Comparison study of the agricultural subsidy policy applied by Ecuador and Hungary in the last 10 years

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Abstract: Agricultural subsidies have long been a consistent concern of government policies; they influence the use of resources for pursuing different goals in this sector. In this research, we are comparing the agricultural subsidy policies of Ecuador and Hungary in the last ten years by a comparative analysis applied for empirical generalization to explain and better understand the subsidies used in the two countries. The results show an enormous advantage for Hungary compared to Ecuador regarding agricultural subsidies. Since they are part of the Common Agricultural Policy of the European Union, Hungary's subsidies are institutionalized and planned in the long term within a series of programs financed by the EU and national funds. While in Ecuador, agricultural policies exist as a general framework, the governing body manages the subsidies through programs and projects that do not remain over time and depend on the current political situation in the country. In the same way, the data collected reflects that although the share of the agricultural sector in Ecuador's GDP is higher than in Hungary, the subsidy amounts for this sector are 36% lower than in Hungary.

Keywords: agricultural subsidies, policies, CAP, EAT.

Agricultural subsidies have long been a consistent concern of government policies; they influence the use of resources in pursuing different policy goals in this sector. This support largely shapes production and consumption patterns, with significant effects on poverty, nutrition, food security, and other sustainability concerns such as climate change, land-use practices, and biodiversity (Belman, 2019; Bittner, Kerékgyártóné Mislovics , Orosz, & Borsos, 2009). The effects of change must be evaluated carefully by applying agri-product evaluation and biodiversity measurement (Kovács, 2010).

In many countries, agricultural subsidies are used to achieve particular objectives, like increasing farmers' income or productivity, improving environmental performance, or enhancing rural employment (Ciaian , Pokrivcak, & Szegenyova , 2012). To achieve the objectives there are subsidies addressed to farmers to collaborate and cooperate by setting specific organisations (Felföldi, 2009).

These basic definitions and assumptions characterized the main proposal of this research, which is to identify the agricultural subsidy policies applied in Ecuador and Hungary in the past ten years with the comparison of both realities within the framework of their geographical, socio-economic, and governmental national environment.

For Hungary, based on the Hungarian Statistic Institute data, the importance of the agriculture sector has been increasing in the past years; in 2018, this sector represented 4.9% of the national GDP. Regarding employment, 214.9 thousand people were working in the agriculture sector, and the share within the national economy was 4.8 per cent that year. Another introductory remark of Hungary is that since they became part of the European Union in 2014, they adopted the Common Agricultural Policy (CAP) that provides financial support to farmers in member states. According to the Ministry of Agriculture, in Hungary, every year, from direct payments and national subsidies, it has paid almost HUF 500 billion out to farmers to stabilize their income, mitigate their risks, and improve their financing positions.

For Ecuador, the agricultural sector had a modest share of the economy in the last decade; it contributes around 10% of GDP, or 14% if the agro-industrial sector is also considered. However, it is still an essential source of employment for the rural sector since over two-thirds of the economically active rural population work in it (Inter-American Development Bank, 2018). The government of Ecuador supports the agricultural sector in two ways by measures regarding the external and internal market and by public investment. The first one consists mainly of tariff barriers and the definition of minimum prices for support in domestic markets and does not require spending of State resources. In contrast, the second corresponds to interventions involving spending the public budget.

LITERATURE SEARCH

The analysis carried out by the (Inter-American Development Bank, 2018), shows that before 2006 agricultural policy in Ecuador was characterized by frequent changes, in part influenced by the climate of the political instability of previous decades and the pressures of the different actors of the agricultural and commercial sector. The suspension of FTA negotiations with the United States in 2006 and the approval of a new Constitution in 2008 laid the foundations for redirecting the Food Sovereignty Regime in 2009. Together with the National Plans for Wellbeing 2009-2013 and 2013-2017, the previous actions established general guidelines for designing policies, programs, and projects to promote production, food security and sovereignty, and rural development.

