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Agricultura familiar: desafíos y perspectivas

Technical note

A methodological approach to estimating the production value of family farming in Uruguay

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Abstract

Family farming plays a pivotal role in the economic and social structure of rural areas, particularly in developing countries, where it underpins food production, food security, and rural employment. Despite its recognized importance, there is a lack of detailed, disaggregated data and estimates regarding its economic contribution. This study fills that gap by quantifying the share of family farming in Uruguay's gross production value (GPV) across five key agricultural sectors: fruit production, horticulture, beekeeping, beef cattle, and dairy farming. Using data from the National Family Farming Registry, combined with administrative records and price data, the research estimates GPV based on physical output and average national prices. From 2018 to 2022, family farming consistently contributed between 14% and 17% to the total GPV in these sectors. By providing empirical evidence of its economic relevance, this work enhances understanding of the sector and informs the development of more targeted and effective agricultural policies.

Keywords: gross production value, beef cattle, dairy farming, fruit production, horticulture, beekeeping

Una propuesta metodológica para estimar el valor de la producción familiar en Uruguay

Resumen

La agricultura familiar desempeña un papel fundamental en la estructura económica y social de las zonas rurales, especialmente en los países en desarrollo, donde sostiene la producción de alimentos, la seguridad alimentaria y el empleo rural. Sin embargo, a pesar de su reconocida importancia, persiste una falta de estimaciones desagregadas sobre su contribución económica. Este artículo busca llenar ese vacío cuantificando la participación de la agricultura familiar en el valor bruto de la producción (VBP) nacional de Uruguay en cinco sectores agropecuarios: fruticultura, horticultura,

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apicultura, ganadería de carne y lechería. A partir de datos del Registro Nacional de la Agricultura Familiar, integrados con registros administrativos y estadísticas de precios, el estudio estima el VBP combinando producción física con precios promedio nacionales. Entre 2018 y 2022, la agricultura familiar representa de forma constante entre 14% y 17% del VBP total en los sectores analizados. Al aportar evidencia empírica sobre su relevancia económica, este trabajo contribuye a una mejor comprensión del sector y respalda el diseño de políticas agrícolas más informadas y eficaces.

Palabras clave: valor de producción, ganadería, lechería, fruticultura, horticultura, apicultura

Uma Abordagem Metodológica para Estimar o Valor de Produção da Agricultura Familiar no Uruguai

Resumo

A agricultura familiar desempenha um papel essencial na estrutura econômica e social das áreas rurais, especialmente nos países em desenvolvimento, onde sustenta a produção de alimentos, a segurança alimentar e o emprego rural. No entanto, apesar de sua importância amplamente reconhecida, ainda são escassas as estimativas desagregadas de sua contribuição econômica. Este artigo busca preencher essa lacuna ao quantificar a participação da agricultura familiar no valor da produção (VP) nacional do Uruguai em cinco setores agropecuários: fruticultura, horticultura, apicultura, pecuária de corte e pecuária leiteira. Com base em dados do Registro Nacional da Agricultura Familiar, integrados a registros administrativos e estatísticas de preços, o estudo estima o VP a partir da produção física e dos preços médios nacionais. Entre 2018 e 2022, a agricultura familiar respondeu de forma consistente por 14% a 17% do VP total nos setores analisados. Ao oferecer evidências empíricas sobre sua relevância econômica, o estudo contribui para uma melhor compreensão do setor e apoia a formulação de políticas agrícolas mais eficazes e fundamentadas.

Palavras-chave: valor de produção, pecuária, produção leiteira, fruticultura, horticultura, apicultura

1. Introduction

Family farming is crucial to the economic and social structure of rural areas, particularly in developing countries. It significantly contributes to food production, sustainable resource management, rural employment, territorial cohesion, and the sustainability of small communities, making it a vital component for inclusive rural development.

