

The Croatian Livestock Sector in the perspective of the New CAP: Pig and cattle production systems, competitiveness, and public expenditure



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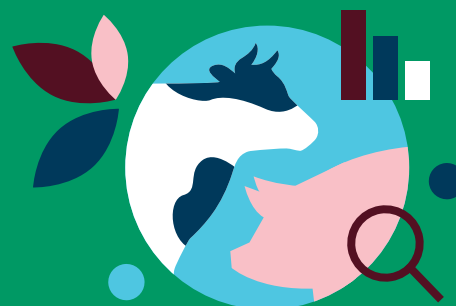
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List of Acronyms

APRRR	Agency for Payments in Agriculture, Fisheries and Rural Development (the "Payments Agency")
ARKOD	Land Parcel Identification System (Croatia)
CAP	Common Agricultural Policy of the European Union
CBS	Croatian Bureau of Statistics
EAFRD	European Agricultural Fund for Rural Development
EU	European Union
EU13	Bulgaria, Czech Republic, Cyprus, Estonia, Croatia, Hungary, Lithuania, Latvia, Malta, Poland, Romania, Slovenia, and Slovakia
EUR	Euro
FADN	Farm Accountancy Data Network
HAMAG-BICRO	Croatian Agency for SMEs, Innovations and Investments
HBOR	Croatian Bank for Reconstruction and Development
HRK	Croatian Kuna (HRK 100.00 = USD 16.00 [January 2021])
IACS/IAKS	Integrated Administration and Control Systems
LU	Livestock Unit
NARDS	National Agricultural and Rural Development Strategy
STARS	World Bank Strategic Transformation in Agriculture and Rural Space
USD	United States Dollar
VCS	Voluntary Coupled Support

Overview



The European Union's Common Agricultural Policy (CAP) has evolved since its inception in 1962 and since the expansion of the EU to 28 member countries (EU28 - EU27, since the departure of the United Kingdom on 31 January 2020). In its latest iteration published in June 2018, the 2021-2027 CAP, now due for implementation in 2023, increases environmental sustainability requirements, while offering more flexibility to member state governments. Based on a detailed modelling exercise, consultations with both the Croatian authorities and agricultural stakeholders, this report supports the Croatian authorities in their efforts to comply with new CAP requirements in the livestock subsectors of pigs, beef and dairy production. Specifically, the report addresses two knowledge gaps: production systems, profitability and economic sustainability of production systems; and the effectiveness and equity of public support.

The authors examine the main trends in productivity, output, prices, costs, and production technology on which to base their findings. Moreover, they built an economic model with observable data and inputs from farmers and using characteristics specific to each subsector. The model produced indicators related to profitability and economic sustainability that can be used by the Ministry and other public authorities to assist the Croatian authorities in elaborating the National Agricultural and Rural Development Strategy.

The report also provides a detailed analysis of all types of public support available to livestock farmers, including rural development support, direct coupled and decoupled support, and subsidized diesel fuel, general expenditure on administration, knowledge and education expenditure, subsidized loans. It examines public support from different angles including a comparison of aggregate indicators with other countries, analysis of the legal background, comments received from producers and, finally, a deeper farm-level view from which micro data is analyzed.

The preparation of this report benefited from multiple consultations and focus group discussions with pork, milk and beef producers.

In all three subsectors, the report finds evidence of decline or stagnation in both production and productivity, with a consequent reduction in the country's self-sufficiency in these products despite conducive agro-ecological conditions for livestock production. At the

same time, in all three subsectors, there is a gradual movement towards larger farming units because of the lack of competitiveness and market connection among small and medium-sized family farms. Larger units were better able to benefit from economies of scale and national as well as CAP-related transfers. This calls for measures that support higher technical performance and financial viability across the scale, and, in particular, among medium-sized family farms that have the potential to make a greater contribution to agricultural output and rural development.

Even with technical and management improvements and increased environmental sensitivity, the three livestock subsectors need support in marketing, sectoral organization and easing administrative burdens, as well as more favorable lending conditions. All three subsectors reveal a need for stronger producer organizations that can enable better access to markets, economies of scale and delivery of advisory services. Farms that are able to accommodate on-farm processing of their products are able to boost incomes and compensate to some extent for low prices and inefficiencies.

While the domestic market is experiencing penetration and competition from other EU member states, external markets – especially for the beef subsector – do exist and offer a potential alternative outlet.

In the pig subsector, sustained domestic consumption of pig meat indicates an opportunity for producers to increase their market share through better marketing. Relatively small financial investments to improve meat quality through recourse to appropriate breeding lines and improved indoor climate management, would help farmers comply with market specifications for product quality. CAP Pillar 2 transfers under Measure 14 (animal welfare) should be made more accessible to pig farmers, since these could be the only direct payments per animal available to them.

In the dairy subsector, the study shows that the smallest farms (3 cows) are not able to reach a positive gross margin without public support and are therefore maintained through direct payments. Larger farms, up to 20 cows can be profitable, especially if they operate value-addition activities. The largest dairy farms in our analysis (125 head) reach the highest per cow margin before payments due to higher productivity from economies of scale in milk production. In parallel to the development of large production units, there is scope for the development of competitive medium-size farms (50-70 cows) that can contribute to maintaining rural employment. In order to improve their viability, such farms will need either to increase their margin with on-farm processing or increase their milk yields to align with EU comparators. This will require some extra training and marketing assistance for farmers in this category to enable them to broaden their markets, while reducing costs. The New CAP offers an opportunity to invest in this type of operation that also has high potential for environmental performance.

For the beef subsector the economic analysis shows that all three beef farm types have positive gross margins per animal and per farm before payment, with significantly higher per animal gross margins in the full-cycle beef farm. The gross margin per animal and per farm increases significantly after payments (especially on farms with large land areas), which indicates a major role for direct support in the entire beef subsector. A substantial effort needs to be made to reduce farmers' dependence on income support. This can be

achieved by increasing competitiveness through, for example, lowering the cost of fattening calves by accessing the local supply, rather than imports. It is important to facilitate sustainable land access that avoids excessive grazing for beef farmers with the twin goals of reducing feed costs and progressing towards the environmental goals outlined in the European Green Deal. Further reductions in feed outlays can be achieved by establishing a better balance between enhanced feed products and cheap silage, leading to improved technical performance in terms of weight gain over time and meat quality.

Rural development funds are relatively under-utilized in Croatia, especially by small and medium-sized operations, but could contribute to farm efficiencies if administrative procedures could be streamlined and the rules held steady over a longer period. A major contribution to improving efficiency and profitability in these three sectors would be access to CAP funds under the European Green Deal. Adherence to environmentally friendly regulations under the new CAP in, for example, organic production and protection of the countryside, could open significant opportunities for Croatian farmers in the pig, dairy and beef agriculture subsectors.

1. Introduction



The European Union's (EU's) 2021-2027 Common Agricultural Policy (CAP) offers enhanced flexibility for member states to apply its provisions, including those with improved environmental considerations within their national CAP strategic plans. In Croatia, the Ministry of Agriculture has developed a National Agriculture and Rural Development Strategy (NARDS), which defines the objectives and identifies actions towards improving the country's agri-food sector. This Strategy serves as the basis for the development of the CAP Strategic Plan for Croatia. By providing a thorough analysis of key parts of the Croatian livestock (beef, dairy and pig) sector this report contributes to the formulation of the National CAP Strategic Plan for 2021-2027. The document provides advice to the Ministry of Agriculture on the design, implementation, monitoring and evaluation of the 2020-2030 agricultural and rural development plans in the context of CAP integration and the objectives of the European Green Deal, presented on 11 December 2019.

The CAP strategic plan needs to be aligned with two important EU strategies: The European Green Deal and the "Farm-to-Fork" strategy. The European Green Deal is a wide plan for sustainable development in Europe. It includes all sectors and not just agriculture. The strategy aims to transform the EU into a prosperous, fair, competitive and resource-efficient economy, with no net emissions of greenhouse gases by 2050, zero pollution and a decoupling of economic growth from resource use. The Farm-to-Fork strategy is an important ingredient of the European Green deal and is directly related to the agricultural sector. The objective is to make food systems fair, healthy, and environmentally friendly to make a positive environmental impact, while generating fairer economic returns, fostering competitiveness in the EU supply sector, and promoting fair trade.

