THE REPUBLIC OF AZERBAIJAN

THE MINISTRY OF ECOLOGY AND NATURAL RESOURCES

Report on Barrier Analysis and Enabling Framework

FOR ADAPTATION TECHNOLOGIES

October 2012

Supported by

UNEP

GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

UNEP RISØ CENTRE
ENERGY, CLIMATE AND SUSTAINABLE DEVELOPMENT

AIT Asian Institute of Technology

TABLE OF CONTENTS

List of Tables

List of Figures

LIST OF ABBREVIATIONS

AIT	Asian Institute of Technology
GEF	Global Environmental Facility
GCF	Green Climate Fund
IFAD	International Fund for Agricultural Development
ICA	Implementing Credit Agency
MEC	Ministry of Emergency Cases
MED	Ministry of Economic Development
MENR	Ministry of Ecology and Natural Resources
MoA	Ministry of Agriculture
NGO	Non-governmental organization
SFSE	State Fund for Support to Entrepreneurship under MED
SOCAR	State Oil Company of Azerbaijan Republic
TAP	Technological Action Plan
TNA	Technological Needs Assessment
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
URC	UNEP Riso Center
WB	World Bank
WP	Work Plan

EXECUTIVE SUMMARY

During the TNA process in Azerbaijan, agriculture and water were selected as priority sectors—as they are both vulnerable sectors in light of climate change tendencies. Existing barriers create obstacles and hinder the transfer and diffusion of prioritized adaptation technologies.

This report is the next phase of the TNA/TAP project in Azerbaijan and aims to outline the analysis of existing barriers and enabling framework for prioritized technologies in agricultural and water sectors. Identifying barriers is the process of determining the reasons that hinder the transfer and diffusion of technologies. These include the identification of any missing measures that could have sustained the diffusion.

As an initial step in the process of barrier analysis, a desk study of policy papers and other pertinent documents was conducted in order to identify the primary reasons why the technology is not currently applied widely, and why neither the private nor public sectors have invested significantly in it. Next, a consultation process was conducted with stakeholders through direct interviews and questionnaires.

For the organization of the barrier analysis process, a sectoral/technology working group representing relevant stakeholders was formed. National consultants have applied a participatory approach for barrier analysis and identification of enabling measures in agricultural and water sectors. Barriers related to technology implementation have been identified in five categories:

i) economic/financial barriers;

ii) policy/regulatory barriers;

iii) technology barriers;

iv) information/capacity barriers;

v) social barriers.

After compiling a long list of barriers, a stakeholder workshop was organized in order to screen barriers and group them under different categories (information, social, technological, capacity building, economic/financial, policy/regulatory). For identification of most important barriers, a simple method was applied grouping them into key and non-key barriers and criteria such as starter, crucial, important, less important and insignificant barriers.

Barriers of prioritized technologies under agricultural sector could be summarized as follows:

Type of barriers	**Barriers**
Introduction of new crop species resistant to climate change	
Economic/financial barriers	- Weak access to acceptable financial means - Weak access to markets - High prices of seeds - Expensive feasibility study
Policy/regulatory barriers	- No specific subsidy mechanism to promote application of new crop varieties
Information/capacity barriers	- Weak capacity of research institutions - Weak agricultural extension services - Low level of awareness of economic and ecological advantages
Social barriers	- Unfamiliarity with new technology
Application of windbreaks technology	
Economic/financial barriers	- Weak access to acceptable financial means - Weak access to markets - Lack of fiscal support to R & D institutions
Policy/regulatory barriers	- No specific subsidy mechanism to promote application of windbreaks technology
Information/capacity barriers	- Weak capacity of research institutions

Type of barriers	Barriers
	- Weak agricultural extension services - Low level of awareness of economic and ecological advantages
Social barriers	- Unfamiliarity with new technology - Small-scale lands
Introduction of water saving technologies	
Economic/financial barriers	- Weak access to acceptable financial means - High investment costs
Policy/regulatory barriers	- No market-based pricing mechanism for use of irrigation water
Technological barriers	- Lack of technological knowledge and skills
Information/capacity barriers	- Weak agricultural extension services - Low level of awareness of economic and ecological advantages
Social barriers	- Unfamiliarity with new technology - Small-scale lands
Application of conservative cultivation technologies	
Economic/financial barriers	- Weak access to acceptable financial means - High investment costs - Expensive feasibility study
Policy/regulatory barriers	- No specific subsidy mechanism to promote application of conservative cultivation technology
Technological barriers	- Weak access to agricultural machinery
Information/capacity barriers	- Weak agricultural extension services - Low level of awareness of economic and ecological advantages
Social barriers	- Unfamiliarity with new technology - Small-scale lands

Barriers of technology deployment under the water sector could be summarized as follows:

Type of barriers	Barriers
Rainwater collection from ground surfaces—small reservoirs and micro-catchments technology	
Economic/financial barriers	- Insufficient governmental support for enhancement research activities - High capital costs for large-scale projects - Weak access to financial sources
Policy/regulatory barriers	- Weak institutional basis and lack of coordination - Lack of stakeholder network for the development and transfer of the technology - Non-existence of mechanism for customs regulations for stimulation of import of necessary technology
Technological barriers	- Difficulties in identification of suitable site and scale of rainwater reservoirs or tanks
Information/capacity barriers	- Weak capacity and lack of skills of existing research institutions
Social barriers	- Unfamiliarity with new technology - Possible conflicts between communities on water access rights
Flood warning technology	
Economic/financial barriers	- High investment cost for surveying devices - High operating cost - Lack of funds

Type of barriers	Barriers
Technological barriers	- Lack of experts to develop programs for automatic analysis, processing, and interpreting images - Lack of research works including short-range run-off models and short-range weather forecast models - Lack of data and data management system - Lack of data linkage among the models -Lack of system to automatically analyze a situation to support a command **Modeling problems** - Lack of data and data storage - Lack of research works - Lack of data linkage among the models **Event Detection and Projection technologies** - Lack of data format standardization - Lack of experts **Real-time Satellite Monitoring area** - High operating cost - Lack of funds - Lack of experts **Data linkage system and data warehouse related barriers:** Lack of data sharing network to easily access the database **Data display system related barriers:** Lack of system to automatically analyze the situation to support a command
Policy/regulatory barriers	- Lack of coordination among relevant institutions - Non-existence of mechanism for customs regulations for stimulation of import of necessary technology
Water reclamation and reuse technology	
Economic/financial barriers	- High capital costs - Inadequate financial initiatives
Policy/regulatory barriers	- Weak regulatory and legislative framework - Weak institutional basis - Lack of coordination among relevant institutions - Non-existence of mechanism for customs regulations for stimulation of import of technology
Information/capacity barriers	- Limited awareness and lack of capacity of local authorities, communal units and residents on advantages of the technology
Social barriers	- Unfamiliarity with the technology
Reducing water leakages in water management facilities technology	
Economic/financial barriers	- High capital costs - Inadequate financial initiatives
Policy/regulatory barriers	- Weak regulatory and legislative framework - Weak institutional basis - Lack of coordination among relevant institutions - Non-existence of mechanism for customs regulations for stimulation of import of necessary technology
Information/capacity barriers	- Limited awareness and lack of capacity of local authorities, communal units and residents on advantages of the technology

Some of the identified barriers are similar throughout all the technologies. For instance, weak capacity and lack of information on use and advantages of the technology are some of the main barriers to deployment of all prioritized technologies under agricultural sector.

For the identification of relevant measures, detailed analysis of current practices at national and international level was provided. National consultants have applied a participatory approach during the analysis by involving a wide range of stakeholders in the process. Measures have been indentified

based on grouped barriers. LPA analysis was applied to identification of measures process in order to get from problems to solution.

CHAPTER 1. THE AGRICULTURAL SECTOR

1.1. Preliminary targets for technology transfer and diffusion

Agriculture is one of the traditional economic activities in Azerbaijan. Historically, vine growing, silkworm breeding and fruit-growing activities have been widely applied in the country. As most of the country is mountainous, cattle-breeding activities play an important role in income generating for local populations (Main and Priority Activities of the Government of the Republic of Azerbaijan: main Outcomes and Prospects 2003-2013).

Agriculture is a strategic sector for the country and a key component of the non-oil economy. While the agricultural sector accounts for only 7% of GDP (total agricultural production in the country was 5801.5 million USD in 2011, of which 2999.7 million USD was crop production and 2801.8 USD was cattle-breeding activities) it is a key employer, providing income and employment for about 40% of the total workforce--employed and self-employed. The agricultural sector plays an important role in food security and in improving the socio-economic condition in rural regions (official web page of National Statistical Committee of Azerbaijan Republic, www.azstat.org).

Agriculture is sensitive to the climate and is a vulnerable sector. The climate projections for Azerbaijan are for significantly higher temperatures and possibly less rainfall. On the other hand, rising carbon dioxide levels will help offset some or all of the production losses, and agriculture and forestry are projected to continue being viable (all else being equal) over much of the current cropping, livestock and fruit-growing regions.

However, the agricultural sector still faces difficulties; in many regions, precipitation is both inadequate and inconsistently distributed. Due to the river network, water resources are unevenly distributed across Azerbaijan. Total water resources of Azerbaijan are about 39 km^3, of which approximately 29.3 km^3 are surface waters and 8.8 km^3 are groundwater. Insufficient precipitation and uneven distribution over the year are problematic for agriculture. As a result, roughly 33% of agricultural land is irrigated and it is this land that accounts for more than 80% of Azerbaijan's total agricultural output.

Flooding affects approximately 300 km^2 of land area, and every other year washes out up to 1 million m^3 of soil, causing significant damage. Mining operations and other human impacts lead to another 30,000 ha of land being unusable for cultivation. In 2010, cereal production fell 33% from 2009 and was 14% below the average annual production between 2005 and 2009, with much of this drop attributed to flooding disasters.

Soil degradation occurs on a large portion of land suitable for agriculture due to erosion, salinity, bogging, and chemical pollution. In Azerbaijan, 96% of human-induced degradation is due to agricultural activities. Erosion affects 3.7 million ha of land within Azerbaijan, 0.7 million ha of which are intended for agriculture. Erosion is naturally caused from wind, water, gullies and irrigation, as well as through lack of proper land management, poor cultivation practices, over grazing, reduction of forests and vegetation, and other human factors.

Salinity affects 1.2 million ha of land, 600,000 of which are irrigated lands. These lands can no longer be cultivated because of poor drainage, lack of appropriate water impoundments, and/or inundation of the coastal zone (Environment in Azerbaijan, State Statistics Committee of the Republic of Azerbaijan, 2005-2007).

The key documents setting out the Government policies for the country, agriculture, rural and agro-industry development include:

(i) the State Programme on Socio-Economic Development of the Regions of Azerbaijan for 2009-2013;

(ii) the State Programme on Poverty Reduction and Sustainable Development for 2008-2015;

(iii) the State Programme on Reliable food supply to the population for 2008-2015;

(iv) “Azerbaijan-2020: glance to future” Development Conception.

Main aspects of agricultural development are more specifically represented by the "Azerbaijan State Programme on Reliable Food Supply of Population" (2009-2015). Its Action Plan consists of 12 main goals including improving land and water use efficiency, plant protection services and crop production.

Almost all development programmes are lacking in aspects related to future tendencies of climate change in spite of the fact that climate change projections have already been provided in the Second National Communication of Azerbaijan to UNFCCC.

Main targets of prioritized technologies in the agricultural sector are to adapt to changes in climate and sustain or increase agricultural productivity in the areas most vulnerable to climate change. Examples of such areas are, agricultural lands with irrigation water scarcity, areas with potential risks of droughts and high temperatures, and cultivated lands with high risk of erosion.

1.2. Barrier analysis and possible enabling measures for introduction of crop species resistant to expected climate change technology

1.2.1 General description of the technology

The introduction of new cultivated species and improved crop varieties is a technology aimed to enhance plant productivity, quality, health and nutritional value and/or building crop resilience to diseases, pest organisms and environmental stresses. Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm, taking into account the different returns from value-added crops with complementary marketing opportunities.

New and improved crop species can be introduced through farmer experimentation with new varieties. Agricultural researchers and extension agents can help farmers identify new varieties that may be better adapted to changing climatic conditions, and facilitate farmers to compare these new varieties with those they already produce.

By introducing new crop species farmers will be able to cover production losses made by climate change impact with increased yield and quality. Crop diversification provides better conditions for food security and enables farmers to grow surplus products for sale at market, thereby increasing income to meet other needs related to household well-being.

Application of this technology successfully lines with the country’s economic, social and environmental development priorities. Moreover, it contributes to food security priority, by increasing productivity, and to the strategy of diversification of the economy, by increasing weight of agricultural sector within the economic system, as well as leading to increase of income of rural population.

The process of farmer experimentation and the subsequent introduction of adapted and accepted varieties can potentially strengthen the farmers cropping systems by increasing yields, improving drought resilience, boosting resistance to pests and diseases as well as by capturing new market opportunities.

One of the possible disadvantages of the technology could be that the costs of new species and their cultivation can be higher than others. Farmers may need to be provided with necessary capacity building and awareness raising activities in order to adapt new technology. Farmers may also face risk from poor economic returns if crops are not selected based on a market assessment.

Such technology will be applied mainly in arid and semi-arid zones of the country. Assessment of vulnerability should be provided in the areas with highest risk to negative impacts of climate change. Agricultural research institutions must be involved in the process in order to provide analyses and experiments with new species.

1.2.2 Identification of barriers

For the organization of the barrier analysis process, a sectoral/technology working group representing relevant stakeholders was formed. National consultants have applied a participatory approach for barrier analysis and identification of enabling measures.

As an initial step in the process of barrier analysis, a desk study of policy papers and other pertinent documents was conducted in order to identify the primary reasons why the technology is not currently applied widely, and why neither the private nor public sectors have invested significantly in it. Next, a consultation process was conducted with stakeholders through direct interviews and questionnaires.

After compiling a long list of barriers, a stakeholder workshop was organized in order to screen barriers and group them under different categories (information, social, technological, capacity building, economic/financial, policy/regulatory). For identification of most important barriers, a simple method was applied grouping them into key and non-key barriers and criteria such as starter, crucial, important, less important and insignificant barriers.

Barriers related to deployment of introducing crop species resistant to expected climate change technology have been identified in four categories:

i) economic/financial barriers;

ii) policy/regulatory barriers;

iii) information/capacity building barriers;

iv) social barriers.

1.2.2.1 Economic and financial barriers

There is no specific economic barrier to the deployment of introducing crop species resistant to climate change technology. Therefore, insufficient governmental support for enhancement research activities in selecting and testing more heat tolerant crop species could be mentioned as one of the barriers for technology diffusion. Additionally, there is a lack of financial support for research institutions (state and private) to provide deeper analysis for selection of most heat tolerant and durable crop varieties. Financial support for the organization of testing is also lacking.

Weak access to financial sources for local farmers could be mentioned as a financial barrier. Most farmers do not have access to financial sources with acceptable terms in order to purchase high quality seeds and provide all the necessary agro-technical measures.

1.2.2.2 Non-financial barriers

Policy/regulatory: The government of Azerbaijan has supportive policy for agricultural development. There are several supportive tools such as subsidy mechanisms or selling fertilizers at discount prices. The government also supports state and private seed producers. Therefore, there is no specific supportive mechanism (subsidy or any other stimulations) related to promoting the application of crop species resistant to climate change.

Capacity/information: One important barrier of the implementation of the technology is weak capacity and lack of skills of existing research institutions. Current capacity of research institutions functioning under MoA and National Academy of Sciences is not up-to-date and does not meet requirements. Special support should be provided in order to improve technical capacity of those institutions.

Social barriers: Unfamiliarity with new technology could also be mentioned as a social barrier to application of the technology. Local farmers are accustomed to applying traditional seeds during the cultivation process. They do not have enough information on the benefits of new species. Non-existent or inefficient agricultural extension services could be mentioned as another barrier.

