FS “MEASURING AND ADDRESSING POTENTIAL ADVERSE IMPACTS ON BIODIVERSITY FROM AGRICULTURAL SUBSIDIES”

3RD DELIVERABLE: PROPOSED BIODIVERSITY INDICATORS FOR RDA PROGRAMMES

Prepared by: Joint Venture - Dzelkva LTD and NNLE “Ecolution Georgia“ for the Biodiversity Finance Initiative (BIOFIN)

23rd May, 2022

Table of Contents

List of Tables

Abbreviations / Acronyms

AMMAR	Agriculture Modernization, Market access and Resilience Project
BIOFIN	Biodiversity Finance Initiative
CAP	Common Agricultural Policy
DIMMA	State Programme of Dairy Modernization and Market Access
EU	European Union
FCI	Flower Colour Index
FiBL	Research Institute of Organic Agriculture
FQI	Floristic Quality Index
GBF	Global Biodiversity Framework
GEL	Georgian Lari
MEPA	Ministry of Environment Protection and Agriculture
NBMS	National Biodiversity Monitoring System
RDA	Rural Development Agency
RDP	Rural development policy
ROA	Return on assets
SDG	Sustainable development goal
UAA	Utilized Agricultural Area
UNDP	UN Development Programme

Executive Summary

The third deliverable – Report on Proposed Biodiversity Indicators for Rural Development Agency (RDA) Agricultural Subsidy Programs, prepared under the UNDP / BIOFIN finance solution - "Measuring and Addressing Potential Adverse Impacts on Biodiversity from Agricultural Subsidies", discusses incorporation of biodiversity considerations into agricultural programs, recommended monitoring of subsidy impacts using biodiversity and socio-economic indicators and associated cost estimation. The report also proposes a new pro-biodiversity subsidy.

The report proposes new measurable targets for the Agriculture and Rural Development Strategy of Georgia derived from the European Green Deal. The recommended targets to be achieved by 2030 are decrease in total pesticide and fertiliser use by 20% each and conversion of 10% of Georgia's agriculture into organic.

The report presents a number of recommendations developed to assist RDA in incorporation of biodiversity considerations at key stages of implementation of agricultural subsidies, viz.:

- Subsidy planning stage
    - Reallocation of percentage of funding for establishment of plantations and livestock and dairy farms (e.g., in the order of 20%) to organic farming to address lack of specific incentives for pro-biodiversity agricultural practices
- Subsidy announcement and application review:
    - Use of proposed Biodiversity Checklist during the subsidy application review process; a revised application form addressing biodiversity considerations has been developed for orchard component of the state program "Plant the Future"
    - Introduction of new pre-requisites to primary agricultural production subsidies in order to reduce potential adverse impacts on biodiversity by means of restricting eligibility dependent on location of respective agricultural land relative to protected areas, Ramsar sites and Emerald Network sites
    - Introduction of new pre-requisites related to use of lakes and wetlands as potential water sources, estimation of planned water consumption, pesticide and fertiliser use, mandatory participation of subsidized farmers with land parcels located in Emerald Network sites and / or within 1km of designated protected areas, Ramsar and Emerald Network sites in early detection of and rapid response to invasive plant species from 2024
- Implementation of the above recommendations to be initiated for the top five biodiversity harmful subsidy programs identified in the second deliverable - Identification of Potential Negative Impacts to Biodiversity and Its Components by Agricultural Subsidies. These programs are: (1) Preferential Agrocredit, (2) State Program "Plant the Future", (3) Dairy Modernization and Market Access State Program (DIMMA), (4) Agriculture Modernization, Market Access and Resilience Project (AMMAR) and (5) State Programme for Supporting Agricultural Production.
- Proposed development of an online platform to facilitate data collection and analysis on water, pesticide and fertiliser use. This platform may also be used for online application submission via database format, data exchange and sharing between RDA, SRCA, regional services and farmers.
- Introduction of new subsidy – Bio Farming / Agroproduction Support to incentivize pro-biodiversity agricultural practices and bio certification.
- Implementation of monitoring impacts on biodiversity using proposed biodiversity indicators (15 in total grouped into four sets covering genetic, species, habitat and farm management levels) for crop plantation and livestock and dairy farm components of the top five biodiversity harmful agricultural subsidy programs (see the bullet point above). The initial stage of the monitoring is collection of baseline data for subsequent monitoring rounds. The report provides details of sampling, monitoring and data interpretation methodologies.
- Proposed implementation of evaluation of socio-economic efficiency of agricultural subsidies via collection and analysis of key socio-economic data. Agricultural subsidies identified as inefficient

in socio-economic terms (high costs, low profit margin, low employment, etc.) and substantial adverse impacts on biodiversity should be subject to reform and / or elimination if reform is not feasible.

- Costs related to baseline data collection for species and habitat level indicators have been estimated for State Program 'Plant the Future (130,300 GEL), DIMMA (16,330 GEL) and maximum number of farms per component of agricultural subsidy to be sampled (97,550 GEL).

1 Introduction

This report represents a third deliverable for the UNDP / BIOFIN Project "Measuring and Addressing Potential Adverse Impacts on Biodiversity from Agricultural Subsidies" – Incorporation of Biodiversity Indicators into the State-funded Programs Implemented by Rural Development Agency (RDA) of Ministry of Environment Protection and Agriculture of Georgia (MEPA).

The scope of work for the third deliverable comprises the following activities: preparing specific guidance / recommendations / checklists for incorporating biodiversity considerations into RDA programs including development of new program and update of ongoing programs, selection / evaluation criteria, recommendations for monitoring.

Detailed information on agricultural subsidies implemented and / or ongoing over the recent years (2018 – 2021) and likely to continue in subsequent years (2022 – 2025) is provided in the first deliverable – Report on Detailed Analysis of Existing and Planned RDA Programs; identification and assessment of potential adverse impacts on biodiversity associated with implementation of agricultural subsidy programs are contained in the second deliverable – Identification of Potential Negative Impacts to Biodiversity and Its Components by Agricultural Subsidies.

The following approach was adopted in order to identify feasible options for incorporation of biodiversity considerations at key stages of implementation of agricultural subsidies by RDA taking into consideration limited financial, technical and human resources and lack of practical application expertise in Georgia:

- Review of biodiversity-related commitments in Georgian agricultural sector including development of their modification to address the most biodiversity harmful impacts and programs identified in the second report - Identification of Potential Negative Impacts to Biodiversity and Its Components by Agricultural Subsidies
- Identification of best practices in management of agricultural subsidies aimed at mitigation of associated negative impacts on biodiversity, preferably in the European Union with whom Georgia has committed to align[1]; revision of such practices to render them feasible for pilot implementation in the country
- Development of recommendations for monitoring based on biodiversity indicators to evaluate subsidy impacts
- Synergy with indicators used in the National Biodiversity Monitoring System (NBMS) to maximize cost-efficiency.

2 Guidance on Incorporation of Biodiversity Considerations into Agricultural Subsidy Programs

2.1 Review of Biodiversity Commitments in Agricultural Sector

The national sustainable development goals[2] (SDG) set for agricultural sector with regard to biodiversity issues are as follows:

- SDG 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
- SDG 2.5: By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote

[1] Chapter 10: Agriculture and Rural Development, EU-Georgia Association Agreement
[2] National SDG Document

access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.

The 2021 – 2027 Agriculture and Rural Development Strategy of Georgia is a national sectoral strategy, which sets the following three key goals:

Goal 1 – Competitive agricultural and non-agricultural sectors
Goal 2 – Sustainable usage of natural resources, retaining the eco-system, adaptation to climate change
Goal 3 – Effective systems of food safety / feed safety, veterinary and plant protection.

Each goal encompasses a set of objectives. Biodiversity-related Goal 2 aims at achievement of the following objectives:

- To disseminate climate-smart and environmentally adapted agricultural practices
- To support the development of ecotourism
- Sustainable usage of forest resources
- To support the implementation of energy-efficient and renewable energy technologies and practices
- To maintain agrobiodiversity.

2021 – 2023 National Action Plan for the 2021 – 2027 Agriculture and Rural Development Strategy of Georgia details respective indicators for measuring fulfilment of the national objectives and provides a summary of objectives and indicators for biodiversity-related National Goal 2 (refer to Table 2-1).

Table 2-1 Indicators for National Goal 2 by Objectives, 2021 – 2027 Agriculture and Rural Development Strategy 2021 – 2023 National Action Plan

National Objectives	Indicator	Funding (000 Lari)
Objective 2.1 Climate-smart and environmentally adapted agricultural practices	2021: Initiation of evaluation of national plan for adaptation to climate change for agricultural sector	State budget (administrative costs)
	2022: assessment of at least 3 agricultural crops for vulnerability to climate change	
	2023: updated national plan for adaptation to climate change for agricultural sector	
Objective 2.2 Development of ecotourism	Development / rehabilitation of 2 units of ecotourist infrastructure in each year	350 / year State Budget
	Development / rehabilitation of 3 units of protection infrastructure (rangers, barriers, etc.) and acquisition of 50 units of fire protection in each year	150 / year State Budget
Objective 2.3 Sustainable usage of forest resources	Availability of 600,000m^3 timber resource allocated per each year	2021: 12,000 2022: 21,900 2023: 23,400 State Budget Own resources
	Planting / restoration of forest on additional 100 ha each year	2021: 1,750 2022: 1,850 2023: 1,850 State Budget Own resources
	Preparation of additional forest management projects: 2021: 2 forestry sites (153,000 ha) 2022: 3 forestry sites (126,800 ha) 2023: 3 forestry sites (128,000 ha)	850 / year State Budget Own resources
ENPARD IV, Indicator 2.1	Additional planting / restoration of forest on 200ha as a minimum as compared to 2019 indicator	

National Objectives	Indicator	Funding (000 Lari)
Objective 2.4 Support to energy-efficient and renewable energy technologies and practices	To Be Determined in 2022	
Objective 2.5 Maintenance of agro-bio-diversity	Research on local breeds of fauna 20 papers published and 7 recommendations developed each year	2021: 500 2022: 1,000 2023: 1,000 State Budget
	Research on annual and perennial crops 2021: 43 papers published and 25 recommendations developed 2022: 43 papers published and 23 recommendations developed 2023: 43 papers published and 26 recommendations developed	2021: 2,200 2022: 1,670 2023: 1,670 State Budget

As evident, national objectives and indicators fail to properly address major biodiversity impacts associated with agricultural and rural development, which are acknowledged worldwide as prime drivers for biodiversity loss[3] such as:

- Loss of non-crop habitat eventually resulting in disrupted food chains and declines in species
- Loss of non-target species, including pollinators, due to direct and indirect effects of pesticides
- Reduced habitat diversity due to consolidation of holdings, removal of patches of non-farmed habitats and boundary features, and greater regional specialisation
- Loss of biodiversity-rich extensive farmlands (e.g. due to increased fertiliser use or increased grazing)
- Destruction of important habitats from land-use change
- Hydrological changes to habitats from drainage or irrigation (e.g. leading to wetland loss and reductions in groundwater levels)
- Eutrophication of freshwater, marine and terrestrial ecosystems (e.g. from fertilizers and nutrient rich run-off)
- Eutrophication of terrestrial ecosystems from deposition of airborne nutrients, particularly ammonia, from intensive livestock systems; and
- Soil degradation and erosion from routine cultivation.