Previous research into Croatian livestock sector has identified substantial structural, technical, and organizational challenges including underperforming productivity and competitiveness issues. Analytical work carried out in the context of the World Bank's Strategic Transformation in Agriculture and Rural Space (STARS) project (World Bank, 2019a, 2019b, 2019c), has shown that improvements in agricultural productivity have been slow since EU accession, mostly as a result of: (i) investment gaps in capital, technology and R&D; (ii) a fragmented production structure; (iii) an aging producer population; (iv) constraints to market and credit access for small producers and agri-businesses; (v) an ill-adapted land-tenure structure; and (vi) increasing climate unpredictability. Despite its receiving

above-average direct public payments (as shown in the following sections), enjoying significant natural resources, and the existence of a lengthy tradition in livestock production, the sector suffers from one of the strongest downward production trends in the economy.

To contribute to understanding why this might be so, this report addresses two, hitherto insufficiently explored knowledge gaps:



GAP 1

The livestock sector's main production systems, and consolidated assessment of related data sources, policy framework and competitiveness



GAP 2

The effectiveness and equity of public support to the livestock sector and options for improvement

It needs to be emphasized that only three subsectors – beef, dairy, and pig breeding – are analyzed in this report because of: i) their relative size (share in livestock production), ii) a large share of direct payments is allocated to beef and dairy, and iii) a visible downward trend in production in all three subsectors. The assessment of the first Gap looks deeper into the main sectoral trends in productivity, output, prices, costs and production technology, but it also builds an economic model using observable data and inputs from farmers, in which farm types for each of the three subsectors are modelled based on their specificities in: farm assets; production area and number of animals; animal production practices and performance; processing and marketing; and levels of public support. Farm profitability indicators and additional economic and sustainability indicators were computed from the model.

The Gap 2 assessment provides a detailed analysis of all types of public support available to livestock farmers, including rural development support, direct coupled and decoupled support, subsidized diesel fuel, general expenditure on administration, knowledge and education expenditure, and subsidized loans. It examines public support from different angles including a comparison of aggregate indicators with other countries, analysis of the legal background, comments received from producers and, finally, a deeper farm-level view from which micro data is analyzed.

These analyses and inputs from producers and Ministry officials¹ give rise to a list of policy suggestions to support the decision-making process for integrating the livestock sector into the NARDS approach to the 2021-2027 CAP.

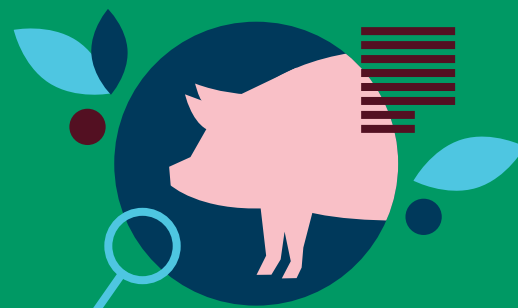
The report does not examine some broad issues impacting the livestock sector such as state-owned agricultural land resources and land-access rights, access to private capital sources, producer organizations or specific marketing strategies.

The report was prepared as the COVID-19 pandemic hit Croatia and the world. The sector was affected, especially disturbing market access for small holders. While locally severe, the overall impacts on volumes and prices were however relatively limited, and the Croatian agriculture sector – including livestock – grew in 2020, despite the pandemic. This report aims at addressing the two knowledge gaps above on a mid-term basis and thus does not dwell on the assessment of COVID-19 impacts and recovery measures.

Sections 2-4 include results from the Gap 1 analysis for each of the three subsectors, while section 5 provides a detailed analysis of public expenditure on the livestock sector in Croatia. Section 6 provides an overview of the revised CAP and some potential consequences it may have for the Croatian livestock sector. Policy suggestions are listed in section 7. Section 8 concludes.

1 The enforcement of COVID-19 control measures impacted the study underpinning this report, and especially the preparation team's capacity to access information and interact with stakeholders. These were partially circumvented through remote communications and the organization of virtual consultations. Six consultations were organized in support of the preparation of this report. Five of them in collaboration with the Croatian Chamber of Agriculture.

2. Pig subsector overview

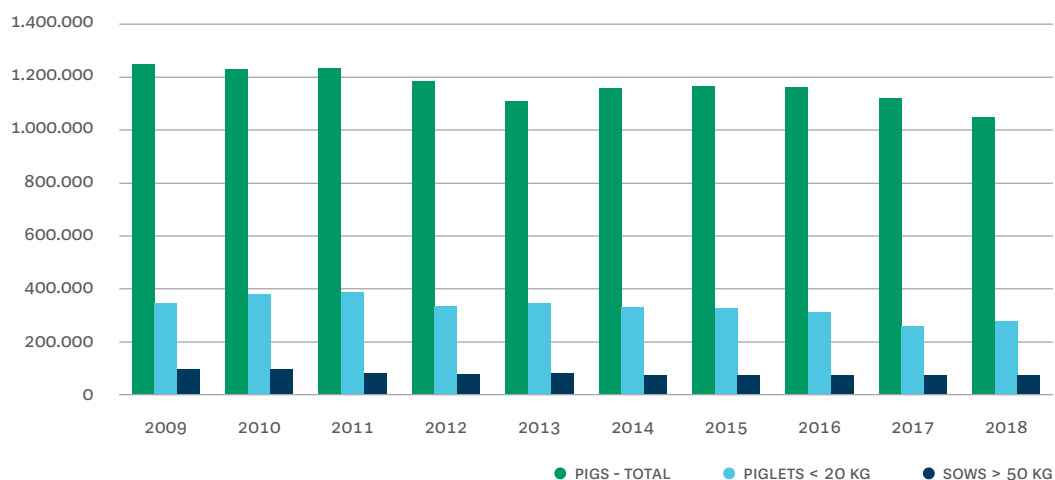


2.1 General trends

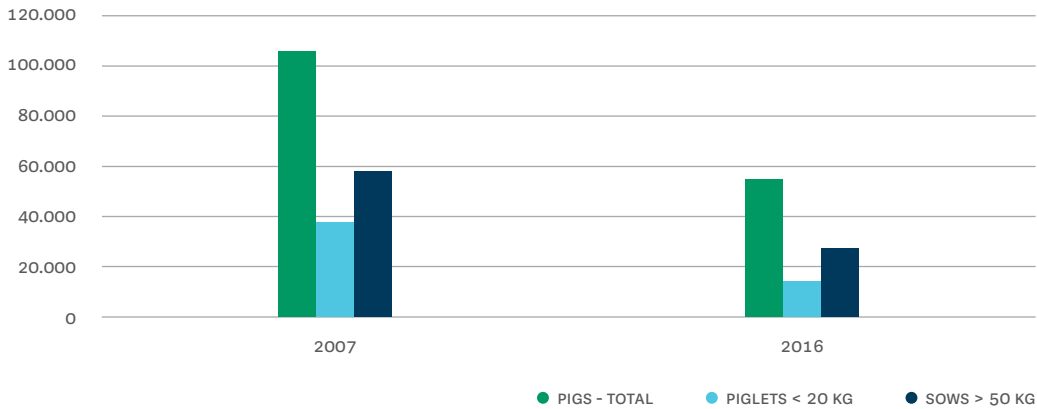
Pig production is one of the most important branches of Croatian livestock production, especially since it is present in almost every part of the country. It impacts many other branches of the economy: the processing industry; the animal feed industry; the processing and finalization of agricultural products; the processing of by-products of the food industry; construction; and equipment production.

The total number of pigs in 2018 was slightly above 1 million head which is a decrease of 6.4% over 2017. Over a longer term, the number of pigs in 2018 decreased by 8.3% compared to the average number of animals for the period 2013-2017 (Figure 1). Both piglets and sows contributed to this overall trend.