Despite its strategic importance, there remains a significant gap in the availability of timely, reliable, and disaggregated economic data on family farming. Globally, the contribution of family farmers to food security and regional development is often inadequately documented[1][2][3]. This data deficit undermines the formulation of evidence-based agricultural and rural policies and hampers efforts to recognize and strengthen the specific contributions of family farms to national economies and agri-food value chains. Consequently, important decisions, such as the allocation of public resources, the design of support programs, and the evaluation of productivity and competitiveness, are frequently made without an adequate understanding of the economic performance of family farming.

Uruguay is an example of this situation. Although family farming is recognized in national policies[4][5], it represents a large portion of the country's farmers[6], particularly in sectors like fruit and vegetable cultivation, beekeeping, beef cattle, and dairy farming. According to Tomassino and others[6], based on the 2011 Agricultural Census, beef cattle and sheep farming account for the largest share of family farmers, constituting 62.2% of all family farming units. Horticulture, fruit production, and viticulture follow with 14.2%, while dairy farming is at 11.8%. Smaller shares are noted in rainfed agriculture (3.5%), pig farming (2.1%), poultry (1.8%), rural services (1.0%), forestry (0.4%), and rice (0.3%).

However, estimates of its economic contribution are absent. This data gap weakens targeted policy development, reduces the visibility of family producers in official statistics, and limits an informed public discussion on their role in agri-food systems.

This article seeks to address that gap by providing new empirical evidence on family farming's economic contribution in Uruguay. Specifically, the study estimates the share of family farming in the gross production value (GPV) across five key sectors: fruit, horticulture, beekeeping, beef cattle, and dairy farming, for the period 2018-2022. The analysis relies on the Family Farming Registry maintained by the General Directorate of Rural Development (DGDR) of the Ministry of Livestock, Agriculture, and Fisheries (MGAP), integrating administrative production records and price data.

By systematically combining various administrative data sources and applying a replicable valuation method, the study offers a new estimate of family farming's share in Uruguay's national production value. Findings show that family producers consistently account for 14% to 17% of total GPV across the selected sectors during the study period. These results underscore the stable and significant role of family farms in Uruguay's agricultural economy.

By enhancing the visibility of family farming in statistics, this study aims to support a more informed public debate about its economic role and the conditions under which it operates.

2. Materials and Methods

2.1 Methodological Approach

Estimating the economic contribution of family farming poses significant challenges, particularly due to the limited availability of disaggregated data by producer type. In this study, we use gross production value (GPV) as a practical proxy for economic contribution. GPV reflects the monetary value of output at the farm-gate level, and can be estimated from production quantities and market prices, without requiring cost or revenue data.

While value added would offer a more comprehensive measure of economic contribution, its estimation is infeasible due to the lack of disaggregated cost data distinguishing family from non-family producers. Therefore, we focus on GPV, applying uniform national average prices to both producer types. This approach is justified by the high level of price integration observed in Uruguay's domestic markets and is commonly adopted when there is no evidence of price discrimination.

Production is assessed using farm gate prices, either directly observed or estimated. For beef cattle, dairy, and honey production, farm-gate prices are obtainable through official statistics. For fruit and horticultural products, where only wholesale prices are reported, farm-gate prices are estimated by deducting transport costs and marketing margins based on value chain studies[7]. In all cases, differences in GPV between family and non-family farming result solely from variations in output quantities, not from price or input cost differences. Technical details on constructing sectoral production values for family farmers are provided in Appendix 1 of the Supplementary materials.

2.2 Identification of Family Farmers

Family farmers are identified through the *Registro de la Producción Familiar*[4] (Family Farming Registry), administered by the General Directorate of Rural Development (DGDR) within Uruguay's Ministry of Livestock, Agriculture, and Fisheries (MGAP). The registry collects each producer's national ID and principal productive activity, enabling linkage with sector-specific administrative data sources.

