Climate Risk Centered Agricultural strategy and Policy analysis for Azerbaijan and scoping review of mitigation potential

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Contents

Introduction

By 2030 the Republic of Azerbaijan targets 35% reduction in the level of greenhouse gas emissions compared to 1990 base year as its contribution to the global climate change efforts."

Agriculture is one of the most important sectors of the Azerbaijanian economy. While it accounts nearly 4% of the country's economy, importance of it in provision of food safety is much greater than it seen. It is essential to rural livelihoods and economic development in rural areas of Azerbaijan. Through its capacity to maintain sustainable development, the agricultural sector plays a vital role in the sustainable use of natural resources and contributes to sustainable development.

Currently, climate change has a direct impact on the agricultural sector. Climate changes causes decreased precipitations and water shortages, which poses a great threat to agricultural production in the country. Recently, water shortages in this area are the common issue that faces farmers. Droughts with longer durations is linked to rising temperatures and reduced rainfalls in all afore mentioned regions. For example, 2014 drought has hugely affected on reduced agricultural production. Irrigated crops are accountable for 85 % of total agricultural output, which will also be at risk from projected water shortages, and higher temperatures increased irrigation to maintain yields. Due to climate changes, it is expected that there will be more need for water for agricultural production, which will cause adverse impacts on food security of children. The low output from agricultural activity and harvests will be aggravated by increasing temperatures and increased water stress.

The aim of this report was to report on the country's agricultural strategy and policy analysis, including the climate risks involved with this sector, the potential for the reduction of GHG emission, institutional and regulatory framework, monitoring and coordination mechanisms.

The main questions that the study aims to answer are the following: What is the climate induced problems agricultural sector of Azerbaijan? What is the main strategy of the country in terms of climate changes in agricultural sector? What policies and programs exists to reduce GHG emissions from agriculture? How country is acting to meet requirements of the Paris agreements in agriculture? And finally, what conclusions emerge from the study that may be relevant to the UNDP's future engagement in Azerbaijan's agricultural sector.

Agricultural policy and strategy of Azerbaijan

Agricultural policy is a system of all laws and initiatives that affect income of all producers and consumers in agricultural sector. They help to improve the activities involved in cropping and animal husbandry and actions related to marketing of agricultural products. The policy process continuously involves a broad range of stakeholders who exert influence in different forms to change the policy environment in their favorable. The government endeavors to lead policy processes by inducing changes in the agricultural sector such that both equity and efficiency are enhanced through various policy instruments.

Agricultural policy of Azerbaijan is represented as a set of laws and programs related to improvement of agricultural markets and economic situation in rural areas of the country.

Agricultural legislation and legislation related to sustainable use of natural resources

Agricultural legislation and legislation related to sustainable use of natural resources should cover issues related to sustainable use of natural resources with possible interventions to mitigate climate changes and degradation. The following table provides a comprehensive list of Agricultural legislation that drives and influences the Agricultural development function. The table also provides and brief overview of possible climate change contents of existing laws.

Table 1. List of laws and their content with respect to climate changes

Law/Code	Year	Description	Climate change content
Water Code	1997	The Code regulates the juridical relations, related to the usage and protection of the water objects in the Azerbaijan Republic.	**Climate change risks are not considered**. Chapter envisages usage of water objects for the needs of agriculture. Article 82 considers keeping condition of water objects in correspondence with ecological requirements, prevention of pollution, contamination and exhaustion of surface and underground waters.