Figure 1. Total number of pigs, piglets and sows in the Republic of Croatia



Source: Statistical Reports of the Croatian Bureau of Statistics

Figure 2. The number of agricultural holdings with pig production

Source: Statistical Reports of the Croatian Bureau of Statistics

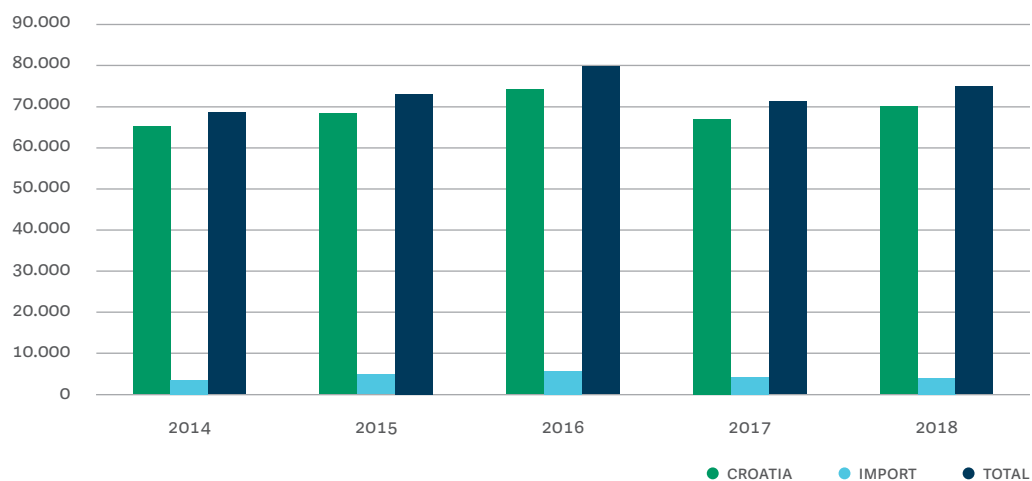
Although there are good conditions for pig production, especially due to the significant production of corn in the country, Croatia's share in the number of pigs in the EU is only 0.7%, for a population equal to about 1.3% of the EU total. Domestic production is very sensitive to changes in the market and economic environment (Ministry of Agriculture, 2019b). More precisely, the purchase price of imported piglets is lower than it is for domestic equivalents, with prices as low as EUR 0.8 to EUR 0.9 per kg (Agroklub, 2020), which supports continued imports.

The number of agricultural holdings raising pigs decreased by 48.3% between 2007 and 2016 (Figure 2) and the average number of units per holding more than doubled, from 10.1 to 22.5 head. The main impact of this decline is the disappearance of medium-sized holdings, leaving only small or large-sized operations in the sector (Figure 7).

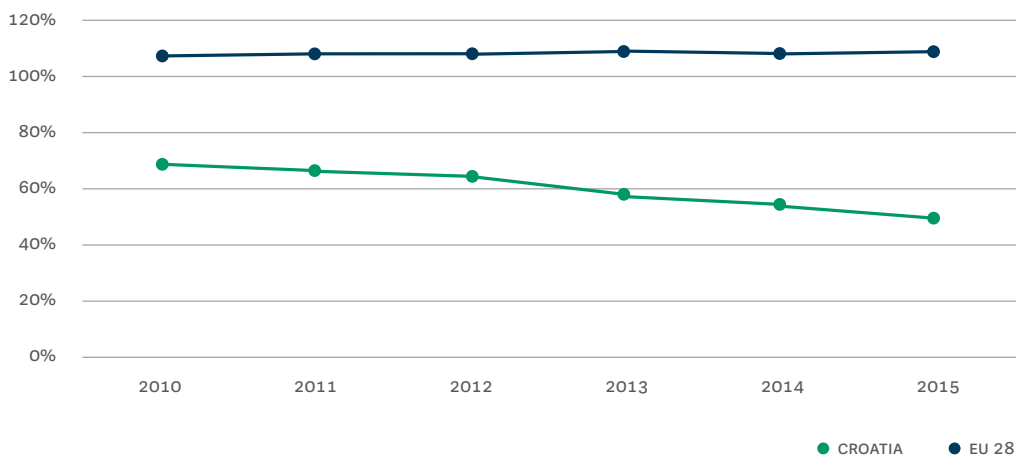
Four counties, Vukovarsko-srijemska, Sisačko-moslavačka, Brodsko-posavska and Osječko-baranjska (Ministry of Agriculture, 2019c), dominate the Croatian pig industry.

There are signs of progressive consolidation and geographical concentration of the pig sector, coupled with an overall decrease in the number of farmers and animals.

Croatia's pork production does not meet domestic demand, which leads to significant imports of animals, from piglets to slaughter pigs. The degree of self-sufficiency in pork meat ranges from between 50% - 70% and this low level has remained fairly consistent over the ten years from 2010. In addition, approximately 5% of processed and classified pig carcasses in Croatia is imported (Figure 3). The balance of pork meat consumed in Croatia is imported and already processed when it crosses the border.

Figure 3. Total carcass weight processed (t) for period 2014 – 2018

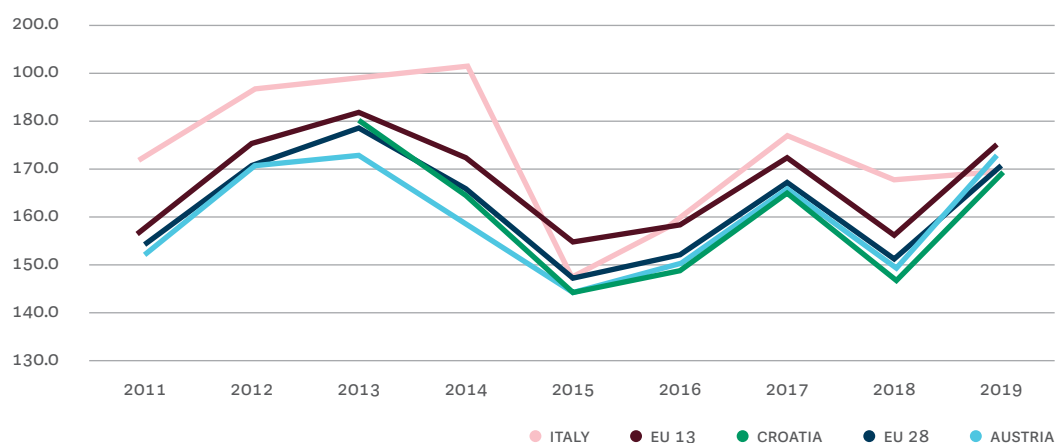
Source: Annual report for pig breeding in the Republic of Croatia 2018., Croatian agricultural agency

Figure 4. Croatia's pork self – sufficiency compared to the EU average (%)

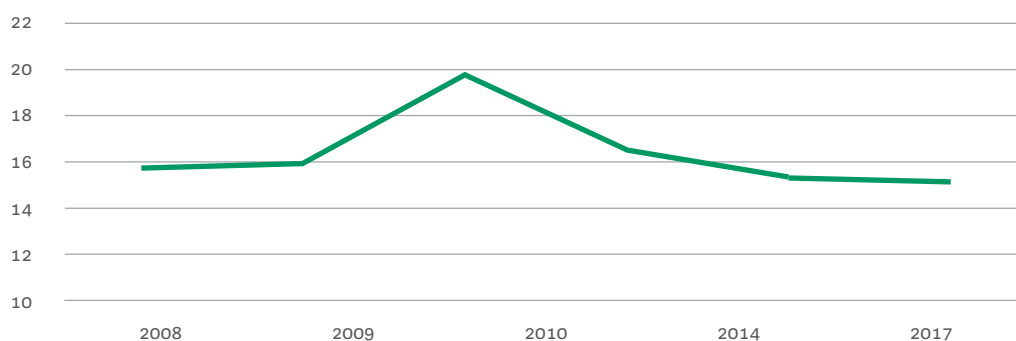
Source: The Croatian Ministry of Agriculture, Annual report on the state of agriculture

Pork prices are low, compared to beef prices (Figures 5 and 17), and are fully aligned with those in other EU countries, while household consumption is about 15 kg per capita.² Hence, one possible reason why the consumption of pork has not decreased is the low comparative price.