The definition of family farming used in this study follows MGAP Resolution No. 1013/2016[8], which establishes activity specific eligibility criteria. These include limits on land area, use of non-family labor, off-farm income, and, depending on the sector, residential proximity to the production unit. **Table 1** summarizes the criteria applied to the five sectors included in the analysis.

Table 1. Criteria for defining family farmers, by sector

Activity	Max. Land Area	Max. Non-Family Labor	Residence Requirement	Other Specific Criteria
Beef cattle farming	≤ 500 ha (CONEAT index 100)	≤ 2 permanent workers or 500 temporary workdays	Must reside on-farm or within 50 km	Monthly off-farm income ≤ 14 BPC
Dairy farming				
Horticulture & Fruit	≤ 500 ha (CONEAT index 100)	≤ 1,250 temporary workdays (permanent and/or seasonal labor)		
Beekeeping	Not applicable	≤ 2 permanent workers or 500 temporary workdays	Not required	Monthly off-farm income ≤ 14 BPC; Must have ≤ 1,000 beehives

Note: In 2023 14 BPC[10] (*Base de Prestaciones y Contribuciones*) equaled approximately UYU 67,920 or USD 1,750.

The CONEAT index[9], a standardized scale in Uruguay, measures land productivity, especially for livestock and wool production. It ranges from 0 to 250, with a score of 100 indicating the national average. This index is widely used for purposes such as taxation and land valuation.

The study concentrates on five key sectors: beef cattle, dairy, horticulture, fruit, and beekeeping. These sectors encompass the majority of registered family producers, with over 85% of family farming units in Uruguay identifying one of these as their primary activity (see **Table 2**).

Table 2. Family farming units by main productive activity

Main Productive Activity	Family Farming Units	% total FFU
Beef Cattle Farming	8,428	53.17%
Horticulture	3,307	20.86%
Artisanal Cheese Dairy Farming	816	5.15%
Wool Sheep Farming	616	3.89%
Cereal and Oilseed Crops	513	3.24%
Fruit and Citrus Production	380	2.40%
Beekeeping	335	2.11%
Fluid Milk Dairy Farming	334	2.11%
Poultry	295	1.86%
Forage for Sale	261	1.65%
Viticulture	198	1.25%
Pig Farming	111	0.70%
Tobacco	70	0.44%
Other	84	0.53%
Floriculture	43	0.27%
Sugarcane	22	0.14%
Forestry / Firewood	18	0.11%
Goats	11	0.07%
Rural Tourism	5	0.03%
Rural Handicrafts	3	0.02%
Total	**15,850**	**100%**

Source: Based on Ministerio de Ganadería, Agricultura y Pesca, DGDR (UY)[4]

The choice to focus on these sectors is based on their representativeness within the family farming community and the availability of reliable administrative data, which allows for consistent classification across different regions and activities.

2.3 Data Sources and Sectoral Valuation Methods

To estimate production volumes and values, the study integrates administrative records and official statistics for each of the five sectors (**Table 3**). Only producers actively registered in the Family Farming Registry during a specific year are classified as family farmers. Although some underreporting or lag in registration updates may occur, the registry remains the most robust administrative source for identifying family producers in Uruguay. Registration is voluntary, but incentivized through access to public programs, including tax exemptions and sectoral support. To maintain eligibility, registration must be renewed biennially.

Table 3. Data sources

Sector	Production Data Source	Valuation Method
Beef cattle	SNIG (stock, slaughter, movements); DICOSE	GPV estimated from live weight gains and slaughter volumes by category; prices from INAC and Livestock Consignors Association.
Dairy	SNIG (milk declarations); DICOSE	GPV calculated as liters produced by the average farm-gate price from INALE bulletins.
Fruit & Vegetables	DIGEGRA-MGAP registries; UAM prices	GPV calculated by crop using wholesale UAM prices adjusted for transport and marketing margins (Ackermann et al.).
Beekeeping	SINATPA (traceability system)	GPV declared honey volume multiplied by export prices (DIGEGRA), converted using BCU exchange rates.
Identification	DGDR Family Farming Registry	Family farmers identified via national ID or DICOSE number, depending on the sector.