According to the national regulations, Ecuador's Ministry of Agriculture and Livestock is the governing and executing institution responsible for agricultural public policies. Its mission is to promote the productivity and competitiveness of the sector, with environmental responsibility through the development of technical, organizational, and commercial capacities for agricultural producers at the national level with emphasis on small, medium, and peasant family farming, contributing to food sovereignty of the country. According to (Ministry of Agriculture and Livestock of Ecuador, 2020) in Ecuador, the main strategic objectives of agricultural Ecuadorian policy are:

- Strengthen associative cooperation and alternative circuits for sustainable production and fair trade of agricultural products that benefit producers, emphasizing small, medium, and family and peasant agriculture.
- Increase access, democratization, and redistribution of production factors and

agricultural technification, promoting the efficient use of soil resources to guarantee food sovereignty.

- Strengthen agricultural and forestry systems (commercial species) through assistance, innovation, generation of information, technification, and implementation of incentives; that promote the insertion of the sector's products in national and international markets
- Increase access, democratization, and redistribution of the factors of production and agricultural technification, to promote the efficient use of the soil to guarantee food sovereignty

Figure 1 mentions the main axels of the Ministry of Agriculture in Ecuador that generate projects for the country's agricultural and livestock sector.

Figure 1. Strategic axels of the Ministry of Agriculture in Ecuador
Source: (Palma Espinosa, 2018)

In the last years, the agricultural policies in Hungary have developed in the context of a transition towards a market economy and the entry into the Europe Union Common Agricultural Policy denominated (CAP).

According to (Regional Institute of Agricultural Economics, 2014) , before the accession into the EU, border measures, administered prices, input subsidies, area, and headage were the main policy instruments used to support agriculture in Hungary. Export subsidies constituted a policy instrument of declining importance in regulating crop and animal produce markets, especially in the poultry and pig meat sectors. Pork meat has to face several problems, such as religious regulations (Vida – Szűcs, 2016$_A$), or customers' misbelieves ("pork meat is unhealthy") (Vida, 2013), or differences in consumption due to gender, age, type of settlement (Vida – Szűcs, 2016$_B$).

During the Covid-19 epidemic was accompanied by numerous new restrictions, strict regulations, which also affected the life of everyone (Vida - Popovics, 2021). Tariffs regulated imports and rate quotas, and the significance of agri-environmental and rural development measures increased gradually.

With its accession to the European Union, Hungary adopted the Common Agricultural Policy (CAP) as an agricultural policy that implements a system of agricultural subsidies and other programs found by the EU member states. According to (European Commission, 2019), this policy aims to:

- Support farmers and improve agricultural productivity, ensuring a stable, affordable food supply.
- Safeguard European Union farmers to make a reasonable living..
- Help tackle climate change and the sustainable management of natural resources.
- Maintain rural areas and landscapes across the EU.
- Keep the rural economy alive by promoting jobs in farming, agri-foods industries, and associated sectors.

The (Hungarian Invest Promotion Agency, 2017) shows that during the 2014 - 2020 financial period, 38% of the overall EU budget has dedicated to this policy program, out of which Hungary received approximately 13.061 billion euros. In Hungary are two central institutions responsible for the agricultural sector, the Ministry of Agriculture as the primary institution and the Ministry of Environment and Regional Policy for regional and rural development..

MATERIALS AND METHODS

Some authors define the comparative method as a systematic procedure applied primarily for empirical generalization. The (Rural Development Institute, Brandon University, 2017) defines comparative analysis as explaining differences and similarities. These support establishing relationships between two or more phenomena and provide valid reasons. In addition, comparisons can be conducted at various regional, national, or broader geographic boundaries based on a specific topic or area of interest.

For this thesis, a comparative analysis was applied, mainly to explain and better understand the process of agricultural subsidies in Ecuador and Hungary (2 different regions).