Land code	1992	The Code aims to regulate land relations in the Azerbaijan Republic arising on the basis of application of different types of land ownership, exercise of the land-related responsibilities of owners, users and lessees of land, protection of their right to land, creation of relevant conditions for rational use of lands and their protection, restoration and increase of the fertility of land, re-cultivation of lands which have become unusable as a result of pollution and destruction, and preservation and improvement of the natural environment.	**Climate change risks are not considered**. Chapter 8 envisages protection of natural regimes of lands. It shows that land protection measures are carried out in line with special programs established by the state.
Law on environmentally friendly agricultural industry	2008	This Law governs the relations connected with production, conversion and turnover environmentally friendly agricultural and the provisions ensuring health and safety of the population, the earth, water, plants and animals of the Azerbaijan Republic	**Climate change risks are not considered**. Article 7 recognizes that crops should be adopted to local climatic conditions. However, there is no climate change considerations.
Law on agricultural cooperation	2016	The law determines legal and economic bases of forming and development of agricultural cooperation, creation and activities of agricultural cooperatives.	No Climate Change risks are considered.
Law of the Azerbaijan Republic On Protection of the Environment	1999	The Law determines legal, economic and social grounds for the protection of the environment.	No climate change risks are considered. While article 42 considers reduction of emission of pollutants into the air, no greenhouse gases are mentioned.

Law of the Republic of Azerbaijan on Land Fertility	1999	The law defines the legal basis for the restoration, enhancement and protection of fertility of state, municipal and private lands in the Republic of Azerbaijan.	When implementing agrochemical, reclamation, phytosanitary, erosion control and other measures on soils, the environmental safety standards and environmental protection requirements are taken into account. According to Article 9 of the Law, burning of arable land is prohibited

Current State Programs related to Agriculture

Current State Programs on development of Agriculture mainly concern increase of production of agricultural production. The purpose of the State Programs is to stimulate the development of agricultural production in order to meet demand in the country, increase exports of products and increase employment and livelihoods of the rural population. However, all the state programs, mostly related to the increase of agricultural fruits may also to contribute to the carbon sequestration. For example, The State Program on Citrus Fruit Development, along with the development of citrus fruit, the process of carbon sequestration may also accelerate, which is not specifically addressed in the program. The same can be said about most of other state programs as well.

Below is a list of other government programs that may be important in terms of carbon accumulation:

1. The State Program on Citrus Fruit Development in the Republic of Azerbaijan for 2018-2025;
2. The State Program for Development of Tea-growing in the Republic of Azerbaijan for2018-2027;
3. The State Program for Development of Rice Growing in 2018-2025;
4. The State program for the Development of Azerbaijan Silkworm Breeding and Sericulture in the Republic of Azerbaijan for 2018-2025;
5. The State Program on the development of cotton growing in the Republic of Azerbaijan for 2017-2022;
6. The State Program on Development of Agricultural Cooperation in the Republic of Azerbaijan for 2017-2022;

7. The Strategic Road Map for the Production and Processing of Agricultural Products in the Republic of Azerbaijan;
8. The State Program on socio-economic development of regions of the Republic of Azerbaijan for 2019-2023;
9. The State Program on reliable food supply of population in the Azerbaijan Republic (2008-2015);
10. The State Program on the development of viticulture in the Republic of Azerbaijan in 2012-2020;
11. The state program on development of wine industry in the Republic of Azerbaijan for 2018-2025
12. The state program on development of industry in the Republic of Azerbaijan for 2015-2020
13. State Program for the Development of Tobacco production in the Republic of Azerbaijan for 2017-2021
14. The development concept "Azerbaijan 2020: a look into the future"
15. The State program for the development of the cadastral real estate system in the Republic of Azerbaijan, increasing the efficiency and use of land in 2016-2020

The carbon sequestration potential of fruit crops given in the table

Table 2. Carbon sequestration potential of fruit crops of Azerbaijan (different sources)

Fruit Crop	The carbon sequestration potential of fruit crops (t/ha/year)
Apple	7.96
Grape	49.5
Corn	48
Syzgium	138.5
Orange	76
Alfalfa	75
Grass (fertilized and non-fertilized)	105
Sunflower	41
Tea	49

Gaps and needs in the current state agriculture policy and strategy

Few of the documents made by the government and reviewed here contains any specific mention of the important and emerging relationship of agriculture and climate change. Except the Strategic Roadmap, about which separately will be talked, other documents have no climate change, mitigation or adaptation content. Although some state programs can be looked as the "potential mitigation activity", they have a purely development goal.

The Strategic Roadmap for Production and Processing of Agricultural Products in the Republic of Azerbaijan, approved by the Decree of the President of the Republic of Azerbaijan dated December 6, 2016, No 1138, 7.1.1. The strategic targets of the Roadmap involve strengthening the sustainability of food safety, increasing production capacity of agricultural products, and developing the market of agricultural products.