² Year-on-year changes in pork consumption may show stronger variation (for instance the peak in 2010) as it is based on survey data.

Figure 5. The average market price of pig carcass (EUR/100kg)

Source: European Commission, Meat market observatory

Figure 6. Pork consumption per household member (kg)

Source: Croatian Bureau of Statistics, Household survey. After 2011, data are collected every three years by the CBS. Note: the data shown only includes home consumption (excluding restaurants)

2.2 Economic analysis and farm type model

In order to capture the diversity of production units, in the analysis, five pig farm types are defined as:³

- Pig 1 – Very small farm (piglets for slaughtering)
- Pig 2 – Small farm (sows + hogs)
- Pig 3 – Medium sized farm (sows + hogs)
- Pig 4 – Large sized farm (sows + hogs)
- Pig 5 – Large hog farm

—

3 More details about typical farm modelling are provided in the Annex.

Each farm is defined by key features: herd size, land area, breeds, average age and weight at slaughter, key management practices, source of labor, building type, slaughtering/processing site, proportion of farmer's income derived from the activity, and key management practices.

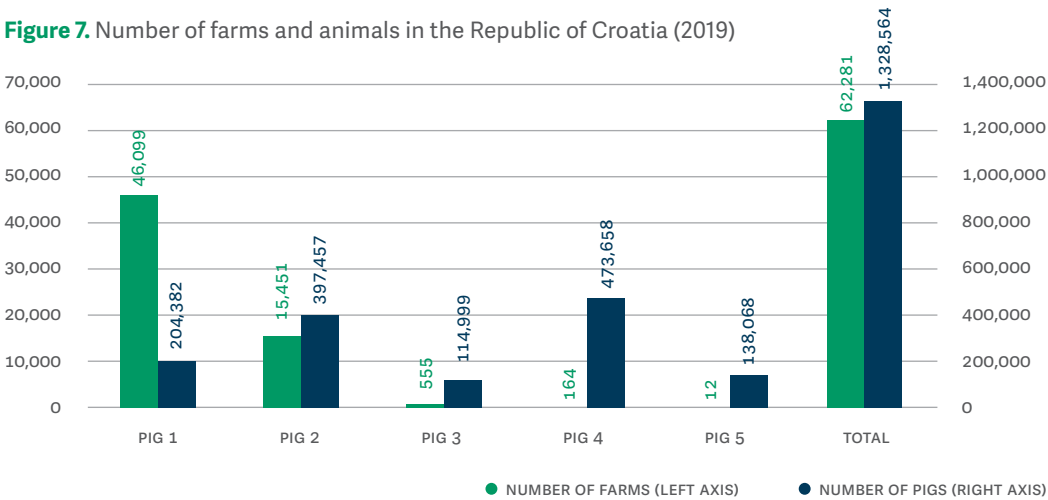
Table 1. Typical pig farms

	PIG 1	PIG 2	PIG 3	PIG 4	PIG 5
Herd size	63 head (3 sows, 60 piglets)	105 head (25 sows, 80 fatteners)	440 head (40 sows, 400 fatteners)	17,600 head (1,600 sows, 16,000 fatteners)	12,000 fatteners
Land area (ha)	3	8	26	700	4,000
Breeds	Crossbreeds	Crossbreeds	Crossbreeds	hybrid	hybrid
Average age and weight at slaughter	3 months at 30kg	6 months at 100kg	6 months at 100kg	6 months at 100kg	6 months at 100kg
Key management practices	Animals kept outside	Breeding animals kept outside	Fatteners kept indoors	Pigs raised to slaughter weight for sale or export	Pigs raised to slaughter weight for sale or export
Main feeding ingredients	Grass and concentrate	Grass and concentrate	Grass and concentrate	Concentrate: own feed + bought	Concentrate: own feed + bought
Labor	Family	Family	Family + workers	Family + employees	Family + employees
Building type	Traditional houses	Traditional houses	Intermediate buildings	Large buildings or barns	Large buildings or barns
Slaughtering / processing	Yes, at least partially on the farm	Yes, at least partially on the farm	No, selling to slaughter-houses	No, selling to slaughter-houses	No, selling to abattoir
Contribution to farmer's income	Main source of income, possible additional farm activities	Main source of income, possible additional farm activities	Main source of income	Main source of income	Main source of income

Source: World Bank, consultations with experts and private-sector stakeholders

Pig production is increasingly concentrated on large farms, driven by economies of scale. Many small farms remain but fewer than 1% of farms are medium-sized (Figure 7). Pig 1 typical farms represent the largest number of farms (74% of total farm number) but host only around 15% of the total herd. The largest share can be found in farm type Pig 4 – the largest mixed pig farm. Pig sector production on larger farms has generally had relatively good results in terms of daily weight gain, but sow productivity and feed utilization are less favorable, compared to other main pig-producing countries in the EU.

Figure 7. Number of farms and animals in the Republic of Croatia (2019)



Source: Ministry of Agriculture, Animal register

Note: The number of typical farms shown on the graph are not exactly equal to the total number of farms of the respective size and production process observed in the data for the country; the approach in this paper represents a simplification of the real world, as is the case for any model. Each of the standardized farm types is, rather, based on a farm size range and similar production processes and each typical farm can, therefore, be seen as representative of such a range.

All five pig farm types showed substantial differences in production practices. Pig 2 and 3 are small family farms but vary greatly based on total pig numbers. Pig 4 and Pig 5 are both large industrial farms, with Pig 4 a closed system, with sows and fatteners, and Pig 5 focused solely on fatteners. Smaller farms tend to keep breeding animals outdoors. Pig production on larger farms showed efficient fattening, with 10%-20% lower production costs per animal. Challenges remain in the sector, with higher mortality and lower herd health, sow productivity, and feed use (Annex Table A1).

Compared to other EU countries, sow productivity on small and medium sized Croatian pig farms is low. Large pig farms may have quite comparable sow productivity, but the feed conversion ratio for growing pigs is rather unfavorable. Relatively cheap feed prices do not induce pig farmers to improve feed utilization. However, increasing foreign purchases of Croatian raw materials indicate the need for more focus on improving technical performance on farms raising pigs.

Table 2. Gross margin for pig farms – Overview

	UNIT	PIG 1	PIG 2	PIG 3	PIG 4	PIG 5
Gross margin before payment (HRK)						
Per farm	HRK/farm	8,448	70,218	275,636	14,670,018	5,696,875
Gross margin after payment (HRK)						
Per farm	HRK/farm	19,495	101,060	351,182	16,189,329	13,632,104

Source: World Bank

Note: Some cost categories, such as depreciation and interest rates, are not included in the gross margin calculations presented here. Each group of typical farms represents a mix of situations, from production units which investments have been fully repaid to production units currently investing or holding reserves for future investments. Including depreciation in our analysis would thus overestimate capital cost for most farms and limit the possibility to compare across farm types.

Table 2 shows the estimated gross margin before and after direct payments. All five pig farm types have positive gross margins per farm before payment, with the highest in Pig 4. However, pig breeding can only be an additional activity for Pig 1 and not the only income-generating activity for the farmer even after direct payments, while Pig 2 has an after-payment income close to the Croatian average economy-wide income. An interesting conclusion when comparing the large pig farms is that Pig 4 is able to achieve a 3 times higher pre-subsidy payment margin than Pig 5, which indicates significant economic gains from raising sows in addition to fatteners. Pig breeding, in general, receives the lowest payments among all livestock sectors and none related to the size of the herd, so the contribution of payments to farm gross margins is relatively low, with the exception of the Pig 5 farm type, which is related to large land area and, hence, receives transfers based on the number of hectares.