LPA for economic/financial and non-financial barriers of deployment of introducing crop species resistant to climate change technology is provided in figure 1:

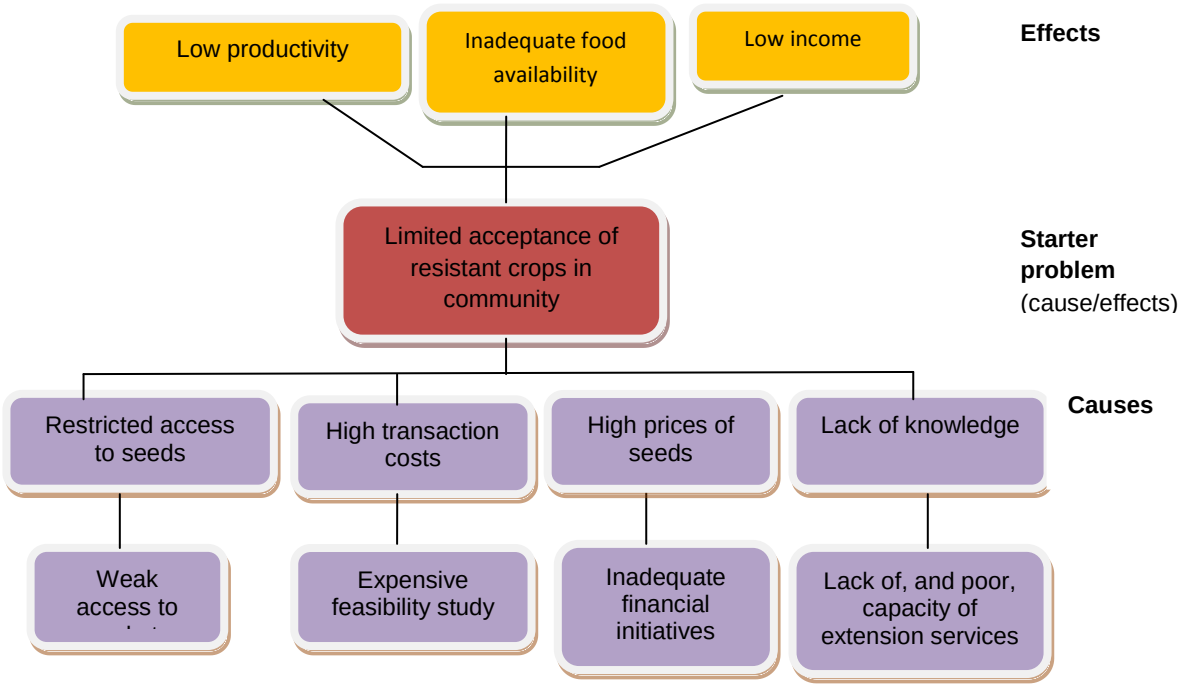


Figure 1: LPA for economic/financial and non-financial barriers of resistant crop technology deployment

1.2.3 Identified measures

Identifying relevant measures is the process of analyzing necessary actions to be taken in order to overcome current barriers to the implementation of prioritized technologies. These measures should have sustained the diffusion.

For the identification of relevant measures, detailed analysis of current practices at national and international level was provided. National consultants have applied a participatory approach during the analysis by involving a wide range of stakeholders in the process. The same procedure for identification of measures was applied. Measures have been indentified based on grouped barriers. LPA analysis was applied to identification of measures process in order to get from problems to solution.

1.2.3.1 Economic and financial measures

In order to overcome existing economic and financial barriers to the introduction of new species resistant to forecasted climate change, the following measures could be proposed:

- Government financial support to research institutions should be increased in order to improve their technical capacity;
- Develop specific subsidy mechanism for farmers to enhance application of new crop species;
- Provision of long-term and low-interest loans through different state funds (for instance, State Fund for Support to Entrepreneurship functioning within the Ministry of Economic Development, Implementing Credit Agency), private sources (different Banks) and international funds (World Bank, IFAD) to support farmers in application of new species.

1.2.3.2 Non-financial measures

In order to overcome existing non-financial barriers to the introduction of new species resistant to forecasted climate change, the following measures could be proposed:

- Capacity and skills of research institutions must be improved by involvement in different trainings or international study tours with the support of government or other donor organizations;
- Technical capacity of research institutions must be improved in order to enable them to implement different researches and studies;
- Strengthen international research network programme in order to learn from effective best practices applied throughout the world;
- Implement pilot projects to practically demonstrate results and achievements of application of new crop species to farmers;
- Information campaigns on the advantages of applied technology must be organized and funded in order to increase capacity of farmers (both small-scale and large-scale farmers), by closely involving local authorities and NGO sector in the process;
- Agricultural extension services must be improved and enhanced in order to provide necessary advisory services and capacity building activities to farmers.

LPA for economic/financial and non-financial measures for deployment of introducing crop species resistant to climate change is provided in figure 2:

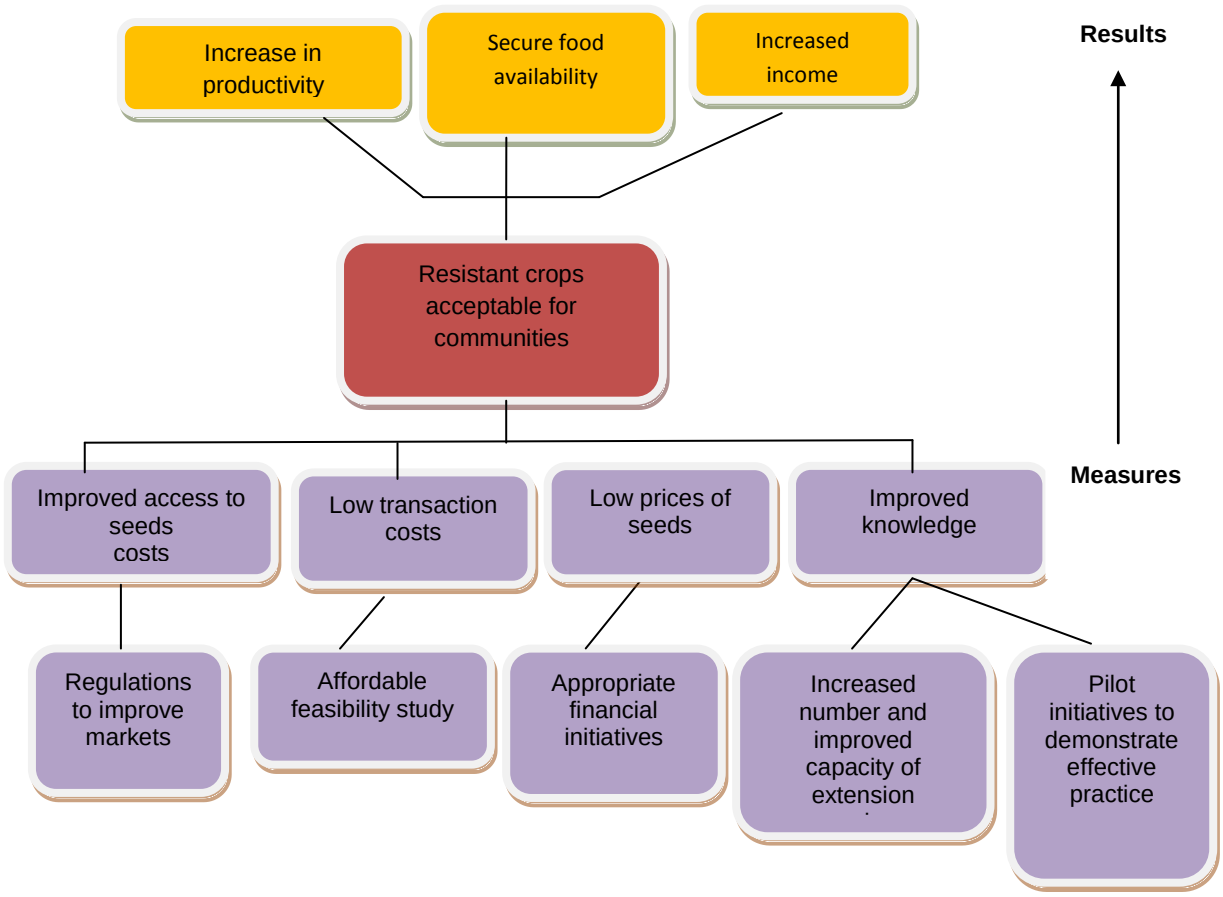


Figure 2: LPA for economic/financial and non-financial measures for resistant crop technology deployment

1.3. Barrier analysis and possible enabling measures for enhancing the application of windbreaks technology

1.3.1 General description of the technology

The practice of agro-forestry was applied in Azerbaijan during former Soviet times. Currently, this practice is not applied by most private land-owners due to lack of knowledge. Agro-forestry has a broad application potential and provides a range of advantages, including the maximum use of the land and increased land-use efficiency, increased productivity of the land, protection and improvement of soils and water sources, and so on (Goal and objectives of windbreaks, lecture).

Agro-forestry systems take advantage of trees in many ways: to hold the soil, which increases fertility through nitrogen fixation, or through bringing minerals from deep in the soil and depositing them by leaf-fall, as well as to provide shade, construction materials, foods and fuel.

Agro-forestry at agricultural lands includes:

- Windbreaks around cultivated lands to reduce wind speed and subsequent soil deflation and evaporation of moisture from the soil surface;

- Shelterbelts along cultivated lands to protect lands from dry winds and reduce soil salinisation and water evaporation;

- Shelterbelts along arable slopes promote better distribution of snow, detention and control run-off, reduce wind speed, reduce run-off, erosion and deflation, increasing its moisture;

- Tree strips at the alleys, tree nurseries, vineyards, tea, citrus plantations also improve the microclimate of surrounding areas protecting the area from the strong winds.

Another advantage of agro-forestry is increased yields and reduced needs for purchased inputs such as fertilizers.

With regard to the disadvantages, agro-forestry systems require substantial management. Incorporating trees and crops into one system can create competition for space, light water and nutrients and can impede the mechanization of agricultural production. Management is necessary to reduce the competition for resources and maximize the ecological and productive benefits.

The application of windbreaks is practiced in Azerbaijan, but is not widely applied by local farmers. The main reason for this being that after privatization lands were divided among farmers, existing windbreaks have been neglected and destroyed due to lack of knowledge on its benefits.

Application of this technology successfully lines with the country's economic, social and environmental development priorities. Moreover, it contributes to food security priority, by increasing productivity, as well as leading to increase of income of rural population and reducing out-migration.

Such technology will be applied mainly in regions with high risk of erosion. Assessment of vulnerability should be provided in the areas with highest risk to negative impacts of climate change. Agricultural research institutions must be involved in the process in order to provide comprehensive analyses and feasibility studies related to application of agro-forestry system.

1.3.2 Identification of barriers

As with previous technology, application of windbreaks technology barriers related to technology implementation have been assessed within several aspects such as economic/financial barriers, information/capacity barriers and social barriers.

1.3.2.1 Economic and financial barriers

Application of windbreaks is considered a non-market-based technology. Therefore, there are no specific economic barriers to the application of the technology.

Insufficient governmental support for enhancement research activities on soil analysis and hydrological regimes, for identification of the areas to be provided with agro-forestry, could be mentioned as one of the financial barriers to technology deployment.

Weak access to financial sources for local farmers could be mentioned as another financial barrier. Most farmers do not have access to financial sources with acceptable terms in order to purchase trees and plant windbreaks on cultivated lands.

1.3.2.2 Non-financial barriers

Capacity building/information: One important barrier of the implementation of the technology is lack of knowledge of local communities on economic and environmental advantages of windbreaks. Lack of extension service providers and weak capacity of existing ones could be mentioned as another non-financial barrier.

Social barriers: Land ownership and structure of lands creates important barriers to technology deployment. Lands are divided into three main categories according to ownership status: state lands, municipal lands and private lands. Application of windbreaks is possible on municipal and private lands, and there will be need for considerable investment to apply windbreaks on cultivated state lands. However, small-scale lands are problematic for local farmers wanting to plant windbreak strips. Poor cooperative activities do not allow local farmers to apply windbreaks on large-scale lands. Unfamiliarity with new technology could also be mentioned as a social barrier to application of the technology.

Non-financial barriers of application of windbreak technology could be summarized as follows:

- Poor knowledge and awareness of land-owners and farmers on economic and environmental benefits of windbreaks technology;
- Lack of, and poor quality, extension services;
- Unimproved cooperative activities;
- Weak access to more heat and drought tolerant tree species.

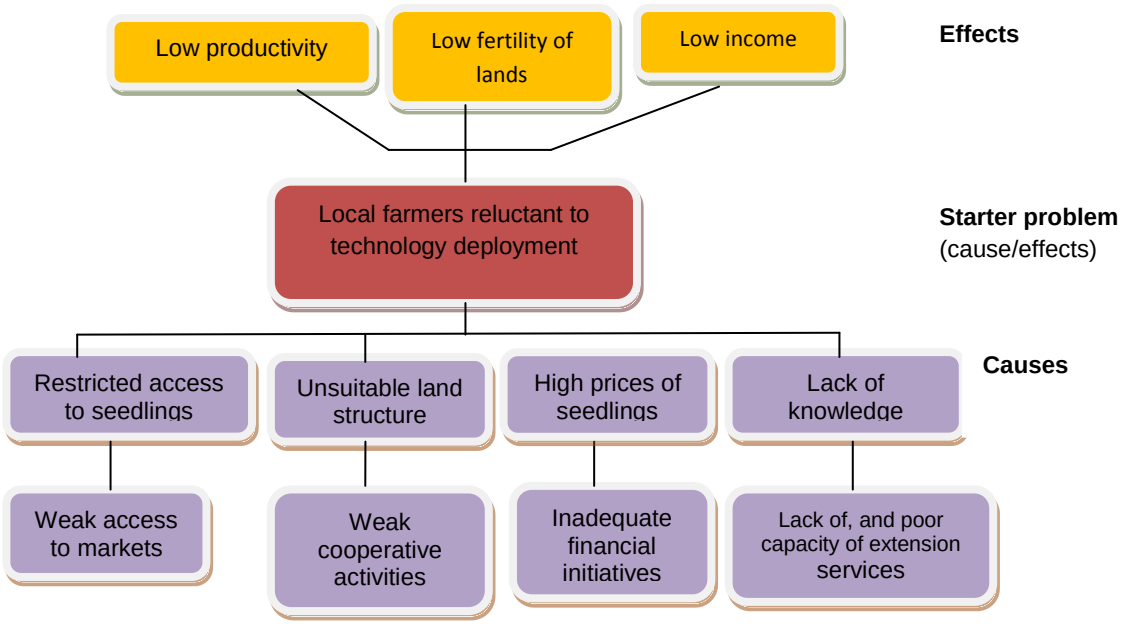


Figure 3: LPA for economic/financial and non-financial barriers of windbreaks technology deployment

1.3.3 Identified measures

1.3.3.1 Economic and financial measures

In order to overcome existing economic and financial barriers to the application of windbreaks technology, the following measures could be proposed:

- Specific National Action Plans should be developed to enhance application of windbreaks on state, municipal and private cultivated lands through involvement of relevant governmental structures (MoA, MED, MENR, National Academy of Sciences) and NGO sector;
- Develop specific subsidy mechanism for farmers to enhance application of windbreaks on private lands;
- Provision of long-term and low-interest loans through different state funds (for instance, State Fund for Support to Entrepreneurship functioning within the Ministry of Economic Development, Implementing Credit Agency), private sources (different Banks) and international funds (World Bank, IFAD) to support farmers in application of windbreaks.

1.3.3.2 Non-financial measures

In order to overcome existing non-financial barriers to the implementation of windbreak technology, the following measures could be proposed:

- Support research institutions in providing assessment on identification of more heat tolerant and durable tree species to be used for windbreaks;
- Implement pilot projects to practically demonstrate results and achievements of application of windbreaks;
- Information campaigns on the advantages of applied technology must be organized and funded in order to increase capacity and raise awareness of farmers (both small-scale and large-scale farmers) on economic and environmental advantages of windbreaks, as well as on advantages of cooperative activities by closely involving local authorities and NGO sector in the process;
- Agricultural extension services must be improved and enhanced in order to provide necessary advisory services and capacity building activities on advantages of windbreaks to local land-owners and farmers.

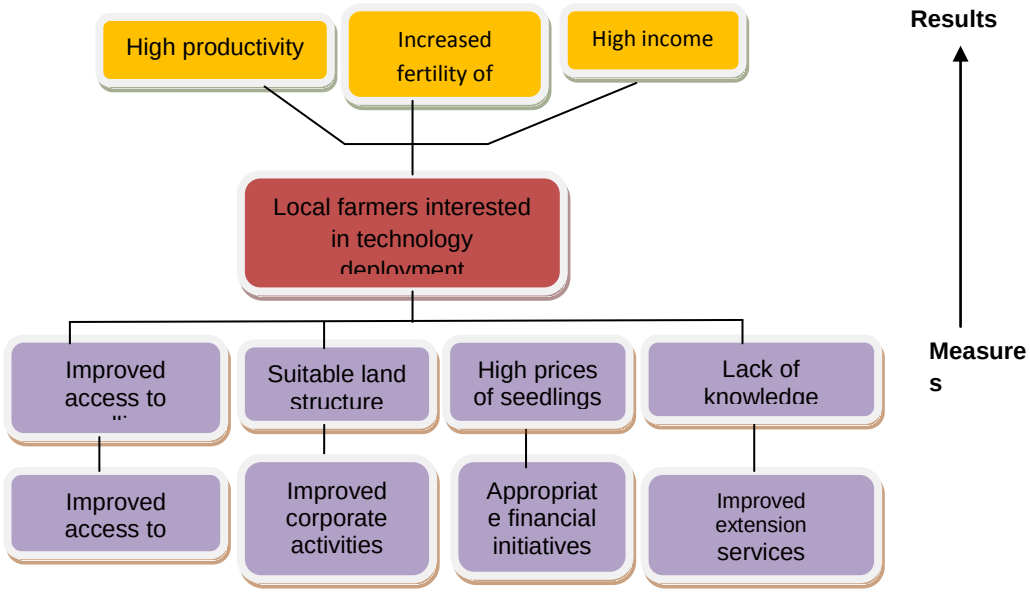


Figure 4: LPA for economic/financial and non-financial measures for windbreaks technology deployment

1.4. Barrier analysis and possible enabling measures for application of water saving technologies at irrigated lands

1.4.1 General description of the technology

Efficient use of irrigation water will be very important due to expected water scarcity forecasted in light of climate change. Drip irrigation can help use water efficiently. A well-designed drip irrigation system reduces water run-off through deep percolation or evaporation to almost zero. If water consumption is reduced, production costs are lowered. Additionally, conditions may become less favorable for the onset of diseases including fungus. Irrigation scheduling can be managed precisely to meet crop demands, holding the promise of increased yield and quality.

