Experience in the calculation of SDG 2.3.1 and SDG 2.3.2 in Georgia using the Survey of Agricultural Holdings*

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Abstract

This paper reviews the experience of calculating of Target 2.3's indicators in Georgia. In December 2021 the National Statistics Office of Georgia (Geostat), for the first time, published SDG 2.3.1- Production Volume of Agricultural Holdings per Labour Day, by Holding Size and Gender of Holder (GEL/labour day) and SDG 2.3.2- Average Annual Income of Agricultural Holdings, by Holding Size and Gender of Holder (GEL). These indicators will play an important role for country to measure agricultural productivity and incomes of small-scale food producers, in particular by gender. Data is published according to the AGRIS (Agricultural Integrated Surveys) program methodological Guidelines calendar, every third reporting year.

Aiming to calculate those indicators Geostat implemented labour and economy module to the Survey of Agricultural Holdings, which is conducted on quarterly bases. At the first stage, the data collected through existing questionnaires were evaluated. The evaluation showed that the main questions from the economy module were already contained in the questionnaire, and only a small part had to be added. A supplementary work was done to add new questions from labour module. Geostat gave this opportunity AGRIS (Agricultural Integrated Surveys) program, to enable it to collect data for agriculture-related SDG indicators 2.3.1 and 2.3.2.

SDG indicator 2.3.1 is to be disaggregated by holding size while SDG indicator 2.3.2 is calculated only for small-scale food producers. Therefore, it is important to determine small-scale producers. In order to calculate small holdings, Geostat is determined by the following three criteria- land area, the total number of livestock, and the total cost of agricultural holding production (output). The holding is small if these three parameters fall into the lower 40 percent

of the cumulative distribution. In other cases, the holding is considered to be a medium or large holding.

This paper describes methodologically all the steps that were necessary to calculate the SDG 2.3.2 indicators.

Keywords: SDG, agricultural statistics, Georgia, survey, AGRIS.

1. Introduction

The National Statistics Office of Georgia (Geostat) is a legal entity of public law responsible for producing and disseminating official statistics in accordance with national legislation. The statistical system in Georgia is centralized, with Geostat serving as the coordinating body.

In this role, Geostat ensures coordination among official statistics producers, develops and promotes statistical standards and methodologies, facilitates data exchange between administrative bodies, and supports the implementation of internationally agreed statistical principles. The production of official statistics is guided by the United Nations Fundamental Principles of Official Statistics. Geostat is also responsible for conducting population, housing, and agricultural censuses. The government places significant emphasis on increasing investment aimed at improving agricultural output and productivity. At the same time, the demand for agricultural statistics is continuously growing, requiring Geostat to respond effectively to user needs.

Although the share of agriculture, forestry, and fishing in GDP has declined over time, the sector remains important. According to recent data, agriculture accounted for approximately 6.2% of GDP in 2024, continuing a downward trend from 6.9% in 2023 and higher levels in earlier years. Despite the relatively modest contribution to GDP, agriculture still plays a crucial socio-economic role, particularly in rural areas. Agriculture has always been one of the important sectors of Georgian economy. 43.2% of employees in Georgia were employed in this sector. The share of rural population is 42.8% according to the Population Census 2014.

Almost every household living in villages is an agricultural holding. According to the Census of Agriculture 2014, total number of agricultural holdings is around 642 thousand, out of them only 0.3% is legal entity while other is household. Majority of agricultural holdings are small and they produce agricultural products mainly for own consumption.

Georgia has favorable geographical location and climate, which allows to produce more than 25 kinds of permanent and more than 20 kinds of annual crops. Also, animal husbandry

is quite common in the agriculture of Georgia. In Georgia the agricultural sector is not well-specialized and majority of holdings produce many different kinds of agricultural products.

The calculation of agricultural productivity, income of small-scale food producers, and the gender dimension is of critical importance for Georgia, as these indicators provide a comprehensive assessment of the performance and inclusiveness of the agricultural sector. Agricultural productivity reflects the efficiency of resource use and is essential for improving food security, reducing dependence on imports, and supporting overall economic growth. At the same time, measuring the income of small-scale producers is particularly relevant in the Georgian context, where agriculture is largely dominated by small family holdings; this indicator allows for the evaluation of rural livelihoods, poverty levels, and the effectiveness of agricultural support policies. Furthermore, incorporating the gender dimension is crucial for identifying disparities between male and female holders in terms of access to resources, productivity, and income. Such analysis highlights structural inequalities and supports the development of targeted, evidence-based policies aimed at promoting gender equality and inclusive rural development. Taken together, these three components provide a holistic framework for monitoring progress toward sustainable agricultural development and achieving the objectives of SDG Target 2.3 in Georgia.