3. Dairy subsector overview

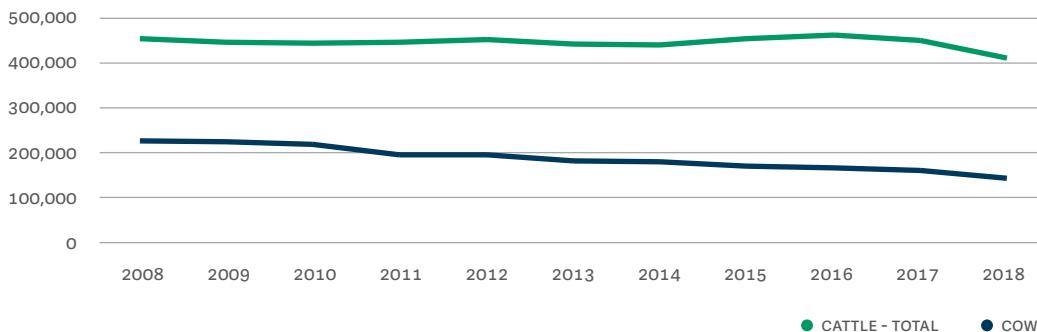


3.1 General trends

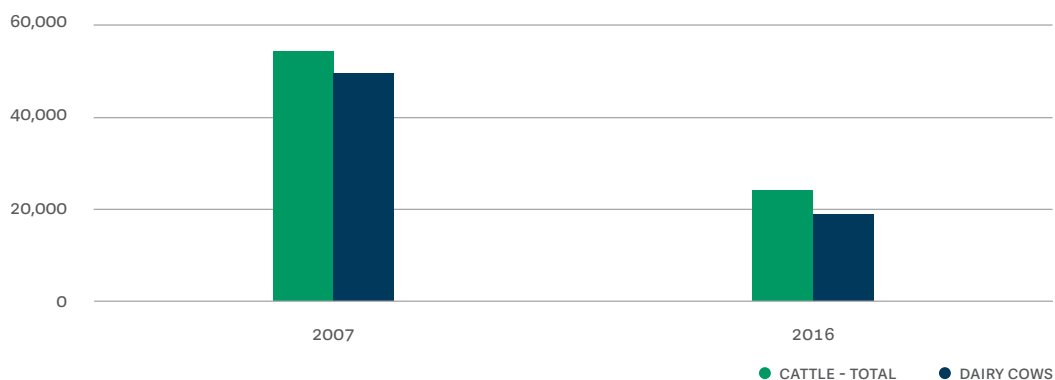
The dairy subsector is one of the most complex agricultural subsectors and suffers from a number of challenges, not only in Croatia. The subsector was hit by the 2008 global economic crisis, the abolition of dairy quotas and Russia’s embargo on food imports from the EU. The dairy subsector and the milk market have yet to recover from these triple blows. The abolition of milk quotas has had a major impact on small milk producers since 2015 and it will be even more difficult for them to find appropriate markets, unlike in countries that are big producers. The extended Russian embargo to the end of 2021 means that a potentially large market for Croatian and others’ dairy products remains closed.

In the Republic of Croatia there is a downward trend in the number of a cows, while the total number of cattle is relatively stable, due to a large number of calves being imported for fattening. Most imported calves come from Romania (66.6%), but large proportions are sourced in Slovakia (8.64%), Czech Republic (7.98%) and Hungary (5.73%) (Ministry of Agriculture, 2019c). The number of cows fell dramatically between 2008 and 2018, with 36% fewer at the end of the period than in 2008 (Figure 8). The Republic of Croatia accounts for 0.5% of the total number of cattle in the European Union (Ministry of Agriculture, 2019b).

Figure 8. Total number of cattle and cows (Dairy and others) in the Republic of Croatia (head)



Source: Statistical Reports of the Croatian Bureau of Statistics

Figure 9. The number of agricultural holdings with cattle and dairy cows

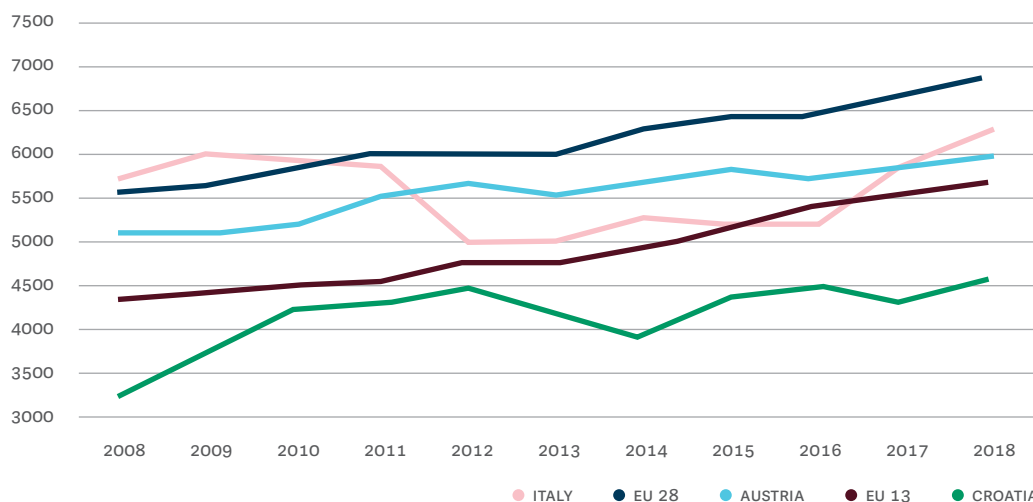
Source: Statistical Reports of the CBS based on data collected every 3 years; 2019 not yet available

The number of agricultural holdings producing cows has declined sharply, over 50%, (2007-2018), with production increases only on large farms (Figure 9). Dairy cow holdings dropped by 62%, and medium-sized holdings almost disappeared, leaving only small or large operations (Figure 14). The large number of small farms, together with the fact that over 70% of Croatia's milk production is concentrated in three large dairy processing companies, points to disparities in market power (Ministry of Agriculture, 2019b).

Two cattle breeds (Simmental and Holstein-Friesian) account for 85% of the total national herd, while 99% of breeds are from international stock (Ministry of Agriculture, 2019b). The most numerous dual-purpose breed is Simmental, followed by Holstein and Brown (Braunvieh). Simmental are bred mainly in central, northern, and northwestern Croatia, where there are many small farms (up to 10 cows and 10-30 cows) and fewer medium and large farms (30-100 cows). Holsteins are mostly raised in the eastern part of Croatia with a large feed area that can support large farms (> 100 cows) and extremely large farms (> 1,000 cows) (Ministry of Agriculture, 2019b).

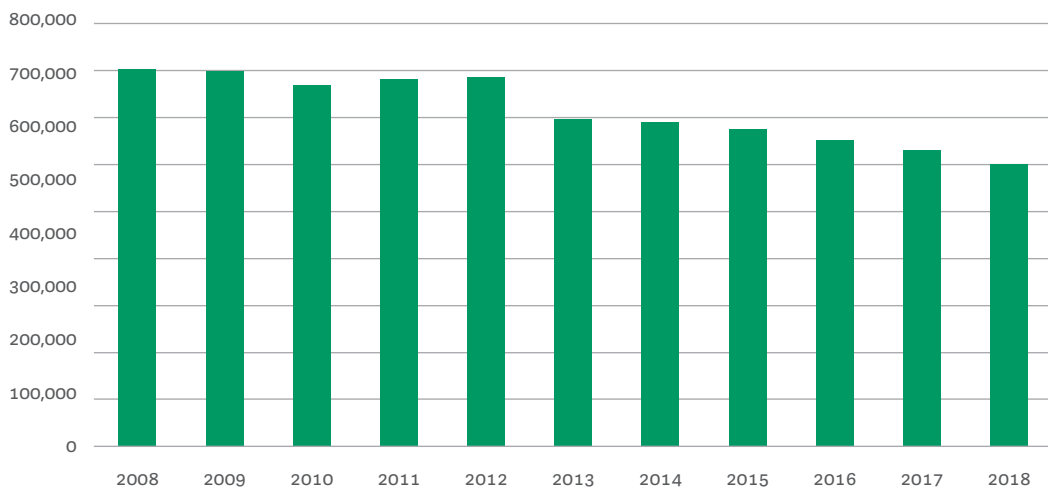
Productivity per cow is significantly below both the EU average and that of the new EU countries (EU 13), (Figure 10), which could be a consequence of the large share of small farms. The total output of milk steadily declined over the ten years to 2018, when it was some 31% below 2008, in a context of declining numbers of cows, which indicates an increase in productivity as a consequence of better genetics (breeding), improved animal feed, and improved management practices. However, this was still not enough to catch up to productivity in other EU countries.