According to the action 7.1.1, Impacts of climate change on agriculture will be assessed by regions of the country, sensitivity levels will be determined, and adequate adaptation and mitigation plans will be developed to minimize expected losses. The regions most affected by climate change in the country will be identified. The amount of damage that can be caused by climate change will be calculated and the amount of investment needed to eliminate the damage will be determined.

The Action 7.2.2 of the roadmap targets reduction of carbon dioxide emissions in the agricultural sector and promotion of the use of renewable energy. According to this target, livestock development activities in the country will be aligned with greenhouse gas emissions reduction measures. The Action 7.2.3 targets planting of protective forest stripes by 2015 along agricultural fields.

Assessment of the transition to a "green economy" in the agrarian sector and the use of alternative energy sources in the heating of greenhouses should be considered as one of the most important climate-related measures in the country. The measure envisages value chain development in the agrarian sector, reduction of losses and efficient use of waste. For example, the creation of biogas landfills in large livestock complexes, such as the collection of methane gas from animal waste and the use of alternative energy, as well as optimizing the cost of application of methane-derived fertilizer as a valuable organic fertilizer.

An analysis of the "Pasture Management Improvement" direction of Action 7.3.4 of this roadmap shows that the implementation of this measure in itself controls a large mitigation process. Given that more than 4,779,500 hectares of agricultural land (according to the 2019 land balance) is

over 2,377,000 hectares of grassland and grazing, the prevention of natural land degradation in this volume would have a significant effect on the gas.