Although both SDG indicators 2.3.1 and 2.3.2 were produced by Geostat, this paper focuses on the methodological framework and implementation of SDG 2.3.2, which measures the average income of small-scale food producers.

2.Data Source: Survey of Agricultural Holdings

This paper presents Georgia's experience in calculating SDG indicator 2.3.2 using the Survey of Agricultural Holdings in Georgia. This Survey is main source of agricultural statistics in Georgia is the survey of agricultural holdings which dates back to 2007 by collecting data from 2006; The Agricultural Census 2014 serves as the primary source for constructing the sample frame of the Survey of Agricultural Holdings. The survey is based on a sample of approximately 12,000 agricultural holdings, selected from a total population of about 642,000 holdings operating in Georgia, using a two-stage stratified cluster random sampling design. At the first stage, clusters (settlements) are selected, while at the second stage, agricultural holdings are sampled within the selected clusters.

The survey covers the entire territory of Georgia, with the exception of the occupied territories of the Autonomous Republic of Abkhazia and the Tskhinvali region. The same

agricultural holdings are interviewed repeatedly over five survey rounds. The survey is conducted on a quarterly basis, with data collected through four rounds of interviews each year. However, the sample follows a rotational design. Specifically, each year approximately 4,000 of the 12,000 holdings are replaced with new ones, ensuring both continuity and representativeness. As a result, each sampled holding remains in the survey for three consecutive years. In addition, large agricultural holdings are included in the sample every year with full (complete) coverage.

The statistical unit of the survey is an agricultural holding (family holdings and agricultural enterprises) - economic unit of agricultural production under single management comprising all livestock kept and all land used wholly or partly for agricultural production purposes, without regard to title, legal form or size in which agricultural activities are conducted by the supervision of a holder (in case of households - a member of household, in case of agricultural enterprises - director or authorized person), who is responsible for making decisions and takes all economic risks and expenses related to agricultural activities.

The survey database consists of 11 datasets covering different thematic areas. The naming of the datasets follows the structure of the survey questionnaire and reflects their respective content:

- part_1_ag_holdings – general information on agricultural holdings;
- part_2_2_parcels – land use of agricultural parcels;
- part_2_6a_crop_prod_and_use – crop production and its utilization;
- part_2_6b_secondary_prod_for_animal_feed – secondary products used for animal feed;
- part_2_7_hay_prod_and_use – hay production (both on- holding and off-holding) and its utilization;
- part_3_1_fertilizers – use of fertilizers in agricultural holdings;
- part_3_2_pesticides – use of pesticides in agricultural holdings;
- part_3_3_manure – use of manure in agricultural holdings;
- part_4_1_livestock – livestock production;
- part_4_2a_livestock_primary_prod – primary livestock products and their utilization;
- part_6_1_cost_of_production – economic information on agricultural holdings.
- Part 7 – Information on labour employed in family holdings;
- Part 8 – Information on labour employed in agricultural enterprises;

- Part 9 – Other sources of income.

In total, the database comprises more than 250 variables that describe various aspects of agricultural activity.

Within the framework of the AGRIS implementation, additional survey components were introduced to enhance the analytical scope of the Survey of Agricultural Holdings. In particular, the some parts of Economy module and the full part of Labour module were incorporated into the survey in 2021. The addition of the Economy and Labour modules significantly expanded the survey's capacity by enabling the collection of detailed data on production costs, revenues, and labour inputs. This development allows for more comprehensive analysis of agricultural productivity, income, and labour dynamics, aligning the survey more closely with international standards and supporting the calculation of key indicators, including those under SDG Target 2.3.

3. Definition of Small-Scale Food Producers

A composite approach will be used to determine the size of agricultural holdings, as the Georgian Agricultural Survey databases consist of many indicators and, taken together, they will create a meaningful economic picture when determining size.

The FAO methodology, which was introduced to calculate the average income of small-scale food producers based on the UN Sustainable Development Goals indicators, will be used to determine holding size for the agricultural survey, and it will be calculated as annual income.

Holding size is determined by the following three main criteria:

I. Land area - a holding is small in terms of land area if it falls in the bottom 40 percent of the cumulative land area distribution;

II. Total livestock (converted to livestock index -LI) - a holding is small in terms of livestock if it falls in the bottom 40 percent of the cumulative livestock index (LI) distribution;

III. Total output (production) - a holding is small in terms of economic size if it falls in the bottom 40 percent of the cumulative distribution of total output.

A holding is classified as small if it is small in terms of all three criteria: output, land area and total livestock - LI. Otherwise, the holding is considered medium or large.

