EVALUATION OF FARMING ACTIVITIES SUPPORTED BY CLIMATE SUB-LOANS IN TAJIKISTAN AND UZBEKISTAN

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ABSTRACT

Increased pressure on environment in combination with extreme weather events, such as droughts and floods, may lead to unsustainability of agriculture. Most probably, decreased crop yield may cause disproportion between production and population need for food.

In Uzbekistan and Tajikistan agrarian sector is the main consumer of water, which is used for irrigation. Climate change and its consequences (increased temperature, low precipitation and decreased area of glaciers) may lead to increased deficit of water availability and increased need for irrigation water in the future.

To improve sustainability of agriculture under climate change, investments will be required, firstly, for reorganization and improvement of irrigation and agriculture infrastructure. In addition, climate risks in agriculture and water sector will require separate investments. In this context, it should be clear, what specific problems need to be financed. It is also essential to understand that these investments should be targeted, with the use of existing high tech tools to solve specific tasks.

The paper presents the assessment of efficiency related climate investments in agriculture in Uzbekistan and Tajikistan. Basic criteria and indicators of assessment were developed. Climate anomalies and risks in agriculture production and adaptation measures were defined.

1. INTRODUCTION

To improve sustainability of agriculture under climate change, investments will be required, firstly, in reorganization and improvement of irrigation and agriculture infrastructure. In addition, climate risks in agriculture and water sector will require separate investments. In this context, it should be clear, what specific problems need to be financed. It is also essential to understand that these investments should be targeted, with the use of existing high tech tools to solve specific tasks.

There are evident risks associated with climate: mudflows, landslides, and glacial melting. There are hidden risks that are not understood by all in different sectors. Those directly depend on climate conditions and variability. For instance, crop diseases develop in agriculture in the years with lower temperatures and heavy precipitation in spring and summer. Pests spread for the same reason. In this context, there is a direct relation between the spread and intensification of diseases and pests and winter warming, increased air humidity and decreased temperatures in spring. If studied deeper, the list of such risks may be larger.

There is little number of research and projects on such kind of risks, their analyses, and tools to eliminate them or adapt to them. There are few experts in water sectors who clearly understand climate-related problems in the sectors. At the same time, those who suffer from climate risks (who are impacted by climate change) do not

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realize that their efforts to resolve problems they come across are directly connected with climate risks.

1.1 Assessment of project proposals and requirements of banks to receive loans from climate funds in Uzbekistan and Tajikistan

In Uzbekistan, sub-project proposals to receive loans in crop production include development of cost-effective greenhouses by purchasing climate control equipment (radiator heater with boiler), structures for greenhouses, dimming system, blinds, and plant hangers system. In livestock production, loans were granted to purchase superior grades cattle.

In Uzbekistan, requirement of banks towards project proposals to receive loans include environmental measures in crop and livestock production. Environmental requirements include checklist of issues for environmental motoring for AFOs. As to livestock production, environmental requirements differ from those for crop production, taking into account key features of livestock production – animal husbandry, diseases, and wastes.

In Tajikistan, sub-project proposals to receive loans include purchase of seedlings, seeds, fertilizers, and fencing materials in crop production. In Tajikistan, requirements of banks towards project proposals to issue loans are based on environmental protection measures aimed to prevent and mitigate impact of agricultural activity under the sup-projects in the area of crop production on water resources and their quality, soil, biodiversity, air pollution (gas emissions due to the use of machinery), health, and industrial safety. In livestock production, environmental requirements differ from that of those in crop production because of special features of animal husbandry, which deals with raising of animals, their diseases, and emitting of wastes.

The review of initial information allowed defining an approach to field visit of areas, where sub-projects were implemented, and behavior to receive full information for assessment and analysis.