2.2 Biodiversity-related Targets for Agriculture and Rural Development Relevant to Georgia

Georgia as a signatory country to the Association Agreement with the EU has an obligation to ensure an agriculture and rural development in compliance with the EU policy and best practices and to harmonize the Georgian legislation with the European Legislation (Chapter 10: Agriculture and Rural Development). The country has also committed to expand the power of the central and local governments in order to comply with policy planning and evaluation frameworks that meet European standards[4]. EU action in agriculture and rural development are guided by two key policies: Common Agricultural Policy (CAP) and Rural Development Policy (RDP).

The CAP plays a key role in supporting Europe's agricultural sector, managing transition to sustainable food production systems and supporting achievement of EU biodiversity commitments by 2030 including implementing tools to deliver on the EU Green Deal Targets. Contribution to these targets are also

[3] (1) Zerzawy F. et al, 2021. Environmentally Harmful Subsidies in Germany: Focus on Biodiversity; (2) Global assessment Report on Biodiversity and Ecosystem Services, 2020. IPBES (3) Biodiversity Damaging Subsidies in Switzerland, 2020. Swiss Academy of Sciences. Vol.15, No.7; (4) TEEB – The Economics of Ecosystems and Biodiversity for National and International Policy Makers, 2009; (5) Public Incentives that Harm Biodiversity, 2012. Centre for Strategic Analysis

[4] Article 333, Georgia-EU Association Agreement: "The Parties shall cooperate to promote agricultural and rural development through the progressive convergence of policies and legislation". Full alignment with the European legislation, policies and standards will become mandatory when Georgia acquires EU Candidate status.

addressed in the CAP strategic plans at a national level.
The EU Green Deal is a package of policy initiatives to achieve a status of climate-neutral bloc by 2050. Its goals extend to key sectors of economy including biodiversity and food sector down to the level of the support allocated to farmers.

The EU Green Deal targets for agriculture are as follows:

1. Making 25% of EU agriculture organic by 2030
2. Reduce by 50% the use of pesticides by 2030
3. Reduce the use of Fertilizers by 20% by 2030
4. Reduce nutrient loss by at least 50%
5. Reduce the use of antimicrobials in agriculture and antimicrobials in aquaculture by 50% by 2030
6. Create sustainable food labelling
7. Reduce food waste by 50% by 2030.

The above targets clearly indicate key directions for agricultural development with reduced impacts on biodiversity and may serve as basis for use in Georgia with modifications due to resource limitations and lack of baseline data (e.g., annual country-scale data on pesticide use).

2.3 Recommendations for Incorporation of Biodiversity Considerations into RDA Programs

Taking into consideration that impacts on biodiversity associated with implementation of agricultural subsidies by RDA[5] have been evaluated as substantial, it is recommended to introduce measurable targets into the Agriculture and Rural Development Strategy of Georgia derived from the European Green Deal with modifications to account for the current stage of economic and agricultural development of Georgia.

The following draft targets are proposed for consideration to be introduced for RDA subsidies by 2030:

- Decrease in total pesticide use by 20%
- Decrease in total fertiliser use by 20%
- Making 10% of Georgia's agriculture organic[6].

Taking into consideration that currently there is no statistical data on area under organic farming and volumes of used pesticides and fertilizers in the country, ambitious targets on par with the European Green Deal or Global Biodiversity Framework[7] are not likely to be achievable. At the same time, low targets will potentially fail to make any tangible effect in mitigating negative impacts on biodiversity associated with agricultural intensification. Twenty percent reduction in fertilizer and pesticide use and making 10% of Georgia's agriculture organic suggested for the next eight years is regarded as sufficiently ambitious targets, which will also achieve noticeable mitigation of harmful impacts on biodiversity resulting from agricultural sector.

It is noteworthy that findings of large-scale research on dependence of farmland management practice indicators with actual diversity of different plant and animal groups indicate that vascular plant and animal richness is negatively associated with pesticide and fertliser use[8,9].

[5] Refer to the report on Identification of Potential Negative Impacts to Biodiversity and Its Components by Agricultural Subsidies

[6] Resolution of Georgian Government No 198, dated 30/07/2013, on Bioproduction (Article 3, Clause d) defines "bio", "eco" and "organic" as received from or associated with bioproduction; hence, bio / organic / eco are used as synonyms in this report.

[7] GBF Target 7. Reduce pollution from all sources to levels that are not harmful to biodiversity and ecosystem functions and human health, including by reducing nutrients lost to the environment by at least half, and pesticides by at least two thirds and eliminating the discharge of plastic waste

[8] Geiger, F. et al. 2010. Persistent negative Effects of Pesticides on Biodiversity and Biological Control Potential on

These targets also ensure alignment with the following National Biodiversity Monitoring System Indicators (NBMS): (1) R6 – Area under organic farming and (2) P1 – Pesticide use tendency.

At present there is no data available on estimated use of pesticides and fertilisers associated with agricultural subsidies implemented by RDA. Therefore, it is necessary to initiate recording of data related to pesticide and fertliser use, ideally in 2023. This can be achieved via introduction of new conditions to subsidy application process – request subsidy applicant farmer to estimate planned use of pesticides and fertilisers (type; volume, area where pesticide / fertilizer will be applied, number of applications and totals through the subsidy period) and RDA monitoring requirements – collect data on actual pesticide and fertliser use via interviews with respective farmers during the monitoring. Alternative option may be creation of an online platform for data collection and exchange with farmers, which will provide more resource- and time-efficient means for data input / collection from beneficiaries and in general, for all RDA subsidy programs.

It appears that there are no specific incentives for promotion of organic / bio farming within the framework of RDA managed subsidy programs (refer to the first and second deliverable reports). The only relevant subsidy program is one component of Technical Support State Program providing co-funding for bio certification to cooperatives, which should not exceed 80% of total costs or 20,000 Lari (if beneficiary has also secured support from a donor organization for this activity, RDA support will be no more that 40% or 10,000 Lari). It is recommended to consider the following modification to subsidies providing support to establishment of annual and perennial crop plantations and livestock and dairy farms starting from or continuing in 2023: at least 20% of respective subsidy funds made eligible only for organic / bio agricultural production to promote organic / bio farming practices. This modification should also include calculation of mean organic / bio farming costs per production unit by SRCA. It is also proposed to consider additional incentive for potential beneficiaries planning to convert to organic / bio farming by offering a 20% bonus above the calculated mean organic / bio farming costs per unit. The suggested 20% bonus has been derived based on analysis of published research on crop yield and livestock productivity gap between organic and conventional agriculture[10,11,12,13,14]. In brief, the cited studies (362 paired sets of organic–conventional yield data from 43 countries in Europe, North America, Asia, Middle East & North Africa, Australia and New Zealand and Latin America covering 67 crops) indicate that organic yields of individual crops are on average 80% of conventional yields, but variation is substantial (standard deviation 21%); however, the organic yield gap significantly differed between crop groups and regions. As regards organic livestock farming, the targeted research (179 data sets covering Europe, North America and New Zealand) shows that organic systems had higher income per animal or full-time employee, lower impacts on biodiversity; however, productivity was consistently higher in conventional systems.

Another recommendation refers to introduction of a new pre-requisite for all agricultural subsidies providing funding for primary agricultural production, viz.: land parcels located within designated protected areas and Ramsar sites must not qualify for agricultural subsidy from 2023 (e.g., thirteen land parcels subsidized under the orchard and damaged sapling replacement components of “Plant the Future” program in 2018-2020 are partially located in four protected areas: Ajameti Managed Reserve[15]

European Farmland.

[9] Billeter, R. et al. 2007. Indicators for Biodiversity in Agricultural Landscapes: A Pan-European Study

[10] Tomek de Ponti, Bert Rijk, Martin K. van Ittersum, 2012.The crop yield gap between organic and conventional agriculture. Agricultural Systems, Volume 108

[11] C. P. A. van Wagenberg, Y. de Haas, H. Hogeveen, M. M. van Krimpen, M. P. M. Meuwissen, C. E. van Middelaar and T. B. Rodenburg, 2017. Animal Board Invited Review: Comparing conventional and organic livestock production systems on different aspects of
Sustainability. doi:10.1017/S175173111700115X

[12] Martin Brückler, Thomas Resl, Andreas Reindl, 2017. Comparison of organic and conventional crop yields in Austria. Die Bodenkultur: Journal of Land Management, Food and Environment Volume 68, Issue 4, 223–236. DOI: 10.1515/boku-2017-0018

[13] M. Schrama, J.J. de Haan, M. Kroonen, H. Verstegen, W.H. Van der Putten, 2018. Crop yield gap and stability in organic and conventional farming systems. Agriculture, Ecosystems & Environment, Volume 256

[14] EU Agricultural Markets Briefs, 2019. Organic farming in the EU

[15] Managed Reserve corresponds to IUCN Category IV

- 3 land parcels, Korughi Managed Reserve - 3 land parcels, Iori Managed Reserve - 6 land parcels and Gardabani Managed Reserve – 1 land parcel based on GIS analysis of protected areas and subsidized land parcels).
Additional pre-requisite recommended for initiation in 2023 is that only organic farming may be subsidized on land parcels located in Emerald Network sites and within 1 km of designated protected areas, Ramsar and Emerald Network sites. It is also proposed to initiate an obligation for subsidy beneficiaries to participate in early detection of and rapid response to invasive plant species from 2024. This program should be developed in close cooperation between different units of the MEPA - RDA, Biodiversity and Forestry Department and Agency of Protected Areas. The setup of the framework for early detection of invasive plants can be linked to the implementation of NBMS indicator P9 – Change of the Spread of invasive species.

Another important issue with direct substantial impacts on biodiversity is unregulated water use for agricultural purposes. At the initial stage (e.g., starting 2023) it is recommended to exclude lakes including associated wetlands as permanent sources for irrigation water (e.g., pre-requisite to application for orchard component of the "Plant the Future" subsidy program (https://rda.gov.ge/projects/read/plant_future/20:child). Use of lake as source of irrigation water disrupts aquatic ecosystem as it lowers the water levels resulting in an increase in concentration of nutrients and pollutants and decrease in dissolved oxygen content, which may cause harmful algal blooms and hypoxia leading to eutrophication and aquatic ecosystem loss.

One of major adverse impacts of intensification / extensification of agriculture in general and specifically due to agricultural subsidy programs is excessive water use. Currently there is no data available on increase in water use resulting from agricultural subsidies. Consequently, it is recommended to commence water use tracking associated with RDA subsidy programs from 2023. The data can be collected via the following:

- Incorporation of a new condition into subsidy application process – request subsidy applicant farmer to estimate planned water use (water source, water volume required for subsidized activity, area to be irrigated if applicable to the given subsidy, frequency of water use, etc.).
- Inclusion of water use data in the RDA monitoring requirements – collect data on actual water use via interviews with respective farmer during the monitoring.

In addition, water use data can be collected from subsidy beneficiaries via an online platform, which will allow verification of compliance with SRCA recommended watering / water application limits and form basis for future optimization of efficient water use.