Agricultural chemicals can be applied more efficiently and precisely with drip irrigation. Fertilizer costs and nitrate losses can be reduced. Nutrient applications can be better timed to meet the needs of plants.

Sprinkler systems eliminate water conveyance channels, thereby reducing water loss. Water is also distributed more evenly across crops helping to avoid wastage. Sprinklers provide a more even application of water to agricultural land, promoting steady crop growth. Secondary benefits from improved crop productivity include income generation, employment opportunities and food security.

High cost of necessary equipment and energy demand could be listed as main disadvantages of the technology. Moreover, drip irrigation systems are very sensitive to damages caused by machinery, animals or floods.

Application of this technology successfully lines with the country's economic, social and environmental development priorities. Moreover, it contributes to food security priority, by increasing productivity and land fertility, as well as leading to increase of income of rural population and reducing out-migration.

The application of drip/sprinkler irrigation is practiced in Azerbaijan, but is not widely applied by local farmers. The main reason for this being high investment costs and lack of knowledge and skills on advantages of the technology. The technology could be successfully applied at agricultural lands with irrigation water scarcity, as well as areas with potential risks to droughts and high temperatures.

1.4.2 Identification of barriers

As with previous technology, application of water saving technology barriers related to technology implementation has been assessed within several aspects such as economic/financial barriers, technology barriers, capacity building barriers and social barriers.

1.4.2.1 Economic and financial barriers

A main barrier to technology diffusion is the relatively low cost of irrigation water. Moreover, irrigation water is priced according to size of land (per ha) and there is no measurement mechanism. Subsequently, farmers are not concerned with overuse and waste of irrigation water. However, efficient use of irrigation water is going to be a significant problem in the future, taking into account forecasted water scarcity due to climate change issues.

Water saving technologies require large investments and have high infrastructure costs. Most farmers cannot afford such investments; therefore, it is necessary to design an enabling framework for access to long-term and low-interest loans for land-owners and farmers.

1.4.2.2 Non-financial barriers

Technologic barrier: Currently, water saving technologies are not produced in Azerbaijan and are only imported. There are no specific customs regulations to simplify the import process of the technology.

Policy/regulatory: After land privatization, lands have been divided among famers and the average size of a farmer's land is only 2-3 ha. However, application of water saving technologies is not effective on small-scale lands.

Capacity/information: One important barrier of the implementation of the technology is weak capacity and lack of technical knowledge and skills of farmers on application of water saving technologies.

Social barriers: Unfamiliarity with new technology could also be mentioned as a social barrier to application of the technology. Local farmers are accustomed to applying traditional irrigation methods during the cultivation process. Non-existent or inefficient agricultural extension services could be mentioned as another barrier.

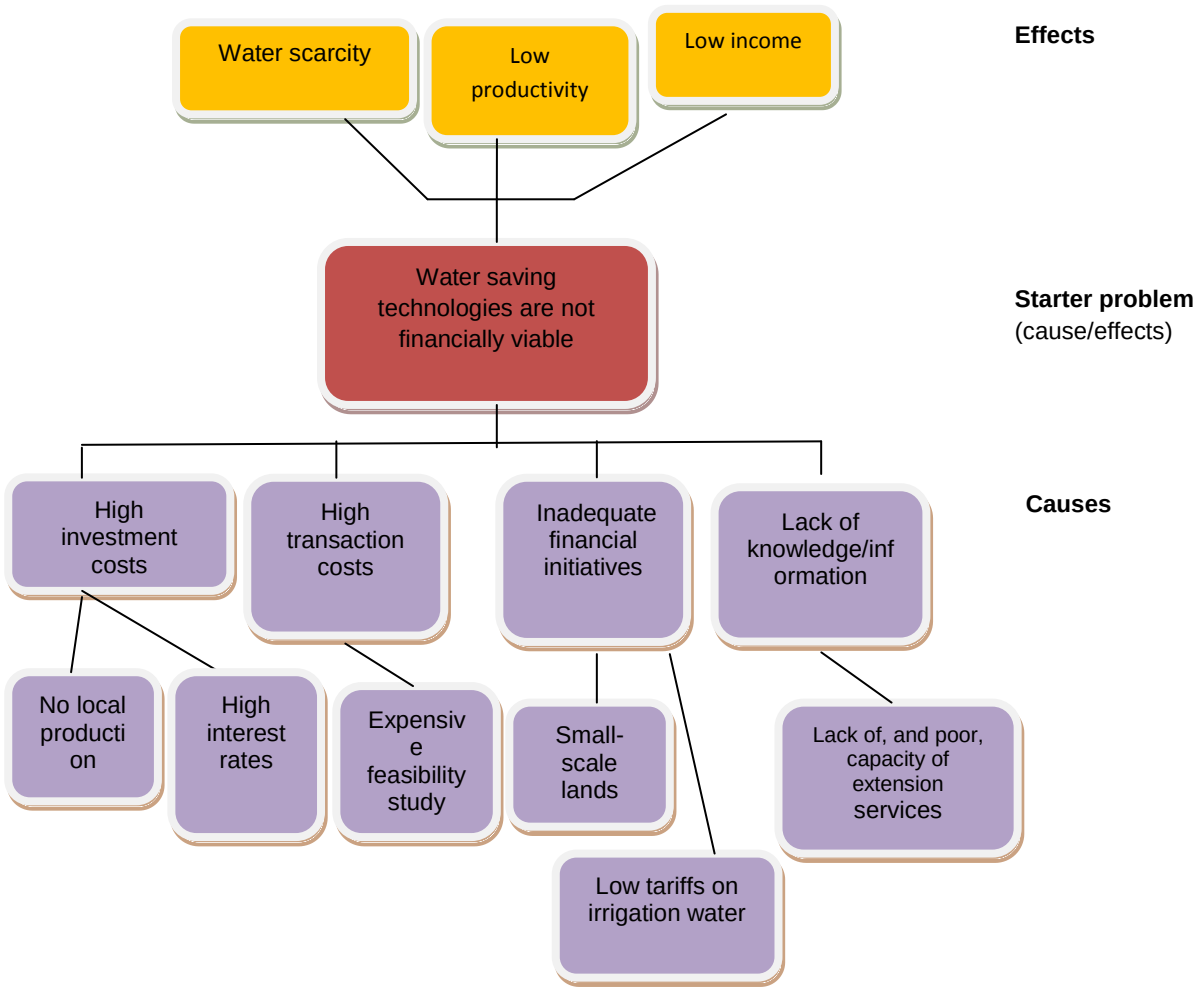


Figure 5: LPA for economic/financial and non-financial barriers of water saving technology

1.4.3 Identified measures

1.4.3.1 Economic and financial measures

In order to overcome existing economic and financial barriers to the application of water saving technologies, the following measures could be proposed:

- Specific customs regulations in order to simplify the import procedures of the technology;
- Specific tax regulations in order to promote private sector investments for local production of water saving technologies;
- Regulation of tariff on irrigation water in order to increase efficient use by land-owners and farmers;
- Develop specific subsidy mechanism for farmers to enhance application of water saving technologies on private lands;
- Provision of long-term and low-interest loans through different state funds (for instance, State Fund for Support to Entrepreneurship functioning within the Ministry of Economic Development, Implementing Credit Agency), private sources (different Banks) and international funds (World Bank, IFAD) to support farmers in application of the technology.

1.4.3.2 Non-financial measures

In order to overcome existing non-financial barriers to the implementation of water saving technologies, the following measures could be proposed:

- Implement pilot projects to practically demonstrate results and achievements of application of water saving technologies;
- Information campaigns on the advantages of applied technology must be organized and funded in order to increase capacity of farmers (both small-scale and large-scale farmers) by closely involving local authorities and NGO sector in the process;
- Information campaigns on advantages of cooperative activities among farmers in order to promote farmers in joint use of private lands, to ease the application of drip or sprinkler irrigation technologies at cultivated lands;
- Agricultural extension services must be improved and enhanced in order to provide necessary advisory services and capacity building activities on advantages of the technology.

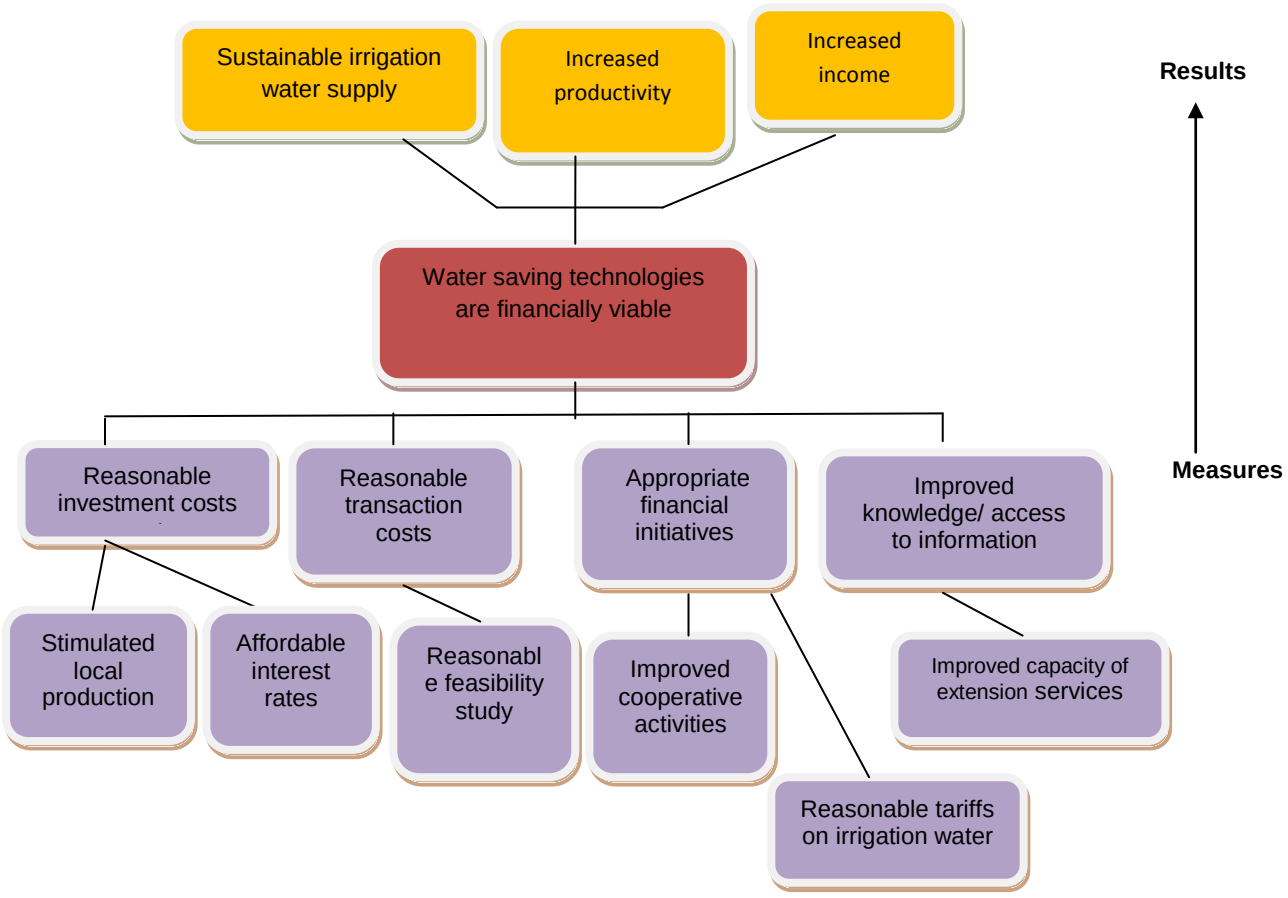


Figure 6: LPA for economic/financial and non-financial measures for water saving technology

1.5. Barrier analysis and possible enabling measures for application of conservative cultivation technologies

1.5.1 General description of the technology

Conservation tillage refers to a number of strategies and techniques for establishing crops in previous crop residues, which are purposely left on the soil surface. Conservation tillage practices typically leave about one-third of crop residue on the soil surface. This slows water movement, which reduces the amount of soil erosion. Conservation tillage is suitable for a range of crops including grains, vegetables, root crops, fruit and wine.

Unpredictability of rainfall and an increase in the mean temperature may affect soil moisture levels leading to damages to and failures in crop yields. Conservation tillage practices reduce risk from drought by reducing soil erosion, enhancing moisture retention and minimizing soil impaction. In combination, these factors improve resilience to climatic effects of drought and floods. Improved soil nutrient recycling may also help combat crop pests and diseases. Conservation tillage benefits farming by minimizing erosion, increasing soil fertility and improving yield.

Conservation Agriculture is not only a technical procedure, but it can also be considered as an approach aimed at environment protection. Conservation Agriculture is based on reduced tillage or zero tillage. It is necessary to fertilize the soil by means of mulching. Additionally, these activities should be combined with crop rotation. This process is intended to reduce greenhouse gas emissions (steam water, methane, carbon dioxide – CO^2) and to sequester increased carbon in soils (http://climatetechwiki.org/content/conservation-tillage).

This technology is very untraditional for local communities. There was no practice of application of the technology in the past. The only initiative for promotion of conservative cultivation technologies has been taken by local NGO – Agro-Information Center under EU funded project. Despite the fact that it is a small-scale project, local farmers have shown great interest towards this new technology.

1.5.2 Identification of barriers

As with previous technology, conservative cultivation technology barriers related to technology implementation have been identified within several aspects such as economic/financial barriers, technology barriers, information/capacity barriers and social barriers.

1.5.2.1 Economic and financial barriers

Application of conservative cultivation technology requires the use of specific agricultural machinery. Such machinery is only imported into the country and the number of existing machinery is very low, as the practice of conservative cultivation is not widely applied by farmers.

Most farmers, particularly small-scale ones, cannot afford the purchase of specific agricultural machinery. Therefore, it is necessary to design an enabling framework for access to long-term and low-interest loans for land-owners and farmers (for instance, leasing mechanism).

1.5.2.2 Non-financial barriers

After land privatization, lands have been divided among famers and the average size of a farmer's land is only 2-3 ha. However, application of conservative cultivation technologies is not effective on small-scale lands.

One important barrier of the implementation of the technology is weak capacity and lack of technical knowledge and skills of farmers on application of the technology.

Unfamiliarity with new technology could also be mentioned as a social barrier to application of the technology. Local farmers are accustomed to applying traditional cultivation procedures. Non-existent or inefficient agricultural extension services could be mentioned as another barrier.