2. METODOLOGY FOR ASSESSMENT OF CLIMATE RISKS AND ADAPTATION MEASURES

2.1 Basic Provisions of Assessment Methodology

The methodology for assessment of climate-related investments is built on the area of activity under the sub-project and assessment of climate indicators. The review of similar approaches to assessment of climate investments and risks revealed that the assessment of climate initiatives and investments should be targeted and random[5].

Evaluation of climate investments should be preceded primarily from the results expected from these investments. The effectiveness of financial investments, in turn, is determined by the effectiveness of the measures climate risk mitigation or adaptation (CRMA). The effectiveness of the CRMA measures is assessed both by financial and economic indicators, and quantitative and qualitative indicators of the degree of adaptation of agriculture to various climate anomalies, to a greater extent, and, to a lesser extent, by the level of reduction of greenhouse gas emissions into the atmosphere.

Main components of sub-project assessment are criteria of assessment, indicators, and efficiency of activity. Those components should be defined according to the tasks

[5] Joint Mission Report (12 to 22 October 2009), Pilot Program for Climate Resilience – Tajikistan

and aims of investment projects and give an overview of selected directions of sub-projects, which should comply with climate investment strategy.

2.1.1 Structure for assessment of climate Investments

1 stage: Initial assessment of sub-projects, including field assessment.

2 stage: Assessment of climate risks and availability of adaptation measures in the project implementation area.

3 stage: Assessment of climate anomalies.

4 stage: Assessment of negative impact of climate.

5 stage: Assessment of efficiency of measures for reduction of greenhouse gas emissions and of adaptation measures.

The overall structure of climate investment is based on climate investment criteria, climate indicators based on climate risk indicators, adaptive measures and measures to reduce greenhouse gas emissions into the atmosphere, and on the effectiveness of climate investment (Figure 1). Assessment activities were preceded by information collection and review of sources on climate, soil, land reclamation, and physico-geographical conditions of the region and areas, where sub-projects are implemented. Agricultural activities of the territory are examined, as well as cultivated crops, conditions for livestock production, and water management situation.

2.1.2. Initial Assessment of Activities Under Sub-Projects

Activities under sub-projects are assessed based on the above mentioned criteria and climate and adaptive indicators of selected sub-projects.

The initial assessment of activities under sub-projects is based on initial data provided by the National Coordination Units (NCU): -List of sub-projects, including their geographical and administrative location; -Purpose of the loan (livestock production, vegetable production, horticulture, etc.); -Loan amount; -Proposals to receive loans; -Reports of National Coordination Units.

Basic areas for sub-project assessments are: -Agricultural activity under sub-projects; -Climate indicators; -Measures for mitigation/elimination of greenhouse gas emissions; -Climate change adaptive capacity;

Activities and climate indicators of sub-projects are assessed based on both information provided by Regional Coordination Units (RCU) and NCUs and field visit of areas, where sub-projects are implemented.

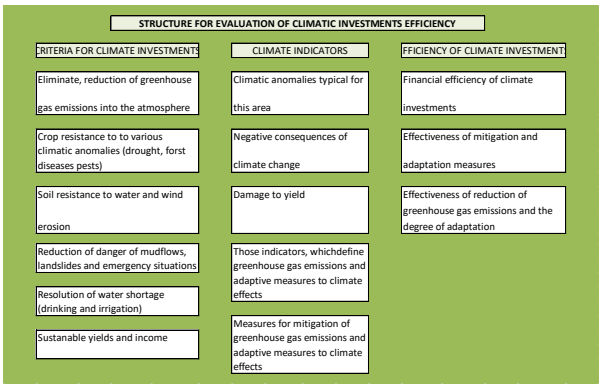


Figure 1. Structure of climate investment assessment

2.1.3. Methodology for Field Assessment of Sub-Projects:

Filed assessment of sub-projects is based on: -Study of project activities in site; -Interview of sub-project executors; -Filling of the template for assessment of climate risks indicators and adaptive and mitigation measures related to reduction of emissions.

