a training for agroforestry. Other activities are regular training in all regions of the country in partnership with extension officers and conducting monitoring and evaluation.

2.8.3.7 Timelines and Budget

The timeline for implementation of all the actions in this project is five years while, the total budget for the implementation of the technology is about USD 5,105,000.

2.8.3.8 Possible Complications/Challenges

The possible challenge is that of difficulty in raising funds and scarce cooperation from growers. This will be overcome through recruiting a good consultant for proposal development and involvement of extension officers in the training, so that they can easily follow up with growers and spread the technology further after the training.

2.8.3.9 Responsible agencies

NEPA, MAIL, FAO, ICARDA and MRRD would be the responsible entities, with overall coordination and oversight from NEPA and MAIL.

2.8.4: Specific project ideas for Crop Diversification technology

2.8.4.1 Introduction

The national priorities and the policies of the government of is to eliminate poverty, ensure food security, sustainable development, while agriculture and agribusiness are highly vulnerable to climate and market variability. Crop diversification is considered as a promising technology or practices for enhancing climate change adaptation and disaster resilience; however, info, best practices and references projects to deploy and diffuse this technology is far limited. This pilot project is expected to increase information on: 1) vulnerability and resilience of existing crop varieties and production systems to changing climate and hydro-met disasters, 2) crop diversifications suitable for different agro-ecological zones, including feasibility (financial and economic including cost and benefit, technical, growers' choice), and 3) develop reference project including best practice guidelines for deployment and diffusion of crop diversification.

2.8.4.2 Objective

To enhance agriculture production and business, and food security, to reduce loss and damage, and increase resilience of crop production, agribusiness and biodiversity conservation. Enhancing resilience of crop production and commercialization through crop diversification pilot project.

2.8.4.3 Impacts/ beneficiary

All producers and business at risk floods, drought and pest-insect epidemics.

2.8.4.4 Main component of activities

Component 1: Research and development of crop diversification best practices.
Component 2: Enhance drought resilient production systems through crop diversification.
Component 3: Enhance floods resilient production systems through crop diversification.
Component 4: Capacity building on crop diversification for climate resilience.

2.8.4.5 Timeframe and cost

The estimated time for the implementation of the project is to be 2022-2026 in association with the USD 10,432,000cost of implementation.

2.8.4.6 Executing Agency

MAIL, FAO, NGOs, ICARDA, MUDL, MPW ME, MCI MOF, NEPA and WFP would be responsible for the successful implementation of the technology.

2.8.4.7 Project objectives and proposed activities

1. Research and development information about crop diversification best practices. Review vulnerability of agriculture sector including agriculture production. Conduct studies and define crop diversification best practices including crop varieties and systems that resilient to climate change. Promote think-tank and disseminate information about crop diversification and climate change.
2. Enhance drought resilient production systems through crop diversification. Develop pilot project or business plan including financial and economic feasibility study of crop diversification systems for resilience to drought. Pilot project or business plan on crop diversification systems including infrastructure and facilities for resilience to drought
3. Enhance floods resilient production systems through crop diversification. Develop pilot project or business plan including financial and economic feasibility study of crop diversification systems for resilience to flood or inundation. Implement pilot project or business plan on crop diversification systems including infrastructure and facilities for resilience to drought.
4. Capacity building on crop diversification for climate resilience. Develop polices and master plan on crop diversification. Organize trainings and workshops on crop diversification and climate change including access to finance.

2.8.4.8 Project monitoring and evaluation (M&E) and audit

The project management team will be responsible for project implementation M&E. Monitoring will be conducted on regular basis, which include meeting and reporting of monthly and quarterly progress, mid-term and annual review. The evaluation will be conducted mid-term and final project completion, by internal and external evaluator. In addition, financial audit will also be performed by internal and external auditor

2.8.5: Specific Project Ideas for Conservation Agriculture

2.8.5.1 Introduction

Conservation agriculture refers to a number of techniques and strategies to establish crops in a former crop's residues purposely left on the soil surface. It improves yield and is suitable for a

range of crops. In relation to climate change, conservation agriculture is useful as it needs fewer labor, stores carbon below ground (good for mitigation too) and improves yields helping people adapt better through improved incomes. In Afghanistan, CA has not been up-scaled to a large extent and stakeholders felt this technology needs to be prioritized.