2.4 Proposed New Pro-biodiversity Subsidy Program

Organic farming has been recognised as a potential approach to achieve a more sustainable food system and promote rural development. Thus, many countries have set targets to increase the share of organic cultivated land taking into consideration that organic production is an overall system of farm management and food production that contributes to the preservation of natural resources and applies high animal welfare and production standards.

Apart from reduced impacts on the environment and specifically, biodiversity, organic farming has been increasingly providing considerable economic benefits. Global organic food and drink sales reached 120 billion Euros in 2020. The countries with the largest organic markets were the United States (49.5 billion Euros), Germany (15.0 billion Euros) and France (12.7 billion Euros). The largest single market was the United States (41% of the global market), followed by the European Union (44.8 billion Euros, 3%) and China (10.2 billion Euros, 8.5%). Switzerland had the highest per-capita consumption in 2020, with 418 Euros. The highest organic market shares were reached in Denmark (13.0 percent), Austria (11.3 percent) and Switzerland (10.8 percent)[16].

[16] FiBL & IFOAM – Organics International, 2022. The World of Organic Agriculture – Statistics and Emerging Trends 2022

The above statistics shows that Georgia could benefit substantially by offering organic / bio agricultural produce to the world's richest countries where demand for such products is very high. However, according to the "EU Imports of Organic Agri-food Products – Key Developments in 2020"[17] Georgia exported 591t of organic agri-food to the EU in 2020, which comprised 34% increase as compared to 2019 (441t); however, Georgia export represented 0% of share in the EU total organic agri-food imports. Georgia's export volume is substantially lower than that of Republic of Moldova's, which exported 22,321t of organic agri-food to the EU in 2020 (0.8% of share in total).

Data on organic / bio farming in Georgia is very limited. According to the article in the Commersant[18], share of organic / bio products in Georgian agriculture is less than 1% even though 142 companies produce bio products and 90 farms are under conversion to bio framing, according to the Caucascert – bio certifying organization with international accreditation. Major challenges associated with expansion of bio farming / production in Georgia are cited as high production costs, lack of knowledge and backward technologies. In total, 2,158ha of agricultural land including 484 ha under conversion is certified as bio farming by Caucascert with total number of certified clients being 72 by 2020[19]. The report on Bio Agroproduction and Food Industry in Georgia concludes that the most important certified organic products exported from Georgia are wine, nuts, honey, tea and wild plants. Another conclusion states that growing demand for organic fresh and processed fruit, berries and vegetables in local and international markets and DCFTA (Deep and Comprehensive Free Trade Agreement) between Georgia and the EU are likely to stimulate growth of organic / bio farming / agricultural production in Georgia.

Taking into consideration current status of the agricultural sector in the country, substantial negative impacts on biodiversity associated with agricultural intensification / extensification and agricultural subsidy programs, high costs of conversion to novel agricultural practices, it is recommended to introduce a new program to specifically support organic / bio farming and agricultural production in Georgia.

Unlike majority of the subsidies implemented by the RDA to date, duration of the new program – "Bio Farming / Agroproduction Support" has to be 3 years as a minimum taking into consideration time required for bio certification process (according to the Caucascert, bio certificate is issued three years after application; until then, the farming / agroproduction is regarded as being under conversion).

Potential beneficiaries can be grouped into two major types: (1) bio certified farmers / agroproducers and (2) farmers / agroproducers willing to setup or convert to bio farming / agricultural production.

It is equally important to ensure sustainability and market access for bio certified farmers / agroproducers.

Farmers / agroproducers willing to setup or convert to bio farming / agricultural production should additionally be eligible for the component of Technical Support State Program providing co-funding for bio certification.

It should be noted that bio farming / agroproduction is characterized by significantly lower yield than conventional farming / agroproduction (Footnote 19), which may represent a strong disincentive; however, it is counter-balanced by higher prices of organic products. Findings of a large-scale study[20] covering 55 crops grown on five continents indicates that "when organic premiums were not applied, benefit / cost ratios (−8 to −7%) and net present values (−27 to −23%) of organic agriculture were significantly lower than conventional agriculture. However, when actual premiums were applied, organic agriculture was significantly more profitable (22–35%) and had higher benefit / cost ratios (20–24%) than conventional agriculture". In 2021 Georgian gross output of the agricultural and fishery sector was

[17] 2021. European Commission

[18] "Share of bio products does not exceed 1% in Georgian agricultural production", 17/08/2021. https://commersant.ge/ge/post/qartul-warmoebashi-bio-produqtebis-wili-1-s-ar-agemateba

[19] Gengenbach, H., 2021. Report on Bio Agropoduction and Food Industry in Georgia

[20] Crowder, D. and Reganold, J. 2015. Financial Competitiveness of Organic Agriculture on a Global Scale. Proceedings of the National Academy of Sciences, Vol. 112, No 24. https://doi.org/10.1073/pnas.1423674112

5,969,800,000 Lari (1,925,741,935 USD). Annual benefits associated with replacement of 10% of conventional farming by organic / bio farming by 2030 have been calculated by years (2023 – 2030) assuming the output ratio is 29% (mean value from 22-35%); calculation results are given in Tables 2-2 – 2-3 below.

Table 2-2 Comparison of conventional and organic agriculture benefits, GEL[21]

Year	Total Output GEL	Organic Farming % of Total Output	Conventional Farming to Be Replaced GEL	29% Premium Compared to Conventional Farming GEL	Cumulative Organic Farming Output GEL
2021	5,969,800,000	0%	0	0	0
2022	6,419,325,940	0%	0	0	0
2023	6,902,701,183	1.3%	86,283,765	25,022,292	111,306,057
2024	7,422,474,582	2.5%	92,780,932	26,906,470	230,993,459
2025	7,981,386,918	3.8%	99,767,336	28,932,528	359,693,323
2026	8,582,385,353	5.0%	107,279,817	31,111,147	498,084,287
2027	9,228,638,971	6.3%	115,357,987	33,453,816	646,896,091
2028	9,923,555,485	7.5%	124,044,444	35,972,889	806,913,423
2029	10,670,799,213	8.8%	133,384,990	38,681,647	978,980,060
2030	11,474,310,394	10.0%	143,428,880	41,594,375	1,164,003,315
TOTAL				**261,675,164**	

Source: National Statistics Office of Georgia, Footnote 22

Table 2-3 Comparison of conventional and organic agriculture benefits, USD

Year	Total Output USD	Organic Farming % of Total Output	Conventional Farming to Be Replaced USD	29% Premium Compared to Conventional Farming USD	Cumulative Organic Farming Output USD
2021	1,989,933,333	0%	0	0	0
2022	2,139,775,313	0%	0	0	0
2023	2,300,900,394	1.3%	28,761,255	8,340,764	37,102,019
2024	2,474,158,194	2.5%	30,926,977	8,968,823	76,997,820
2025	2,660,462,306	3.8%	33,255,779	9,644,176	119,897,774
2026	2,860,795,118	5.0%	35,759,939	10,370,382	166,028,096
2027	3,076,212,990	6.3%	38,452,662	11,151,272	215,632,030
2028	3,307,851,828	7.5%	41,348,148	11,990,963	268,971,141
2029	3,556,933,071	8.8%	44,461,663	12,893,882	326,326,687
2030	3,824,770,131	10.0%	47,809,627	13,864,792	388,001,105
TOTAL				**87,225,055**	

Source: National Statistics Office of Georgia, Footnote 22

[21] Output growth rate is calculated from the Last 5-year average output growth numbers which is 7.53%

Figures given in the above tables indicate that conversion of 10% of conventional agriculture into bio / organic farming and agroproduction starting from 2023 may generate estimated 87 mln USD surplus by 2030.

2.5 Biodiversity Checklist for Application Evaluation

Review of subsidy qualifying conditions and application forms available for the subsidies analyzed under the Project "Measuring and Addressing Potential Adverse Impacts on Biodiversity from Agricultural Subsidies" shows that no biodiversity-related issues are considered in the subsidy application review process. The following checklist has been developed to assist respective RDA staff in evaluation of potential biodiversity impacts associated with implementation of applicant's proposal.

1 Location of the target land parcel relative to designated protected areas (including Ramsar sites):
- 1.1 Given land parcel is entirely within the borders of the designated protected area – if yes, the respective application is disqualified.
- 1.2 Given land parcel is partially located within the borders of the designated protected area – request applicant to confirm in writing that activities to be subsidized will be carried out on the part of the land outside the designated protected area.
  - 1.2a Non-compliance is automatic disqualification.
  - 1.2b If confirmed, the applicant shall comply with conditions set out in Item 1.3b.
- 1.3 Given land parcel is within 1km from the designated protected area:
  - 1.3a Any part of given land parcel located within 1km – conditions specified in Item 1.3b shall apply.
  - 1.3b Given land parcel is entirely within 1km – if subsidy is requested for organic farming, applicant shall be requested to confirm participation in early detection of and rapid response to invasive plant species. Non-compliance is automatic disqualification.
  - 1.3c Given land parcel is entirely within 1km – automatic disqualification if subsidy application fails to qualify as organic farming.

2 Location of the target land parcel relative to Emerald network Sites:
- 2.1 Given land parcel is entirely or partially located in and within 1km off Emerald Network Site – refer to Item 1.3b.

3 Pesticide use:
- 3.1 Pesticide type[22]
- 3.2 Estimated volume (relevant units such as litre, kg, etc.)
- 3.3 Intended area of use (m^2)
- 3.4 Number of applications per year and throughout subsidy period

IF ANY ABOVE DATA IS MISSING, REQUEST RE-SUBMISSION. AUTOMATIC DISQUALIFICATION IF NOT PROVIDED.

4 Fertiliser use:
- 4.1 Fertiliser type – please indicate inorganic / organic or both
- 4.2 Estimated volume (relevant units such as litre, kg, etc.)
- 4.3 Intended area of use (m^2)
- 4.4 Number of applications per year and throughout subsidy period

IF ANY ABOVE DATA IS MISSING, REQUEST RE-SUBMISSION. AUTOMATIC DISQUALIFICATION IF NOT PROVIDED.

5 Water use:
- 5.1 Potential water source – if lake / wetland is indicated as water source, request substitution with acceptable alternative. Automatic disqualification if non-compliant.

[22] Insecticide / herbicide / fungicide / rodenticide, etc.

5.2 Water use purpose – irrigation / livestock farming / facility cleaning, etc.
5.3 Estimated water volume (m^3)
5.4 Area to be irrigated (m^2) per year and through the subsidy period if applicable
5.5 Frequency of irrigation per year and through the subsidy period if applicable.
IF ANY ABOVE DATA IS MISSING, REQUEST RE-SUBMISSION. AUTOMATIC DISQUALIFICATION IF NOT PROVIDED.

It is recommended to request provision of data specified in Items 3 – 5 from all subsidy applicants. Collection of the data will assist in evaluation of biodiversity impacts associated with agricultural subsidies, tracking achievement of proposed measurable targets for agricultural and rural development in Georgia (Section 2.2) and the NBMS indicators (Table 3-7, Section 3.3).