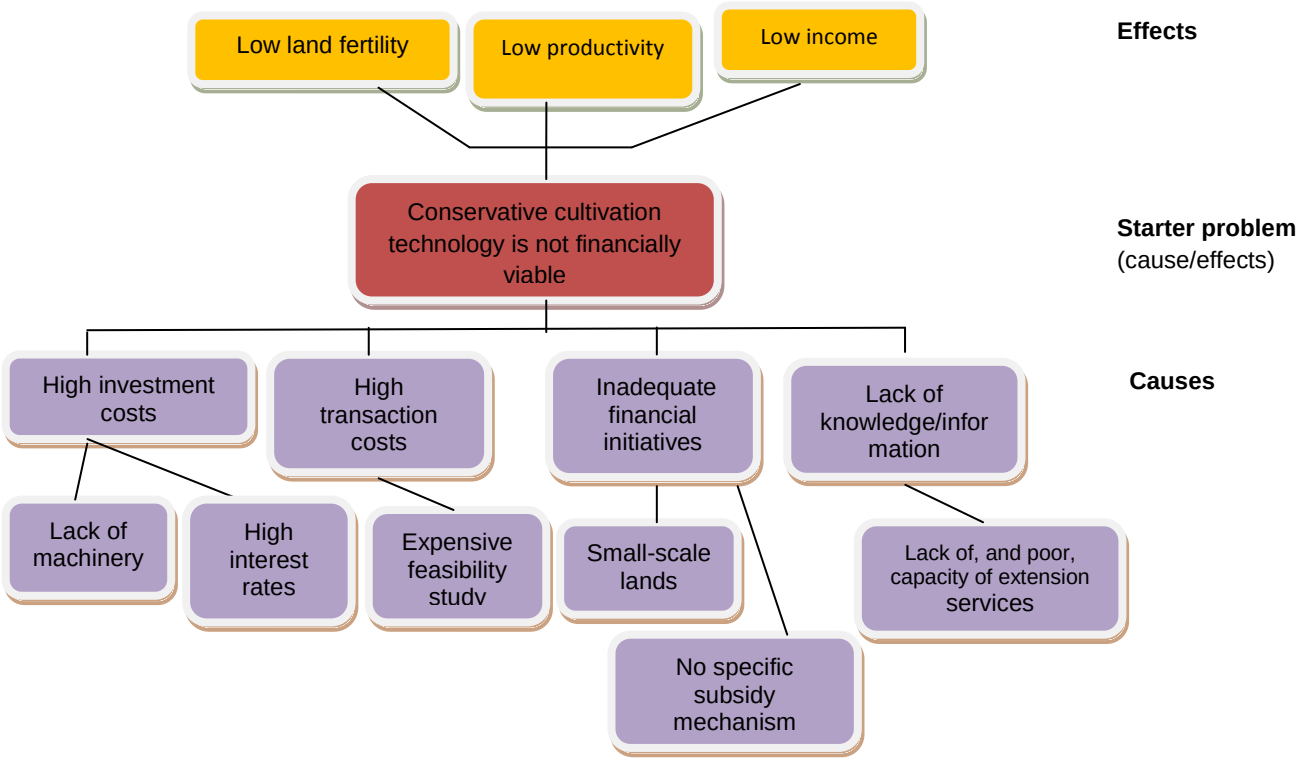


Figure 7: LPA for economic/financial and non-financial barriers of conservative cultivation technology

1.5.3 Identified measures

1.5.3.1 Economic and financial measures

In order to overcome existing economic and financial barriers to the application of conservative cultivation technology, the following measures could be proposed:

- Specific customs regulations in order to simplify the import procedures of the technology;
- Specific governmental program to purchase necessary agricultural machinery for existing Agro-services, in order to increase farmers' access to machinery;
- Develop specific subsidy mechanism for farmers to enhance application of conservative cultivation technologies on private lands;
- Provision of long-term and low-interest loans through different state funds (for instance, State Fund for Support to Entrepreneurship functioning within the Ministry of Economic Development, Implementing Credit Agency), private sources (different Banks) and international funds (World Bank, IFAD) to support farmers in application of the technology.

1.5.3.2 Non-financial measures

In order to overcome existing non-financial barriers to the implementation of conservative cultivation technologies, the following measures could be proposed:

- Implement pilot projects to practically demonstrate results and achievements of application of conservative cultivation technology;
- Information campaigns on the advantages of applied technology must be organized and funded in order to increase capacity of farmers (both small-scale and large-scale farmers) by closely involving local authorities and NGO sector in the process;
- Information campaigns on advantages of cooperative activities among farmers in order to promote farmers in joint use of private lands, to ease the application of conservative cultivation technologies at cultivated lands;
- Agricultural extension services must be improved and enhanced in order to provide necessary advisory services and capacity building activities on advantages of the technology.

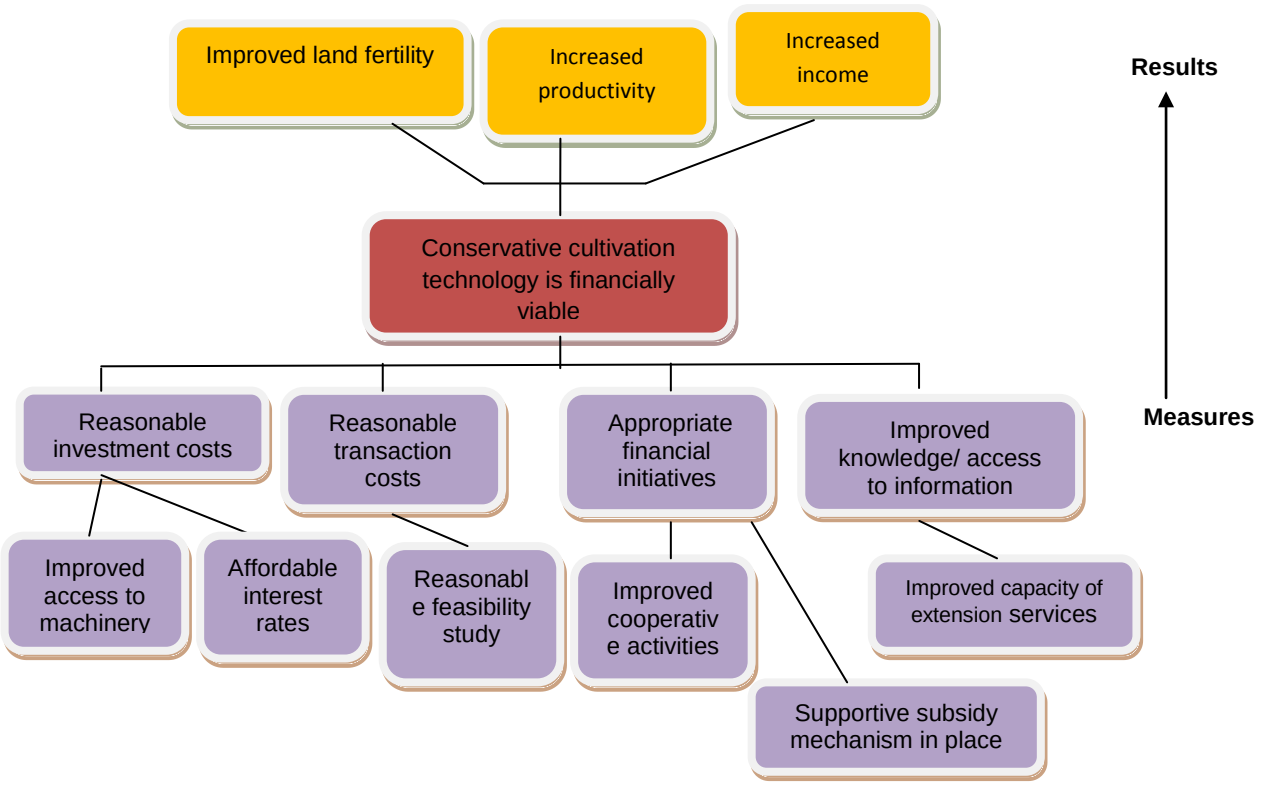


Figure 8: LPA for economic/financial and non-financial measures for conservative cultivation technology

1.6. Linkages of barriers identified

As it was indicated in previous sections, barriers related to the implementation of technologies for agricultural sector have been identified in five categories: i) economic/financial barriers, ii) policy/regulatory barriers, iii) technology barriers, iv) information/capacity barriers and v) social barriers.

Some of the identified barriers are similar throughout all the technologies. For instance, weak capacity and lack of information on use and advantages of the technology are some of the main barriers to deployment of all prioritized technologies under agricultural sector. Unfamiliarity with new technology could also be mentioned as a social barrier to application of prioritized technologies. Local population is accustomed to traditional irrigation and cultivation practices.

With regard to water saving technologies, regulatory actions from the government are needed on the tariff system in order to increase efficiency of irrigation water use. High cost of investment and

infrastructure is another barrier to the wide application of the technology. Not having access to low-interest and long-term financial means, private farmers are unable to provide sufficient investment for the development of the technology.

Lack of necessary agricultural machinery is a major barrier in conservative cultivation technology. Social barriers are also important, as local farmers are unaware of economic and environmental advantages of the technology.

Barriers related to implementation of technologies for the agricultural sector could be summarized as follows:

Table 1: Summary of barriers of agricultural sector

Barriers	Technologies			
	New resistant crop species	Windbreaks technology	Water saving technologies	Conservative cultivation
Economic/financial	- Weak access to acceptable financial means - Weak access to markets -High prices of seeds -Expensive feasibility study	- Weak access to acceptable financial means - Weak access to markets - Lack of fiscal support to R & D institutions	- Low prices for irrigation water - Weak access to acceptable financial means - High investment costs	- Weak access to acceptable financial means - High investment costs -Expensive feasibility study
Policy/regulatory	- No specific subsidy mechanism to promote application of new crop varieties	- No specific subsidy mechanism to promote application of windbreaks technology	- Improper pricing mechanism for use of irrigation water	- No specific subsidy mechanism to promote application of conservative cultivation technology
Technology			- Lack of technological knowledge and skills	- Weak access to agricultural machinery
Information/capacity	-Weak capacity of research institutions - Weak agricultural extension services - Low level of awareness of economic and ecological advantages	-Weak capacity of research institutions - Weak agricultural extension services - Low level of awareness of economic and ecological advantages	- Weak agricultural extension services - Low level of awareness of economic and ecological advantages	- Weak agricultural extension services - Low level of awareness of economic and ecological advantages
Social	- Unfamiliarity with new technology	- Unfamiliarity with new technology - Small-scale lands	- Unfamiliarity with new technology - Small-scale lands	- Unfamiliarity with new technology - Small-scale lands

1.7. Enabling framework for overcoming the barriers in agricultural sector

Agriculture is a strategic sector for Azerbaijan and the government has approved specific development programmes in this field. Main aspects of agricultural development are more specifically represented by the "Azerbaijan State Programme on Reliable Food Supply of Population" (2009-2015). However, almost all development programmes are lacking in aspects related to future tendencies of climate change. Therefore, specific measures are necessary in order to overcome existing barriers to the implementation of prior technologies.

Main measures needed to enable the country to overcome identified economic/financial and non-financial barriers of prioritized technologies under agricultural sector are listed below:

Table 2: Barriers and measures for agricultural sector

Barriers	Measures
Introduction of new crop species resistant to climate change	
- Weak access to acceptable financial means - Weak access to markets - High prices of seeds - Expensive feasibility study	- Enable provision of long-term and low-interest loans or grants through state funds (for instance, State Fund for Support to Entrepreneurship, Implementing Credit Agency), private sources (different Banks) and international funds (WB, IFAD, GEF, GCF, Adaptation Fund)
- No specific subsidy mechanism to promote application of new crop varieties	- Develop specific subsidy mechanism to promote application of the technology
-Weak capacity of research institutions - Weak agricultural extension services	- Capacity building for research institutions - Strengthen international research network programme - Enhance and improve agricultural extension services
- Low level of awareness of economic and ecological advantages - Unfamiliarity with new technology	- Information campaign on the advantages of applied technology - Capacity building activities - Implement pilot projects at community (municipal) level
Application of windbreaks technology	
- Weak access to acceptable financial means - Weak access to markets - Lack of fiscal support to R & D institutions	- Enable provision of long-term and low-interest loans or grants through state funds (for instance, State Fund for Support to Entrepreneurship, Implementing Credit Agency), private sources (different Banks) and international funds (WB, IFAD, GEF, GCF, Adaptation Fund)
- No specific subsidy mechanism to promote application of windbreaks technology	- Develop specific subsidy mechanism to promote application of windbreaks technology
- Weak capacity of research institutions - Weak agricultural extension services	- Capacity building for research institutions - Strengthen international research network programme - Enhance and improve agricultural extension services
- Low level of awareness of economic and ecological advantages - Unfamiliarity with new technology - Small-scale lands	- Information campaign on the advantages of applied technology - Capacity building activities on advantages of technology and cooperative activities - Implement pilot projects at community (municipal) level
Introduction of water saving technologies	
- Low prices for irrigation water	- Tariff regulations on irrigation water
- Improper pricing mechanism for use of irrigation water	- Develop mechanism for distribution and pricing of irrigation water
- Weak access to acceptable financial means - High investment costs	- Enable provision of long-term and low-interest loans or grants through state funds (for instance, State Fund for Support to Entrepreneurship, Implementing Credit Agency), private sources (different Banks) and international funds (WB, IFAD, GEF, GCF, Adaptation Fund) - Develop specific subsidy mechanism to promote application of the technology - Specific customs and tax regulations to promote import and production of the technology by private sector
- Lack of technological knowledge and skills	- Specific capacity building activities to increase technical capacity of relevant technical experts
- Weak agricultural extension services - Low level of awareness of economic and ecological advantages	- Enhance and improve agricultural extension services - Information campaign on the advantages of applied technology
- Unfamiliarity with new technology - Small-scale lands	- Capacity building activities on advantages of technology and cooperative activities - Implement pilot projects at community (municipal) level to demonstrate effective practice and promote cooperative

Barriers	Measures
	activities
Application of conservative cultivation technologies	
- Weak access to acceptable financial means - High investment costs - Expensive feasibility study	- Enable provision of long-term and low-interest loans or grants through state funds (for instance, State Fund for Support to Entrepreneurship, Implementing Credit Agency), private sources (different Banks) and international funds (WB, IFAD, GEF, GCF, Adaptation Fund)
- No specific subsidy mechanism to promote application of conservative cultivation technology	- Develop specific subsidy mechanism to promote application of conservative cultivation technology
- Weak access to agricultural machinery	- Specific regulations to improve access to relevant agricultural machinery
- Weak agricultural extension services	- Enhance and improve agricultural extension services
- Low level of awareness of economic and ecological advantages	- Information campaign on the advantages of applied technology
- Unfamiliarity with new technology - Small-scale lands	- Capacity building activities - Implement pilot projects at community (municipal) level to demonstrate effective practice and promote cooperative activities

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

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

Subsidy mechanisms are effective tools to promote and stimulate application of the technologies. At present, most of the farmers (agricultural sector) and local consumers (water sector) cannot afford to buy and apply relevant technology. This is financial barrier and could be eliminated by improving access to reasonable financial resources, such as credits. There is a positive example for stimulation of initiatives in Azerbaijan using specific subsidy, mostly applied in the agricultural sector. It is a specific subsidy mechanism developed by the government to stimulate wheat producers (40 Euro direct subsidy and 50% discount for fertilizers), as well as producers of wheat seeds. Similar mechanisms, with different features adjusted to type of adaptive technology, could be developed by the government to stimulate initiatives in related fields.

CHAPTER 2. WATER SECTOR

2.1. Preliminary targets for technology transfer and diffusion

Water resources of Azerbaijan constitute about 39 km^3. Approximately 29.3 km^3 of this is surface water, 8.8 km^3 is ground water and 0.06-0.08 km^3 is the water contained in glaciers. Although surface waters are now widely used for various purposes, the potential of ground waters is not yet used to a large extent. In addition, various lakes are found in the country. Water impoundments regulating water between high and low water seasons and glaciers can also play an important role in the resolution of water supply issues. This is particularly significant in the elimination of water crises, which is likely to occur as a result of an increasing demand for water and climate change effects. These additional factors should become part of adaptation measures (Water Resources Development Potential of Azerbaijan, 1997).

Water resources play an important role in the country's economy. For agriculture, alone, 10-12 km^3 of water is annually drawn from the rivers for irrigation. In most parts of the country, shortage of water resources and its uneven distribution, by seasons and over the country's territory, causes problems for water use. During the plants' vegetation period the annual water flow of rivers falls by 5-20% depending on the region. By contrast, while water shortfall is observed during low water seasons, in high water seasons cases of inundations and flash floods take place (Some Environmental Aspects of Climate Amelioration in Mountainous Areas of Arid Zone, 1988).

Vulnerability of water resources to the upcoming climate change was simulated for 2021-2050 and 2071-2100 based on recently updated statistic models reflecting the dependence of river flows on meteorological factors. In 2071-2100 water resources will be reduced by 10% and make up 26.3 km^3. The level of water shortage will make up 4.0 km^3 in the first period and 10.3 km^3 in the second, which is 1.5-3.0 times as high as the level of the baseline period. The expected population growth (by 1.5-2.0 times) will reduce the share of water per capita and will significantly worsen water supply for the population (Environment in Azerbaijan, 2005-2007).

In the future, similar to the present time, agriculture, hydro-energy and water supply will continue to be the most vulnerable areas:

- As a result of water shortage, taking current watering standards as the basis, water scarcity will be expected in the area of 250-300 thousand ha and might result in the fall of yield;
- Expected decline in river flows might reduce energy production at HESs by 20%;
- Increasing drinking water shortage will be more intensive in the target periods and the share of water per capita will reduce by 1.5 times and constitute 650m^3 accordingly. The pollution of available water resources will aggravate the situation.

In order to mitigate adverse effects of the upcoming climate change, the following adaptation measures are proposed:

- Reducing water leakages in water management facilities;
- Introduction of additional sources of water;
- Use of hydrologic cycle water, including ground waters;
- Regulation of flows;
- Taking engineering protective measures in stream beds of lakes and rivers against floods;
- Building small HESs on mountain rivers and construction of new water impoundments;
- Building small HESs on currently used irrigation channels;
- Clean-up of river channels, etc.

Climate change issues have not been incorporated into most socio-economic development programmes of the country. Almost all development programmes are lacking in aspects related to future tendencies of climate change in spite of the fact that climate change projections have already been provided in the Second National Communication of Azerbaijan to UNFCCC.