2.8.5.2 Objectives

The project aims to scale-up CA through setting up demonstration sites to be used for training growers and providing 250 mechanized planters to growers through the Government tractors hire system and create consciousness of this technology.

2.8.5.3 Outputs

The expected outputs are: 200 mechanized planters made available at Government tractors hire, at least two demonstration sites for CA and consciousness rising; Reports and photographs will provide evidence; The project is in alliance with the National Development Strategy and Vision 2022 which calls for improved food security in the country and the National Communication to UNFCCC and Afghanistan's Nationally Determined Contribution to the UNFCCC, prioritized adaptation technologies including CA.

2.8.5.4 Project Deliverables

The values from this project is socio-economic benefits to growers and environment. Growers will be better resilient with this technology and it will provide improved yields and thereby greater incomes.

2.8.5.5 Project Scope and Possible Implementation

The scope of the project includes a number of actions including providing mechanized planters to growers, training growers using demonstration sites and creating consciousness about CA technology.

2.8.5.6 Project activities

Project activities include developing proposals for funding purchase of 200 mechanized planters which will be supplied to growers through Government's tractors scheme. The activities also include setting up two demonstration sites acting as training centers for growers and raising consciousness through road shows and IEC materials about the technology.

2.8.5.7 Timelines and Budget

The timeline for implementation of all the actions in this project is four years and activities are phased and timed along with the total budget of USD 814,400.

2.8.5.8 Measurement/Evaluation

Deliverables from the project include a successful proposal in raising funds for CA activities, mechanized planters bought, consciousness raising done, and demonstration sites set up.

2.8.5.9 Possible Challenges

The major challenge that the project could face is that of lack of funding as needed in considerable amount. Decent fundable proposals need to be developed. Another challenge might be absence of cooperation from communities in technology adoptation. Setting up demonstration plots where field days will help growers appreciate CA's benefits will help address this challenge.

2.8.5.10 Responsible agencies

The main responsibility rests with MAIL, FAO, MCIT, MRRD, MPW, ME and CANGO who will implementation, supervision and coordination of the project and undertaking monitoring and evaluation. During implementation, local authorities, NGOs and communities will be involved.

2.8.6: Specific project idea for Land Use Planning technology

2.8.6.1 Introduction

Land use planning (LUP) technology meant at a wide range of activities tha direct the future use of land with the aim to ensure optimal land use within a political, social, environmental, cultural and economic context. An arrangement of land use change developments projects in all the country could potentially cause unexpected impacts on agriculture. Presently, information, development and capacity of MAIL and other relevant organizations are inadequate. Studying and improving info about 1) balanced use of the land, 2) land use change, 3) cultivation and other water development projects and 4) hazards are expected to provide useful information and best practices for better and sustainable land use.

2.8.6.2 Objective

To study and develop combined maps of balanced land uses, development for design and planning land management and development of land use planning as well as studying and developing an integrated development map for climate resilient and sustainable LUP.

2.8.6.3 Key beneficiaries

All growers and communities at risk of floods, landslide and drought.

2.8.6.4 Main component of activities

1. Study and improve information about balanced land use and LUP best practices.
2. Organize forum on the integrated land use mapping for sustainable LUP.
3. Capacity building on the application tools for the integrated mapping and planning for climate change adaption and sustainable LUP.

2.8.6.5 Time frame and cost

The time for the implementation of the project is to be 2021-2031 along with the cost of the project will be about 40.05 million US$.

2.8.6.6 Executing Agency

MAIL, NEPA, MUDL, MRRD, MPW, ME, MCI, NWARA and ANDMA would be responsible for the implementation of the project.