Mitigation Potential of Azerbaijan in agricultural sector

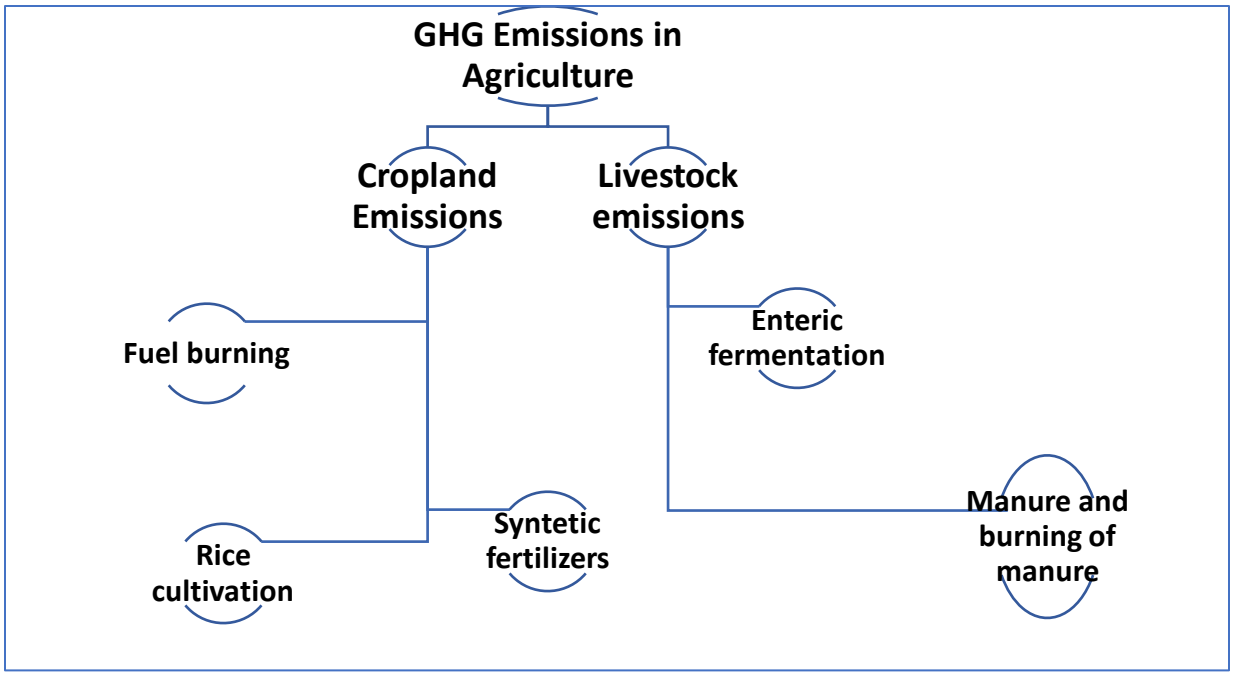
Agricultural Emission sources

The primary greenhouse gases produced by agricultural activities are the methane and (CH4) and nitrous oxide (N2O). CH4 and CO2 comprise about 55 per cent and 44 per cent of emissions respectively. CH4 has global warming potential 28 times higher, N2O has 298 times higher than CO2.

Agricultural sector of Azerbaijan is one of the leading sectors in terms of carbon emissions. According to the Third National Communication to UNFCCC of Azerbaijan, Agricultural sector accounts more about 20 percent of the total Greenhouse Gas (GHG) emissions in the country. There are two main sources of agricultural emissions in the country: cropland emissions and livestock emissions. The sources of cropland emissions include fuel burning and use of synthetic fertilizers. Livestock emissions includes enteric fermentation, manure, rice planting, burning of agricultural residues (figure 1).

Given that every year, around 300,000 tons of different types of mineral fertilizers are used in the agricultural sector in terms of increasing productivity, and there is a great need for education and promotion of the use of organic fertilizers in order to limit the effect of the greenhouse gas emissions.

Figure 1. Main sources of GHG in Agricultural sector of Azerbaijan



Enteric fermentation is a digestive process by which carbohydrates are broken down by microorganisms into simple molecules for absorption into the bloodstream of an animal. This is main source and largest contributor of methane emissions in agricultural sector.

Livestock manure and its management is a second largest contributor of the CH4 emissions. It produces

both CH4 and N2O. Livestock manure also produces carbon dioxide, GHG potential of which is very lower than CH4 and N2O. Using of manure as a heating source also emits CH4 and N2O.

Synthetic and organic nitrogen fertilizers are the third major source of N2O, which is created when nitrogen not taken up by crops undergoes microbial processes in soils.

Animal husbandry in Azerbaijan

Animal husbandry is one of the traditional and economically most efficient subsectors of animal husbandry in Azerbaijan, and it plays an important role in developing the agroindustry complex of regions in the mountain zone, increasing employment, and improving the well-being of the rural population. This subsector is the sole source of very important types of products: mutton, sheep's milk, wool, fat, wooled and clothing sheepskins, and so on.

Economic efficiency of animal husbandry makes private owner to increase number of cattle, sheep and goats. Therefore, over the last 20 years, The rapid increase in a number of livestock (figure 2 and 3), which simultaneously caused increase of GHG in agricultural sector.