Figure 10. Milk production per cow, comparing Croatia and EU comparators (l/cow/year)



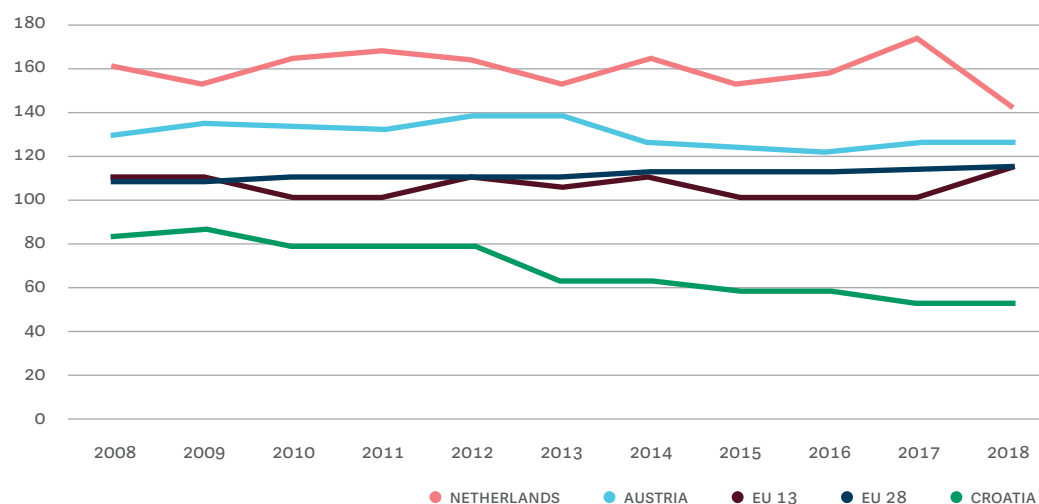
Source: Eurostat data of milk delivered to the dairies

Figure 11. Quantity of cattle milk produced in Croatia (l)

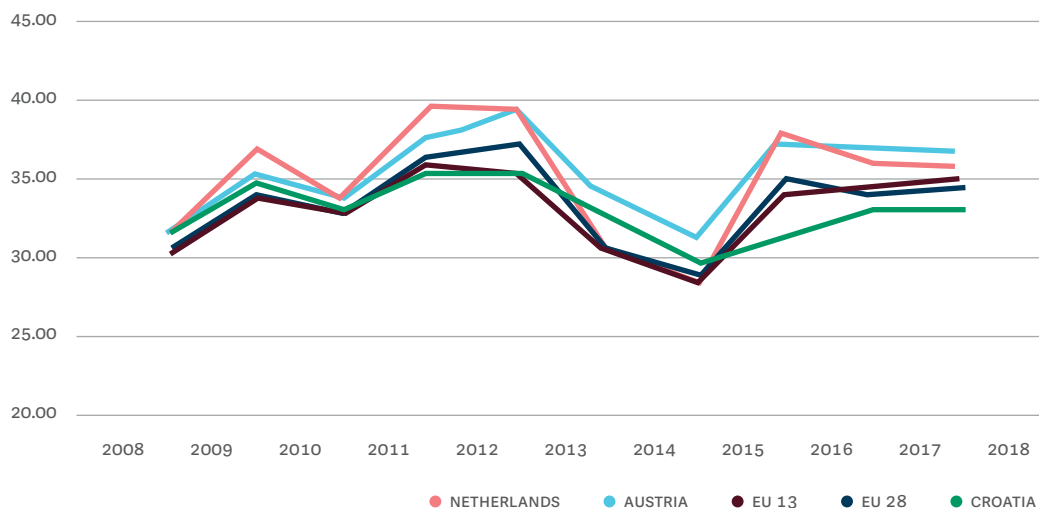


Source: Statistical Reports of the Croatian Bureau of Statistics

Prices of raw milk have been somewhat below the EU and new-EU (EU13) countries' average, (in 2019, 4.2% below the EU13 and 3.2% below the EU28 average) which also points to a less favorable position of Croatian livestock farmers, compared to their European peers. However, compared to milk prices in Slovenia and Poland, for example, Croatian milk prices are somewhat higher (up to 7%) in some years. In Croatia, the low purchasing power of domestic consumers drives prices down, causing a problem for domestic producers. The abolition of milk quotas has further exacerbated the problems because large agri-businesses in the most competitive countries of the European Union are able to market their products in other EU markets, including Croatia, at more attractive prices to the consumer.

Figure 12. Milk self – sufficiency in Croatia compared to EU average (%)

Source: CLAL.it

Figure 13. The average raw milk purchase price (EUR/100kg)

Source: Market price information system in agriculture and European Commission

Compared to the other milk-producing countries in the EU, Croatia suffers from a relatively low level of milk self-sufficiency (Figure 12) which has further decreased over the last decade. On the Croatian market, almost every other litre of milk comes from imports; according to the Italian consultancy firm CLAL, the degree of self-sufficiency in milk has fallen from 83.5% to only 52.2% (Clal.it, n.d.).

Moreover, per capita milk consumption has dropped by 18%, with consumers shifting towards processed dairy products, which indicates wider market opportunities for processors than for raw milk producers (Croatian Bureau of Statistics, 2016).

3.2 Economic analysis and farm type model

In the analysis, four dairy farm types were defined to illustrate the diversity of the subsector:

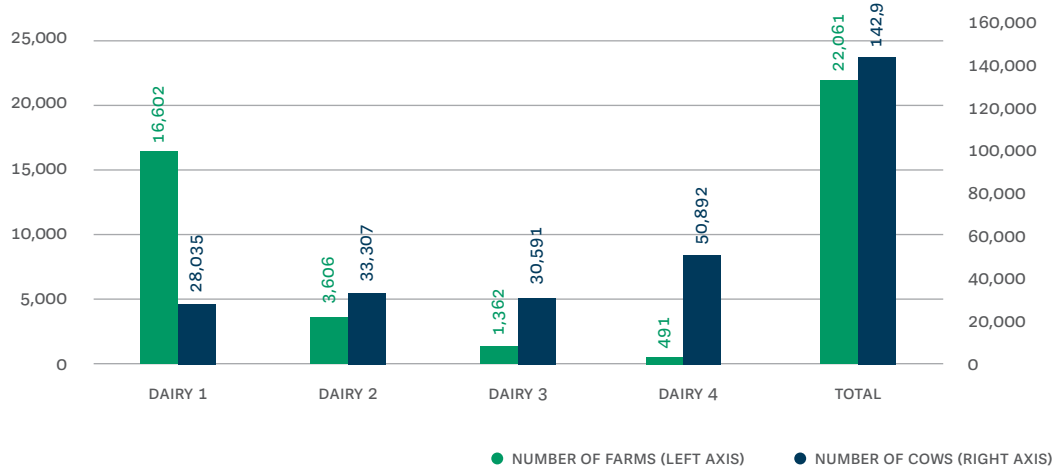
- Dairy 1 – Very small
- Dairy 2 – Small dairy farm with on-site processing
- Dairy 3 – Medium dairy farm
- Dairy 4 – Large dairy farm

Table 3. Typical dairy farms

	DAIRY 1	DAIRY 2	DAIRY 3	DAIRY 4
Herd size (Cows only)	3	10	20	125
Land area (ha)	10	20	45	60
Breeds	Simmental	Simmental	Simmental/ Holstein	Holstein
Milk yield (kg/cow)	4,000	4,000	7,500	9,000
Animal housing	Tie - stall	Free – stall and tie-stall	Free - stall	Free – stall
Feeding	Fresh grass and hay	Fodder concentrated feed	Fodder and concentrated feed	Fodder and concentrated feed
Feed source	Own	Own and purchased	Own and purchased	Own and purchased
Labor	Family	Family	Family	Family + workers
Building type	Traditional	Semi - modern	Semi - modern	Modern
Milk processing	No	Yes, on site	No	No
Contribution to farmer's income	Part – time and/ or other activities	Main source of income	Main source of income	Main source of income

Source: World bank

There are major differences between the types of dairy farm in their productivity, costs, and income. In 2019, 75% of Croatia's dairy farms (Dairy 1 farm type) had only 20% of all dairy cows. These farms are the smallest, most traditional, and least productive. There are only 491 large, more modern dairy farms responsible for a third of all cows under the Dairy 4 classification. According to the animal register, the number of smaller and medium farms declined in number and size of herd between 2008 and 2019. Only the largest, Dairy 4 category increased in both the number of head and farms.