2.8.6.7 Project activities

1. Study and improve info about balanced land use change and other development projects, hazards and LUP best practices.
2. Improve the technical working group and form the study team.
3. Conduct studies about balanced land use and other development projects, hazards and scenarios and LUP best practices in the key resources.
4. Organize forum and dialogue on the integrated land use mapping for sustainable LUP.
5. Capacity building on application tools for the integrated mapping and planning for climate change adaption and sustainable LUP.
6. Organize workshops and trainings on the use of GIS for LUP including hazards mapping.
7. Organize workshops and trainings on adaptation including vulnerability valuation and adaptation planning.
8. Organize workshops and trainings on modelling and demand and supply valuation including evaluation and planning system.

2.8.6.8 Project monitoring and evaluation (M&E)

The project management team will be responsible for project implementation M&E. Monitoring will be conducted regularly, including meeting and reporting monthly and quarterly progress, mid-term and annual review. The evaluation will be conducted mid-term and final project completion by internal and external evaluator. In addition, financial audit will also be performed by internal and external auditor.

2.8.7: Specific project idea for Responsive Agriculture Extension (Increase awareness and promotion of modernize agriculture system in Afghanistan through demonstration plots and audio-visual information)

2.8.7.1 Introduction

The Responsive Agricultural Extension (RAE) is a rural agrarian extension model based on the idea of providing specialized and intensive technical training to identified people in living rural communities to promote a variety of technologies and offer technical services with support and review from an extension organization. The RAE is a demand driven model that provide opportunity for farmers groups or community to contact the service provider for specific information and related services. The RAE model was introduced in the country to complement the efforts of agricultural services in addressing farming products along with livestock health problems in the absence of adequate qualified staff. It is also being used to promote climate change adaptation in parts of the northern region by ICARDA, an NGO. The use of the model however remains on pilot basis with limited coverage.

Afghanistan and particularly the arid and semi-arid areas of the country are prone to drought.

The Extension working group has pointed the awareness creation through demonstration plots and audio-visual information as having potential to enhance transfer and adoption of responsive agriculture extension technology in Afghanistan.

2.8.7.2 Objectives

The objective of this project is create awareness, promote and massif responsive agriculture extension in Afghanistan. Specifically the project aims to remove the barriers for transfer and dissemination of responsive agriculture extension by massifying the establishment of demonstrations plots and transmission of audio-visual information about the best practices and techniques of responsive agriculture extension.

2.8.7.3 Expected results

The massification of demonstration plots and transmission of audio-visual information will create awareness and promote the technology and its benefits which will increase the possibility of its use. The demonstration will be established using farmer field schools which in addition of creating awareness and promotion, it will offer the possibility of participating farmers to learn by doing the implement of technology. This will enhance acceptance and mainstream adoption of the technology across the country.

2.8.7.4 Relation of results with the country sustainable development priorities

The strategies and policies of the country and agriculture sector development, specifically, the strategic plan for agriculture development and the action plan for agriculture adaptation to climate change, has pointed to responsive agriculture extension as one of the technologies that can help the country to adapt to climate change. As approaches to awareness creation and dissemination of technology, demonstration plots and dissemination of audio-visual information has been referred to as having a potential to ensure massification of its dissiminação. This indicates that the approaches proposed for the transfer and dissemination of technology in this project idea fall within the national priorities for sustainable development of Afghanistan.

2.8.7.5 Project products

Product 1: Number of farmers covered by the project, which are expected to be around 75% farmers in the 5 provinces that will benefit from the project. The number of producers will be achieved through direct assistance to farmers groups of FFS which is expected to cover about 50% and other 25% that will be achieved via audio-visual information (radio programs, television, Flyers, brochures and manuals)

2.8.7.6 Project scope

The project proposed here will be implemented initially in 5 provinces, namely, Kabul, Nanagarhar, Herat, Mazar-e sharif and Kandahar. It is expected to cover 4 districts in each province and which are situated in arid areas and semi-arid drought prone areas. In terms of population, it is expected to cover about 75% of which 50% will be through direct assistance and 25% reached via audiovisual information. Since the promotion of conservation agriculture is already happening

and various locations including where the project will be implemented, this project will be connected to current and past projects sites and will try whenever possible make massificaion of previously developed actions.