Figure 2. Changes in a number of domestic cattle over the 1999-2017

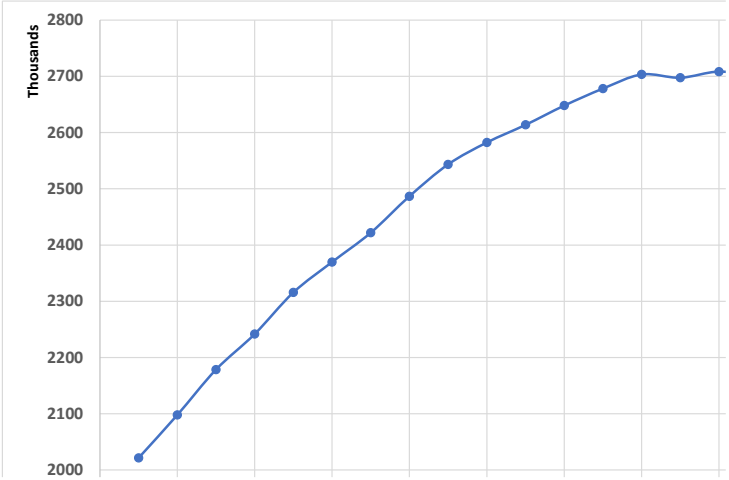
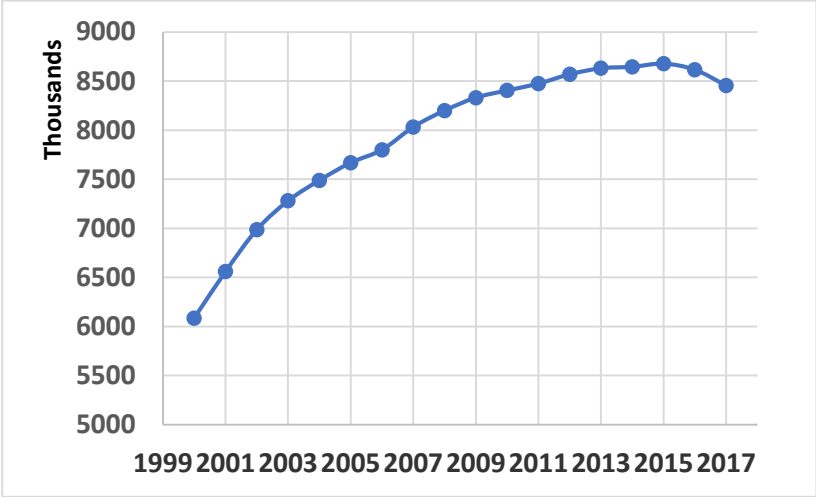


Figure 3. Changes in a number of sheep and goats over the 1999-2017



According to studies an average cow does on average release between 70 and 120 kg of Methane per year. Ruminant animals such as cattle, sheep, and goats produced 170 million metric tons (mmt) in CO2 of methane through digestion.

Current mitigation activities and carbon sequestration by agricultural plants

Azerbaijan has favorable climatic conditions for growing citrus fruit crops, teas, pomegranates, apples and other many types of agricultural fruit crops. The country has high economic efficiency and export potential. All these fruit crops has a high value in terms of sequestration of carbon. In terms of carbon sequestration, the production of apples, pomegranate, persimmon and grapes are the most important fruits. The production of these fruits in the country may simultaneously increase carbon sequestration. For example, broad range of research works confirm that exposure of subtropical fruit trees to elevated carbon concentrations notably increases photosynthesis process, which in turn increases tree biomass.

Along with other plants, citrus plants also have a strong carbon sequestration potential. In other words, citrus plants have a great potential to accumulate carbon in their timbers, roots etc.

Carbon sequestration is the process by which carbon dioxide (CO2) from the atmosphere is absorbed by trees, plants and crops through photosynthesis and stored as carbon in biomass such as tree trunks, branches, foliage, roots and soils. Carbon in trees can be stored in trunks, branches, leaves, flowers, fruits and roots. Research works confirm that that exposure of subtropical fruit trees to elevated carbon concentrations notably increases photosynthesis process, which in turn increases tree biomass.

Agricultural lands can be used for agricultural purposes through forest style gardens. It can be easily integrated with beekeeping, tourism, gardening and cropping. In cropping, tree belts can be used to manage wind and water erosion. For bees, agroforests can be good sources of honey, simultaneously, bees can provide pollination of trees.

Agroforestry may have a big importance in terms of carbon sequestration. These areas are not considered as forested areas, however, they are under heavy pressure of traditional uses, such as overgrazing and illegal logging.

Current mitigation activities in agricultural sector mostly have been included massive planting of protection forests along agricultural fields, and establishment of orchards, which includes apple orchards, citrus and nut plantings. A protection forests mostly planted to prevent wind erosion. Although the main purpose of these measures was not carbon sequestration, they have a huge importance in terms of carbon absorption.

Over the last five years, the following are the activities carried out:

- ✓ Due to development of silk worming production, 3.5 million of mulberry trees have been planted in 2016-2018
- ✓ In 2018, 9754.6 hectares of new gardens (fruit, berries, green tea, grapes) were planted throughout the country.
- ✓ In accordance with paragraph 2.4 of the Agricultural Products Subsidy Rule, orchard plants the first 7 years will be provided with high subsidies, with appropriate coefficients applied. It predicts that intensive orchards and grape plantations will continue to expand.