Study of project activities in situ includes the examination of fields, soil, irrigation canals, and water bodies. Technologies and tools proposed by the sub-project are reviewed. As to livestock production, cattle sheds, housing and feeding conditions, manure dumps, and conditions for watering points are examined. Technology for adaptation or elimination of greenhouse gas emissions is reviewed. In addition, sub-project executors are interviewed.

Survey format are the interview and focus group. A focus group includes a farmer, farm staff, agronomists, and hydrotechnicians. Questionnaires are used for interview. Those were developed based on assessment templates. Assessment templates and notes accompanying them are shown below.

2.2 Criteria and Approaches to Assess Climate Risks and Adaptation Measures

The assessment methodology was developed according to the aims and tasks defined in the Terms of Reference. The assessment is built on the three following conditions, which define the structure of support to adaptive and mitigation measures related to greenhouse gas emissions in the atmosphere. Climate investments should be focused on supporting agricultural activities in the areas with: -Climate anomalies; -Negative consequences resulting from climate anomalies; -Damage caused to agriculture by negative climate events.

These three conditions and aims of climate investments define criteria and indicators of assessment, which should consider positive results of investments achieved through specific measures for reduction or elimination of greenhouse gas emissions in the atmosphere or adaptation to negative impacts of climate change.

Criteria for assessment of climate investment should reflect positive/negative results of applied measures, with the use of various approaches, technologies, and tools.

The following criteria were used for methodology to assess climate-related investments in sub-projects: -Decrease in greenhouse gas emissions in the atmosphere; -Crop resilience to various climate anomalies (droughts, frost, diseases, and pests); -Soil resilience to water and wind erosion; -Decreased risks of mudflows, avalanches, and other extreme events; -Resolution of water deficit (drinking and irrigation water); -Reduced energy consumption; -Sustainable yields and incomes.

2.3 Indicators to Assess Climate Risks and Adaptation Measures

Climate phenomena, which have negative impacts on environment and agricultural activities, and measures for their elimination or adaptation allow determining climate indicators to assess climate-related investments.

What climate indicators are used for assessment of investments? In agriculture, those include the following: types of climate anomalies typical for the certain area; types of negative climate consequences in agriculture caused by climate anomalies; types of damage to agriculture caused by climate change; indicators determining greenhouse gas emissions in agriculture and measures for their mitigation or elimination; adaptive measures for climate impacts.

Thus, the following five types of indicators were developed to assess climate investments:

I. Indicators of climate anomalies typical for this area:

1) Increased temperature; 2) Spring frost;3) Heavy precipitation; 4) Drought;5) Winter warming;6) Strong wind; 7) Dusty storm; 8) Sharp variations of temperature and precipitation.

II. Indicators of negative climate change consequences in agriculture resulting from climate anomalies:

1) Water deficit;2) Land degradation;3) Salinization;4) Spring freezing of plants;5) Plant diseases; 6) Occurrence and spread of pests;7) Thermal stress;8) Soil erosion caused by water;9) Flooding;10) Mudflows.

III. Indicators of agriculture damage resulting from climate impact:

1) Seedling losses due to spring frosts;2) Yield losses due to increased temperature;3) Yield losses due to water deficit;4) Yield and seeding losses due to diseases and pests resulting from winter warming, low temperatures, and high spring humidity; 5) Yield losses due to strong winds, heavy rain, mudflows, and floods.

IV. Indicators, which determine greenhouse gas emissions in agriculture:

1) Manure dumps;2) Gas-fired heating; and3). Oil combustion.

V. Indicators to assess measures for mitigation or elimination of greenhouse gas emissions and measures for adaptation to climate impacts:

1) Available methodology, technology, approaches, and tools to eliminate greenhouse gas emissions;2) Available methodology, technology, tools, and approaches sustainable to negative consequences of climate change; 3) Sustainability of applied methodology, technology, tools and approaches (positive results – elimination, decrease, or mitigation of greenhouse gas emissions consequences or adaptation to negative climate change impacts).