Besides the Family Farming Registry, producers are also required to register in sectoral databases in order to qualify for other benefits. This enhances the coverage and consistency of the data.

It is important to note that sectors such as beef, dairy, and honey are primarily export-oriented, so registration coverage in these areas is expected to be nearly complete[11]. In contrast, fruit and horticulture are geared toward the domestic market, and may have greater coverage limitations, especially among larger commercial producers. While no recent studies exist to measure registry penetration using census data, it is likely that small and medium-scale producers are well captured due to the incentive structure for registering. Large producers are also required to register, but coverage gaps may persist in some cases.

3. Results

3.1 Family Participation in Beef and Dairy Production

Administrative data from the National Livestock Information System (SNIG) and DICOSE[12] indicate that Uruguay's cattle sector comprised approximately 38,000 to 39,000 registered production units from 2017 to 2022. These units cover around 14 million hectares and generate up to USD 2.7 billion annually in beef production value. Within this sector, family producers represented about 30% of the total number of farms. However, despite their share in farm numbers, they accounted for only around 10% of the total beef production value and managed less than 9% of the land dedicated to cattle farming in 2022 (see **Table 4**).

Table 4. Share of family farming in cattle production (2017-2023)

Year	% Family Farms (units)	% Family Area	% Family Value of production
2017	30.1%	8.7%	10.0%
2018	30.7%	8.9%	10.7%
2019	31.2%	9.0%	10.6%
2020	31.4%	9.1%	10.7%
2021	31.0%	9.0%	10.0%
2022	30.1%	8.7%	10.1%
2023	28.7%	8.3%	9.8%

The number of DICOSE registrations is used as a proxy for identifying production units. It's important to note that a single farm may have multiple DICOSE numbers. To improve accuracy, an analysis was conducted using the society code variable in SNIG, which serves as a proxy for unique farm enterprises. Aggregating DICOSE numbers by entity yielded similar results to the disaggregated data, reinforcing the robustness of the reported figures.

In dairy, family producers account for a relatively higher share of national production. In 2022, they contributed 20% of the total milk production value (**Table 5**).

Table 5. Milk production value in current USD by year

Year	All Producers	Family production	% Family
2017	682,697,229	135,035,940	20%
2018	688,816,669	141,015,717	20%
2019	655,483,011	127,515,778	19%
2020	801,763,595	125,227,721	16%
2021	773,795,282	149,609,458	19%
2022	894,537,996	178,422,025	20%
2023	911,391,962	165,546,222	18%

3.2 Family Participation in Beekeeping

Beekeeping is a significant component of family farming in Uruguay. Between the 2017/18 and 2022/23 seasons, over 1,100 of the approximately 2,600 to 2,900 registered beekeepers each year were identified as family farmers. Economically, their contribution to the sector ranged from UYU 216 million to UYU 370 million annually, indicating a meaningful presence in the national honey value chain.

Throughout this period, family beekeepers consistently accounted for between 41% and 46% of all registered producers and contributed a similar share to the total honey production value, as shown in **Table 6**. These figures highlight the central role that family farming plays in Uruguay's apiculture sector.

Table 6. Share of family farming in beekeeping

Season	% Family Beekeepers	% Family Production
2017/18	44%	41%
2018/19	45%	41%
2019/20	45%	45%
2020/21	44%	43%
2021/22	42%	43%
2022/23	41%	46%

However, the actual proportion of family participation may be underestimated. Some beekeepers are registered under different primary activities in the National Registry of Family Farming (RNFH)[13], which could lead to underreporting of their involvement in apiculture. This discrepancy occurs because beekeeping is often not the primary activity of the farm. When including family producers for whom beekeeping is a secondary activity –adding approximately 300 additional producers– the total approaches the figures reported in SINATPA data[14].