3.1 Definition of a small agricultural holding based on land area.

For each i-th holding, the total area of utilized agricultural land L_i should be calculated as the sum of all land areas. The data should be sorted in ascending order according to L_i for

the i-th holdings. Each i-th holding should then be assigned a weighted value of utilized agricultural land by multiplying it by the sampling weight of the holding, i.e., $L_i W_i$, where W_i is the sampling weight of the i-th holding.

The cumulative relative frequencies of the weighted values of utilized agricultural land should be assigned to each i-th holding.

$$LW\_cum_i = \frac{\sum_{j=1}^{i} L_j W_j}{\sum_{j=1}^{N} L_j W_j}$$

Where N is the number of holdings in the survey.

Let us calculate the 40th percentile of utilized agricultural land. The 40th percentile is the value of land area at which the cumulative relative frequency reaches 0.4. In other words, L_k is the 40th percentile if $LW\_cum_{k-1} < 0.4$ and $LW\_cum_k \geq 0.4$.

An i-th holding is classified as small in terms of land area if its total utilized agricultural land area does not exceed the 40th percentile, i.e., if $L_i < L_k$.

3.2 Definition of a small agricultural holding based on livestock numbers.

The identification of small holdings based on livestock is carried out using the so-called livestock index (LI). To calculate the livestock index, the number of animals of each livestock species in a holding is converted into livestock conditional units (LCU), and their total sum is computed.

For each i-th holding, the livestock index LI_i should be calculated based on the corresponding coefficients.

The data should be sorted in ascending order according to LI_i for the i-th holdings.

Each i-th holding should then be assigned a weighted value of the livestock index by multiplying it by the sampling weight of the holding, i.e., $LI_i W_i$, where W_i is the sampling weight of the i-th holding.

The cumulative relative frequencies of the weighted values of the livestock index should be assigned to each i-th holding.

$$LIW\_cum_i = \frac{\sum_{j=1}^{i} LI_j W_j}{\sum_{j=1}^{N} LI_j W_j}$$

Where N is the number of holdings in the survey.

Let us calculate the 40th percentile of the livestock index. The 40th percentile is the value of the livestock index at which the cumulative relative frequency reaches 0.4. In other words, LI_k is the 40th percentile if $LIW\_cum_{k-1} < 0.4$ and $LIW\_cum_k \geq 0.4$.

An i-th holding is classified as small in terms of livestock if its total livestock index does not exceed the 40th percentile, i.e., if $LI_i < LI_k$.

3.3 Definition of a small agricultural holding based on total output of the holding.

The volume of agricultural output produced during the year should be calculated from different parts, which are presented below in the form of five variables. For each i-th holding, five variables should be calculated:

$R_i(a) = \sum_i R_j(a)$ - total output of crop products.

$R_i(b) = \sum_i R_j(b)$ - total output of by-products (used as animal feed)

$R_i(t) = \sum_i R_j(t)$ - total hay production

$R_i l = \sum_i R_j(l)$ - total livestock production

$R_i(s) = \sum_i R_j(s)$ - total output of livestock products

For each i-th holding, total output R_i is calculated using the following formula:

$R_i = R_i(a) + R_i(b) + R_i(t) + R_i(l) + R_i(s)$ (1)

The data should be sorted in ascending order according to total output R_i for the i-th holdings.

Each i-th holding should then be assigned a weighted value of total output by multiplying it by the sampling weight of the holding, i.e., $R_i W_i$, where W_i is the sampling weight of the i-th holding.

The cumulative relative frequencies of the weighted values of total output should be assigned to each i-th holding.

$$RW\_cum_i = \frac{\sum_{j=1}^{i} R_j W_j}{\sum_{j=1}^{N} R_j W_j}$$

Where N is the number of holdings in the survey

Let us calculate the 40th percentile of total output. The 40th percentile is the level of total output at which the cumulative relative frequency reaches 0.4. In other words, R_k is the 40th percentile if $RW\_cum_{k-1} < 0.4$ and $RW\_cum_k \geq 0.4$.

An *i-th* holding is classified as small in terms of total output if its total output does not exceed the 40th percentile, i.e., if $R_i < R_k$.

3.4 Classification of Small-Scale Food Producers by Three Criteria

Using the described methodology, small agricultural holdings are identified based on data from the 2022 Agricultural Holdings Survey.

First, the 40th percentile of utilized agricultural land, livestock index and total output was calculated using the 2022 survey microdata.

- A holding is classified as small in terms of land use if its utilized agricultural land area does not exceed 0.91 ha.
- A holding is classified as small in terms of livestock if its total livestock index does not exceed 2.097.
- A holding is classified as small in terms of total output if its total output does not exceed 7 770.9 GEL.

According to the three criteria, a holding is classified as small only if it meets all three conditions simultaneously: total output, utilized agricultural land area, and livestock index. Otherwise, the holding is considered medium or large.