3. RESULTS OF FIELDS SURVEY ON SUB-PROJECTS

3.1 Assessing Climate Components and Adaptation Measures Under the Sub-Project In Uzbekistan

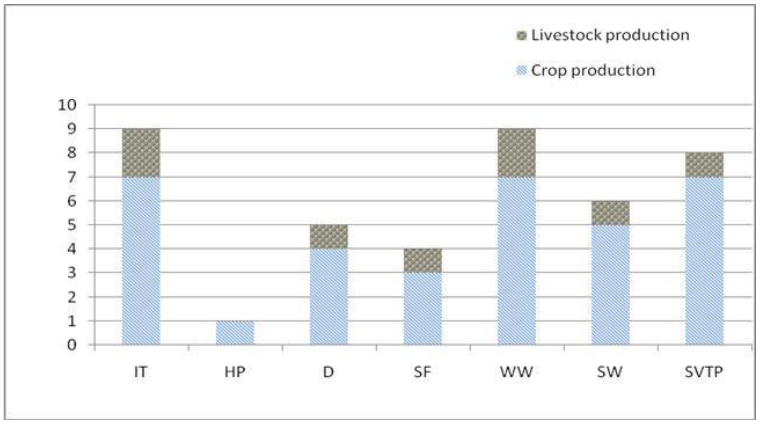
The survey in Uzbekistan showed that the majority of sub-borrowers could not answer questions on climate change, although adaptive approaches were implemented under the sub-projects, such as development of greenhouses. The reason may be inadequate review of documents while submitting proposals under the credit line.

The survey shows that Authorized Financial Organization (AFOs) and potential sub-borrowers are more careful towards complying with environmental requirements, with available definitions and templates on these requirements. Taking into account that climate investment is rather new kind of activity, it is important to simplify the work of AFOs and potential sub-borrowers by developing similar templates.

To define climate components in sub-projects, the experts conducted interviews with each of the sub-borrowers based on the already developed templates:

First template – What climate anomalies exist in their zone?

The following challenges were defined: increased temperature (IT) and winter warming (WW) in nine sub-projects, including two ones on livestock production; sharp variations of temperatures and precipitation (SVTP) in seven sub-projects on crop production and one sub-project on livestock production; strong winds (SW) in five sub-projects on crop production and one sub-project on livestock; drought (D) in four sub-projects on crop production and one sub-project on livestock production; spring frosts in four farms, including heavy precipitation in one sub-project on livestock production and one sub-project on crop production (Figure 2).

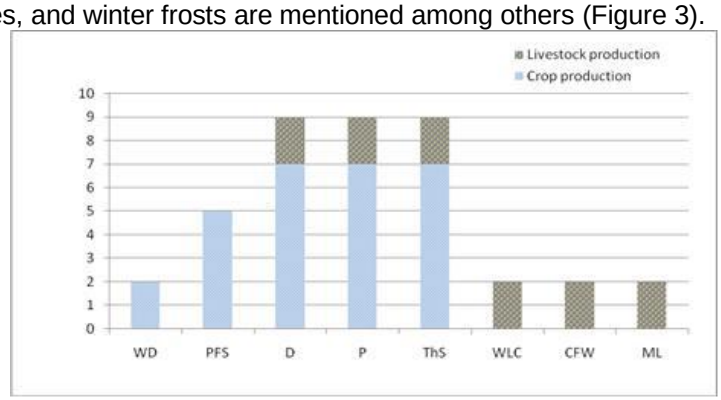


Climate phenomena

Figure 2 Climate anomalies in Uzbekistan

Second template – What negative phenomena caused by climate anomalies exist in the zone:

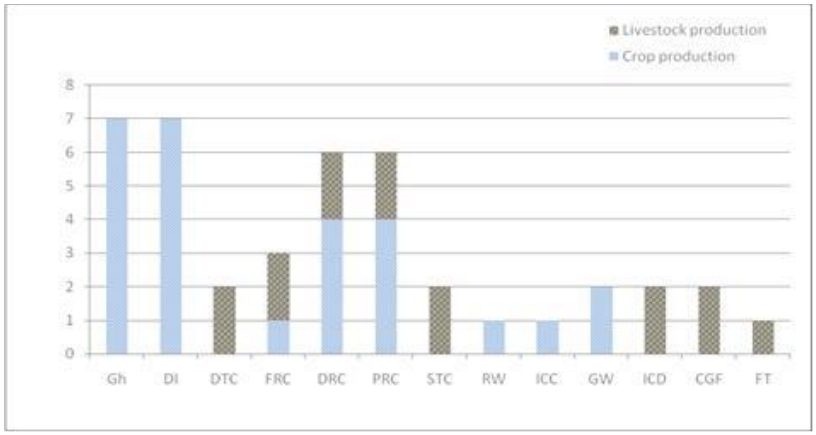
Water deficit was detected in 2 out of 9 sub-projects on crop production; plant disease (PD), pest outbreak (PO) and thermal stress (ThS) were detected in 9 subprojects, including two on livestock production; plant freezing in spring is observed in the areas of 5 sub-projects on crop production during low temperatures in spring. In livestock production, weight loss of cattle (WLC) due to thermal stress, cattle freezing in winter (CFW) in the Republic of Karakalpakstan, and milk losses (ML) due to diseases, high temperatures, and winter frosts are mentioned among others (Figure 3).



Phenomena caused by climate anomalies

Figure 3. Negative phenomena caused by climate anomalies in Uzbekistan

Third template – What adaptation measures are applied in each sub-project area?: greenhouses – (GH), drip irrigation (DI), water-retaining measures (WRM), drought-tolerant crops (DTC), frost-resistant crops (FRC), disease-resistant crops (DRC), pest-resistant crops (PRC), salt-tolerant crops (STC), building of soil (BS), construction of mud diversions (MD), rain water use (RW), irrigation taking into account climate conditions (ICC), sub-soil irrigation (SSI), groundwater use (GWU), injection for cattle from diseases (ICD), cooling and greenhouse conditions at farms (CGF), and specific forage treatment for salt removal (FT) (Figure 4).



Adaptive approaches
Figure 4. Adaptive measures in Uzbekistan

3.2 Assessing Climate Components and Adaptation Measures Under the Sub-Project in Tadjikistan

The survey in Tajikistan showed that the majority of sub-borrowers could not answer questions on climate change.

Only one farm in the Khurosan district clearly understands what climatic risks are taking place in its zone, what problems they cause, and what needs to be done to solve this problem, and how much money is needed.

Loan funds in this individual enterprise were used to collect rain water. Another two enterprises did not apply such measures; however they were aware of existing climate risks and measures for adaptation to current climate conditions.

To define climate components in sub-projects, the experts conducted interviews with each of the sub-borrowers based on the already developed templates:

First template – What climate anomalies exist in their zone?: All eight sub-projects mentioned existing increased temperature (IT), seven sub-projects – winter warming (WW), six sub-projects – drought (D) and sharp variations of temperatures and precipitation (SVTP), and five sub-projects – heavy precipitation. In one farm, there was observed spring freezing, and strong winds – in two farms. It is obvious that the majority of sub-projects mentioned five different anomalies typical to this region (Figure 5).