(Tilly, 1984), distinguishes four types of comparative analysis: individualizing, universalizing, variation-seeking, and encompassing. The present research carried out an individualizing comparative analysis to capture the peculiarities of the two countries and contribute to broadening their knowledge.

In order to establish a relationship between these two countries, the results analyzed the agricultural subsidy policies applied in the last ten years in each country and made a comparative analysis of different parameters based on the data set available for both countries.

Parametres of the Comparative analysis

- SWOT matrix.
- Governments expenditure on the agriculture sector.
- Total amounts of agricultural subsidies based on the agricultural policies applied in the two countries (built on the data collection of the author)
- Impact on the productivity of certain crops of the agricultural sector in both countries
- Production cost coverage index (design of the author).

The collection technique used was a documentary analysis based on the collection and analysis of secondary data. These data were based on statistical information from governmental institutions in Ecuador and Hungary related to the agricultural sector. However, since the reality of the countries is different and their databases, this research also collected information from international databases related, such as the European Union in the case of Hungary and the Andean Trade Community in the Ecuadorian case.

RESULTS AND DISCUSSION

Differences and Similitudes of the country's studies analyzed through the SWOT matrix

Appendix 1 and 2 illustrate the SWOT analysis of the agriculture sector in Ecuador and Hungary, respectively. The analyses were done from a general view of the sector since each crop or livestock has its strengths, weakness, opportunities, and threats to confront. However, it is possible to identify some similitudes in both country's studies, such as:

- The two countries have geographical positions, land vocation, and availability of natural resources that contribute to intensive agricultural and livestock production.
- In both countries, the agricultural and livestock sector has essential participation in the local economy.
- There is a local and international demand for good quality agricultural products as opportunities for Ecuador and Hungary.
- As a common threat to both countries, migration rates from the rural sector remain high. Climate change affects the worldwide environment, especially the agricultural sector, which is more vulnerable.
- Finally, the two countries coincide in producing quality agricultural products exported to different countries.

In the same SWOT matrix, it is also possible to determine differences in the Ecuadorian and Hungarian Agricultural sectors, such as:

- Although government institutions in both countries implement subsidy policies for the agricultural and livestock sector, the primary and significant difference between the two countries is the institutionalization of the subsidies. As a member of the EU, Hungary is under the framework of the Common Agricultural Policy and has a series of tools and subsidy parameters for all Europe Union. In contrast, Ecuador does this on its own without supranational support from another institution through programs and projects that are not necessarily sustainable in the long term.
- Because of the Ecuadorian monetary system (dollars), production costs, especially labour costs, are higher than neighbouring countries. While for Hungary, it is a comparative advantage since its agricultural labour costs are relatively low compared to the rest of the EU countries.
- The climatic factor in Ecuador allows for maintaining permanent production throughout the year, while Hungary depends on the climatic seasons, limiting certain crops' production.
- For Ecuador, one of the potent threats in the Amazon rainforest is the agricultural expansion that deforests extensive areas of land and implements agricultural or livestock production; for Hungary, one threat is an expansion of bioenergy that affects land occupation.

There are countless differences between the two countries since each sector within the agricultural and livestock field is very broad; the analysis is a summary made by the author according to her research and perception of the two countries.

Governmental Expenditure on Agriculture

This analysis was based on data presented by (FAO, 2020), which measures expenditures on agriculture, forestry, fisheries, and environmental protection of government programs based on the Classification of the Functions of Government (COFOG)[1].