2.8.7.7 Project activities

Project activities will include the following:

i. Identification of farmers / groups (FFS) interested in participating in demonstration plots
ii. Establish and monitor demonstration plots
iii. Produce the audio visual materials
iv. Train extension workers in establishment, maintenance and monitoring of demonstration plots

2.8.7.8 Timeframe and Budget

The expected timeframe for technology implementation is 2022 – 2026 along with the budget of USD 13,000,000 this will cover the expenses of conducting demonstrations plots, training of extension workers and audio-visual production.

2.8.7.9 Monitoring and evaluation

The project management team will be responsible for project implementation M&E. Monitoring will be conducted on regular basis, which include meeting and reporting of monthly and quarterly progress, mid-term and annual review. The evaluation will be conducted mid-term and final project completion by internal and external evaluator. In addition, financial audit will also be performed by internal and external auditor.

2.8.7.10 Challenges

The challenge foreseen is the difficulty in getting funding for the implementation of the proposed project idea. Once the funding has been achieved, the implementation of idea will be carried out given that technical conditions for its implementation and political will exist given that the idea proposed fall into the sustainable development priorities of Mozambique.

2.8.7.11 Responsibility and coordination

The responsibility for the implementation of this project will be of the MAIL, MRRD, MPW, NEPA, NGOs, and FAO.

Chapter 3 Cross-cutting Issues

This Chapter outlines the centrality of crosscutting themes in the attainment of climate change adaptation technology. For this reason, these issues are presented as follows

The crosscutting issues to be considered fundamental to the success of climate change adaptation programs are the following: (i) water and agriculture sector (ii) gender equity, (iii) stakeholders coordination, (iv) barriers and opportunities, and (v) the technology transfer. Sustainability of development processes powered by better organized, modernized and competitive sectors must find solid ground in the proper management of adaptation technologies, in particular agriculture and water. For this reason, as a cross-cutting issue of the action adaptation technologies, in particular the sustainable use of agriculture and water resources.

(A)Water and Agriculture sector:

To manage and develop the water resources in the country so as to reduce poverty, increase sustainable economic and social development, and improve the quality of life for all Afghans and ensure an adequate supply of water for future generations. Given the importance of water resources, the Government has made improved water management a high priority. Steps are being taken to address shortcomings in governance as well as meeting some of the most pressing needs through donor funded projects. Some key achievements have been: Current situation in the sector. There is a pressing need to enhance the ground water resource recharge capacity. Coordination among water related institutions and agencies remains weak. This sector strategy incorporates feedback and comments from the sub-national consultations. Top priorities are development and proper management of water resources, upper catchment management, and reforestation, including agro-forestry and water conservation and enhanced sustainability of agricultural systems. Agriculture was the only job available for man and women even though it did not pay enough to survive. Climate change adaptation was more important for smallholders relying on rain-fed agriculture as decreased rain and droughts and the impact on their yields.

National capacity for agriculture water management enhanced with appropriate adoptive measures to respond to the impact of climate variability and change, multi-level capacity of smallholder farmers to achieve higher productivity/production, higher competitiveness of agriculture and crop diversification upstream support to policy making and information management; support to capacity development to sustainable development and use of rangelands and forests through community-based approaches; and support to a better response to impact of climate change on agriculture through mitigation and adaptation measures. No progress in agriculture can be sustainably achieved unless, beside other inputs, water resource development and management for irrigation is improved, pollution is reduced in water for irrigation and natural resource degradation is stopped, paying greater attention to environmental protection, negative impacts of climate change and volatile weather conditions. Improved physical infrastructure and institutional strengthening to support agriculture production, improved on-farm water management approaches introduced for irrigation through new technologies

The National Environmental Protection Agency pursues all this by aiming at higher economic growth, food security, improved natural resource management, poverty eradication and better national security, in an economically, socially and environmentally sustainable manner.