3.3 Family Farming in Fruit and Horticultural Production

Family farming plays an important contributor in Uruguay's fruit and horticultural sectors. Between 2018 and 2023, family producers represented approximately 70% of registered fruit farms and about 80% of horticultural farms (see **Table 7**). However, their contribution to total production value was comparatively lower, reflecting structural differences in farm size, crop specialization, and market orientation.

In the case of fruit production, the estimated contribution of family farms may be overstated. Underreporting is likely for certain crops, such as apples and peaches, mainly because large-scale commercial producers are often absent from the RNFH. This bias is even more evident in citrus fruits, where production is highly concentrated among large producers who are frequently not registered in the system.

In horticulture, similar limitations apply. For instance, potato production (a sector dominated by a small number of large-scale producers not included in the RNFH) is significantly underestimated. Nonetheless, RNFH data align reasonably well with results from the Montevideo Wholesale Market (UAM) for most crops, with potatoes as a notable exception.

Despite these data limitations, the RNFH remains a valuable starting point for estimating family farming's contribution to fruit and horticultural production. Its utility would be further enhanced through more comprehensive and systematic data collection.

Table 7. Share of family farming in fruit and horticulture production (2018-2022)

	Fruit		Horticulture	
Year	**% Family Producers**	**% Value from Family Farms**	**% Family Producers**	**% Value from Family Farms**
2018	72%	26%	82%	67%
2019	72%	41%	82%	70%
2020	72%	24%	82%	61%
2021	69%	34%	81%	57%
2022	68%	35%	79%	54%

3.4 Cross Sector Summary

Table 8 presents the total value of production (VP) generated by family producers across the five sectors analyzed.

Table 8. Production value by sector in 2022

Sector	Total	Family production	% Family production
Horticulture	5,208,484,023	2,822,071,415	54%
Beekeeping	866,594,949	369,942,119	43%
Fruit Growing	2,450,458,879	847,560,687	35%
Dairy Farming	36,788,482,222	7,337,726,876	20%
Beef Cattle Farming	111,761,800,200	11,303,061,651	10%
Total	**157,075,820,273**	**22,680,362,748**	**14%**

Note: Does not include large-scale potato and citrus producers. Value in current pesos.

In 2022, family farming accounted for 14% of the total sectoral value, amounting to approximately 22.7 billion pesos. Horticulture, dairy, and beekeeping were the most significant contributors.

Table 9 shows that the contribution of FP to the VP of these five sectors remained relatively stable, fluctuating between 17% and 14% over the period.

Table 9. Evolution of the share of family production

	Total	Family production	% Family production
2018	80,062,914,281	13,674,734,684	17%
2019	93,242,511,520	14,656,615,380	16%
2020	127,855,740,102	18,363,328,188	14%
2021	121,528,372,543	17,735,294,895	15%
2022	157,075,820,273	22,680,362,748	14%

Note: Does not include large-scale potato and citrus producers.

4. Discussion and Conclusions

Agrifood value chains in Uruguay account for approximately 11% of national GDP, 80% of goods exports, and generate close to 230,000 jobs (13% of national employment)[15][16]. Their territorial relevance is also strong: 32 of Uruguay's 44 cities with more than 5,000 inhabitants (excluding Montevideo) are highly specialized in agrifood production[17]. Within this context, family farming in Uruguay plays a significant, yet often underrecognized, role in Uruguay's broader agrifood system[18]. Beyond food supply and rural livelihoods, family farming supports regional development and social cohesion.

Uruguay's agricultural policies recognize the strategic importance of family farming for sustainable development, environmental conservation, and biodiversity[18]. The recently launched National Plan for Family Farming (2024-2028), aligned with the UN Decade of Family Farming (2019-2028)[19], reaffirms this commitment[5]. However, implementing these policies effectively hinges on the availability of reliable, disaggregated data to inform decision-making and measure progress.