Figure 14. Number of farms and cows in the Republic of Croatia (2019)

Source: Ministry of Agriculture, Animal register

Note: The number of typical farms shown on the graph are not exactly equal to the total number of farms of the respective size and production process observed in the data for the country. Each of the standardized farm types is based on a farm size range and similar production processes and each typical farm can, therefore, be seen as representative of such a range.

Table 4. Gross margin for dairy farms – Overview

UNIT		DAIRY 1	DAIRY 2	DAIRY 3	DAIRY 4
Gross margin before payment (HRK)					
Per farm	HRK/farm	-7,839	89,169	81,917	1,257,312
Per cow	HRK/cow	-2,613	8,917	4,096	10,058
Gross margin after payment (HRK)					
Per farm	HRK/farm	22,569	136,685	219,453	1,711,457
Per cow	HRK/cow	7,523	13,668	10,973	13,692

Source: World Bank

Note: Some cost categories, such as depreciation and interest rates, are not included in the gross margin calculations presented here. See Table 2 for further details.

According to the gross margin estimates shown on Table 4, the smallest dairy farms are not able to reach a positive gross margin without public support and are therefore kept alive by direct payments. However, even after public payments, although positive, the gross margin of Dairy 1 is insufficient to be the main full-time activity of that type of family farm. Dairy categories 2-4 all have positive gross margins before payments with significant increases after payments. The medium-sized dairy farm (Dairy 2) compensates for having smaller herds by operating more value-added activities than Dairy 3, which indicates important gains from such supplementary activities. It, however, needs to be noted that operating more value-added activities also implies additional work, but work done by the farm owner and her or his family is not included in the costs provided in Table A2. It should also be noted that farmers relying on this value addition strategy and direct marketing of their products were particularly affected by the COVID-19 control measures, and in particular the closure of open markets and restaurants. Dairy 4, the only large farm type in this subsector, reaches the highest per-cow margin before payments due to higher productivity from economies of scale in milk production.

4. Beef subsector overview



4.1 General trends in the beef subsector⁴

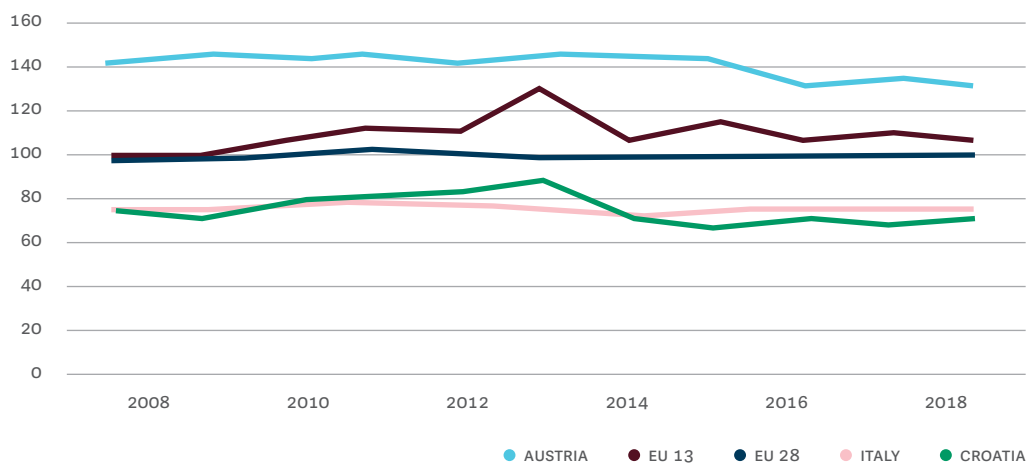
The beef subsector is a major undertaking with high levels of expenditure in husbandry, production, processing and marketing. It is economically important because it provides a wide range of products for human consumption and generates employment based on favorable geographical and climatic conditions for cattle. Cattle production uses less expensive feed crops and by-products in the form of forage, hay, straw and natural pasture, while producing manure that improves soil fertility and enhances crop yields.

Figure 8, above, shows that the total number of beef cattle in Croatia has been relatively stable, but only owing to a large number of imported young animals. However, the number of agricultural holdings producing cattle has declined sharply, by around 56% from 2007 to 2016 (Figure 9), with production increasing only on large farms.

The number of animals sent to slaughterhouses declined by 25% from 2008 to 2018, with half of the total beef production made up of calves imported for fattening and slaughtering, according to Eurostat data. Approximately 30% of imported cattle were exported after fattening, to the Middle East (Lebanon) or to the EU (Italy, Austria) (Ministry of Agriculture, 2019b).

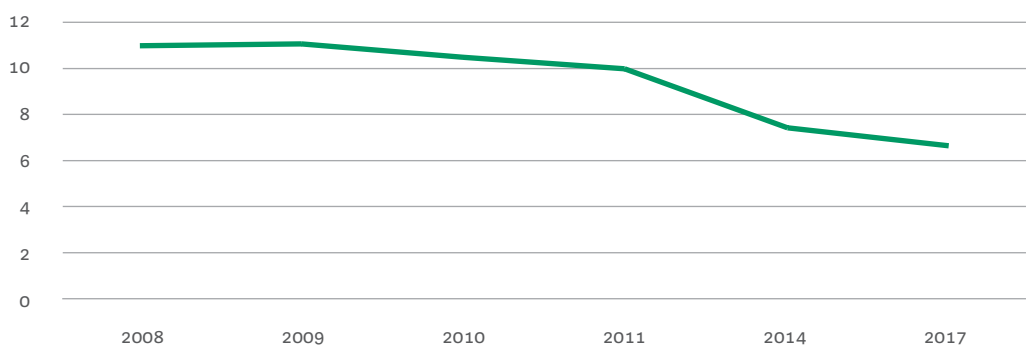
⁴ The beef subsector in this analysis encompasses all beef fattening farms and cow-calf system farms.

Figure 15. Beef self sufficiency in Croatia vs EU average (%)



Source: Ministry of Agriculture, Annual report on the state of agriculture and Eurostat data

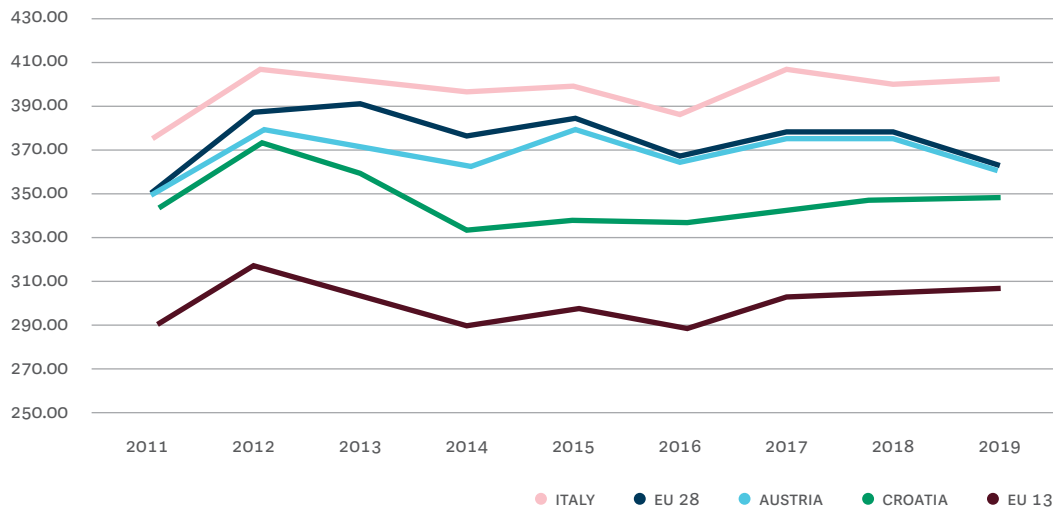
Figure 16. Annual Beef and Veal consumption per household member (kg per capita per year)



Source: Statistical Reports of the Croatian Bureau of Statistics, Household survey. Note: the data shown only includes home consumption (excluding restaurants)

Domestic household-level consumption of beef has declined by 40%, as people switch to other meat and non-meat products (Figure 16). Croatian consumers mostly prefer poultry and pork meat as it is cheaper than beef, despite the lower nutritional values, which reflects differences in per capita income of the average Croatian consumer, compared to the average EU consumer. The drop in consumption was observed despite relatively stable beef prices (Figure 17).