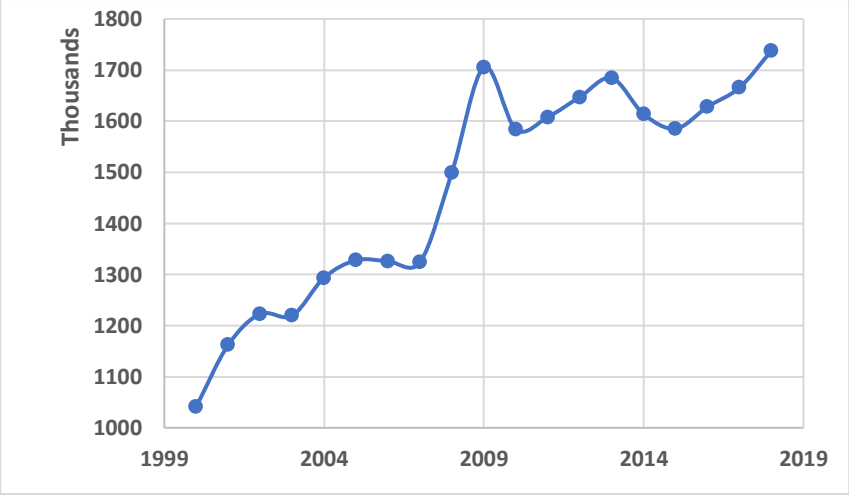
According to the decree of the president of Azerbaijan republic (dated June 27, 2019), which is applied from January 1, 2020, grape and tea plantings are highly subsidized. Grape producers will receive subsidies during the first 4 year of production, while teas producers within the first 7 year of production.

It also predicts that with the support of the state, intensive orchards will continue to expand.

More recently, establishment of contemporary agroparks started in the country. It is suggested that establishment of agroparks will contribute to the mitigation activities in Azerbaijan.

The figure 4 shows changes in the area of agricultural plants over the last 20 years.