The composition of the FAO indicator is explained in terms of the parameters of each category which includes crops and livestock, forestry (cash forest crops and timber), and, finally, fishing and hunting (Food Agriculture Organization of the United Nations, 2020). These parameters are:

a) Agriculture administration of affairs and services.
b) Construction or operation of flood control, irrigation, drainage systems, pest and disease control, forest fire-fighting, fire prevention services, fish hatcheries, extension services, or stocking activities.
c) Operation or support of programs or schemes to stabilize or improve production
d) Production and dissemination of general information, technical documentation, and statistics
e) Compensation, grants, loans, or subsidies
f) Administration and subsidies of government agencies engaged in applied research and experimental development

Table 1 shows the evolution of Ecuador and Hungary's government support between 2006 and 2016. In the first three years, the percentage of Ecuador's government expenditure in agriculture was around 3% and 8% for the Hungarians. Since 2009 these differences have decreased almost five times. The annual variation within each country is different; for Ecuador, only in 2011 presented a negative variation, while in Hungary, only in 2007,2011 and 2014 presented a positive deviation.

Table 1. Government Expenditure on Agriculture between 2006 and 2016 in Ecuador and Hungary.

Years	Hungary		Ecuador		Representation of Ecuadorian vs Hungarian *(percentage)*
	Million dollars	**Annual Variation**	**Million dollars**	**Annual Variation**	
2006	1346	0	47.84	0	3.43
2007	1 548.5	15.04	61.39	28.32	3.81
2008	986.9	-36.27	94.9	54.59	8.77
2009	959.02	-2.83	243	156.06	20.22
2010	609.12	-36.49	290.71	19.63	32.31
2011	718.02	17.88	174.7	-39.91	19.57
2012	630.32	-12.21	224	28.22	26.22
2013	606.4	-3.79	267	19.20	30.57
2014	840.49	38.60	440	64.79	34.36
2015	680.41	-19.05	554.87	26.11	44.92
2016	590.97	-13.15	341.9	-38.38	36.65

Source: own analysis based on annual statistics of Food Agriculture Organization of the United Nations (FAO), 2020.

To complement the previous analysis, Figure 2 illustrates the evolution of government expenditure in Ecuador and Hungary; in the last three years, the gap between the countries is less than in the first years of the comparison. This analysis is relevant as it emphasizes the importance for Hungary of the funds received by the EU in the framework of the Common Agricultural Policy since part of the subsidies to the agricultural sector come from this fund plus government resources, contrary to Ecuador, which only the state resources subsidize the farm sector.

[1] Classification of Functions of Government (COFOG) as outlined in the IMF's Government Finance Statistics Manual, 2001-

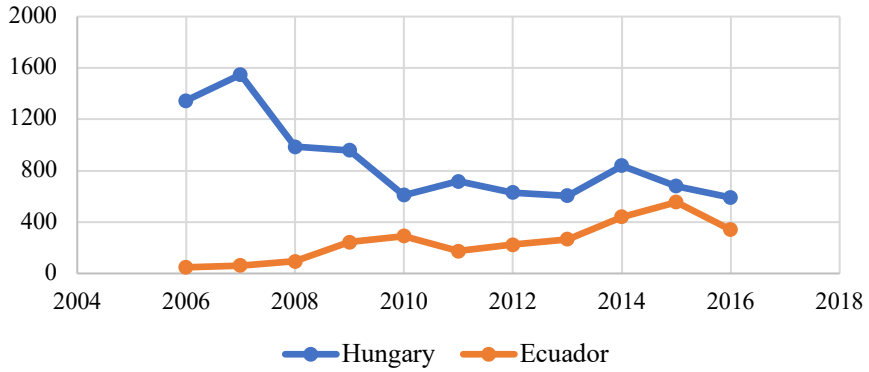

Figure 2: Evolution of Government Expenditure for Ecuador and Hungary (million dollars)
Source: based on Food Agriculture Organization of the United Nations (FAO), 2020.

Total amounts of agricultural subsidies are based on the agricultural policy instruments applied in the two countries.

This comparison is based on the data collection of the research made by the author from the total amounts of subsidies from agricultural subsidy policy instruments applied by each country. This data does not include fishing and aquaculture areas, only crops and livestock production.