It is proposed to rollout use of the above biodiversity checklist starting with the five most harmful subsidy programs in terms of biodiversity, which have been identified in the second report - Identification of Potential Negative Impacts to Biodiversity and Its Components by Agricultural Subsidies. These subsidies are:

1. Preferential Agrocredit
2. State Program “Plant the Future”
3. Dairy Modernization and Market Access State Program (DIMMA)
4. Agriculture Modernization, Market Access and Resilience Project (AMMAR)
5. State Programme for Supporting Agricultural Production.

Proposed revised application form incorporating biodiversity considerations for orchard component of state program “Plant the Future” is given in Appendix 1.

3 Recommended Monitoring of Agricultural Subsidy Impacts Using Biodiversity and Socio-economic Indicators

3.1 Overview of Biodiversity Indicators for Agriculture

At present biodiversity loss associated with agricultural landscapes has accelerated substantially due to intensification of farming practices and expansion of agricultural land use worldwide. Consequently, halting and / or mitigating impacts of agriculture on biodiversity are one of the recognized priorities for conservation. One of the most widely used tools to detect and monitor biodiversity degradation and loss is application of sets of biodiversity indicators tailored to measure impacts associated with agricultural sector.

All biodiversity indicators developed, tested and utilized in Western countries with intensive agriculture sectors are generally represented by sets of direct and indirect indicators[23]. Direct indicators are grouped at the three levels of biological organization:

- Genetic[24]
- Species
- Ecosystem (commonly equated with habitat).

Indirect indicators reflect farm management practices:

[23] (1) Biodiversity Indicators for European Farming Systems – a Guidebook. 2012; (2) Underwood, E (2014) Result indicators used in Europe, Prepared for the European Commission, DG Environment. Institute for European Environmental Policy, London.(3) Tasser, E. et al. 2019. Simple Biodiversity Assessment Scheme Supporting Nature-friendly Farm Management. In Ecological Indicators, #107. (4) Loch, J. 2015. Initiative for Biodiversity Impact Indicators for Agricultureal Commodity Production. Prepared for Convention on Biological Diversity Secretariat (SCBD), Mainstreaming, Partnerships and Outreach (MPO) Division. (5) Chiatante, G. et all. 2021. Indicators of biodiversity in an intensively cultivated and heavily human modified landscape. . In Ecological Indicators, #130

[24] Implies only crop varieties and animal breeds

- Farm management system (e.g., organic or non-organic)
- Farm type (e.g., arable, livestock production or mixed farming)
- Agricultural management practices.

Both direct and indirect Biodiversity Indicators meet the following quality assessment criteria[25]:

1. Policy relevant and meaningful - Indicators should send a clear message and provide information at an appropriate level for policy and management decision-making by assessing changes in the status of biodiversity (or of pressures, responses, use or capacity), if possible, with reference to baselines and agreed policy targets
2. Biodiversity relevant - Indicators should address key properties of biodiversity
3. Scientifically sound - Indicators must be based on clearly defined, verifiable and scientifically acceptable data collected using standard methods of known accuracy and precision
4. Sensitive - Indicators should be sensitive in order to show trends, and where possible permit the distinction between human-induced and naturally occurring changes
5. Representative - The set of indicators provides a representative picture of the pressures and biodiversity status
6. Minimum number of indicators - The lower the total number of indicators, the more communicable they are to policy-makers and the public, and the lower the cost of implementation
7. Applicability to different major farm types.

A comprehensive set of indicators for detecting biodiversity in farming systems must include measures of genetic diversity within species. However, reliable detection of genetic diversity is generally labour-intensive, often technically demanding, and can be difficult owing to the lack of information on e.g. breeding pedigrees and seed sources. In Biodiversity Indicators for European Farming Systems, the assessment of on-farm genetic diversity is based on survey data on the number and abundance of different breeds per farm animal species, the number and abundance of different varieties per crop species, the origin of crops, and pedigree-based genetic diversity. Direct Indicators utilized in the EU countries are detailed in Tables 3-1 – 3-3.

Table 3-1 Genetic Diversity Indicator Set

	Indicator Code	Indicator	Unit	Data Source	Sub-indicators	Notes
1	Breeds	Animal breeds	Number of breeds & stocks by breeds	Farmers	Rare breeds	
2	CultDiv	Cultivar diversity	Number of cultivars / varieties	Farmers	1) Average number of varieties across all crop species per farm 2) Percentage of endangered crop varieties per species per farm	
3	CropOrig	Origin of Crops	Percentage of landraces (across all crop species and varieties) per farm	Farmers	Percentage of landraces per farm	

[25] UNEP/CBD/SBSTTA/9/INF/26, 2003. Proposed biodiversity indicators relevant to the 2010 target. Report on the ninth meeting, Montreal.

	Indicator Code	Indicator	Unit	Data Source	Sub-indicators	Notes
4	**CroPedDiv**	Pedigree-based genetic diversity	Coefficient of parentage (Index)	Farmers	Coefficient of parentage	Low pedigree-data availability – only on major crops
5	**GrassGenDiv**	Genetic diversity of model grassland species	Genetic diversity index, Gene diversity (He) per plot/farm	Laboratory analysis	Gene diversity	

Table 3-2 Species Indicator Set

	Indicator Code	Indicator	Unit	Data Source
1	Plants	Vascular Plants	Number of species per farm	Field survey
2	Earthworms	Earthworms	Number of species per farm	Field survey
3	Spiders	Spiders	Number of species per farm	Field survey
4	Bees	Wild bees & bumblebees	Number of species per farm	Field survey
5	Birds	Birds of farmland habitats	Number of species per farm	Field survey
6	**Butterflies**	Butterflies of farmland habitats	Number of species per farm	Field survey
7	**Ants**	Ants of farmland habitats	Number of species per farm	Field survey
8	**Small mammals**	Small mammals of farmland habitats	Number of species per farm	Field survey
9	**Bats**	Bats of farmland habitats	Number of species per farm	Field survey

Sub-indicators for all indicator species groups:

1. Gamma diversity (Total number of species aggregated over the habitats)– species of cultivated forage, food crops and semi-natural habitats
   1.1 Gamma diversity – species of cultivated forage and food crops
   1.2 Gamma diversity – species of semi-natural habitats
2. Alpha diversity (Average number of species over the habitats) – species of cultivated forage, food crops and semi-natural habitats
   2.1 Alpha diversity – species of cultivated forage and food crops
   2.2 Alpha diversity – species of semi-natural habitats
3. Area weighted diversity (Number of species over the habitats weighted by the area of the habitats) – species of cultivated forage, food crops and semi-natural habitats
   3.1 Area weighted diversity – species of cultivated forage and food crops
   3.2 Area weighted diversity – species of semi-natural habitats
4. Rarefied richness (Average number of species over the smallest number of plots found in a farm) – species of cultivated forage, food crops and semi-natural habitats
5. Chao estimated richness (Extrapolated number of species based on the accumulated number of species found in plots) – species of cultivated forage, food crops and semi-natural habitats

Table 3-3 Habitat Indicator Set

	Indicator Code	Indicator	Unit	Data Source	Sub-indicators	Notes
1	HabRich	Habitat richness	Number of habitat types per hectare	Habitat mapping	Habitat richness of cultivated forage and food crops Habitat richness of semi-natural habitats	

	Indicator Code	Indicator	Unit	Data Source	Sub-indicators	Notes
2	HabDiv	Habitat diversity	Shannon diversity	Habitat mapping	Habitat diversity of cultivated forage and food crops Habitat diversity of semi-natural habitats Habitat diversity of areal habitats Habitat diversity of linear habitats	
3	PatchS	Average size of habitat patches	ha	Habitat mapping	Patch size of cultivated forage and food crops Patch size of semi-natural habitats	
4	LinHab	Length per hectare of linear elements	m / ha	Habitat mapping	Length of grassy linear features Length of woody linear features Length of aquatic linear features Length of wall linear elements	
5	CropR	Crop richness	Number of crops per farm / per hectare	Interviews		Most relevant for arable systems
6	ShrubHab	Shrub cover	% of farmland	Habitat mapping		Interpretation in context. Can be positive in intensively cultivated areas, but negative in areas of agricultural abandonment
7	TreeHab	Tree cover	% of farmland	Habitat mapping	Share of cultivated forage and food crops with trees (%) Share of semi-natural habitats with trees (%) Share of area with trees (%) Share of lines with trees (%)	
8	SemiNat	Percentage of semi-natural habitats	% of farmland	Habitat mapping	1) … without trees 2) … with trees 3) Semi-natural aquatic habitats	Includes all linear habitats and areal habitats classified as semi-natural. Can also be calculated for further sub-categories

	Indicator Code	Indicator	Unit	Data Source	Sub-indicators	Notes
9	**Weed**	Cover of non-crop plants on arable fields, at the plot level	Share of crop field covered by weeds	Vegetation relevé or habitat mapping		Could be derived from vegetation sample or noted during habitat mapping but would require several visits per season

European Union Farmland Indirect Indicator set is provided in Table 3-4.

Table 3-4 Farm Management Indicator Set

	Indicator Code	Indicator	Unit	Data Source	Sub-indicators	Notes
1	EnerIn	Total direct and indirect energy input	Fuel in Litres / ha UAA[26]	Farm inter-views		
2	IntExt	Intensification / Extensification: Expenditures on fuel, pesticides, fertiliser and animal fodder	€/ha UAA	Farm inter-views		
3	MinFert	Area with use of mineral nitrogen fertiliser	% of UAA	Farm inter-views		
4	NitroIn	Total nitrogen input	kg N/ha UAA	Farm inter-views		
5	FieldOp	Field operations	Number of field opera-tions	Farm inter-views	1) Cuts / Mowing frequency (No. of cuts); 2) Mowing timing (Date of first cut); 3) Plough Ploughing (% arable land)	
6	PestUse	Pesticide use	Number of applications	Farm inter-views	1) PestH - Herbicide use; 2) PestI - Insecticide use; 3) PestF - Fungicide use	
7	Av Stock	Average stocking rate	Number of livestock units/ha UAA	Farm inter-views	AvStockF Average stocking rate per ha forage area	
8	Graze	Grazing Intensity	Number of grazing livestock units/ha grazing area	Farm inter-views		

[26] Utilized Agricultural Area

	Indicator Code	Indicator	Unit	Data Source	Sub-indicators	Notes
9	**Irrig**	Irrigation	Litre / ha UAA	Farm inter-views		

It should be noted that the Biodiversity Indicators described above have been developed by a large number of universities and research centers of different European and international cooperation partner (ICP) countries (consortium of sixteen institutions from fourteen countries with stakeholder advisory board comprised of twenty representatives from farmers' organization, nature protection organizations, consumers, agricultural agencies) with substantial financial support of EU member states at all stages of development, pilot testing (case studies) and implementation. Development and case studies for pilot implementation of indicators required almost four years. In total, elaborated biodiversity indicators were tested on 195 farms in 12 case study regions across Europe.

Data available on development and implementation of biodiversity indicators for agriculture in Europe and partner countries clearly indicates the need for significant financial, scientific and administrative resources to measure, analyze and develop further mitigation measures for agriculture impacts on biodiversity. At the same time, implementation of biodiversity indicators is a continuing process, which requires securing funding on permanent basis.