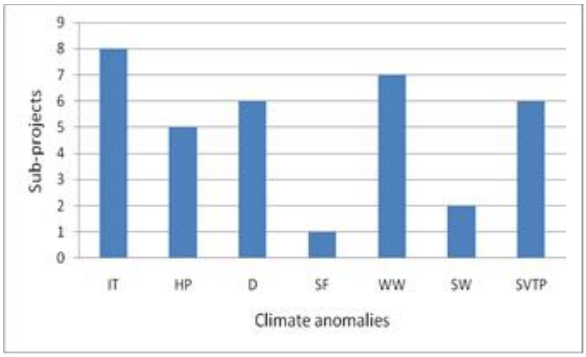


Figure 5. Climate anomalies in Tajikistan

Second template – What negative phenomena caused by climate anomalies exist in the zone:

In four out of eight sub-projects, plant disease (PD), spread of pests (SP), and thermal stress of plants (ThS) were found out; there were mudflows (MF) and freezing of plants in spring (FPS) in two farms. There was water deficit (WD), lack of drinking water (LDW), and water erosion (WE) in three farms, respectively (Figure 6).

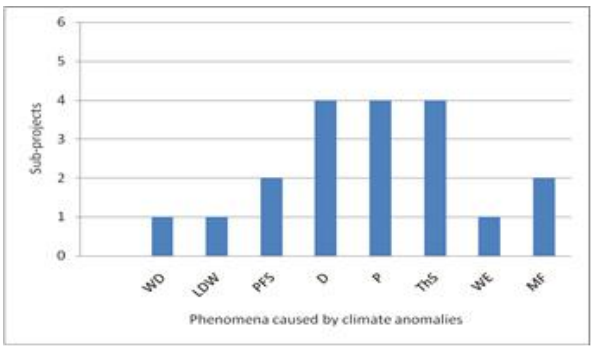


Figure 6. Negative phenomena caused by climate anomalies in Tajikistan

Third template – What adaptation measures are applied in each sub-project area?: greenhouses – (GH), drip irrigation (DI), water-retaining measures (WRM), drought-tolerant crops (DTC), frost-resistant crops (FRC), disease-resistant crops (DRC), pest-resistant crops (PRC), salt-tolerant crops (STC), building of soil (BS), construction of mud diversions (MD), rain water use (RW), irrigation taking into account climate conditions (ICC), sub-soil irrigation (SSI), groundwater use (GWU), injection for cattle from diseases (ICD), cooling and greenhouse conditions at farms (CGF), and specific forage treatment for salt removal (FT) (Figure 7).

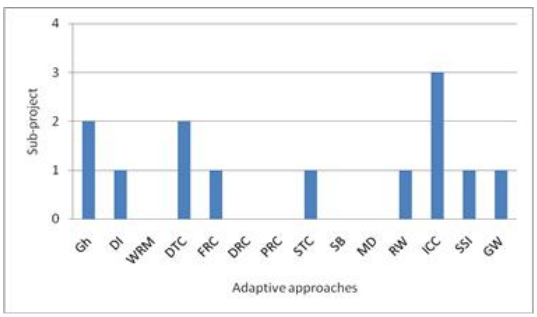


Figure 7. Adaptive measures in Tajikistan

4. CONCLUSION

Assessment of sub-project proposals showed that proposals to receive loans did not fully cover specific aspects of climate change. Since the matter concerns climate loans, it is recommended in the future to accept applications for loans based on specific climate requirements.

During the interview, sub-borrowers informed on adaptive measures they applied. In the Bukhara and Navoiy provinces, hi-tech greenhouses are developed in the areas with 7 sub-projects. In areas under 4 sub-projects, pest- and disease-resistance crops were planted in greenhouses, and groundwater was used in two sub-projects. Under the sub-projects on livestock production, farmers use drought- and salt-tolerant crops typical for saline lands and arid conditions of the region; use of injections to protect animals from diseases resulting from climate anomalies; farms are built to protect animals from thermal stress and freezing.

The interview of sub-borrowers allowed defining adaptive measures, which were used: greenhouses in two sub-projects and drought-tolerant crops in another two sub-projects. Drip irrigation was applied under one project; in addition, there was discovered the use of frost-resistant and salt-tolerant crops, water deficit, sub-soil irrigation, and use of groundwater.