In the case of Ecuador, the data considered is the Estimated Total Support to the Agricultural sector based on:

- Individual support to producers (through mechanisms or programs that distort market prices and by direct transfers),
- Price support or direct transfers from the consumers,
- General services that benefit the broad conglomerate of producers

For Hungary, the data consider is the Common Agricultural Expenditure based on:

- Direct payment expenditure
- Rural development expenditure
- Market expenditure

Figure 3 compares both countries' agricultural subsidies according to their instrumental policies. The percentage difference between Ecuador compared to Hungary is 36% less than the total data set, which confirms the relevance of the Common Agricultural Policy for Hungary.

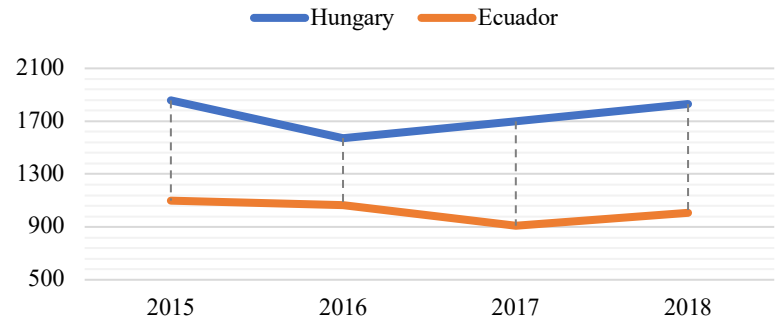

Figure 3: Total amount of subsidies according to agricultural subsidy policies instruments implemented in Hungary and Ecuador between 2015 and 2018 (million euros)[2]
Sources: own analysis based on Inter-American Development Bank, 2018 and Europe Union Commission, 2020

[2] For Ecuadorian amounts the currency was converting from US dollars to euros according to international rates at the years refers in the Figure

Impact on the productivity of certain crops of the agricultural sector in both countries

In order to compare both countries for this parameter, the data analyzed was between 2013 and 2016. This short period is because the data in the variables to be evaluated were only available in these years for the two countries; that is why the significant degree of the data is minimal since it does not have more extensive historical databases.

This analysis intended to determine the correlation between the number of subsidies given to a specific crop and the yield per hectare of that evaluated crop. To understand the data to be assessed, it is essential to know the information analyzed in the two countries.

- Amount of subsidies: For Ecuador, the amounts analyzed were the levels of product-specific support to specific crops that come from tariff and price control measures (APM) and public intervention expenditures. The amount analyzed was corn and rice since those are relevant crops to country food security. For Hungary, subsidy amounts analyzed were the decoupled direct payments, based on the assumption that the highest allocation of these resources is directed to cereals and oilseeds crops.

- Yield per hectare: the data was obtained from the Food Agriculture Organization (FAO) statistics database to standardize the measures between the two countries; the data shows hg/ha in each crop. The significant difference to consider in this variable is that for Hungary, the cereals were analyzed in single value as a group of crops (wheat, corn, barley, rye, and oats); the same case for oilseed that groups crops as (rapeseed, soybeans, sunflower, among others).

Figure 4 shows the evolution between the amounts of subsidies and the yield/ha in each crop evaluated by the country.