This study provides the first systematic estimates of the economic contribution of family farming in Uruguay, focusing on beef cattle, dairy, fruit, horticulture, and beekeeping sectors. Results suggest that family producers contributed between 14% and 17% of gross production value from 2018 to 2022.

Findings reveal that family producers are more prevalent in sectors oriented toward domestic markets, such as horticulture and fruit, and in beekeeping. Conversely, their presence is less pronounced in export-driven sectors like beef and dairy, highlighting the sectoral heterogeneity of family farming.

Methodologically, gross production value serves as a practical proxy for economic contribution using available data. Nonetheless, it has limitations: it excludes costs, value added, labor inputs, and income distribution. In some sectors, price data used in the estimations, particularly for fruits and vegetables, are outdated, relying on margins from 2017. Additionally, current registries tend to underrepresent large producers in crops like apples, citrus, and potatoes, which may result in sectoral underestimation and hinder comparative analysis.

This research's key contribution lies in integrating multiple datasets from the Ministry of Livestock, Agriculture, and Fisheries (MGAP) and applying harmonized criteria to identify family farmers. Despite this, reliance on registry data likely omits unregistered producers, underscoring the need for better coverage. The limited use of recent census data restricts assessment of registry completeness, highlighting a critical area for future improvement.

Enhancing the scope, granularity, and interoperability of public registries is essential for stronger policy formulation and evaluation. Although the Family Farming Registry (RNFH) is the most comprehensive tool currently available, its sectoral effectiveness varies. While livestock, dairy and beekeeping benefit from well-developed systems like SNIG and SINATPA; fruit and horticulture suffer from bigger data limitations like lack of price series, limited coverage of large producers, and fragmented administrative records.

These challenges are not unique to Uruguay; similar issues are prevalent across Latin America, as seen in Brazil, Argentina, and Colombia. This regional trend emphasizes the importance of improving data integration and interoperability to better capture the diverse contributions of family farming.

Looking ahead, the research agenda should advance along several key lines to deepen and refine the understanding of family farming's economic contribution in Uruguay. First, future studies should incorporate disaggregated analysis to better reflect the diversity within the family farming sector. Segmenting producers by variables such as farm size, gender, age, and region would allow for a more nuanced assessment of their economic roles and challenges. This, in turn, could support the design of more effective public interventions.

Second, there is a need to move beyond gross production value (GPV) and develop a broader set of complementary indicators. These could include measures of net value added, employment generation, labor intensity, productivity, contribution to exports, and even fiscal impacts. Such indicators would provide a more comprehensive view of how family farming contributes to the national economy.

Third, the analytical scope should be expanded to include additional sectors not currently covered by registry-based systems. Sectors such as rainfed agriculture, forestry, and rice are economically significant and may also involve family producers whose contribution remains unquantified due to data limitations.

Fourth, there is a need to improve valuation methods, particularly for crops and vegetables. This includes the development of systematic, up-to-date producer price series that reflect actual farm-gate conditions. Without accurate pricing data, estimates of economic contribution risk being outdated.

Finally, future research should explore the sales and commercialization channels used by family farmers. Many rely on informal or alternative markets, where pricing structures, margins, and buyer relationships differ from those in formal wholesale markets. Understanding these dynamics is essential for accurately valuing production and designing market-oriented support policies.

From a policy perspective, quantifying the economic importance of family farming is crucial for designing targeted support measures and evaluating their impact. The new National Plan presents an opportunity to enhance data systems for evidence-based policymaking. Improved information will help ensure that interventions effectively reach and benefit family farmers, unlocking their full development potential.

In conclusion, family farming remains economically significant in Uruguay. By producing new evidence on its share of total production value, this study takes an important step toward bridging that gap. Ultimately, enhancing the quality and availability of economic data on family farming is critical to accurately quantifying its economic contribution, it is important for developing a more nuanced understanding of its scale and importance, as well as for informing effective policy decisions.

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Transparency of Data

Due to confidentiality commitments regarding the information, the dataset supporting the results of this study is not publicly available.