Figure 4. Area of agricultural plantations over the last 20 years

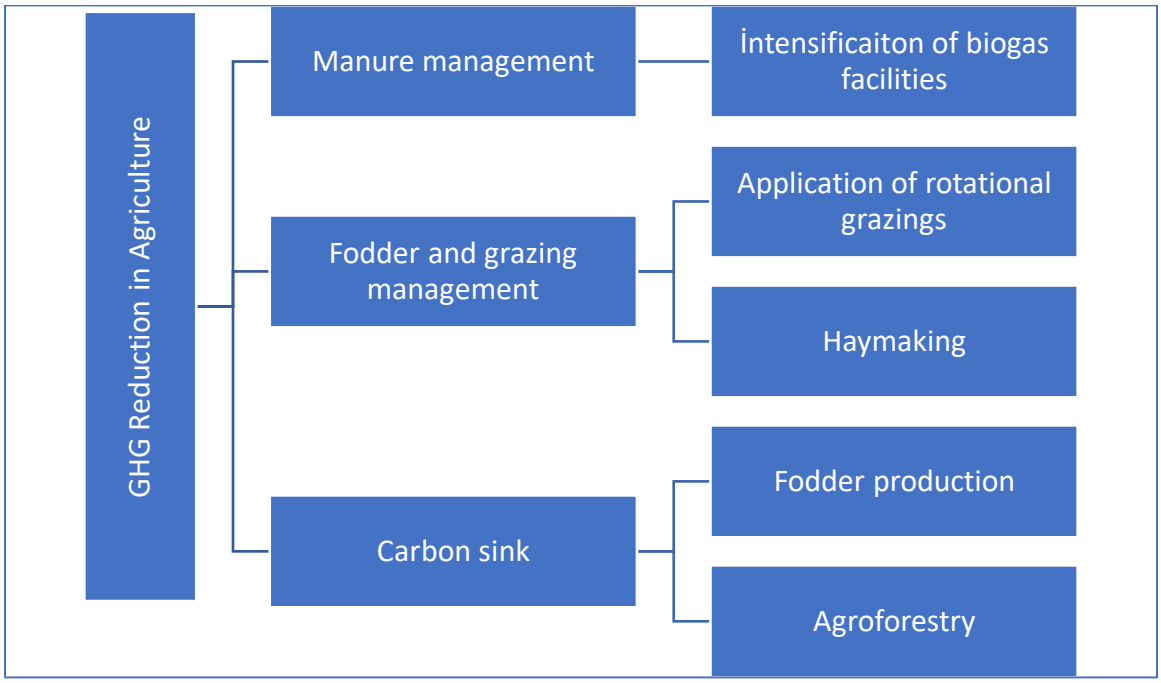


Mitigation opportunities

The potential of agricultural activities to remove and help avoid carbon dioxide emissions is becoming increasingly important for reducing GHG emissions. The main directions that would help to reduce GHG emissions from agricultural sector are the livestock-manure management and carbon sink (figure 5).

Azerbaijan has a big carbon removal potential through broad range of actions. These actions include options related to livestock management and fodder managements. Carbon sequestration is another big direction that can be intensified in the future.

Figure 5. Main directions of mitigation activities in agricultural sector



Grazing management and carbon sequestration

Most recent studies found that both overgrazing and under grazing may have negative effects on a pasture management. Overgrazing may be cause of land degradation, while undergrazing may cause land fires, and negatively change water and vegetation regime of soils.

Most common activities that may increase carbon sequestration includes stock rate balancing, rotational grazing and protection of grasslands from livestock grazing. Government statistics confirms rapid increase in the number of domestic animals over the last 20 years. This situation increases pressure on land, causes erosion and land degradation, simultaneously increasing carbon emissions. In addition, continuous overgrazing destroys grasslands and reduce their ability to sequent carbon.

One of the most popular ways to increase carbon sequestration is to apply rotational grazing. Rotational grazing is the practice of moving livestock between pastures on a regular basis. As we said, overgrazing happens when plant cover is used for continuous grazing for prolonged periods of time. In order to apply rotational grazing, pastures are divided into several sectors through which sectors are used periodically.
Grazing should be appropriately controlled to improve carbon sequestration. It is essential to know that emissions, grazing and growth of woodland cover are all closely related things. Therefore, emissions should be taken into account in combination with carbon sequestration when studying the impacts of livestock on greenhouse emissions and climate change. According to FAO sustainable livestock circulation could be applied, including a rotational grazing and seasonal use of land. It is suggested that grazing reduction would result in increased soil carbon stocks.

Haymaking is the activity of making hay from grass grown for fodder. The areas are kept making a hay for a time, for subsequent pasturing. This is confirmed that the lands kept for haymaking are rather resilient, durable to erosion and have more capacity to carbon sequestration. Haymaking is one of the traditional activities in mountain areas of Azerbaijan. The areas kept for haymaking are rather resilient to erosion as well.

Conclusions

Current and future agricultural management systems could help to mitigate GHG emission by sequestering greater quantities of carbon in soil organic matter with the adoption of conservation

practices. Climate Change component is not reflected nor in laws neither in state programs, while many state programs related to development of agricultural fruit production can be looked as the mitigation efforts.

Several state programs suggest increase of perennial plants in agriculture, which may increase carbon capture. While the carbon capturing was not a main goal of these programs, it can be part of the nationally determined contributions. For example, state program in increasing tea production, suggest increase of tea plants in the country, which will result in increasing of carbon capture.

Way forward

Assessments of mitigation potential require a broad range of data that may come from different sources. This data can be taken directly in the field through surveys among farmers or taken from government databases. Recent research on climate changes reveals that there will be notable shifts in frequencies and magnitudes of the observed hazards, which will increase vulnerability of the climate sector. This may also should be taken into account through proper adaptation measures.

- ✓ Carbon sequestration potential of agricultural crops should be studied more deeply.
- ✓ A new policy tools should be developed that reflect new agricultural policy with respect to climate changes.
- ✓ Developing a scenario with livestock with less methane and current BAU situation
- ✓ Developing a scenario with proper fodder and grazing management and current BAU situation

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