4.Calculation of SDG 2.3.2

4.1 Methodology for Calculating the Average income of Agricultural Holdings

To determine the profitability of agricultural holdings, we calculate the average income of holdings. For this purpose, both revenues and production costs must be taken into account, since pr income ofit is defined as the difference between revenues and costs.

For the Agricultural Holdings Survey, income will be calculated for the following activities: crop production and livestock production. Typically, costs also include depreciation expenses; however, since this information is not available, it cannot be taken into account.

The average income of holdings (AI – Average Income) is calculated using the following formula for i-th holding:

$$AI_i = \frac{\sum_{i=1}^{n}(R_i - C_i)W_i}{\sum_{i=1}^{n} W_i}$$

where:

R_i is the total output of the i-th holding during the year;

C_i is the total costs of the i-th holding during the year;

W_i is the sampling weight of the small i-th holding;

n is the number of small holdings.

Finally, the average income of small holdings is calculated using the following formula:

$$AI = \frac{R - C}{\sum_{i=1}^{n} W_i}$$

where:

R is the total output of holdings during the year;

C is the total costs of the holdings during the year;

W_i is the sampling weight of the small i-th holding;

n is the number of small holdings.

4.2 Calculation of the Average income of small Agricultural Holdings by Sex of holder

According to the 2022 Agricultural Holdings Survey results, the total output of holdings amounted to 1,554,691,147 GEL. In the same year, total costs were 498,041,230 GEL, while the number of holdings in 2022 was 419,842.

$$AI = \frac{1\,554\,691\,147 - 498\,041\,230}{419\,842} = 2\,516.8\ GEL$$

Average Annual income of Small Agricultural Holdings:

$$AI = \frac{448\,103\,286 - 142\,458\,022}{321\,320} = 951.2\ GEL$$

Average Annual income of Medium and Large Agricultural Holdings:

$$AI = \frac{1\,106\,587\,861 - 355\,583\,208}{98\,522} = 7\,622.7\ GEL$$

According to the results, the average income of small agricultural holdings is presented by the sex of the holding manager as follows:

- Male (GenderID = 1): the average income is 1 081.9 GEL
- Female (GenderID = 2): the average income is 735.0 GEL

According to the results, the average income of medium and large agricultural holdings is presented by the sex of the holding manager as follows:

- Male (GenderID = 1): the average income is 8,161.9 GEL
- Female (GenderID = 2): the average income is 5,590.4 GEL

The results obtained within the framework of the study on the average annual income of family agricultural holdings, by holding size and sex of the holding manager, are presented in Table:

Average Annual Income of family Agricultural Holdings, by Holding Size and Gender of Holder (2022,GEL)		
	Small holdings	Medium and large holdings
Male	1 081.9	8 161.9
Female	735.0	5 590.4
Total	**951.2**	**7 622.7**

5. Challenges and Lessons Learned

The implementation of the Agricultural Holdings Survey and the calculation of SDG-related indicators revealed several methodological and operational challenges.

One of the main challenges was the presence of data gaps prior to the implementation of AGRIS modules. In earlier stages, several key variables required for comprehensive analysis were either missing or not fully harmonized, limiting comparability across time.

Cost estimation also presented challenges, particularly in relation to indirect costs and the valuation of intermediate consumption. In addition, the absence of information on fixed capital consumption (depreciation) led to an underestimation of total production costs.

Respondent burden was another relevant issue, as the complexity and length of the questionnaire can affect data quality and response accuracy, especially in small family holdings.

From an institutional perspective, Geostat has gained important experience, improving methodological consistency, and strengthening the implementation of AGRIS modules, including labour and economic components. This has contributed to enhanced capacity in agricultural statistics production and SDG indicator measurement

6. Conclusion

This study demonstrates that Georgia has successfully implemented the calculation of SDG 2.3.2 indicator using data from the Agricultural Holdings Survey. The results provide a consistent and internationally comparable framework for assessing agricultural productivity and the economic performance of holdings.

The implementation of AGRIS modules played a crucial role in improving data availability, harmonization, and the overall quality of agricultural statistics. In particular, the

integration of labour and economic modules significantly enhanced the capacity to produce more detailed and policy-relevant indicators.

The resulting indicators are highly relevant for evidence-based policymaking, as they allow for better targeting of agricultural development policies, monitoring of structural changes in agriculture, and assessment of productivity differences across holding types.

Looking forward, further improvements are planned in several areas. These include increasing the frequency and timeliness of data collection, improving methodological approaches for cost and labour measurement, and strengthening gender-disaggregated analysis to better understand inequalities in agricultural productivity and income. Continued development of integrated statistical systems will further enhance the quality and usability of agricultural statistics in Georgia.

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