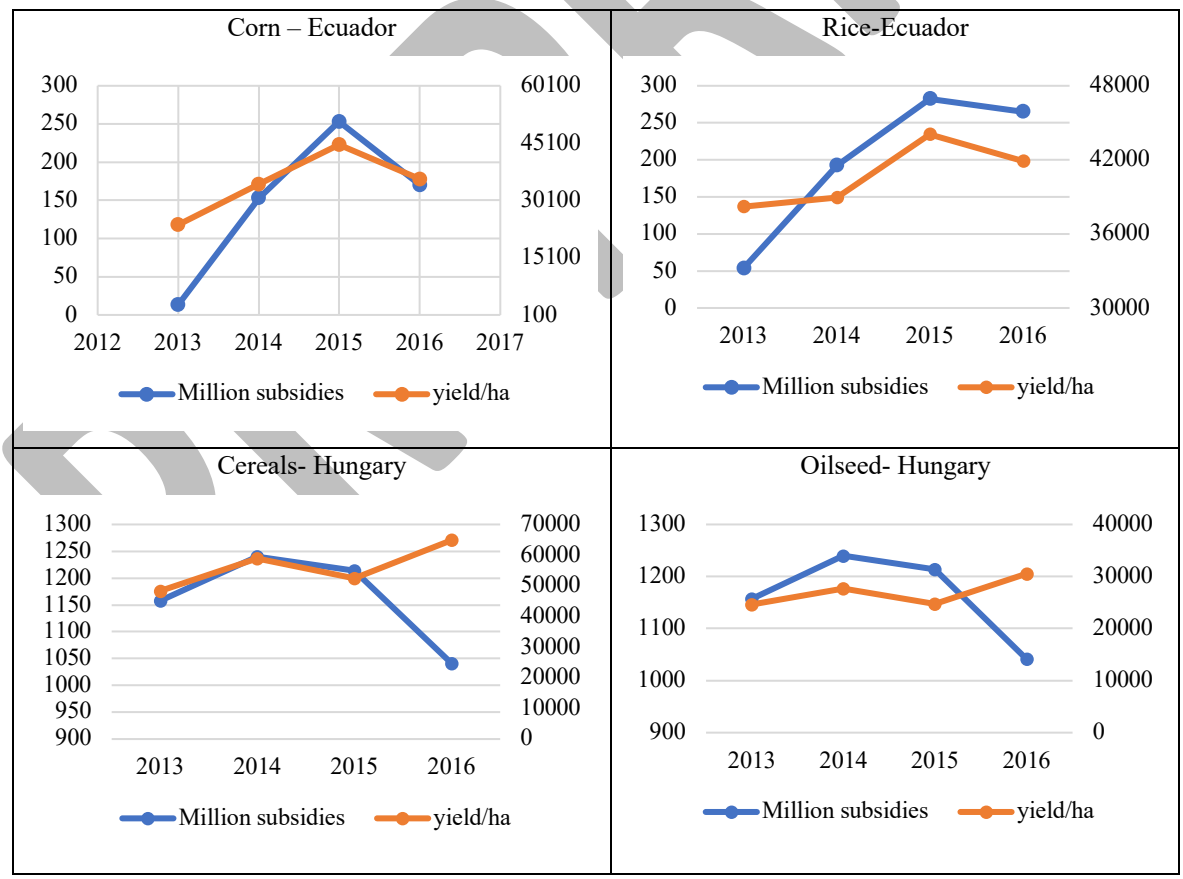

Figure 4: Evolution between the amounts of subsidies and the yield/ha in each country between 2013 -2016
Source: own analysis based on IDB and Euro Commission, 2018.

For Ecuador, the correlation is positive, and to a high degree (Table 2), it is estimated that the contribution of subsidies increases to the same extent as the yield of the compared crops (corn and rice). It is important to note that for both crops, there is a minimum support price and technological packages provided by the government, which include high-yielding seeds that influence crop productivity. According to (Astudillo, 2020), although state aid and subsidies have expanded the mechanized chemical agriculture model that has improved productivity, they did not generate competitive local supply since productivity levels are far from reaching international levels. Local supply continues to be more expensive than foreign.

In the case of Hungary, the correlation is harmful and to a moderate degree (Table 2), estimating that as the contribution of subsidies increases, crop yields decrease. However, this assumption needs further evaluation by adding more data and specifying the number of subsidies for each crop group analyzed.

Figure 4 shows a relevant decrease in yield per ha in both crop groups in 2015; according to (Hungarian Central Statistical Office, 2015) the production volume decreased in that year due to the high base of the previous year and unfavourable dry weather for crops.