Main targets of prioritized technologies in the water sector are to adapt to changes in climate and sustain sufficient water supply in areas most vulnerable to climate change, as well as areas with potential risks of droughts and high temperatures.

2.2. Barrier analysis and possible enabling measures for rainwater collection from ground surfaces—small reservoirs and micro-catchments technology

2.2.1 General description of the technology

Most precipitation that falls on human settlements is lost to the atmosphere through evapotranspiration (evaporation plus transpiration of water taken up by plants), or runs into rivers away from settlements before it can be used. In some water-rich regions, particularly wealthy regions with centralized water infrastructure, these losses may not be a major concern. However, in many water-poor areas, small-scale collection infrastructure can contribute greatly to the volume of freshwater available for human use. This is especially an issue in arid and semi-arid regions, where the minimal rainfalls are usually very intense and often seasonal. Consequently, run-off and river flows can be abundant for brief periods and non-existent throughout the rest of the year.

Collection, storage and use of rainfall that lands on the ground can be done in the following ways:

- Collecting rainfall from ground surfaces utilizing “micro-catchments” to divert or slow run-off so that it can be stored before it evaporates or enters watercourses; and
- Collecting flows from a river, stream or other natural watercourses (sometimes called floodwater harvesting).

This technique often includes an earthen or other structure to dam the watercourse and form “small reservoirs”.

Micro-catchments are often used to “store” water as soil moisture for agriculture. Small reservoirs are typically used in areas with seasonal rainfall to ensure that adequate water is available during the dry season. This broad categorization can provide a basic framework for defining which strategies may be appropriate in a given setting. Collection and storage infrastructure can be natural or constructed and can take many forms.

These include:

• Underground tanks (i.e. cisterns) and excavations (either lined for waterproofing or unlined) into which rainwater is directed from the ground surface. Volumes of these are typically small and they are usually used by one household or institution (e.g. a school or health clinic);

• Small reservoirs with earthen bunds or embankments to contain run-off or river flow. The earthen bunds or embankments are typically built from soil excavated from within the reservoir to increase storage capacity. A spillway or weir allows controlled overflow when storage capacity is exceeded;

• Groundwater aquifers can be recharged by directing water down an unlined well. Groundwater recharge is also an added benefit of unlined reservoirs as stored water will infiltrate permeable soils during storage and eventually reach the groundwater table;

• As soil moisture for agriculture. Many run-off control methods for irrigation incorporate inundation or extended contact time with soils to increase topsoil moisture. Traditional methods were often developed in response to local conditions and have been practiced for centuries. Examples of these practices include variations of contour farming, which is broadly defined as plowing or digging

trenches perpendicular to the direction of run-off flow; this slows rainfall, decreasing erosion and increasing infiltration.

Rainwater collected from the ground surface is typically used for non-potable purposes, including irrigation, general domestic use, and livestock. However, in some regions with seasonal rainfall small reservoirs are commonly used for drinking water supply during the dry season, despite the high turbidity and poor bacteriological quality of the water.

Application of this technology successfully lines with the country's economic, social and environmental development priorities. Moreover, it contributes to water priority by improving quality and increasing amount of water, as well as to the strategy of diversification of the country's economy by improving the water sector within the economic system. Collection and storage of rainwater can provide a convenient and reliable water supply during seasonal dry periods and droughts.

One of the possible disadvantages of the technology could be that the costs of the new technology and its maintenance can be higher than others. Users may need to be provided with necessary capacity building and awareness raising activities in order to adapt new technology.

Such technology will be applied mainly in arid and semi-arid zones of the country. Assessment of vulnerability should be provided in the areas with highest risk to negative impacts of climate change. Water research institutions must be involved in the process in order to provide analyses and experiments.

2.2.2 Identification of barriers

Barriers related to the technology have been identified in six categories: i) economic/financial barriers, ii) policy/regulatory barriers, iii) capacity/information barriers, iv) technology barriers, v) social barriers and vi) environmental barriers.

2.2.2.1 Economic and financial barriers

As the technology is not market-based, there are no specific economic barriers to the application of the technology.

Insufficient governmental support for enhancement research activities in the application of this technology could be mentioned as a financial barrier to technology diffusion.

High capital costs for large-scale harvesting projects, which include building large reservoirs, public tanks, and channels, may exceed local capacity. Weak access to financial sources for people in these regions could be mentioned as another financial barrier.

2.2.2.2 Non-financial barriers

Policy/regulatory:

- Weak institutional basis and coordination among organizations;
- Lack of stakeholder network for the development and transfer of the technology;
- Non-existence of mechanism for customs regulations to stimulate import of necessary technology;
- Lack of support for research institutions (state and private) to provide deeper analysis for selection of most relevant technology.

Capacity/information:

- Weak capacity and lack of skills of existing research institutions;
- Unfamiliarity with new technology.

Technological:

- Difficulties in identification of suitable site and scale of rainwater reservoirs or tanks.

Social:

- Possible conflicts between communities on water access rights;
- Risk of disease outbreaks among people and cattle due to the use of same water source.

Environmental:

- Possible negative environmental impacts in the downstream of reservoirs.

Logical Problem Analysis for small reservoirs and micro-catchments technology is provided in figure 9:

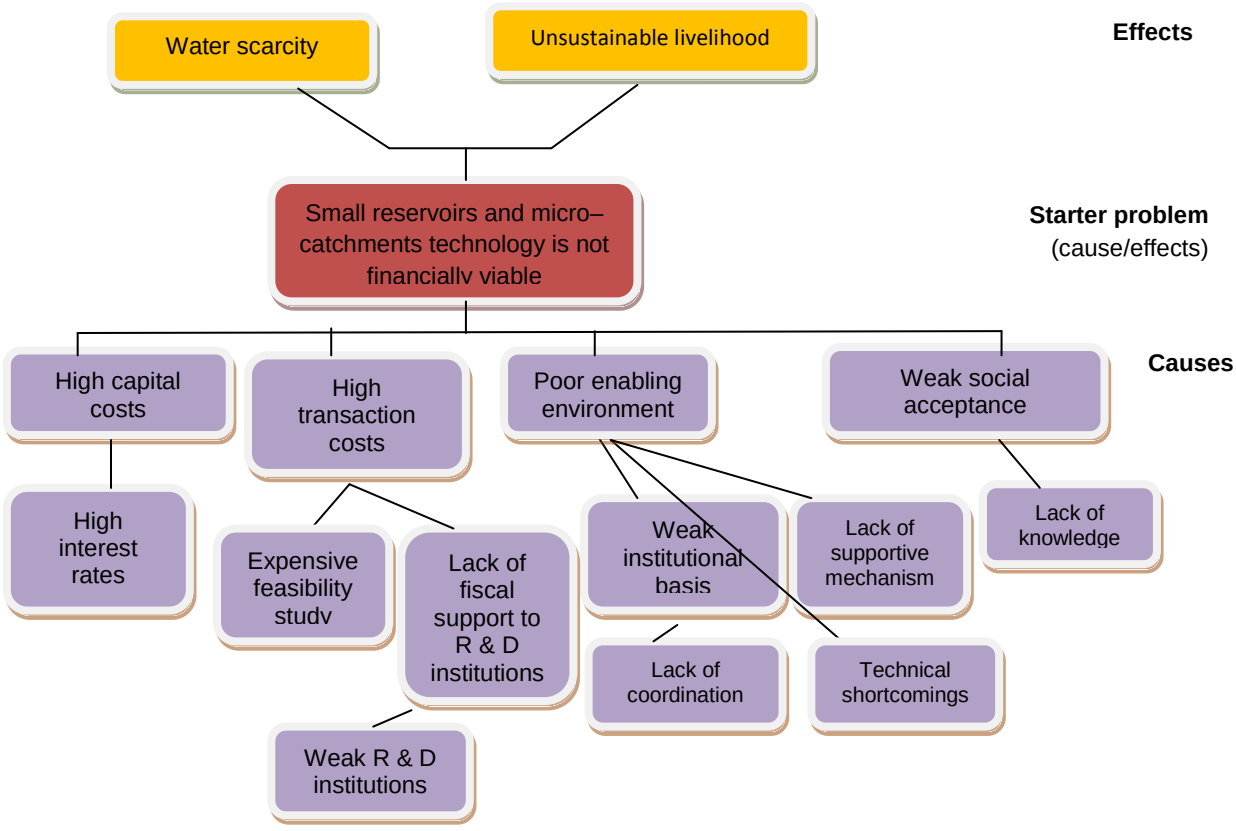


Figure 9: LPA for economic/financial and non-financial barriers of small reservoirs and micro-catchments technology

2.2.3 Identified measures

Identifying relevant measures is the process of analyzing necessary actions to be taken in order to overcome current barriers to the implementation of prioritized technologies. These measures should have sustained the diffusion.

For the identification of relevant measures, detailed analysis of current practices at national and international level was provided. National consultants have applied a participatory approach during the analysis by involving a wide range of stakeholders in the process.

2.2.3.1 Economic and financial measures

In order to overcome existing economic and financial barriers to the implementation of efficient water systems technology, the following measures should be provided:

- Increase fiscal support to R & D institutions;
- Enable provision of long-term and low-interest loans or grants through state funds (for instance, State Fund for Support to Entrepreneurship, Implementing Credit Agency), private sources (different Banks) and international funds (WB, IFAD, GEF, GCF, Adaptation Fund);
- Develop specific subsidy mechanism to promote application of the technology.

2.2.3.2 Non-financial measures

In order to overcome existing non-financial barriers of technology implementation, the following measures should be provided:

- Information campaigns to raise public awareness on the advantages of applied technology;
- Support the creation of a stakeholder network for the development and transfer of the technology (through a network of technical experts);
- Support capacity building activities for technology development and transfer;
- Improve legislative and regulatory reforms to stimulate the application of the technology;
- Develop support policies (specific subsidy mechanism) to encourage local deployment of the technology;
- Necessary regulatory actions in the field of tax regulations or customs regulations;
- Implementation of pilot projects at municipal or community level to demonstrate the advantages of the technology.

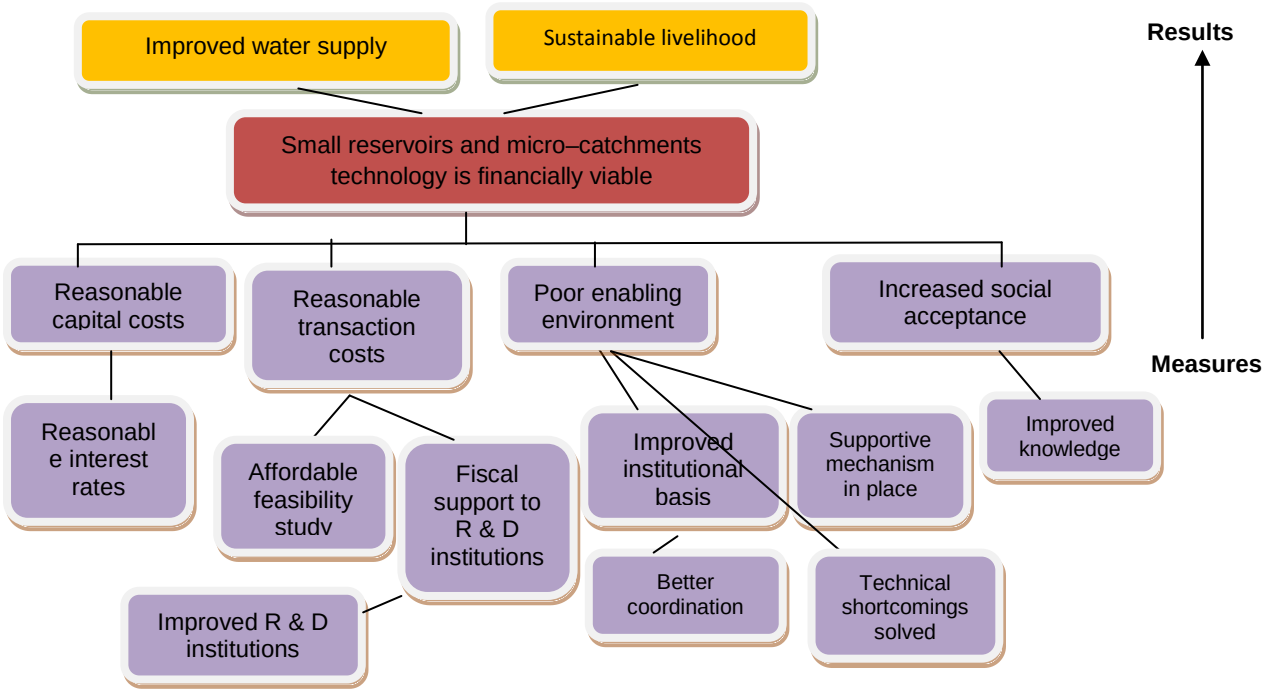


Figure 10: LPA for economic/financial and non-financial measures for small reservoirs and micro-catchments technology

2.3. Barrier analysis and possible enabling measures for flood warning technology

2.3.1 General description of the technology

The second prioritized technology under the water sector is use of modern weather and flood modeling and prediction technology. A sensor web consists of the following tools: real-time observation models for short-term run-off and weather estimation, event detection and projection, real-time satellite monitoring, a data linkage system and data warehouse center, data display system (DSS), and workflow management system.

Technology and database are in need of the most development. Experts and collaboration among research centers are required for transfer and diffusion. Real-time observations, models for run-off forecasting, and data display systems are fully developed technologies and ready to be implemented, unlike workflow management technology, which has yet to be developed. Event detection and precision technology are at an early stage of development. Models for run-off forecasting can be accessed, while other technologies are limited or inaccessible.

2.3.2 Identification of barriers

Barriers related to the technology have been identified in three categories: i) economic/financial barriers, ii) technology barriers and iii) information/capacity barriers.

2.3.2.1 Economic and financial barriers

Real-time observation technology has the following economic and financial barriers:

- High investment cost for surveying devices;
- Lack of maintenance budget.

High operating costs and lack of fiscal support could be mentioned as financial barriers to real-time Satellite Monitoring.

2.3.2.2 Non-financial barriers

Non-financial barriers to deployment of flood warning technology could be listed as follows:

Barriers related to the capacity development for each element of the modeling:

- Lack of devices for real-time observation;
- Lack of data sharing;
- Lack of data validation.

Barriers related to models for run-off forecast:

- Lack of research works including short-range run-off models and short-range weather forecast models;
- Lack of data linkage among the models;
- Data is not updated regularly.

Barriers related to Event Detection and Projection Technologies:

- Lack of standard data format;
- Lack of experts to develop programs for automatic analysis, processing, and interpreting images.

The lack of a system to automatically analyze a situation to support a command could be mentioned as an important barrier related to data linkage system and data storage.

For both real-time Satellite Monitoring and Workflow management systems, lack of qualified experts is the main barrier to technology deployment.

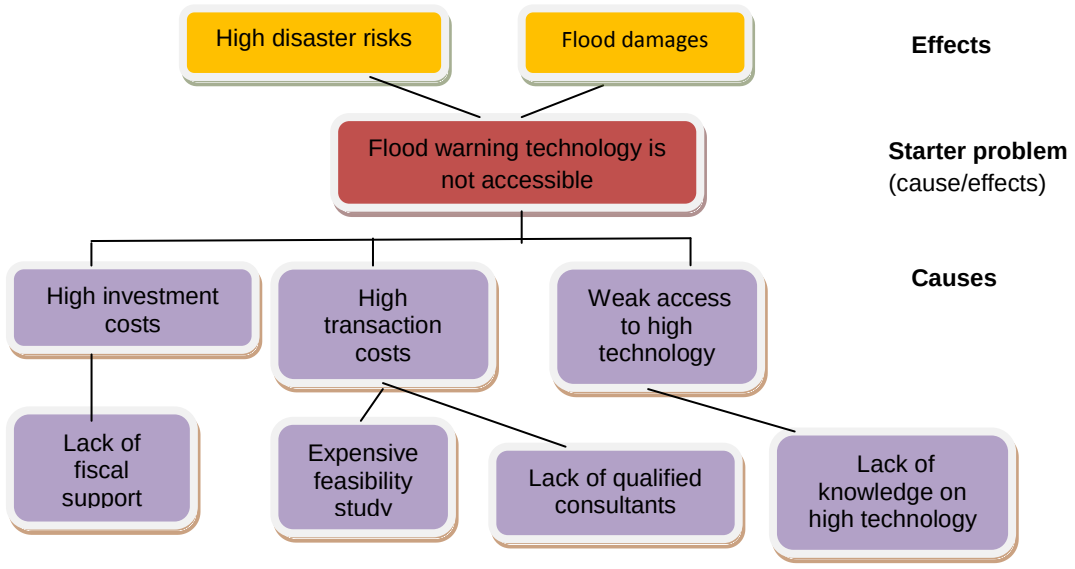


Figure 11: LPA for economic/financial and non-financial barriers of flood warning technology

2.3.3 Identified measures

2.3.3.1 Economic and financial measures

Overall, possible solutions for addressing the economic barriers include allocating funds for maintenance programs and research works, and waiving copyright fees. In order to overcome existing economic and financial barriers to the application of the technology, the following measures could be proposed:

- For Real-time Observation component -- allocating a maintenance budget for the devices and supporting locally-developed devices/research works;
- For Real-time Satellite Monitoring -- use of different funds as well as collaboration with IFI will be necessary to finance this component;
- For Workflow management system -- waiving copyright fees.