3.2 Selection of Biodiversity Indicators for RDA Programmes

The biodiversity indicator sets described in Section 3.1 are feasible for implementation in developed countries where substantial financial and scientific resources are allocated for biodiversity conservation, data required for evaluation of impacts on biodiversity has been collected, mapped and analysed over many decades, such data is organized in easily searchable databases and farmer communities and consumers are well aware of the scale and magnitude of detrimental impacts of agricultural sector on depleting natural resources and strongly support and in many cases are directly involved in pro-biodiversity actions / programmes.

Review of information on past and on-going agricultural subsidies administered by RDA in Georgia shows that no biodiversity-related indicators have been considered in designing and implementing the subsidies. Full-scale implementation of biodiversity indicators used in the developed countries appears impossible in Georgia due to the following limitations: no funding available or possible to secure for monitoring impacts of agricultural subsidies in near future considering more pressing national biodiversity priorities in the country, lack of relevant scientific capacity, poor-organization of limited biodiversity baseline data on current state of habitats, major plant and animal groups, absence of scientifically reliable data on biodiversity associated with agricultural landscapes, low biodiversity awareness of farmers and rural population, etc. Information of critical importance in decision-making on development projects including agricultural sector such as data on ranges and abundance of legally protected plant and animal species is absent; moreover, endangered species of major part (up to 90%) of the Georgian flora – herbaceous plants are not included in the national red list.

The most expedient option for tracking, measuring and addressing impacts on biodiversity associated with agricultural subsidies appears critical revision of biodiversity indicators for agriculture, which have been in use in other countries over sufficiently long period (several years, as a minimum) and are feasible for implementation in Georgia taking into account the following considerations:

1. Data availability
2. Ease of field data collection
3. Time required for field data collection
4. Ease of data processing and interpretation
5. Affordable cost.

The above filtering criteria have been applied to Biodiversity Indicators for European farmland in order to identify a core list of indicators to be proposed for measuring impacts of agricultural subsidy programs in Georgia (refer to Table 3-5).

Table 3-5 Screening Biodiversity Indicators of European Farmland for Applicability in Georgia

Biodiversity Indicator	Feasibility for Implementation in Georgia
Genetic Diversity Indicator Set	
Animal breeds	Feasible – information to be acquired from interviews with farmers
Cultivar diversity	Feasible – information to be acquired from interviews with farmers
Origin of Crops	Not feasible due to lack of reliable data on the origin among Georgian farmers
Pedigree-based genetic diversity	Not feasible due to lack of pedigree data among Georgian farmers
Genetic diversity of model grassland species	Not feasible as it requires highly competent personnel for calculations (Genetic diversity index, Gene diversity (He) per plot/farm) and laboratory analysis, which is very costly
Species Indicator Set	
Vascular plants	Not feasible as it requires highly competent personnel to collect field data, calculate Alpha and Gamma Diversity indices, Rarefied weighted diversity and Chao estimated richness. It is proposed to substitute this indicator with Flower Colour Index and Floristic Quality Index, which are widely accepted as reliable indicators for vascular plant diversity and indirect indicators for insect pollinator diversity.
Earthworms	Not feasible as it requires highly competent personnel to identify species, calculate Alpha and Gamma Diversity indices, Rarefied weighted diversity and Chao estimated richness
Spiders	
Bees	
Birds	
Butterflies	Not feasible as in addition to the above, observations are weather dependent and require several visits
Ants	Not feasible as in addition to the above it requires intensive laboratory work
Small mammals	Not feasible as it requires highly competent personnel to identify species, calculate Alpha and Gamma Diversity indices, Rarefied weighted diversity and Chao estimated richness
Bats	Not feasible as in addition to the above it is difficult to survey (night time survey)
Habitat Indicator Set	
Habitat richness (of cultivated forage and food crops and semi-natural habitats)	Feasible as it requires visual identification of forage and food crops and semi-natural habitats in broad terms (grassland, shrubland, wetland, tree patches / lines, etc)
Habitat diversity (of cultivated forage and food crops and semi-natural areas)	Not feasible as it requires highly competent personnel to collect, process and interpret field data.
Average size of habitat patches	Not feasible as determination of this index requires mapping of farmland habitats, which is a fairly time-consuming task during the fieldwork
Length per hectare of linear elements	Not feasible as determination of this index requires mapping of farmland habitats, which is a fairly time-consuming task during the fieldwork
Crop richness (Number of crops per farm / per hectare)	Feasible – information to be acquired from interviews with farmers
Shrub cover (% of farmland)	Not feasible as determination of this index requires mapping of farmland habitats, which is a fairly time-consuming task during the fieldwork
Tree cover (% of farmland)	
Percentage of semi-natural habitats in farmland	
Cover of non-crop plants on arable fields, at the plot level	Not feasible as determination of this index requires several visits during vegetation period
Farm Management Indicator Set	
Total direct and indirect energy input (Litre/ha of UAA)	Feasible – information to be acquired from interviews with farmers
Intensification / Extensification Expenditures on fuel, pesticides, fertiliser and animal fodder (Lari / ha UAA)	Feasible – information on expenditures on fuel, pesticides, fertiliser and animal fodder to be acquired from interviews with farmers
Area with use of mineral nitrogen fertiliser (% of UAA)	Feasible – information on area with use of mineral nitrogen fertiliser to be acquired from interviews with farmers

Biodiversity Indicator	Feasibility for Implementation in Georgia
Total nitrogen input (kg N / ha UAA)	Feasible – information on area with use of total nitrogen fertiliser to be acquired from interviews with farmers
Field operations	Feasible – information to be acquired from interviews with farmers on cuts / mowing frequency, mowing times including date of first cut and ploughing on % arable land
Pesticide use	Feasible – information to be acquired from interviews with farmers on number of applications and volumes applied per ha per each application
Average stocking rate	Feasible – information to be acquired from interviews with farmers on number of livestock units / ha UAA
Grazing Intensity	Feasible – information to be acquired from interviews with farmers on number of grazing stock units / ha of grazing area
Irrigation (Litre / ha UAA)	Feasible – information to be acquired from interviews with farmers

Note: Indices discarded for use in Georgia are shown in red font.

Apart from screening the sets of Biodiversity Indicators for European farmland by feasibility filters for Georgia, expert judgement was applied to validate dismissal and / or substitution of individual indicators.

The genetic diversity of crop varieties and livestock breeds is of major significance in agriculture; at the same time on-farm genetic diversity is an essential part of agrobiodiversity, and hence of biodiversity as a whole. The proposed indicators of on-farm genetic diversity will provide ground-truthed representative data on in-situ crop and livestock genetic diversity at farm level. Other indicators within the Genetic Diversity Indicator Set used in European farmlands were discarded due to lack of reliable data among Georgian farmers, time-efficiency and need for high quality specialist surveys.

Species indicator set widely used for European farmland includes nine individual indices. Collection of data required for determination of these indices (Gamma diversity, Alpha Diversity, Area weighted diversity, rarified richness and Chao estimated richness) and subsequent processing and analysis requires engagement of highly competent scientists with experience in field surveys and is time and labour-intensive with implications for prohibitively high associated costs.

Flowering vascular plants are the essential primary producers in majority of ecosystems including agricultural habitats. It is therefore proposed to use Flower Colour Index (FCI) as a representative indicator of vascular plant diversity and abundance in different communities. This index also indirectly indicates the presence and relative abundance of insect pollinators. The advantage of FCI is that field data collection and processing takes limited time and could be carried out by farmers or their assistants requiring no botanical skills. Data collection for this index implies identification of abundance and richness of plant groups with different flower colours using standardised colour key. Field survey timing is selected taking into account latitudinal, altitudinal and temperature clines; hence, it may vary from May to July-August.

Another index proposed as a substitute for a number of species-level indices used for European farmland is Floristic Quality Index (FQI), which is widely recognized as an effective tool to identify trends in plant communities as it explores the ratio between native and invasive species or conservation value of communities (the increased abundance of invasive species and gradual elimination of natives clearly indicates the decline of a given plant community reflected in lower values of FQI). Field data collection and analysis requires involvement of qualified botanist; however, it is assumed that the field work and data processing is not time-consuming.

Two indices from the Habitat Indicator Set utilized in European farmland are recommended for use in Georgia. Determination of other indices requires a time-consuming task of preparation of digitized farmland mapping, engagement of a team of highly competent experts (botanist, toposurveyor, GIS specialist) in the course of field surveys, data processing and analysis.

The farm management indicator set is recommended for application in Georgia as the data can be easily collected via interviews with farmers. This indicator set reflects agricultural intensity level, which translates into magnitude of impacts on biodiversity.

The recommended indicator sets for monitoring biodiversity impacts of agricultural subsidies in Georgia are provided in Table 3-6.

Table 3-6 Biodiversity Indicator Sets Recommended for RDA Programmes

NN	Biodiversity Indicator	Brief Description
	Genetic Diversity Indicator Set	
1	Animal breeds	Number of breeds & stocks by breeds based on interviews with farmers
2	Cultivar diversity	Number of cultivars / varieties based on interviews with farmers
	Species Indicator Set	
3	Flower Colour Index (FCI)	Identification of abundance and richness of plant groups with different flower colours in semi-natural habitat (if present) using standardised colour key – botanist will be required at the initial stage to introduce practical implementation of the methodology
4	Floristic Quality Index (FQI)	Identification of native and invasive species in selected permanent sampling plots in semi-natural habitat (if present) to calculate their ratio and conservation value of community – botanist will be required at all stages of monitoring
	Habitat Indicator Set	
5	Habitat richness (number of habitat types per hectare)	Habitat richness of semi-natural habitats identified with farmer's assistance
6	Crop richness	Number of crops per farm / per hectare based on interviews with farmers
	Farm Management Indicator Set	
7	Total direct and indirect energy input (Litre/ha of UAA)	Fuel used per ha of utilized agricultural area based on interviews with farmers
8	Intensification / Extensification	Expenditures on fuel, pesticides, fertiliser and animal fodder (Lari / ha UAA) based on interviews with farmers
9	Area with use of mineral nitrogen fertiliser (% of UAA)	Percentage of utilized agricultural area where mineral nitrogen fetiliser is used based on interviews with farmers
10	Total nitrogen input (kg N / ha UAA)	Total amount of nitrogen fertiliser used utilized agricultural area based on interviews with farmers
11	Field operations	Number of cuts / mowing frequency, mowing times including date of first cut and ploughing on % arable land based on interviews with farmers
12	Pesticide use	Number of applications and volumes applied per ha per each application based on interviews with farmers
13	Average stocking rate	Number of livestock units / ha UAA based on interviews with farmers
14	Grazing Intensity	Number of grazing stock units / ha of grazing area based on interviews with farmers
15	Irrigation (Litre / ha UAA)	Volume of irrigation water applied per ha UAA based on interviews with farmers

3.3 Application of Biodiversity Indicators to RDA Programmes

Up to date no attempt has been made to develop and implement tracking and / or monitoring schemes for biodiversity impacts associated with agricultural subsidies administered by RDA and / or agriculture in general. Evaluation of the agricultural subsidies implemented over the recent three years (2018 – 2021) and / or likely to be continued in the nearest future (2022-2025) (refer to Second Report – Identification of Potential Negative Impacts to Biodiversity and Its Components by Agricultural Subsidies prepared for the project: "Measuring and Addressing Potential Adverse Impacts on Biodiversity from Agricultural Subsidies") has shown that substantial negative impacts on biodiversity are associated with a number of assessed agricultural subsidy programmes. Consequently, it is critical to initiate application of biodiversity indicators to ongoing and future agricultural subsidies in the nearest future. However, Georgia faces a number of pressing biodiversity-related priorities requiring immediate actions with limited financial and technical resources available within the country. Therefore, it is deemed appropriate to design and carry out a pilot scheme of biodiversity indicator application with limited scope, which would provide reliable basis for measuring the worst impacts of agricultural subsidies on

biodiversity and further development of monitoring program.