Author Contribution Statement

	MN Ackermann	E Aguirre	A Cortelezzi	M Sanguinetti
Conceptualization	■	■	■	■
Data curation	■	■		■
Formal analysis	■	■	■	■
Project administration		■		
Writing – original draft	■	■	■	■
Writing – review and editing		■		

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Supplementary Material

1. Methodology for Estimating Gross Production Value

A. Livestock Production Value

To estimate the gross value of beef cattle production (GVCP), we adapt the methodology commonly used to estimate live-weight beef output[20][21], applying it at the farm level using administrative records. Through the use of unique DICOSE identifiers, the National Livestock Information System (SNIG) enables the identification of family producers and estimation of their beef (in kilograms) and milk (in liters) production. This analysis excludes sheep meat due to limited data quality.

In beef cattle farming, physical output is estimated by analyzing year-on-year changes in herd inventories, livestock movements, average live weights for animals exchanged between farms, and slaughter weights. Cattle sold for fattening or replacement are valued using average prices by category, published by the Livestock Consignors' Association, while animals sent to slaughter are valued using slaughter prices from the National Meat Institute (INAC).

The gross value of cattle production (GVCP) is calculated by valuing beginning and ending stocks, purchases and sales of replacement and slaughter cattle, and on-farm consumption. The approach builds on methods developed for estimating beef production at the unit level[21].

Data from sworn declarations submitted to the National Livestock Information System (SNIG) provide information on herd inventories for each cattle category (including male and female calves, steers aged 1 to 2 years, 2 to 3 years, and over 3 years, heifers aged 1 to 2 years and over 2 years, breeding cows, and cows for fattening), as well as on-farm beef consumption. Net changes in sales between producers and cattle sent to slaughter are estimated using SNIG movement records.

Live weights for animals traded between producers are estimated using data from televised cattle auctions, disaggregated by year and category. Live weights for animals sent to slaughter are obtained from slaughter records. This allows the physical quantity of beef produced to be estimated. To express production in value terms, price data are required.

To estimate the GVCP, the herd must be valued at the beginning and end of the production year, along with transactions involving replacement cattle, finished (slaughter-ready) cattle, and any on-farm slaughter (if applicable).

The following equation summarizes the estimation of GVCP:

$$GVCP_k = \sum_{i=1}^{I} (Price_{Stock_{ik}})(Weight_{Stock_{ik}})(\Delta Stock_{ik}) +$$

$$\sum_{i=1}^{I} (Price_{Replace_{ik}})(Weight_{Replace_{ik}})(\Delta Replace_{ik}) +$$

$$\sum_{i=1}^{I} (Price_{Slaugther_{ik}})(Weight_{Slaugther_{ik}})(\Delta Slaughter_{ik}) +$$

$$(Price_{Consummption_{ik}})(Weight_{Consummption_{ik}})(Consummption)$$

Table S1 and **Table S2** present the average national prices used for valuing replacement and slaughter cattle, respectively.

Table S1. Prices for replacement cattle (US$/kg live weight)

Category	2016	2017	2018	2019	2020	2021	2022	2023
Bulls	1.75	1.65	1.69	1.91	2.17	1.87	2.591	2.185
Breeding cows (pregnant)	0.851	0.918	0.894	0.959	1.08	0.936	1.181	1.110
Cows for fattening	1.22	1.15	1.21	1.38	1.64	1.41	1.87	1.68
Heifers > 2 years (non-pregnant)	1.51	1.41	1.50	1.67	1.94	1.67	2.15	1.98
Heifers 1 to 2 years	1.57	1.49	1.60	1.75	2.03	1.77	2.21	2.03
Steers > 3 years	1.59	1.50	1.53	1.73	1.98	1.70	2.28	2.06
Steers 2 to 3 years	1.67	1.58	1.61	1.76	2.03	1.73	2.30	2.11
Steers 1 to 2 years	1.78	1.70	1.72	1.82	2.08	1.82	2.33	2.15
Calves	1.86	1.92	2.00	2.3	2.05	2.47	2.34	1.86