In the study of (Join Research Center of the Europe Commission, 2015) a survey among farmers indicates their consideration of the most critical determinants of wheat yields: climate change, seasonal weather, and soil conditions. Concerning the effect of CAP subsidies on wheat yields for Hungarian farmers, the yield improvement obtained by additional support has a negative correlation (based on linear prediction).

Table 2: Correlation coefficients between the amounts of subsidies and the yield/ha of crops in Ecuador and Hungary

Type of crop	Correlation Coefficient	Degree of Correlation
Corn	0.99	High
Rice	0.89	High
Cereals	-0.51	Between Low and Moderate
Oilseeds	-0.65	Moderate degree

Source: own analyses

Production cost coverage index (design by the author)

As a final parameter for this study, an index IPCC was designed to determine the coverage in the cost production of the most important crops (area related) by the total amount of agricultural subsidies. This index can be used as a comparative parameter for the two countries, considering the differences in the productive systems of Hungary and Ecuador.

The index is the ratio between the subsidy cost average (per hectare) and the production cost average.

Explanation of the formulas

The subsidy cost average is the total subsidy per year that the government generally supports to the agricultural sector, divided by the total arable land plus grassland in the country.

$$Subsidy\ cost\ average = \frac{total\ subsidy\ per\ year}{total\ arable\ land\ plus\ grassland}$$

The production cost average per hectare can be estimated as the weighted sum of the production cost of the country's most important crops, where the weighted factor WC for each crop is the relative surface occupation of the given crop.

$$(WC) = \frac{AC\ (one\ crop)}{total\ arable\ land\ plus\ grassland}$$

$$Production\ cost\ average\ (PCA) = \sum\ WC * PC$$

$$PC = production\ cost\ of\ crop\ per\ ha$$

Finally, the IPCC index includes the division between the subsidy delivered per hectare and the surface occupation of the most important crops in each country multiplied by the production cost of each crop. To obtain adequate data is important to emphasize several aspects related to the formula proposed:

- The total agricultural subsidy considers the total amounts per year that the government supports the agricultural sector in general terms; it does not specify the type of production, whether livestock or agricultural production.
- The area of hectares considers the arable area and the cultivated pastures, and it does not consider other land use types.
- For the correct estimation of the index is essential to include the crops that occupied most of the area considered in the study. The margin error comes from those uncounted crops with smaller area coverage.
- Production costs (P) are those reported by each country's agricultural authorities yearly and consider each crop's direct and indirect costs.
- Interpreting the values obtained by calculating the index will be: (0) no coverage of production cost by the subsidies, and (1) complete coverage of production cost by the subsidies.

The following formula is a sample of the previous considerations, which will help visualize the proposal index better. We take this sample as a reference year (2016) and one of the two countries studied (Ecuador).

$$Subsidy\ cost\ average = \frac{1\ 013\ 000\ 000\ \$}{5\ 390\ 000 ha} = 187{,}94\ \$/ha$$

$$Production\ cost\ coverage = \left[\frac{559\ 000 ha}{5\ 390\ 000 ha} * 2000\$ + \frac{385\ 000 ha}{5\ 390\ 000 ha} * 2009\$ + \frac{341\ 000 ha}{5\ 390\ 000 ha} * 1702\$ + \right.$$

$$\left. \frac{320\ 000 ha}{5\ 390\ 000 ha} * 2153\$ + \frac{186\ 000 ha}{5\ 390\ 000 ha} * 3190\$ + \frac{109\ 000 ha}{5\ 390\ 000 ha} * 2275\$ + \frac{3\ 101\ 000 ha}{5\ 390\ 000 ha} * 1182\$ \right] = 1422{,}58\$/ha$$

For the denominator, the crops considered were cocoa, rice, corn, oil palm, banana, sugar cane, and grassland in the respective order in the formula.

$$IPCC\ 2016\ (Ecuador) = \frac{187,94}{1422,58} = 0,13$$

Due to not having all the necessary data within a broader historical database in all the parameters required for the index calculations, only a sample was generated for 2016 and 2017 in the two countries (Table 4). As illustrated, the subsidy coverage of production cost is three times higher in Hungary than in Ecuador, while in 2017, it is 4 points higher, respectively.