2.3.3.2 Non-financial measures

For the capacity barriers, possible solutions are listed as follows:

- Promoting the utilization and exchange of the data and research outcomes among stakeholders;
- Providing an accessible database free of charge;
- Developing data verification and screening systems with low uncertainty;
- Developing data standardization and data collection procedures;
- Providing training programs for data administrators to enable accurate data collection;
- Providing training programs to increase the number of skillful human resources in the fields of mathematic program development and GIS;
- Promoting international collaboration in conducting research for technology transfer.

For real-time observation:

- Promoting data exchange as well as utilizing research outcomes;
- Developing systems for data auditing/screening.

For models for run-off forecasts:

- Promoting data sharing as well as utilizing research outcomes;
- Allocating a maintenance budget for the devices and supporting locally-developed devices/research works;
- Establishing a national data center to collect information, both domestic and international;
- Developing systems for data auditing/screening.

For Event Detection and Projection technologies:

- Setting data format standardization and appropriate data collection procedures;
- Providing training for administrators so that they have updated knowledge and understanding, which enhances the quality of data collection;
- Increasing capacity of governmental sector personnel in the field of mathematic program research and development;
- Promoting collaboration with foreign agencies/private sectors in conducting research.

For Real-time Satellite Monitoring:

- Promoting collaboration with foreign agencies/private sectors in conducting research for technology transfer;
- Developing governmental sector personnel in the fields of mathematic programming and GIS research and development.

Increasing knowledge on the system of operation for executives and operators, in order to efficiently prioritize command procedures, could be mentioned as a measure to overcome the capacity barrier to Workflow management system.

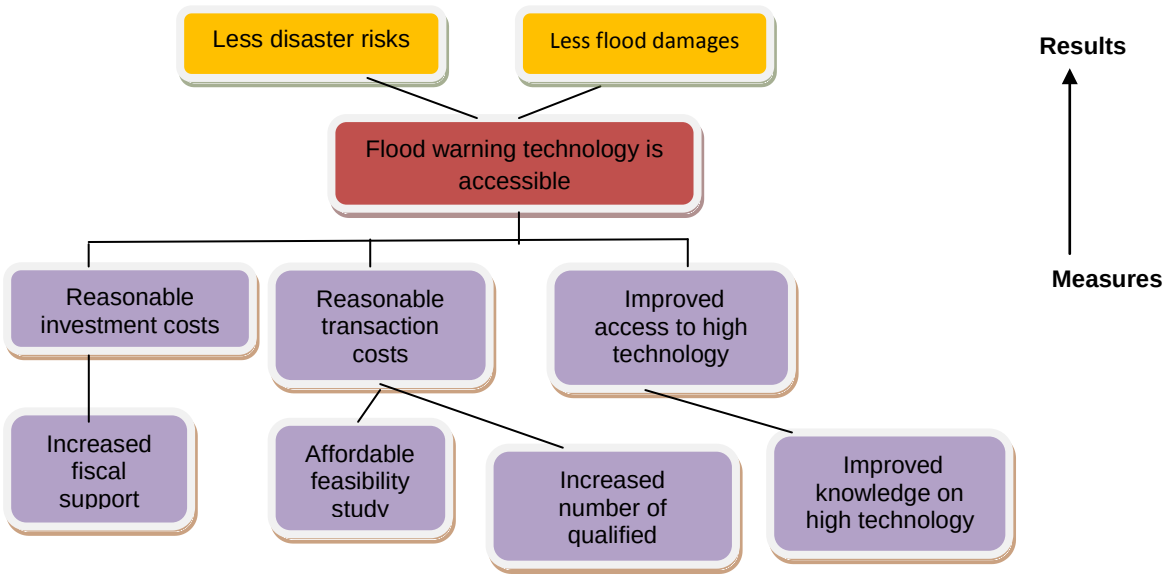


Figure 12: LPA for economic/financial and non-financial measures for deployment of flood warning technology

2.4. Barrier analysis and possible enabling measures for water reclamation and reuse technology

2.4.1 General description of the technology

In many communities around the world, the increase in population and growth of economies are causing demand for freshwater to increase at an alarming rate. Without a sound and sustainable strategy for integrated water resource management (IWRM), demand in these areas can quickly expand to exceed available supply. One integrated approach in this field that is gaining acceptance is the considering of municipal wastewater as a vital resource for appropriate applications such as irrigation for agriculture, as well as industrial and domestic purposes. This practice is called water reclamation and reuse. It is an example of an Environmentally Sound Technology as it protects the environment, results in less pollution, utilizes resources in a more sustainable way, allows its waste and products to be recycled, and handles residual wastes in a more acceptable manner than other technologies.

A number of sustainable and safe approaches to meeting increasing water demand with municipal wastewater have been identified. These general approaches include:

- Substituting reclaimed water for applications that do not require potable water;
- Augmenting existing water sources and providing an additional source of water supply to assist in meeting both present and future water needs;
- Protecting aquatic ecosystems by decreasing the diversion of freshwater, as well as reducing the quantity of nutrients and other toxic contaminants entering waterways;
- Postponing and reducing the need for water control structures;
- Complying with environmental regulations by better managing water consumption and wastewater discharges.

Typical wastewater treatment schemes incorporate multiple levels of physical, biological, and chemical treatment in order to ensure that the water discharged does not pose a significant risk to the environment or have adverse health impacts. Treated wastewater is usually discharged into surface water, which is often used by a water source for a water utility downstream.

Water reclamation and reuse approaches utilize the same treatment technologies as conventional wastewater treatment, including secondary clarifiers, filtration basins of various designs, membranes, and disinfection basins. Further reading regarding the application of such technologies to water reclamation and reuse is available.

2.4.2 Identification of barriers

Barriers related to the technology have been identified in four categories: i) economic/financial barriers, ii) technology barriers, iii) information/capacity barriers and iv) social barriers.

2.4.2.1 Economic and financial barriers

Financing opportunities and services for the facilitation of water reclamation and reuse initiatives are very low. Water reclamation and reuse technologies require large investments and have high infrastructure costs. Most communities cannot afford such investments; therefore, it is necessary to design an enabling framework for access to long-term and low-interest loans for communities.

2.4.2.2 Non-financial barriers

Currently, water reclamation and reuse technologies are not produced in Azerbaijan and are only imported. There are no specific customs regulations to simplify the import process of the technology.

Low level of awareness and lack of capacity of local authorities, communal units and residents on the advantages of the technology, as well as the lack of coordination among relevant institutions could be mentioned as another barrier to technology deployment.

Unfamiliarity with new technology could also be mentioned as a social barrier to application of the technology.

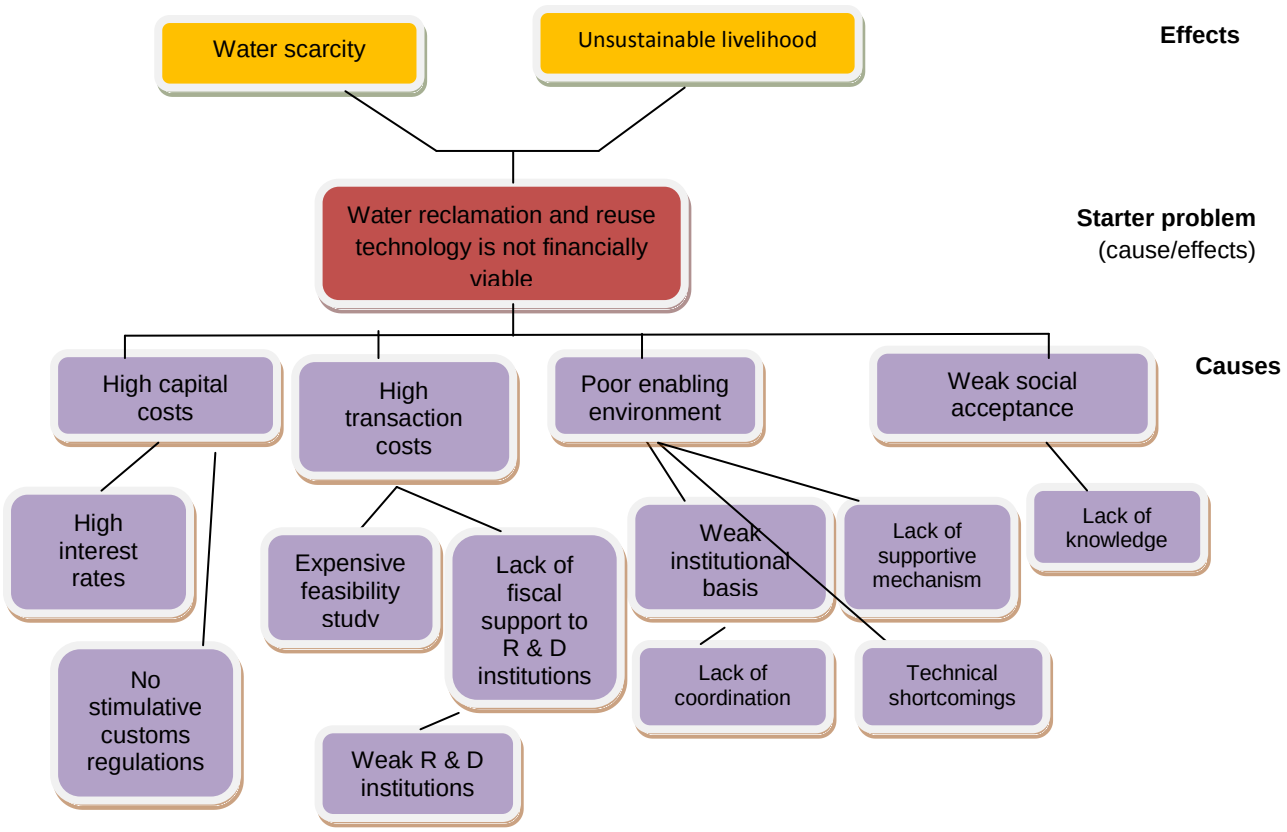


Figure 13: LPA for economic/financial and non-financial barriers of water reclamation and reuse technology

2.4.3 Identified measures

2.4.3.1 Economic and financial measures

In order to overcome existing economic and financial barriers to the application of the technology, the following measures could be proposed:

- Specific customs regulations in order to simplify the import procedures of the technology;
- Specific tax regulations in order to promote private sector investments for local production of water saving technologies;
- Develop specific subsidy mechanism to enhance application of water reclamation technologies;
- Financing opportunities and services for water reclamation and reuse initiatives will need to be expanded in order to facilitate such technologies;

- Information campaigns and capacity building activities to increase knowledge on advantages of the technology;
- Provision of long-term and low-interest loans through different state funds (for instance, State Fund for Support to Entrepreneurship functioning within the Ministry of Economic Development, Implementing Credit Agency), private sources (different Banks) and international funds (World Bank, IFAD) to support farmers in application of the technology.

2.4.3.2 Non-financial measures

Non-financial measures to overcome existing barriers to technology deployment could be summarized as following:

- Strengthening of local water and wastewater personnel's technical and managerial ability to evaluate limitations of current practice, potential benefits and requirements of wastewater reuse, as well as the fostering of their capability to implement new programs;
- Information campaigns on the advantages of the applied technology should be conducted;
- Implementation of pilot projects at municipal or community level to demonstrate the advantages of the technology;
- It will be necessary for policies and legal frameworks that facilitate safe and appropriate reclamation and reuse programs to either be created or aligned, in order to ensure the protection of human health and the environment;
- Develop supportive policies (subsidy mechanism) to encourage local deployment of the technology;
- Restructuring institutional basis for better coordination;
- Necessary regulatory actions in the field of customs regulations to simplify technology import.

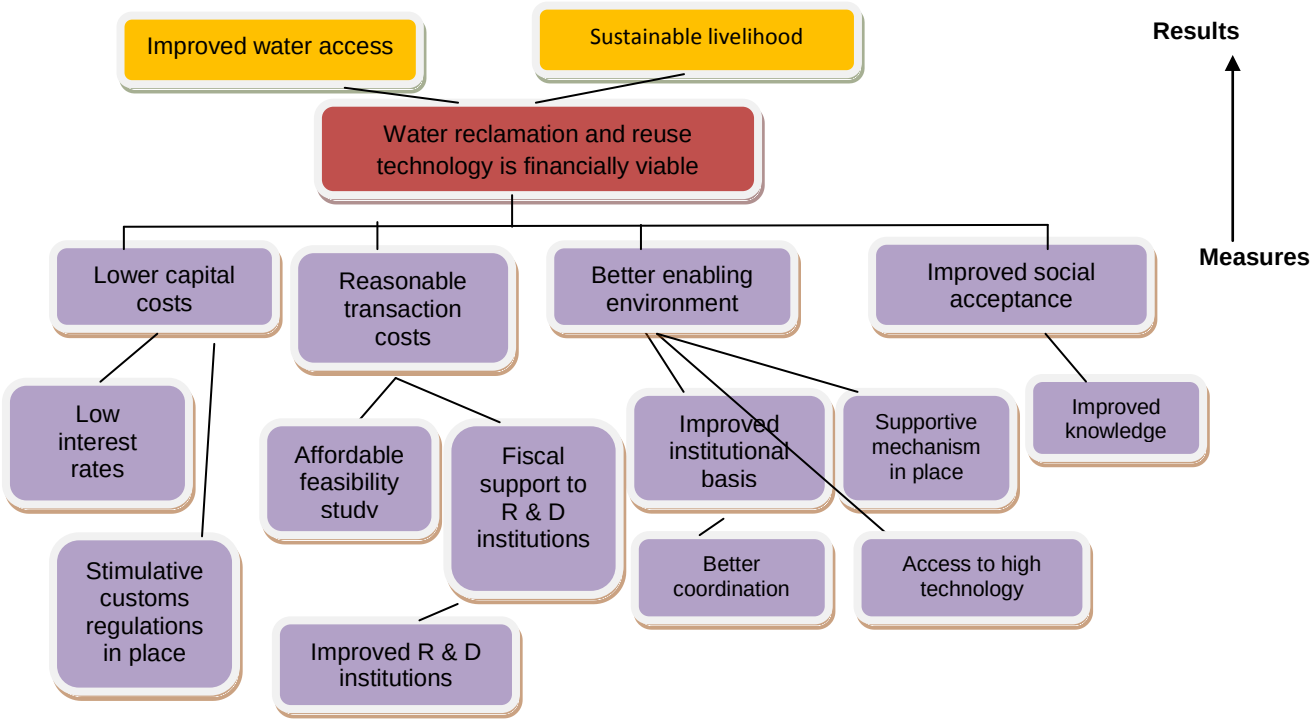


Figure 14: LPA for measures for water reclamation and reuse technology deployment

2.5. Barrier analysis and possible enabling measures for reducing water leakages in water management facilities technology

2.5.1 General description of the technology

Water losses are often observed in open canals (ground canals) and pipelines, and reach as much as 50% in many cases. These are often called 'real losses' and consist of any water that is physically lost from the system before it reaches the consumer's water meter.

Leakage in distribution systems and canals is a major problem for water utilities throughout the world, in both developed and developing countries. Out-dated water distribution pipes and ground canals lead to 50% losses during water transportation and distribution.

Management, detection and repair of canals and small leaks are critical functions of system operation and maintenance, yet they are often neglected. Large water main breaks can cause serious damage and draw media attention, however those catastrophic failures only account for about 1% of water lost to leaks. Some small leaks are noticeable at the ground surface and are easily identified, but many leaks continue below ground for months or years. A minor leak of four liters per minute would likely continue for years before it was noticed, resulting in the loss of over two million liters per year.

Prior to the repairing of canals and implementing of formal leak management, detection and repair programs, a water audit should be performed to quantify leakage and prioritize leak management activities.

Many new technologies for leak detection have appeared in recent years. The primary methods used for leak detection included acoustic, infrared thermography, chemical tracer, and mechanical methods. Among the acoustic methods were ground microphones, acoustic loggers on pipe fittings, and tethered in-line leak detectors. New and emerging technologies include ground penetrating radar (GPR), combined acoustic logger and leak noise correlators, digital correlators, and radio-frequency interferometers.183. More advanced acoustic methods have also been developed recently, including un-tethered leak detection (e.g. the Sahara® and SmartBall® systems).

Acoustic methods are able to recognize leaks based on the characteristic patterns of sound that leaks create; they have been, and continue to be, the most common leak detection methods. The choice of an appropriate leak detection technology must consider the pipe material and pipe diameter of a system.

New technologies enable rapid and accurate detection of leaks, but investing in rapid detection is futile unless repairs can be performed quickly. Repairs to pipes with holes generally involve either covering the hole from outside the pipe or inserting a smaller pipe inside the one that is leaking. The complexity and time for repairs varies widely, from one employee tightening a loose nut to large crews and excavators spending days repairing a deeply buried main.