(B) Gender:

Enhancement of gender equality in the agriculture and water sectors technologies through active cooperation of both women and men for the opportunity to contribute and benefit equally from the activities of adaptation technologies. Increase understanding of the different roles of women and men in agricultural activities, decision-making and their share in the benefits; Identify potential barriers to participation in Agric- water led development initiatives and technology adoption; Understand gender differences in accessing information sources and services. Still and despite the fact women play a vital role in the conservation, use and management of natural resources, they are generally excluded from decision-making, the world over. Afghanistan is no exception to this. Women provide agricultural labor including cultivating crops, help in rearing livestock and also collect water and wood. And yet women do not have equal rights or access to land and other natural resources and their economic contribution is neglected and overseen. In addition, climate change will have significant impact on women, with scarcity of water, reduction in women will be highly vulnerable to impacts of climate change of women. TNA focused development efforts will succeed only if women are on board. Women have a deep understanding of local ecosystems and how to sustainably manage them.

The NEPA will address the barriers to women's full economic participation in political, social, cultural and economic empowerment or economic life to their increased productivity. It will assist them through facilitating access to capacity building, resource management, capital, raising awareness, job placements and skills development, extension services. The Government accords priority to increasing the representation of women in managerial, policy and decision-making positions.

(C) Stakeholders Coordination

Worldwide very strong well developed coordination and relationship exist between numbers of partners and aid funding agencies including the (United Nations Development Programm UNEP, Food and Agriculture Organization FAO, World Bank, Asian Development Bank ADB, United States Agency of International Development USAID, German Agency for international Cooperation GIZ, Centre for Integrated Development and Research CIDAR European Union EU United Nations Development Programm UNDP).

Public Agriculture and Water sectors of Afghanistan (Ministry of Agriculture Irrigation and Livelihood MAIL Ministry of Energy and Water MoEW Afghanistan Meteorological Authorities AMA Ministry Rehabilitation and Rural Development MRRD Ministry of Information and Culture MoIC Ministry of Public Health MoPH Ministry of Foreign Affairs MoFA Ministry of Woman Affairs MoWA Land, Water and Environment High Council Faculty of Agriculture, Pol-e-technic University, Faculty of Geo Science, Ministry of Urban and Development and Housing

MUDH Da Afghanistan Brishna Sherkat DABS Ministry of Transport and Civil Aviation MoTCA private sectors, National and international NGOs), for adaptive institution and coordination as well as application of Agriculture and Water sectors technologies. In terms of sharing information leading towards proper direction and providing technical support using this collaborative approach progress is being made in addressing TAP problems and implementation. Addressing the TAP problem in country is an immense challenge that will take decades to achieved by the National Environmental Protection Agency NEPA. Sustained financial assistance and technical cooperation will be needed during the entire process from the international community.

(D) Barriers and Opportunities

The key weaknesses prevailing in Afghanistan for the promotion of climate change adaptation technology transfer are the lack of human resources in the country, poor coordination amongst the institutions, and the low capacity of the committees formed to promote coordination. Non-availability of information and know• know and absence of the institutional arrangement to collect and disseminate is absence. Very poor enforcement of the pollution control provisions of the legal system, traditional tax and customs without incentives for cleaner technologies, and lack of networking with regional institutions are the key barriers for smooth technology transfer in Afghanistan. Huge opportunities are available through GEF and UNEP+ to transfer cleaner technologies in Afghanistan. Also Basel convention provides good opportunities for environmentally sound technology transfer. Afghanistan faces major challenges in the present historical phase in numerous areas, linked to persistent insecurity, slow progress in the internal reconciliation process and weak governance conditions also linked to a fragile economy, limited national capacities, high demographic growth, high rate of unemployment harsh physical environment, frequent natural disasters, widespread poverty conditions and widespread food and nutrition insecurity.

(E)Technology Transfer

Parties are encouraged, in the light of their social and economic conditions, to provide information on activities relating to the transfer of, and access to, climate change adaptation sound technologies and know how, the development and enhancement of endogenous capacities, technologies and know how, and measures relating to enhancing the enabling environment for development and transfer of adaptation technologies. However, there are many constraints and gaps to facilitate the best practices.

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Indexes

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