Table S2. Prices for slaughter cattle (US$/kg live weight)

Category	2016	2017	2018	2019	2020	2021	2022	2023
Bulls (ACG)	1.31	1.26	1.24	1.43	1.61	1.49	1.93	1.73
Cows for fattening	1.44	1.35	1.47	1.60	1.78	1.61	2.21	1.92
Heifers > 2 years (non-pregnant)	1.58	1.46	1.54	1.65	1.86	1.67	2.27	2.01
Heifers 1 to 2 years	1.58	1.46	1.54	1.65	1.86	1.67	2.27	2.01
Steers > 3 years	1.77	1.62	1.70	1.82	2.02	1.84	2.51	2.23
Steers 2 to 3 years	1.77	1.62	1.70	1.82	2.02	1.84	2.51	2.23
Steers 1 to 2 years	1.77	1.62	1.70	1.82	2.02	1.84	2.51	2.23
Calves	1.68	1.58	1.69	1.85	2.03	1.87	2.54	2.16

B. Dairy Production Value

Milk production is reported directly by producers to the SNIG. Production value is estimated by multiplying reported milk volumes by average annual farm-gate prices, as published in bulletins from the National Milk Institute (INALE).

C. Beekeeping Production Value

Beekeeping data are sourced from SINATPA, Uruguay's national traceability system for apicultural products, which includes individual identification numbers for all registered beekeepers. This enables the identification of family farmers within the apiculture sector.

Production volumes are taken from SINATPA records. Honey prices are derived from DIGEGRA-MGAP bulletins, which report average annual export producer prices. These prices are converted to Uruguayan pesos using the annual average exchange rate from the Central Bank of Uruguay. The gross production value is calculated by multiplying prices by reported honey volumes.

It is important to note that discrepancies exist between the number of family beekeepers recorded in different registries. In 2022, the Family Farming Registry listed 672 beekeepers whose main activity was apiculture, while SINATPA identified over 1,140 family beekeepers. This difference arises because many producers engage in beekeeping as a secondary activity, not reflected as their primary classification. Including these secondary activities raises the estimated total of family beekeepers by approximately 300 units, more closely aligning with SINATPA's figures.

D. Horticulture and Fruit Culture Production Value

In the fruit and horticultural sectors, producer-level data are obtained from MGAP's DIGEGRA registries. Production values are estimated using wholesale prices from the Montevideo Wholesale Market (UAM), adjusted for marketing and transportation costs following the methodology developed by Ackermann et al.

Price information is sourced from fruit sales data at the Agro-Food Unit. To determine the farm-gate price, the wholesale price is adjusted by deducting the profit margin and transportation costs between the producer and the wholesaler. This information is drawn from the study by Ackermann and others[7]. For products where specific studies on the value chain are unavailable, and profit margins and transportation costs between producers and wholesalers cannot be determined, the average profit margin and transportation cost are applied as assumptions.

To calculate the Production Value, wholesale prices from the UAM are used. For crops produced year-round, weighted average prices are applied; for seasonal crops, simple seasonal averages are used.

Horticulture and fruit culture do not have official data from OPYPA or DIEA, which do not offer updated information on total production or cultivated area. The UAM provides annual statistics on the volume received by crop, which aligns reasonably well with RNFH data –except for crops like potatoes, which are dominated by a few large producers not registered in RNFH.

This data encompasses issues with both underestimation and overestimation, depending on the product, as the volume passing through the UAM is not fully representative of total production. Additionally, the RNFH is not reliable for large producers, particularly for crops with high concentration.

Despite these limitations, RNFH data align reasonably well with UAM figures for most crops, excluding outliers like potatoes. Thus, the RNFH serves as a starting point for estimating horticultural production, particularly for family farming, and could be improved with more comprehensive data collection.