A warmer climate is highly likely to result in more frequent drought. Additionally, growing population will push many countries into water stress and water scarcity in the coming decades. Detection and repair of leaks in water systems is an important part of comprehensive strategies to reduce pressure on existing water resources. Detecting and preventing leakage in piped water systems can lead to large savings in the energy used to transport, treat and distribute water.

2.5.2 Identification of barriers

Barriers related to the technology have been identified in four categories: i) economic/financial barriers, ii) technology barriers, iii) policy/regulatory barriers and iv) information/capacity barriers.

2.5.2.1 Economic and financial barriers

Most communities, service providers and utilities, particularly small-scale ones, cannot afford the purchase of specific technology. Therefore, it is necessary to design an enabling framework for access to long-term and low-interest loans for utilities, communities and service providers.

Financing opportunities and services for leakage management initiatives are very low and are not enough to facilitate such technologies. The capability of utilities and potential users to understand and access these services might also be very low.

2.5.2.2 Non-financial barriers

Policy/regulatory: Application of leak detection and management technology is currently imported to the country and access to the technology is weak. There are no specific customs regulations to simplify the import of the technology to the county. Weak regulatory and legislative framework and lack of coordination among relevant institutions are other barriers to technology deployment.

Capacity/information: Limited awareness and lack of capacity of local authorities, communal units and community residents on the advantages of the technology is one the main barriers in technology deployment. Lack of technical knowledge and skills of service providers on application of the technology is also an important barrier.

Social barriers: Unfamiliarity with new technology could also be mentioned as a social barrier to application of the technology. Local residents and utilities are accustomed to applying traditional procedures.

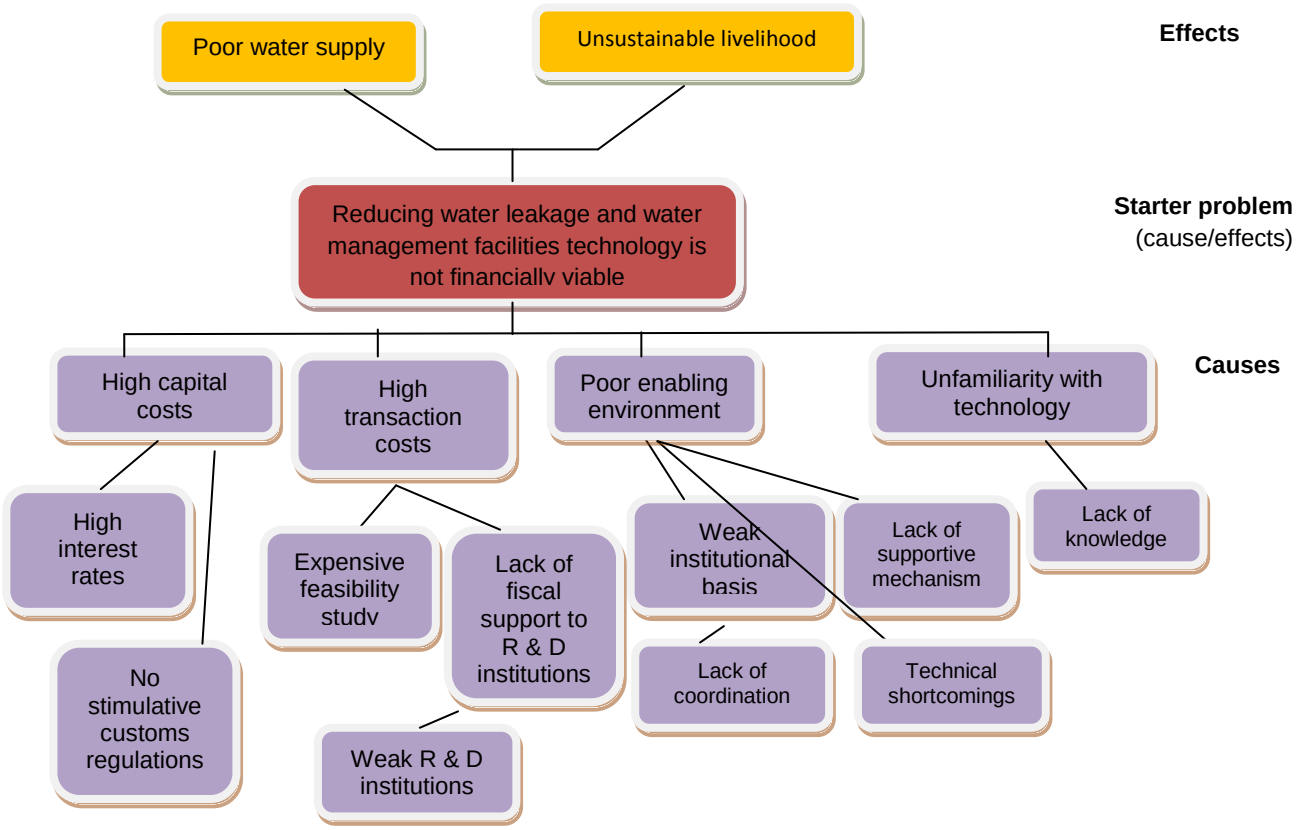


Figure 15: LPA for barriers under reducing water leakages and water management facilities technology

2.5.3 Identified measures

2.5.3.1 Economic and financial measures

In order to overcome existing economic and financial barriers to the application of the technology, the following measures could be proposed:

- Develop specific subsidy mechanism for utilities to enhance application of these technologies at local level;
- Financing opportunities and services for leakage management initiatives will need to be expanded in order to facilitate such technologies. It is also likely that the capability of utilities and potential users to understand and access these services will need to be improved;
- Provision of long-term and low-interest loans through different funds to support utilities in application of the technology.

2.5.3.2 Non-financial measures

In order to overcome existing non-financial barriers to the implementation of the technology, the following measures could be proposed:

- Specific customs regulations in order to simplify the import procedures of the technology;
- Specific governmental program to purchase necessary leakage-detection equipment and management for existing services, in order to increase their access to them;
- Capacity building for national and community level water management institutions;
- Information campaigns on the advantages of applied technology should be conducted;
- Implementation of pilot projects at municipal or community level to demonstrate the advantages of the technology;
- Restructuring institutional basis for better coordination.

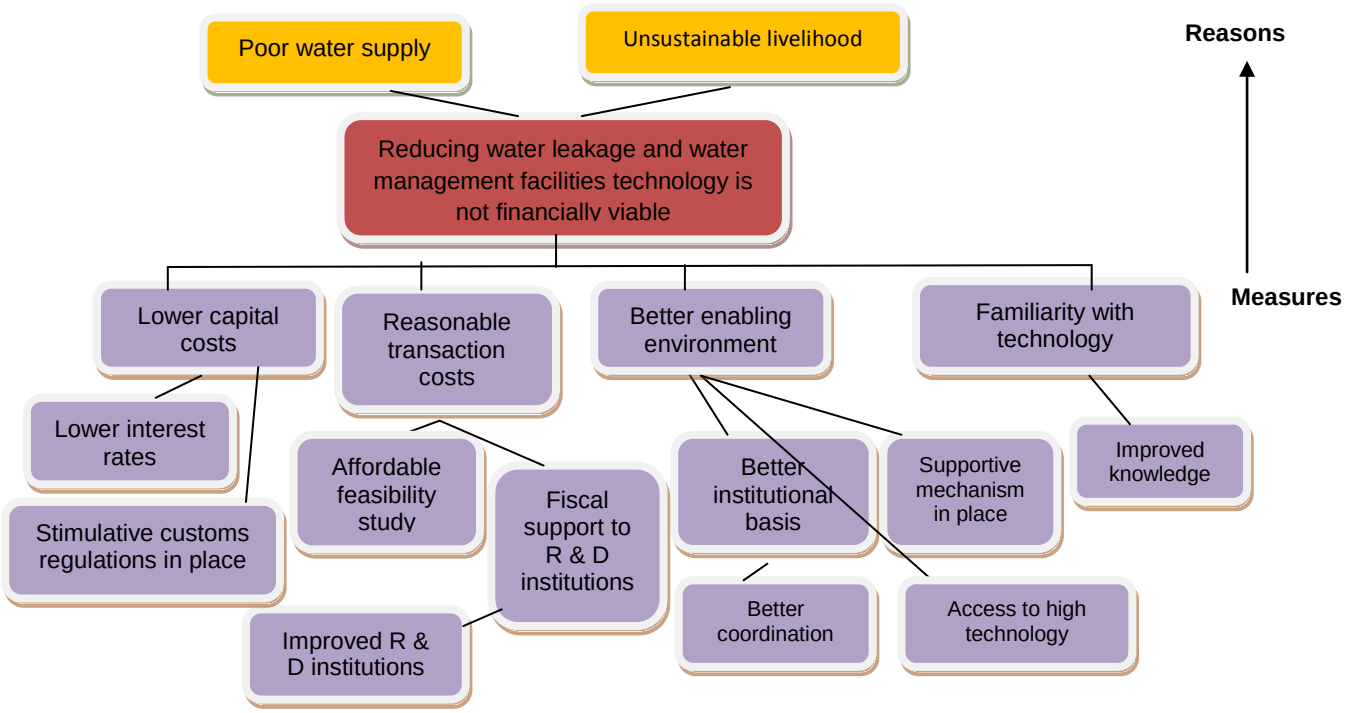


Figure 16: LPA for measures for deployment of reducing water leakages and water management facilities technology

2.6. Linkages of barriers identified

As it was indicated in previous sections, barriers related to the implementation of technologies for water sector have been identified in five categories: i) economic/financial barriers, ii) policy/regulatory barriers, iii) technology barriers, iv) information/capacity barriers and v) social barriers.

Some of the identified barriers are similar throughout all the technologies. For instance, weak capacity and lack of information on use and advantages of the technology are barriers to all prioritized technologies. Unfamiliarity with new technology could also be mentioned as a social barrier to application of prioritized technologies. Local population is accustomed to traditional water use practices.

With regard to reducing water leakages and water management facilities technology, regulatory actions from the government are needed on the tariff system in order to increase efficiency of water use. High cost of investment and infrastructure is another barrier to the wide application of the technology. Not having access to low-interest and long-term financial means, utilities and users are unable to provide sufficient investment for the development of the technology.

The lack, and high cost, of flood forecasting and leak detection technology are major barriers. Social barriers are also important, as local utilities and users are unaware of economic and environmental advantages of the technology.

Barriers related to implementation of technologies for the water sector could be summarized as follows:

Table 3: Summary of barriers of water sector

Barriers	**Technologies**			
	Rainwater collection from ground surfaces—small reservoirs and micro-catchments technology	**Flood warning technology**	**Water reclamation and reuse technologies**	**Reducing water leakages in water management facilities technology**
Economic/financial	- Insufficient governmental support for enhancement research activities - High capital costs for large-scale projects - Weak access to financial sources	- High investment cost for surveying devices - High operating cost - Lack of funds	- Inadequate financial initiatives - High investment and infrastructure costs - Lack of enabling framework for access to long-term and low-interest loans	- Inadequate financial initiatives - Weak access to long-term and low-interest loans for utilities, communities and service providers
Policy/regulatory	- Weak institutional basis and lack of coordination - Lack of stakeholder network for the development and transfer of the technology - Non-existence of mechanism for		- There are no specific customs regulations in order to simplify the import process of the technology -Lack of coordination among relevant institutions	- Weak regulatory and legislative framework - Non-existence of mechanism for customs regulations for stimulation of import of necessary technology

	customs regulations			
Technology	-Difficulties in identification of suitable site and scale of rainwater reservoirs or tanks	- Lack of data and data management system - Lack of data linkage among the models - Lack of system to automatically analyze a situation to support a command	- Lack of technological knowledge and skills	- Weak access to high technology -Lack of coordination among relevant institutions
Information/capacity	- Weak capacity and lack of skills of existing research institutions	- Lack of experts to develop programs for automatic analysis, processing, and interpreting images - Lack of research works including short-range run-off models and the short-range weather forecast models	- Low level of awareness of economic and ecological advantages - Low capacity of utilities and potential users to understand and access these services	- Limited awareness and lack of capacity of local authorities, communal units and residents on advantages of the technology
Social	- Unfamiliarity with new technology - Possible conflicts between communities on water access rights	- Unfamiliarity with new technology	- Unfamiliarity with new technology	- Unfamiliarity with new technology

2.7. Enabling framework for overcoming the barriers in water sector

Water is a strategic sector for Azerbaijan and the government has approved specific development programmes in this field. Main aspects of water management are included in different state programmes and will be more specifically represented in “State Water Strategy of Azerbaijan”, which is currently being prepared with the support of UNEC and OECD. However, almost all development programmes are lacking in aspects related to future tendencies of climate change. Therefore, specific measures are necessary in order to overcome existing barriers to the implementation of prior technologies.

Main measures are listed below:

Table 4: Barriers and measures for commercial and residential sub-sector

Barriers	Measures
Rainwater collection from ground surfaces—small reservoirs and micro-catchments technology	
- Insufficient governmental support for enhancement research activities - High capital costs for large-scale projects - Weak access to financial sources	- Enable provision of long-term and low-interest loans or grants through state funds (for instance, State Fund for Support to Entrepreneurship, Implementing Credit Agency), private sources (different Banks) and international funds (WB, IFAD, GEF, GCF, Adaptation Fund)
- Weak institutional basis and lack of coordination - Lack of stakeholder network for the development and transfer of the technology - Non-existence of mechanism for customs regulations for stimulation of import of necessary technology	- Develop specific subsidy mechanism to promote application of the technology - Restructuring institutional basis for better coordination
- Difficulties in identification of suitable site and scale of rainwater reservoirs or tanks	- Strengthen capacity for water management, operation and protection - Capacity building for local authorities, communal units and residents - Develop a network of technical experts
- Weak capacity and lack of skills of existing research institutions	
- Unfamiliarity with new technology - Possible conflicts between communities on water access rights	- Information campaign on the advantages of applied technology - Implementation of pilot projects at municipal or community level to demonstrate the advantages of the technology
Flood warning technology	
- High investment cost for surveying devices - High operating cost - Lack of funds	- Enable provision of long-term and low-interest loans or grants through state funds (for instance, State Fund for Support to Entrepreneurship, Implementing Credit Agency), private sources (different Banks) and international funds (WB, IFAD, GEF, GCF, Adaptation Fund) - Develop specific subsidy mechanism to promote application of the technology - Allocating a maintenance budget for the devices and supporting locally-developed devices/research works
- Lack of experts to develop programs for automatic analysis, processing, and interpreting images - Lack of research works including short-range run-off models and the short-range weather forecast models	- Providing training for surveying, data calibration, data completion, climate model development, computing mathematics, and mainframe computing resource management - Increasing human resources in the field of model development and data analysis - Encouraging research collaboration and data exchange - Provision of high-performance computers required in calculating/processing the models - Promoting data sharing as well as utilizing research outcomes
- Lack of data and data management system - Lack of data linkage among the models -Lack of system to automatically analyze a situation	-Establishing a national data center to collect information, both domestically and internationally - Developing systems for data auditing/screening

Barriers	Measures
to support a command	
Modeling problems - Lack of data and data storage - Lack of research works - Lack of data linkage among the models **Event Detection and Projection technologies** - Lack of data format standardization - Lack of experts **Real-time Satellite Monitoring area** - High operating cost - Lack of funds - Lack of experts **Data linkage system and data warehouse related barriers:** Lack of a data sharing network to easily access the database **Data display system related barriers:** Lack of system to automatically analyze the situation to support a command	- Setting data format standardization and appropriate data collection procedures - Providing training for administrators so that they have updated knowledge and understanding, which enhances the quality of data collection - Developing governmental sector personnel in the field of mathematic program research and development - Promoting collaboration with foreign agencies/private sectors in conducting research for technology transfer - Developing governmental sector personnel in the fields of mathematic programming and GIS research and development related to flood forecasting and modeling - Developing national policy and agreement to create common understanding of the co-ownership of data and data sharing - Setting data format standardization and appropriate data collection procedures - Providing training for administrators so that they have updated knowledge and understanding, which enhances the quality of data collection
- Lack of coordination among relevant institutions	- Restructuring institutional basis for better coordination
- Non-existence of mechanism for customs regulations for stimulation of import of necessary technology	- Necessary regulatory actions in the field of customs regulations
Water reclamation and reuse technology	
- High capital costs - Inadequate financial initiatives	- Financing opportunities and services for water reclamation and reuse initiatives expanded
- Weak regulatory and legislative framework	- Necessary policies and legal frameworks to facilitate safe and appropriate reclamation and reuse programs - Improve regulatory reforms to stimulate the application of the technology - Develop supportive policies to encourage local deployment of the technology
- Non-existence of mechanism for customs regulations for stimulation of import of technology	- Necessary regulatory actions in the field of tax regulations or customs regulations
- Weak institutional basis - Lack of coordination among relevant institutions	- Strengthen technical capacity for water management, operation and protection - Restructuring institutional basis for better coordination
- Limited awareness and lack of capacity of local authorities, communal units and residents on advantages of the technology - Unfamiliarity with the technology	- Capacity building activities of water reclamation and reuse - Information campaign on the advantages of applied technology - Implementation of pilot projects at municipal or community level to demonstrate the advantages
Reducing water leakages in water management facilities technology	
- High capital costs - Inadequate financial initiatives	- Financing opportunities and services for water reclamation and reuse initiatives expanded
- Weak regulatory and legislative framework	- Improve regulatory reforms to stimulate the application of the technology - Develop supportive policies to encourage deployment of the technology
- Weak institutional basis	- Strengthen technical capacity for water management, operation and protection
- Lack of coordination among relevant institutions	- Restructuring institutional basis for better coordination
- Non-existence of mechanism for customs regulations for stimulation of import of necessary technology	- Necessary regulatory actions in the field of customs regulations
- Low awareness and lack of capacity of local authorities, communal units and residents on advantages of the technology	- Capacity building for national and community level water management institutions - Information campaign on the advantages of applied technology should be conducted - Implementation of pilot projects at municipal or community level to demonstrate the advantages