At the initial stage it would be feasible to apply core number of biodiversity indicators (Table 3-6) to agricultural subsidies, which have been found to result in the highest adverse biodiversity impacts by qualitative and quantitative analysis described in the second report – Identification of Potential Negative Impacts to Biodiversity and Its Components by Agricultural Subsidies. These programmes are Preferential Agrocredit, Plant the Future, AMMAR, Supporting Agricultural production and DIMMA. It should be noted several proposed biodiversity indicators are linked to the National Biodiversity Monitoring System (NBMS) indicators currently available as draft (refer to Table 3-7).

Table 3-7 Linkage between Draft NBMS Indicators, Indicators for Post-2020GBF, SDGs and Biodiversity Indicators Recommended for RDA Programmes

Draft NBMS Indicator	Biodiversity Indicators Recommended for RDA Programmes	Indicators for the Post-2020 GBF	SDG Indicator
R6 – Area under Organic Farming	Farm Management Indicator Set		
R6 – Number of Agricultural Plant and Animal Species, Share of Local Species	Animal Breeds Cultivar Diversity Crop Richness		
P1 – Pesticide Use tendency	Pesticide Use	7.0.3 Pesticide use per area of cropland	
P1 - Contents of Nutrients and Pollutants in Internal Waters	Total Nitrogen Input Pesticide Use		
P7 – Intensity of Use of Pastures	Average stocking rate Grazing Intensity		
P9 - Change of the spread of invasive species	Floristic Quality Index (FQI)	6.0.1 Rate of invasive alien species spread	15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

3.4 Proposed Socio-economic Indicators for RDA Programmes

It is essential to develop specific guidance and recommendations regarding socio-economic impacts from RDA administered agricultural subsidies. The following criteria are proposed to evaluate past and current programmes.

Financial Monitoring: it is recommended to conduct monitoring twice a year and prepare reports, which will provide data for multiple-aspect analysis of agricultural subsidies.

First of all, it is important to create a database about beneficiaries providing information on:
a) General information about the beneficiary.

- Legal type of the business (Ltd, sole entrepreneur, public enterprise, etc)
- Name of the Business
- ID Number / Legal Number
- Field of operation
- Amount of the funds

b) Financial Information about the project implemented by beneficiary

- Number of employed labour force
- Area of the land used
- Amount of the subsidy spent
- Financial indicators of the project at the end of a 6th month:
    - Cash
    - Liabilities (Short-term and Long-term)
    - Asset values
    - Gross Profit Margin
    - Net Profit Margin
    - Current Ratio
    - Leverage
    - Return on Assets (ROA)

Some of the information needs to be filled by the beneficiary, but most of the ratios will be calculated automatically using an excel sheet. All this information will lead to the preparation of an informative report, based on which efficiency the subsidies can be analyzed and most/least successful programmes can be determined in terms of financial evaluation.

Socio-economic evaluation: For the programme to be considered successful from a socio-economic point of view, it should meet two main criteria:

a) Number of beneficiaries. As many beneficiaries as possible is the most important aim of every subsidy from a socio-economic point of view. Every state funded social program is oriented to cover all the niche population it aims.
b) Funds spent per beneficiary. When a state institution provides the socio-economic subsidy, it is difficult to maintain a golden ratio between the number of beneficiaries and the funds spent per beneficiary. As the number of the beneficiaries grows, funds per beneficiary decreases.

To find the golden ratio, weighted numbers must be calculated. The methodology is given in the second report.

Land price: Every successful business affects the commercial price of the land. It creates / increases demand for real estate and raises confidence of the business activity in the area from the investors' perspective. The land price and the increased percentage of this criteria gives reliable information about how successful the business is. Apart from that, it can be used to partially evaluate how wary the beneficiary business is in terms of damaging nature. For example, more pollution means less increase in terms of land prices. Annual land price evaluation in areas where RDA subsidies were implemented, will give reliable evaluation criteria in terms of how successful is the beneficiary business.

4 Estimated Costs of Recommended Biodiversity Monitoring for Farmland Subsidized by RDA Programs

4.1 Selection of Agricultural Subsidies for Pilot Implementation of Biodiversity Monitoring

It is recommended to design monitoring program / system for biodiversity impacts resulting from agricultural subsidies using the biodiversity indicators proposed for RDA programs (Table 3-6, Section 3.3). The previous report on Identification of Potential Negative Impacts to Biodiversity and Its Components by Agricultural Subsidies showed that Preferential Agrocredit, State Program "Plant the Future", DIMMA, AMMAR and State Programme for Supporting Agricultural Production are top five in terms of harmful impacts on biodiversity based on available data and an array of statistical analysis methods applied. These subsidy programs include a number of components with different potential for harmful biodiversity impacts. Analysis contained in the second report indicates that most severe biodiversity impacts are associated with the subsidy components providing co-funding for establishment of new annual and perennial crop plantations and setup / rehabilitation / expansion of livestock and dairy farms. Consequently, such components of the five most biodiversity harmful subsidies should be the targets for pilot monitoring.

4.2 Selection Criteria for Farmland Monitoring

The monitoring scheme proposed in this report is based on systematic sampling of target farmlands.

At the initial stage it is recommended to review data on subsidized farmlands to define sampling pools on farmland types such as:

- Crop plantations
  - Annual crops
  - Perennial crops
    - Orchards
    - Berries
  - Vineyards
- Dairy and livestock farms
  - 'Vulnerable'[27] farmer – stock of 1-5 milking cows
  - 'Progressive' farmer – stock of 6 – 20 milking cows.

The data on beneficiaries' farmland available for this report is of different level of detalization (e.g., data for Preferential Agrocredit, AMMAR and State Programme for Supporting Agricultural Production do not contain information on number of agreements per year by subsidy component). Hence, the most recent data of "Plant the Future' and DIMMA were used to determine types and numbers of farms to be considered for monitoring (Table 4-1). A standard 5% sampling size per subsidized region is recommended to determine number of the monitoring target farmlands. Taking into consideration limited financial resources, minimum and maximum sampling thresholds are proposed. Minimum threshold (minimum farmland number) is defined as 1 and maximum (maximum farmland number) – 50 per harmful component of the subsidy.

Table 4-1 Summary Information on Farmland Types and Numbers to Be Monitored

Subsidy	Farmland Type	Subsidized Farmland Number / 2020	Standard Sampling Number for Monitoring (5%)
Plant the Future	Orchards	551	28

[27] Definition of livestock farmer follows DIMMA beneficiary types

Subsidy	Farmland Type	Subsidized Farmland Number / 2020	Standard Sampling Number for Monitoring (5%)
	Berry plantations	788	39
DIMMA	"Vulnerable' farms	8	1
	'Progressive' farms	140	7

At the next stage specific farms should be selected based on systematic and random selection methods:

1. Systematic selection of specific farms for monitoring:
    a. 50% of total number of monitored farms should be selected from those located in
        i. Partially located within designated protected area including Ramsar Site
        ii. Entirely and partially located in Emerald Network Site
        iii. Entirely or partially located within 1km off designated protected areas including Ramsar Site and Emerald network Sites
        iv. If none of the farms are located as described above, move to Item 1b.
    b. Farmland, which were subsidized by RDA programs in past with priority given to those subsidized twice or more times if any; if none identified, move to Item 2b.
2. Random selection of specific locations of:
    a. 50% of monitored farms to be determined using random sample number generation software
    b. If none identified in locations specified under Item 1, total number should be subject to random selection.

Farmland selection is to be conducted once the new beneficiaries are approved for the components of the subsidy programs providing funding for establishment of new annual and perennial crop plantations and setup / rehabilitation / expansion of livestock and dairy farms.

Monitoring using recommended indicators should be carried out in the same farms. However, some farms may be found in subsequent years to be subject to land use or profile change. A new farm with similar characteristics should be selected for the next monitoring session.

4.3 Methodology for Field Monitoring and Data Interpretation

The proposed monitoring using biodiversity indicators involve data collection for four indicator sets: (1) genetic diversity indicator set, (2) species indicator set, (3) habitat indicator set and (4) farm management indicator set. It is proposed that data required for the genetic diversity and farm management indicators be collected within the subsidy implementation monitoring framework carried out by the RDA representatives to minimize costs of activities requiring outsourcing.

Field surveys to collect data for species and habitat indicator sets should be initiated in the first mass vegetation / flowering season before or during subsidized agricultural activities.

Flower Colour Index (FCI) is a good indicator of vascular plant diversity and abundance in different communities; it also indirectly indicates the presence and relative abundance of insect pollinators. The advantage of FCI is that field data collection and processing takes limited time and could be carried out by farmers or their assistants without botanical skills with a time.

Flower colour is considered as a surrogate for plant species richness. For a standardised survey of the indicator, however, some basic prerequisites must be taken into such as natural variations in flowering times and flower longevity reveal strong latitudinal, altitudinal and temperature clines. The best time to survey the flower colours is at the vegetation peak, with shifts from May in lower altitude sites until August in higher altitude sites. Furthermore, to assess flower colour, a standardised colour key with the most common colours should be used to register flowers. The colours refer to the colours of the flower petals. Flower colour is assessed by counting the number of individual flowers per colour in a 4-m^2

survey plot, using three abundance classes (class 1: 1–5 individuals; class 2: 6–20 individuals; class 3:>20 individuals). To calculate the FCI, the three abundance classes were transformed into metric values by dividing the mean number of flowers per abundance class through an assumed maximum of 50 individuals per colour. Hence, abundance class 1 (1–5 individuals, mean number of flours: 2.5) received the value of 0.06, class 2 the value of 1.26, and class 3 the value of 1.7. The FCI for a patch was then calculated by summing up the abundance values of all colours. An example of field data collection form is given in Table 4-2.

Table 4-2 Field Datasheet Form for FCI

Flower colour	Flowers (n)			
	0	1-5	6-20	>20
White				
Yellow				
Orange				
Pink				
Red				
Violet				
Blue				

There is a tight relationship between flowers and their pollinators, and the diversity of flower colours can be used to assess the diversity of their pollinators: for instance, bees are attracted to bright blue and violet colours. Other dipterans can prefer red, pink, fuchsia, or purple flowers. Butterflies enjoy bright colours such as yellow, orange, and pink. The key of colour richness evaluation above allows for estimation of pollinator richness simply by summing the flower colour scores. Then, the high score in flower colours will mean a high pollinator diversity[28].