Table 4: Production cost coverage index between 2016 and 2017

Year	IPCC Ecuador	IPCC Hungary
2016	0.1	0.3
2017	0.1	0.4

Source: own analyses

From the data reviewed, it is essential to note that crop production costs are significantly lower in Hungary than in Ecuador. This could be attributed to the degree of mechanization applied in production. For example, in Ecuador, the main crops are not fully mechanized, and harvesting is still manual and a dollarized economy, making labour more expensive.

The IPCC shown in Table 4 also indicates Hungary's dependence on agricultural subsidies as they cover a significant percentage of the cost of crop production. At the same time, Ecuador has a smaller and less substantial coverage.

CONCLUSIONS

Hungary and Ecuador have different production systems determined by their geographic conditions and natural resources. However, for both countries, the agriculture sector is important in their internal composition and external trade economies.

The SWOT matrix generally reflects the differences and similarities between the agricultural sectors of the two countries within their geographical and climatological realities.

Regarding the agricultural subsidy policies, in comparison with Ecuador, Hungary possesses an enormous advantage for being part of the Common Agricultural Policy of the European Union. The subsidies in EU countries are institutionalized and planned long-term within a series of programs financed by the EU and national funds and evaluated periodically. In Ecuador's case, there are agricultural policies as a general framework; however, the governing body manages the subsidies through projects that do not necessarily remain over time and depend on the current political situation in the country.

According to the data collected, although the share of the agricultural sector in Ecuador's GDP is higher than in Hungary, the subsidy amounts for this sector in Ecuador are 36% lower than in Hungary.

In the case of Ecuador, support for the agricultural sector is provided in two ways: the first is through measures related to the external and internal markets, which do not require the expenditure of government resources. The second is public investment, which involves spending from the government budget. Hungary is in line with the European Union's Common Agricultural Policy, which is found by two sources. The first is the European Agricultural Guarantee Fund, which directly supports and finances market measures. The second is the European Agricultural Fund for Rural Development, which finances rural development.

In Ecuador, there is no system for registering agricultural areas that recognizes a direct monetary incentive based on the crops subsidized under the agricultural policy, which exists in Hungary under the CAP policy. Furthermore, in Ecuador, there is no specific rural development program that invests in the progress of these areas.

Despite the lack of a comparative historical database for the two countries, from the analysis of the impact on the yield of certain crops with the amount of subsidies granted to them, it is observed that the correlation coefficient for Ecuador is positive while for Hungary it is negative in the periods analyzed.

As part of the comparison of subsidy policies, an index of coverage of production costs by aggregate agricultural subsidies is proposed. The calculation method is based on the most representative crops within the total area, their production costs, and the agricultural subsidies provided by the State. As a sample, the research points out the results of a specific year for the two countries. In conclusion, the IPCC could indicate Hungary's dependence on agricultural subsidies as they cover a significant percentage of the cost of crop production, while in Ecuador, it is lower and less significant in its coverage.

Over time, sustainable agricultural subsidy policies are essential to encourage this sector, which is important in the two countries' economies. Analyzing their efficiency is a difficult task, because efficiency can be measured in different ways, with different levels (partial, complex, social, corporate, regional and macro-economical) of indicators (NÁBRÁDI et al., 2008).

As a recommendation, both countries need to have historical databases of agricultural subsidies from the governing bodies of agricultural sectors that allow a more detailed analysis by type of crop or livestock. The data available for this study proceeds from online sources from different institutional departments that making the analysis more complex during the selected period.

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