List of references

UNEP Riso Center, Guideline for Overcoming Barriers for technology transfer

Main and Priority Activities of the Government of the Republic of Azerbaijan. Main Outcomes and Prospects (2003-2013). Statistic overview. Statistical Committee Baku, 2008

Official web page of National Statistical Committee of Azerbaijan Republic, www.azstat.org

Environment in Azerbaijan, State Statistics Committee of the Republic of Azerbaijan, Baku, 2005-2007

ClimateTechWiki, a climate technology platform: http://climatetechwiki.org/content/conservation-tillage

Mamedov R.G. *Water Resources Development Potential of Azerbaijan*. Baku-1997

Eyubov A.D., Ragimov Kh.Sh., Ulkhanov N.D. *Some Environmental Aspects of Climate Amelioration in Mountainous Areas of Arid Zone (based on an example of Azerbaijan SSR) – Environmental and Economic Aspects of Amelioration.* T.III., Tallin-1988

FAO. 2011. Food Security and Agriculture Highlights: Azerbaijan. http://www.fao.org/docrep/014/am598e/am598e00.pdf

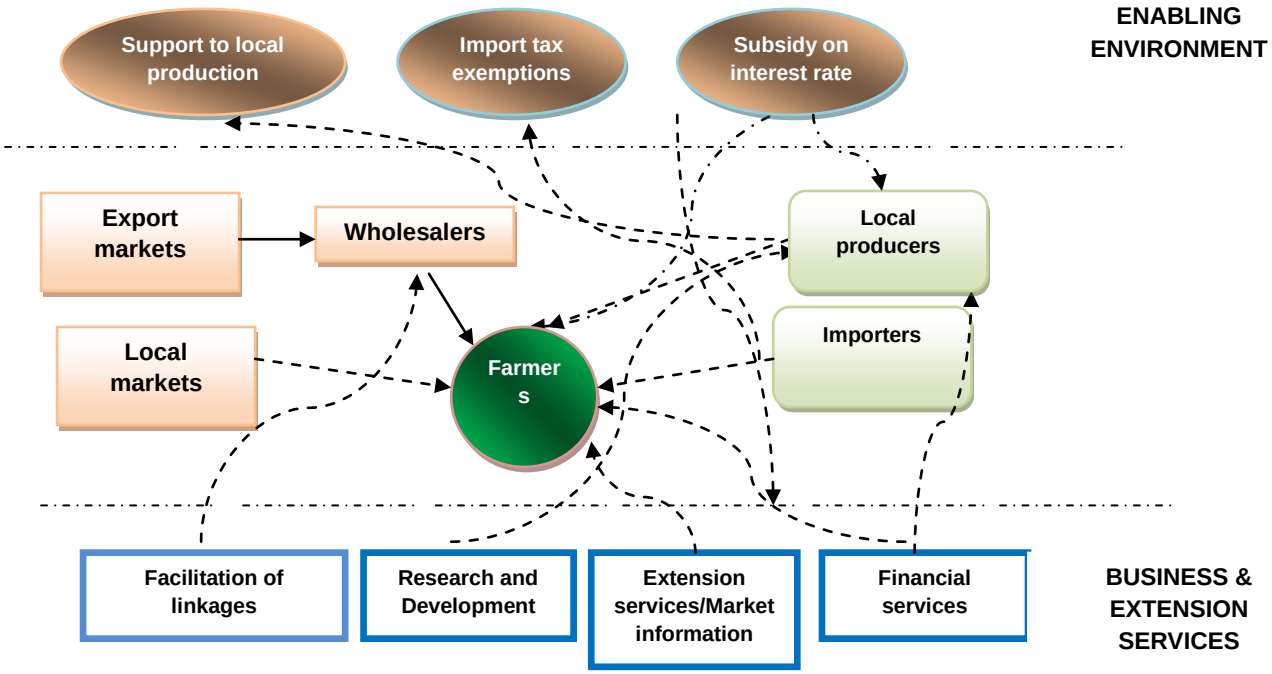
United Nations (UN). 2011. *Regional Climate Change Impacts Study for the South Caucasus Region*. Tbilisi, Georgia.

National water supply and sanitation project, Shamakhi region water supply and Sanitation systems, Environmental impact Assessment, Baku, 2009

Goal and objectives of windbreaks, PhD., E. Allahverdiyev, lecture

Annex I. Market maps for prioritized technologies

Figure 17: Market mapping for water saving technologies at irrigated lands



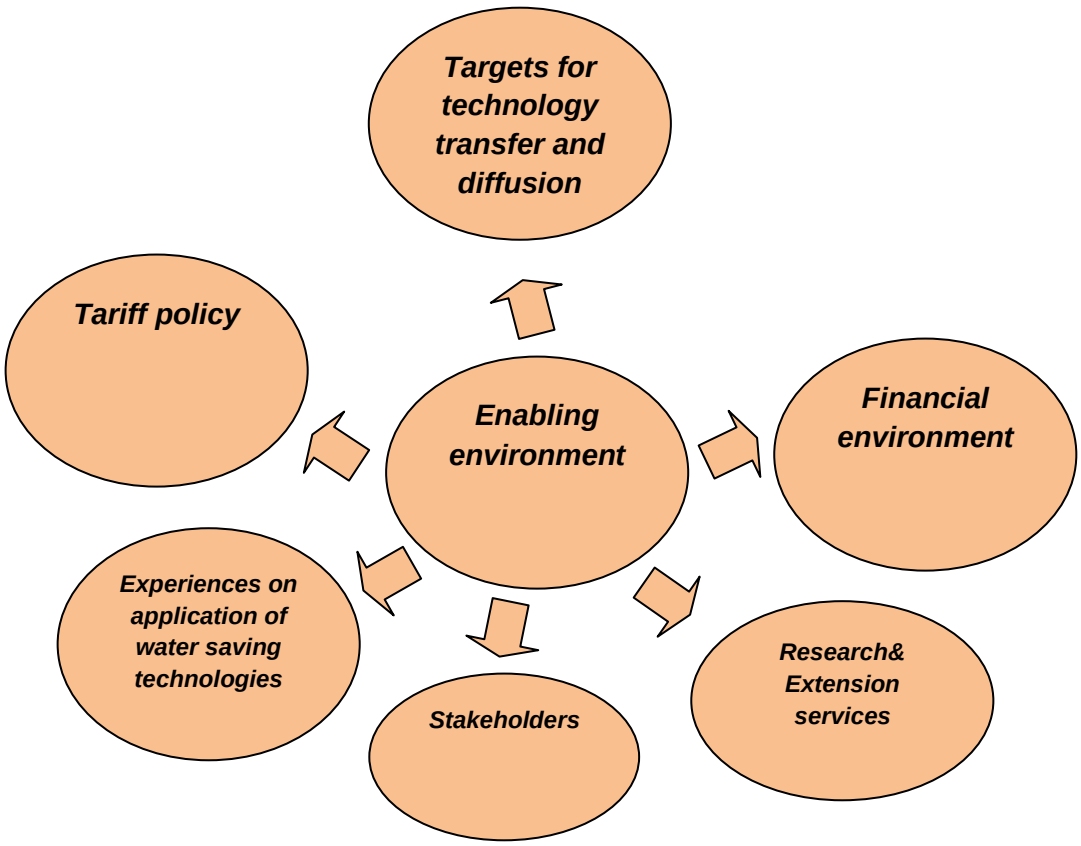
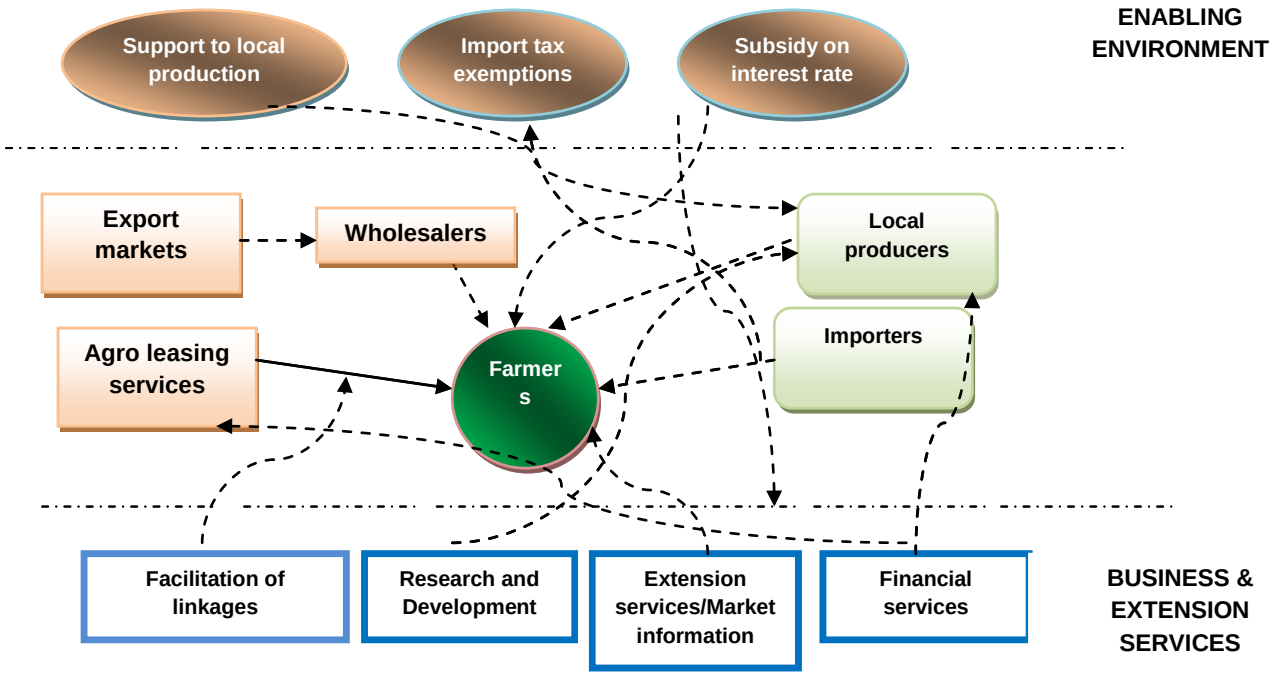
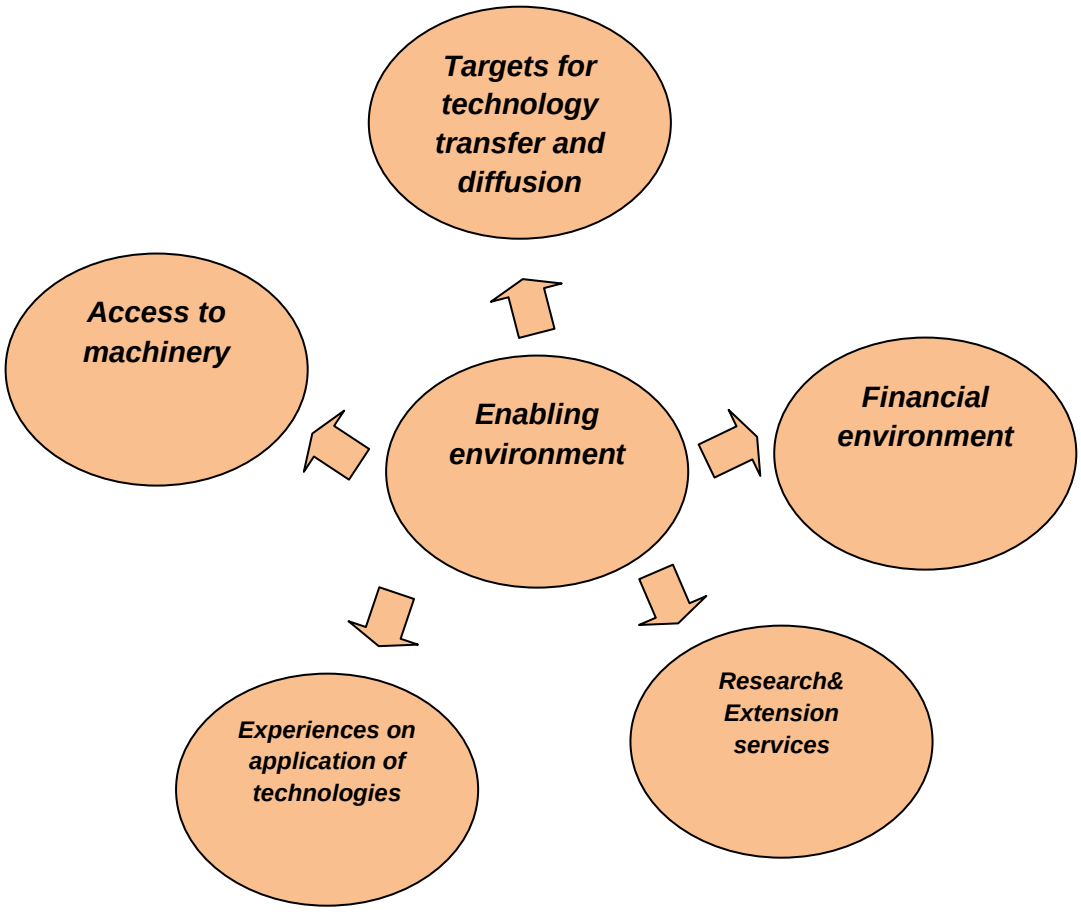


Figure 18: Market mapping for conservative agriculture technologies





Annex II. List of stakeholders involved and their contacts

Institutions	Representative	Contacts
State organizations		
Ministry of Agriculture	C.Isayev	c.isayev@gmail.com
Ministry of Ecology and Natural Resources	O.Jafarov	o_jafarov@yahoo.com
Ministry of Economic Development	A.Cafarov	altay.cafarov@gmail.com
National Academy of Sciences	X.Ragimov	khayyamr@yahoo.com
National Academy of Sciences, Erosion Institute	S. Safarly	erosiya_suvarma@mail.ru
State Land and Cartography Committee, Head of Division at the Scientific Research Institute on Soil Science	G.Yagubov	gasham.yagubov@gmail.com
State Water Agency under Ministry of Emergency Cases	S.Hasanzade	sahib540@mail.ru
Public and private companies		
”Azersu“ Open Joint Stock Company	A.Bayramov	a.memmedov@sukanal.az
Amelioration and Water Farms Open Stock Company	T.Osmanov	safsu@mail.ru
NGOs		
Azerbaijan Branch office of REC Caucasus	I.Aliyev	Issa.aliyev@rec-caucasus.org
“Ecooil”	M. Gurbanov	m_gurbanov@mail.ru
“Ecolife”	S.Hasanov	h.sadiq@mail.ru
Independent expert (on energy and renewable energy sources)	Sh.Movsumov	movzumov@yandex.ru

Annex III. Policy factsheets

Policy: "State Programme on Reliable food supply to the population" for 2008-2015	
Name of field	**Content**
Date Effective:	
Date Announced:	21/10/2008
Date Promulgated:	-
Date Ended:	-
Unit:	Agriculture, food security
Country:	Azerbaijan
Year:	2008
Policy Status:	In force
Agency:	Ministry of Agriculture, State Land and Cartography Committee, MENR, MED
Funding:	State budget, international donor funding
Stated Objective:	Long-term sustainment and ensuring food security
Description:	Program aims to develop agricultural sector, increase productivity and ensure food security

Policy: Development vine growing activities during 2012-2020	
Name of field	**Content**
Date Effective:	
Date Announced:	15/11/2011
Date Promulgated:	-
Date Ended:	2020
Unit:	Agriculture
Country:	Azerbaijan
Year:	2011
Policy Status:	In force
Agency:	Ministry of Agriculture
Funding:	State budget, international donor funding
Stated Objective:	Develop vine growing activities
Description:	Program aims to develop vine growing activities in order to enhance income generating activities of rural population