Floristic Quality Index (FQI) is an effective tool to identify trends in plant communities as the increased abundance of invasive species and gradual elimination of natives clearly indicates the decline of a given plant community reflected in lower values of FQI. Field data collection and analysis requires involvement of qualified botanist; however, it is assumed that the field work and data processing is completed in limited time period.

FQI has been used specifically for assessment of conservation value of communities. This index is a standardized tool for natural area assessment developed by Swink and Wilhelm[29]. Since 1994, this index has been widely used to assess floristic quality of natural and semi-natural habitats[30,31,32]. To calculate the FQI, coefficient of conservatism (C values - 0 to 10) have been assigned to each taxon (a group of organisms of any taxonomic rank) of the flora recorded in permanent plots. General categories for species assignments consist of the following:

C 0-1: Taxa that are adapted to severe disturbance, particularly anthropogenic. Disturbance occurs so frequently that often only brief periods are available for growth and reproduction. Generally considered ruderal species/opportunistic invaders.

C 2-3: Taxa within this category are associated with more stable, though degraded habitat. Generally

[28] De Jager, M.L., Dreyer, L.L. and Ellis, A.G., 2011. Do pollinators influence the assembly of flower colours within plant communities?. Ebeling, A., Klein, A.M., Schumacher, J., Weisser, W.W. and Tscharntke, T., 2008. How does plant richness affect pollinator richness and temporal stability of flower visits?.

[29] Swink, F. and Wilhelm. G. 1994. Plants of the Chicago Region, 4th ed., Indiana Academy of Science,Indianapolis.

[30] Andreas, B. K., and Lichvar, R. W. 1995. Floristic index for establishing assessment standards: A case study for northern Ohio. Technical Report WRP-DE-8. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS, USA.

[31] Herman, K. D., L. A. Masters, M. R. Penskar, A. A. Reznicek, G. S. Wilhelm, and W. W. Brodowicz. 1997.Floristic quality assessment: Development and application in the state of Michigan (USA). Natural Areas Journal 17:265-279.

[32] Wilhelm, G. S., and D. M. Ladd. 1988. Natural area assessment in the Chicago region. Transactions of the 3rd North American Wildlife and Natural Resource Conference. 3:361-375.

considered ruderal-competitive species, found in a variety of habitats.

C 4-6: Taxa that have a high consistency of occurrence within a given community type and will include many dominant or matrix species for several habitats. Species will persist under moderate disturbance.

C 7-8: Taxa associated mostly with natural areas but can persist where the habitat has been somewhat degraded. Increases in the intensity or frequency of disturbance may result in reduction in population size, or; taxa may be subject to local extirpation.
C 9-10: Taxa exhibiting a high degree of fidelity to a narrow range of synecological parameters. Species within this category are restricted to relatively intact natural areas.

By applying the C values to a plant species list compiled for each plot, a mean C value (C) has been calculated by summing the C values for each species present in the survey and dividing the summation by the total number of species present (N):

$$\overline{C} = \frac{\Sigma C}{N}$$

Thus, $\overline{C}$ represents the average conservatism of the plant community. FQI is obtained by multiplying $\overline{C}$ by the square root of the number of native species present (N):

$$FQI = \overline{C}\sqrt{N}$$

For the field data collection, a 4-m^2 permanent plot is established to carry out inventory of all species of vascular plants within the quadrat. Only presence of each species is recorded.

FQI indicates the ratio between invasive and native species in the sampled community. Higher the FQI value, higher is the number of native plants in the sampled plot as they are assigned higher coefficient of conservatism. Simple comparison of FQI values over the years of monitoring shows trends in plant community.[33]

Data on habitat richness (number and area of each habitat identified) will be collected in the following broad habitats within the farmland:

1. Cropland
    a. Monocrop plantation: crop breed / cultivar variety and area based on visual estimation and information provided by farmer
    b. Mixed plantation: crop breed / cultivar variety and area per breed / variety based on visual estimation and information provided by farmer
2. Semi-natural grassland:
    a. without trees / shrubs - area based on visual estimation and information provided by farmer
    b. with trees / shrubs - area based on visual estimation and information provided by farmer
3. Aquatic / wetland / riparian habitats - area based on visual estimation and information provided by farmer.

The collected data on cropland will be compared over the years of monitoring – a shift towards mixed plantation is regarded as a positive trend in terms of biodiversity.

Semi-natural habitat richness data collected over the years of monitoring will indicate the following:

- Retention of the originally documented status (baseline) – neutral to positive trend
- Increase in habitat diversity and / or area of occupancy – positive trend
- Reduction in habitat types and / or extent – negative trend.

[33] Rooney, T.P. and Rogers, D.A., 2002. The modified floristic quality index

It is recommended to carry out monitoring surveys using species and habitat level indicator sets in two follow-up rounds after the baseline data collection (1st year): (1) third year and (2) fifth year. This will provide sufficient data to evaluate biodiversity impacts from subsidies to inform decision-making on subsidy removal, reform and / or continuation.

As a rule of thumb, a sharp decline in the index values (e.g., >20%) is a clear alarming signal indicating a strong impact on the biodiversity of the given habitats. The decline <5% can be natural variation, however, if repeatedly observed after a second survey, the correct assessment and designing mitigation measures might require additional observations (e.g., long-term monitoring on regular basis).

Monitoring at genetic and farm management level is to be carried out at frequencies determined by the RDA, ideally on an annual basis or once in two years as a minimum.

It is recommended to implement a program for early detection and rapid response to invasive plant species. This program should be developed in close cooperation between different units of the MEPA - RDA, Biodiversity and Forestry Department and Agency of Protected Areas and scientific community (Institute of Botany, Ilia State University, National Botanical Garden of Georgia, Batumi Botanical Garden, etc.).

At the initial stage Black Lists of Worst Invasive Plants should be compiled by regions. The Black Lists will include non-technical descriptions of target invasive species accompanied by plant images in different phenological phases (vegetative: stems and leaves; flowering: flowers and inflorescences and fruiting: fruits and seeds) to assist non-botanists in easy identification. In addition, a list of contact scientific institutions by regions will be compiled; these institutions will assist in identification of invasive plant species and development of respective control measures, if required.

Regional Black Lists are likely to include up to twenty species maximum. These lists should be provided to all farmers subsidized by RDA. If suspected invasive plant is found by a farmer, electronic image and specimen should be provided to regional / municipal RDA representatives who will contact relevant scientific institution for consultation.

4.4 Estimated Costs for Species and Habitat Indicator Sets

Field monitoring team will be composed of expert, assistant and driver; rental of off-road vehicle is recommended as farmlands may be located in areas with difficult access.

The following assumptions have been made to estimate total costs:

1. Data collection per farmland will require 2 days on average including travel
2. Data collection at 50% of all monitored farmland will require overnight stay.

Estimated costs for initiation of monitoring using biodiversity indicators (baseline data collection only) are given based on 2020 data of the State program 'Plant the Future' and DIMMA (Table 4-3). Table 4-4 provides indicative costs for the same activity based on maximum number of farms to be sampled (50 in total).

Table 4-3 Estimated Costs for Baseline data Collection, 'Plant the Future'

Fieldwork based on sampling 67 farmlands (28 orchards and 39 berry plantations)			
Personnel	**Gross Rate[34], Gel/day**	**Number of Days**	**Gross Costs, Gel**
Botanist	190	134	25,460
Assistant	65	134	8,710
Driver	60	134	8,040
Vehicle including fuel	375	134	50,250

[34] Rates are based on minimum market rates by May, 2022

Accommodation (3 personnel)	80	67	16,080
Per Diem (3 personnel)	15	134	6,030
Subtotal 1 (fieldwork)			**114,570**
Data Interpretation - 1st Year			
Personnel	**Cost, Gel/day**	**Number of Days**	**Costs, Gel**
Botanist	190	67	12,730
GIS specialist	150	20	3,000
Subtotal 2 (desktop)			**15,730**
Total for Baseline data collection			**130,300**

Table 4-4 Estimated Costs for Baseline data Collection, DIMMA

Fieldwork based on sampling 8 farmlands (1 'vulnerable' farm and 7 'progressive' farms)			
Personnel	**Gross Cost, Gel/day**	**Number of Days**	**Gross Costs, Gel**
Botanist	190	16	3,040
Assistant	65	16	1,040
Driver	60	16	960
Vehicle including fuel	375	16	6,000
Accommodation (3 personnel)	80	8	1,920
Per Diem (3 personnel)	15	16	720
Subtotal 1 (fieldwork)			**13,680**
Data Interpretation - 1st Year			
Personnel	**Cost, Gel/day**	**Number of Days**	**Costs, Gel**
Botanist	190	10	1,900
GIS specialist	150	5	750
Subtotal 2 (desktop)			**2,650**
Total for Baseline data collection			**16,330**

Table 4-5 Estimated Costs for Baseline data Collection, Maximum Number of Farms to be Sampled

Fieldwork based on sampling 50 farmlands			
Personnel	**Gross Cost, Gel/day**	**Number of Days**	**Gross Costs, Gel**
Botanist	190	100	19,000
Assistant	65	100	6,500
Driver	60	100	6,000
Vehicle including fuel	375	100	37,500
Accommodation (3 personnel)	80	50	12,000
Per Diem (3 personnel)	15	100	4,500
Subtotal 1 (fieldwork)			**85,500**
Data Interpretation - 1st Year			
Personnel	**Cost, Gel/day**	**Number of Days**	**Costs, Gel**
Botanist	190	50	9,500
GIS specialist	150	17	2,550
Subtotal 2 (desktop)			**12,050**
Total for Baseline data collection			**97,550**

5 Conclusions

Main conclusions and recommendations based on review of biodiversity-related commitments in Georgian agricultural sector, best practices in incorporation of biodiversity considerations into agriculture and rural development programs and monitoring approaches applied in developed countries to track and mitigate negative impacts on biodiversity associated with agricultural subsidies can be summarized as follows:

- Current biodiversity-related objectives and indicators in agricultural sector of Georgia take account of globally acknowledged prime drivers for biodiversity loss associated with agriculture only on minor scale. Three measurable targets have been proposed to facilitate consideration of biodiversity issues into the agricultural sector development process. The proposed targets are aligned with the European Green Deal (Georgia has committed to ensure an agriculture and rural development in compliance with the EU policy and best practices under the Association Agreement with the EU) and NBMS indicators.
- Proposed reallocation of a sizeable percentage of funding for establishment of plantations and livestock and dairy farms (up to 20%) to organic farming to address absence of incentives to promote organic farming – primary agricultural production recognized as the least biodiversity harmful activity.
- Proposed introduction of limiting eligibility criteria into all agricultural subsidies aimed at reduction of adverse impacts associated with agricultural intensification / extensification such as:
    - No funding granted to land parcels located in designated protected areas and Ramsar sites (e.g., thirteen land parcels subsidized under the orchard and damaged sapling replacement components of “Plant the Future” program in 2018-2020 are partially located in four managed reserves: Ajameti, Korughi, Iori and Gardabani based on GIS analysis of locations of subsidized land parcels relative to borders of protected areas) from 2023.
    - Funding to be granted only to organic farming for land parcels located in Emerald Network sites and / or within 1km of designated protected areas, Ramsar and Emerald Network sites from 2023.
    - Obligatory participation of subsidized farmers with land parcels located in Emerald Network sites and / or within 1km of designated protected areas, Ramsar and Emerald Network sites in early detection of and rapid response to invasive plant species from 2024. Setup of this framework can be linked to the implementation of NBMS indicator P9 – Change of the Spread of invasive species.
- Use of proposed Biodiversity Checklist during the subsidy application review process, which will reduce impacts on biodiversity via:
    - Disqualification of applicants carrying out agricultural activities in land parcels located within designated protected areas including Ramsar sites.
    - Granting subsidies to only organic farming for land parcels located in Emerald Network sites and / or within 1km of designated protected areas and Emerald sites provided applicants confirm participation in early detection of and rapid response to invasive plant species.
- Introduction of a new condition requesting provision of data on estimated water, pesticide and fertiliser use during the application process for all subsidies. It is proposed to develop an online platform to facilitate data collection and analysis on water, pesticide and fertiliser use. This platform may also be used for data exchange and sharing between RDA, SRCA, regional services and farmers. This platform could also incorporate module for application upload in database format to allow subsequent analysis. This will assist in evaluation of biodiversity impacts associated with agricultural subsidies, tracking achievement of proposed measurable targets for agricultural and rural development in Georgia and the NBMS indicators.
- Implementation of the above recommendations to be initiated for the top five biodiversity harmful subsidy programs identified in the second deliverable - Identification of Potential Negative Impacts to Biodiversity and Its Components by Agricultural Subsidies. These programs are: (1) Preferential Agrocredit, (2) State Program “Plant the Future”, (3) Dairy Modernization and Market Access State Program (DIMMA), (4) Agriculture Modernization, Market Access and Resilience Project (AMMAR) and (5) State Programme for Supporting Agricultural Production.
- Introduction of new proposed subsidy – Bio Farming / Agroproduction Support to incentivize pro-biodiversity agricultural practices and bio certification.
- Implementation of monitoring impacts on biodiversity using proposed biodiversity indicators (15 in total grouped into four sets covering genetic, species, habitat and farm management levels) for crop plantation and livestock and dairy farm components of the top five biodiversity harmful agricultural subsidy programs (see the previous bullet point). The initial stage of the monitoring is collection of baseline data for subsequent monitoring.
    - Selection of farmlands to be sampled - standard 5% sampling size with minimum (1) and

maximum (50) thresholds is recommended to determine number of the farmlands to be monitored.

  - 50% of total sampling number to be selected from land parcels (1) partially located within designated protected area including Ramsar Site, (2) entirely and / or partially located in Emerald Network Site, (3) entirely or partially located within 1km off designated protected areas including Ramsar Site and Emerald network Sites.
  - If none found in the above group, all monitored farms to be determined using random sample number generation software.
  - Priority be given to farmlands subsidized by RDA programs in past.

- Data collection for genetic and farm management level indicators is recommended to be carried out by RDA representatives within the subsidy implementation monitoring framework.
- Data collection for species and habitat level indicators to be conducted by experts.
- Proposed monitoring surveys using species and habitat level indicator sets are to be carried out in two follow-up rounds after the baseline data collection (1st year): (1) third year and (2) fifth year. This will provide sufficient data to evaluate biodiversity impacts from subsidies to inform decision-making on subsidy removal, reform and / or continuation.
- Costs related to baseline data collection for species and habitat level indicators have been estimated for State Program 'Plant the Future (130,300 GEL), DIMMA (16,330 GEL) and maximum number of farms per component of agricultural subsidy (50) to be sampled (97,550 GEL).
- Proposed implementation of evaluation of socio-economic efficiency of agricultural subsidies via collection and analysis of key socio-economic data. Agricultural subsidies identified as inefficient in socio-economic terms (high costs, low profit margin, low employment, etc.) and substantial adverse impacts on biodiversity should be subject to reform and / or elimination if reform is not feasible.

Appendix 1 – Proposed Revised Application Form, Orchard Component, State Program "Plant the Future"

To be completed by RDA

Application Registration Number:	
Submission Date:	

Please review this application to Program "Plant the Future" and allocate the co-funding.

1. General Information

1.1. Name, surname of the applicant:	
1.2. Id personal number:	
1.3. Mobile phone number:	
1.4. Additional phone number:	
1.5. E-mail address:	
1.6. Applicant status:	☐ Legal person / company ☐ Physical person ☐ Individual entrepreneur
1.7. Name, surname of potential beneficiary:	
1.8. Id personal number of potential beneficiary:	
1.9. Address of potential beneficiary:	

2. Information on legal person / company

2.1. Company name:	
2.2. Legal form:	
2.3. Identification number:	
2.4. Head / representative:	
2.5. Contact phone number:	
2.6. Company legal address:	
2.7. Company physical address:	
2.8. Comments:	

3. Information on land parcel:

3.1. Municipality:	
3.2. Address:	
3.3. Cadaster code:	
3.4. Total area (ha):	
3.5. Is land parcel fenced:	☐- yes ☐ - no
3.6. Ownership form:	☐property ☐ - lease
3.7. Land lease start and end dates: (fill in in case of land lease only)	
3.8. Landholder: (fill in in case of land lease only)	
3.9. Last crop cultivated on land parcel:	
3.10. Water supply availability:	☐- yes ☐ - no
3.10.1. Distance of land parcel to water source:	☐- 0 – 20 m ☐- 20 - 200 m ☐- 200 – 500 m
3.10.2. Do you plan to setup well / borehole / pump station?	☐- yes ☐ - no
3.10.3. Water source type:	☐- stream/river/pond ☐- lake including wetland **NB. Applicants planning to use lake including wetlands as water source are not eligible. Applicants are encouraged to substitute lake use by other alternative.**
3.11 Distance to the nearest protected area (including Ramsar Sites)	☐- within ☐- < 1 km ☐- > 1 km **NB. Applications for land parcels located within protected areas are not eligible.** **Only applications for organic farming are eligible for land parcels located less than 1km from protected areas provided applicant confirms participation in early detection of and rapid response to invasive plant species.** **I, undersigned, confirm that I will participate in the program of early detection and rapid response to invasive plant species.** **Signature:** **Name, surname:** **Date:** **No additional pre-requisites apply to applications for land parcels located more than 1km from protected areas**
3.12 Distance to the nearest Emerald site	☐- within ☐- < 1 km ☐- > 1 km **NB. Applications for land parcels located within or less than 1km from Emerald Sites:** **Only applications for organic farming are eligible provided applicant confirms participation in early detection of and rapid response to invasive plant species.** **I, undersigned, confirm that I will participate in the program of early detection and rapid response to invasive plant species.** **Signature:** **Name, surname:** **Date:**

4. Information on planned orchard:

4.1 Planned orchard area (ha):			
4.2 Orchard type:	☐- intensive	☐- semi-intensive	
4.3 How many perennial crop varieties are to be planted:	☐- 1 ☐- 2	☐- 3 – 5 ☐- >5	
4.4 Perennial crop varieties to be planted: Tick perennial crop variety in relevant entry and indicate area in ha and number of saplings (please indicate saplings number in figures and words)	Perennial crop variety	Area ha	Number of saplings:
	☐ - peach		
	☐ - plum		
	☐ - sweet cherry		
	☐ - sour cherry		
	☐ - apricot		
	☐ - wild plum		
	☐ - cornelian cherry		
	☐ - olive		
	☐ - currant		
	☐ - gooseberry		
	☐ - raspberry		
	☐ - blackberry		
	☐ - blueberry		
	☐ - persimmon		
	☐ - kiwi		
	☐ - feijoa		

	☐ - pomegranate		
	☐ - lemon		
	☐ - orange		
	☐ - tangerine		
	☐ - fig		
	☐ - pear		
	☐ - quince		
	☐ - apple		
	☐ - hazel		
	☐ - walnut		
	☐ - almond		
	☐ - pistachio		
	☐ - grafted pistachio		
	☐ - grape		
	☐ - wine grape (white)		
	☐ - wine grape (red)		
	☐ - bay laurel		
	☐ - other		
4.5 Planned period of orchard setup (season):	☐ - 20_spring; ☐ - 20 fall		
4.6 Pesticide use:	☐- yes☐ - no If yes, fill in 4.6.1 – 4.6.4		
4.6.1 Pesticide type	☐- Insecticide ☐- herbicide ☐- fungicide ☐- rodenticide ☐- other		
4.6.2. Estimated volume:	_kg _litres		
4.6.3. Intended area of use:	_m^2		
4.6.4 Number of applications per year and throughout subsidy period	_per year _subsidy period		
4.7 Fertilizer use:	☐- yes☐ - no If yes, fill in 4.7.1 – 4.7.4		
4.7.1 Fertilizer type:	☐- inorganic ☐- organic ☐- both		

4.7.2. Estimated volume:	_kg _litres
4.7.3. Intended area of use:	_m^2
4.7.4 Number of applications per year and throughout subsidy period	_per year _subsidy period
4.8 Water use:	☐- irrigation ☐ - other (specify)
4.8.1 Estimated water use volume:	_m^3 per year _m^3 for subsidy period
4.8.2 Area to be irrigated:	_m^2 per year _m^2 for subsidy period
4.8.3 Irrigation frequency:	_number per year _number for subsidy period

5. Information on investment costs: 5.1. Procurement of saplings

Perennial crop variety	Sapling type	Unit price (in invoice currency)	Number	Total costs (in invoice currency)
5.1.1.				
5.1.2.				
5.1.3.				
5.1.4.				

5.1.5.				
5.1.6.				
5.1.7.				
5.1.8.				
5.1.9.				
5.1.10.				
		Total:		

5.2. Information on sapling provider:

Name of sapling provider company	Country	Perennial crop variety	Number	Cost
5.2.1.				
5.2.2.				
5.2.3.				
		Total:		

5.3. Other project purpose:

Product / activity	Company name	Total cost (Lari)
5.3.1.		
5.3.2.		
5.3.3.		
5.3.4.		
5.3.5.		
	Total:	

6. Appendices:

Appendix	Number of Pages
☐ Extract from Registry of Entrepreneurs (if legal person)	
☐ Registration confirmation document (if cooperative)	
☐ Copy of Id	
☐ Reference issued by LEPL Scientific-research Centre of Agriculture on suitability and adequacy of land parcel soil for all perennial crop varieties listed in this application	
☐ Land ownership confirmation document (extract from Public Registry and cadaster map). In case of land lease, lease agreement to be provided as well.	
☐ Reference on land parcel soil cultivation issued by regional service of agricultural project management agency of relevant municipality	
☐ Invoice and / or agreement on procurement of saplings	
☐ Invoices and / or agreement on procurement of watering system (drip irrigation, sprinkler irrigation)	
☐ Reference on quality of saplings / qualification of beneficiary's nursery issued by LEPL Scientific-research Centre of Agriculture if saplings provided by potential beneficiary	
☐ Beneficiary's bank details	
Total number of pages:	

Signature /---------- /

Date / -- / / -- / ----------

DD / MM / Year