Figure 17. The average price of beef carcass (EUR/100kg)



Source: European Commission, Meat market observatory

4.2 Economic analysis and farm type model

In the analysis, three beef farm types were defined as:

- Beef 1 – Medium – size fattening operation (feedlots)
- Beef 2 – Large fattening operation (feedlots)
- Beef 3 – Large “cow – calf” farm (full cycle operation mostly relying on grass feeding)

Table 5. Typical beef farms

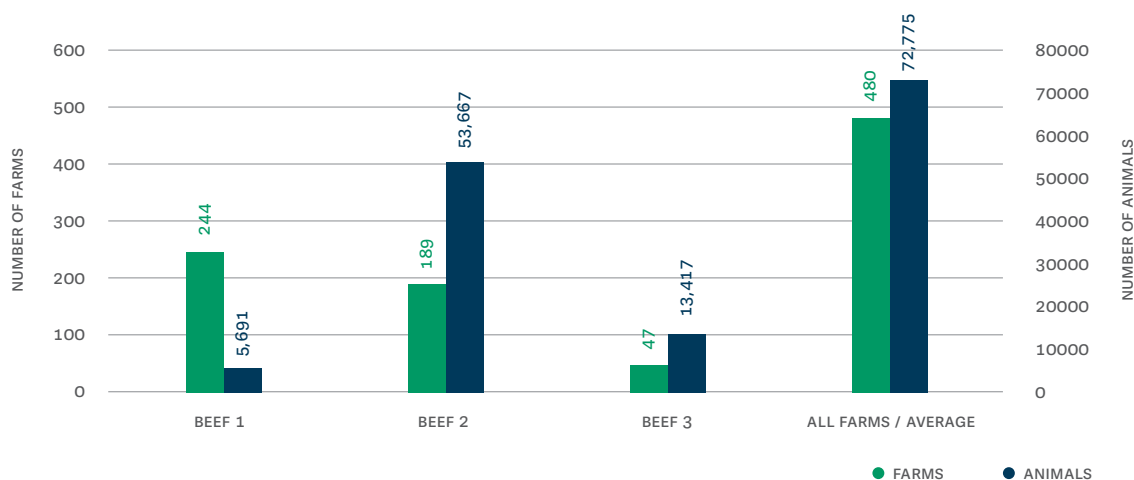
	BEEF 1	BEEF 2	BEEF 3
Herd size (incl. calves)	50	280	200
Land area (ha)	5	40	120
Breeds	Crossbreeds	Crossbreeds, Simmental	Simmental, Charolais
Age and liveweight at slaughter	13/15 months at 500 kg	15/17 months at 550kg	10 months, depending on technology (further fattening)
Animal housing	Free – stall	Free – stall	Animals kept outside
Feeding	Silage/mixture/hay	Grass, concentrated feed, silage, cereals	Pasture and inexpensive bulk feed
Feed source	Own+ bought	Own + bought	Own + bought
Labor	Family	Employees	Family + worker
Building type	Semi – closed buildings	Modern	Traditional
Slaughtering on farm	No, selling to slaughterhouses	No, selling to slaughterhouses	No, selling to slaughterhouses
Contribution to farmer's income	Main source of income	Main source of income	Main source of income

Source: World Bank, consultations with the experts and stakeholders of the private sector

Beef production is increasingly dominated by farms with over 200 head of cattle. Beef 3 farms statistically have a larger land area, which is used to keep animals outside (versus free stall for Beef 1 and Beef 2) and use cattle farming on pastures with little investment, but greater income. It is the major type of operation in mountainous areas like Gorski kotar, Dalmatinska zagora and Lika, because most of the Croatian grasslands are in those areas. They are also found, in somewhat smaller percentages of the total beef-farming units, in the hilly areas of Slavonia (the highlands of Požega and Đakovo). Beef 3 farms mostly use dual-purpose breeds. Additional differences between the three farm types are also related to feed and building types, with Beef 2 the more modern of the three. The efficiency of human labor is achieved by a high degree of mechanization or automation for Beef 3 and Beef 2. The main reason for the establishment of large cattle-breeding systems is economies of scale. For all three types the number of farms and herd size increased by some 13% and 25%, respectively, between 2015 and 2017 (Figure 18). Smaller farms were left out of the analysis because their herds and output tend to be negligible and in decline.

Some production units in Croatia combine dairy and beef production, essentially owning dairy cattle and fattening surplus calves on the farm for beef production. Typically, the beef activity contributes one third of the income on these farms, against two thirds from dairy. Although locally important, this production system was not reflected as a separate typical farm in the light of comparability issues and lack of data: national statistics do not distinguish such production units. Intensive beef farms have – compared to several other countries – relatively low productivity, with an average daily gain in live weight of a little over one kilo. Increased competition for cheap feed from other EU member states increases the sense of urgency for improving technical productivity through further optimizing feed strategies aimed at higher growth rates.

Figure 18. Number of farms and beef cattle in the Croatian beef subsector in 2017



Source: Paying Agency data; Coupled support for beef fattening

Note: The number of typical farms shown on the graph are not exactly equal to the total number of farms of the respective size and production process observed in the data for the country. Each of the standardized farm types is based on a farm size range and similar production processes and each typical farm can, therefore, be seen as representative of such a range.

The economic analysis shows that all three beef farm types have positive gross margins per animal and per farm before and after payment, but with significantly higher per animal gross margins in the full-cycle beef farm (Beef 3), which points to additional value added from this, more complicated type of farm. The producers confirmed during focus group meetings that operating a full-cycle farm might be more profitable than operating fattening operations only. Moreover, the medium-sized fattening farm (Beef 1) has a relatively low margin before payments which reaches only 80% of the average economy-wide gross income after payments (Table 6). This points to a strong income dependence on direct public support for this farm type. However, as for the other two farm types, the gross margin per animal and farm increases significantly after payments, which indicates a major role of direct support in the entire beef subsector.

Table 6. Gross margin for beef farms (multiyear averages)

	UNIT	BEEF 1	BEEF 2	BEEF 3
Gross margin before payment (HRK)				
Per farm	HRK/farm	19,000	205,590	333,000
Per animal	HRK/animal	380	734	1,665
Gross margin after payment (HRK)				
Per farm	HRK/farm	71,573	524,277	647,702
Per animal	HRK/animal	1,431	1,872	3,239

Source: World Bank. Note: Some cost categories, such as depreciation and interest rates, are not included in the gross margin calculations presented here. See table 2 for further details.

An important finding of the economic analysis is that beef production benefits from the availability of relative cheap feed in Croatia, where feed represents 30% of allocated production costs. Purchase of calves is the greatest cost with 58% of allocated production cost (Annex Table A3).

5. Expenditure review



This section provides a detailed analysis of public expenditure on the livestock sector in Croatia by looking at the policy instruments currently available, analyzing determinants of public support, and providing cross-country comparisons, as well as analyzing micro farm-level data and taking into account farmers' comments and suggestions.

5.1 What types of support are available for livestock farmers?⁵⁶

Public expenditure on agriculture in Croatia is financed from national and EU funds. In addition to the two broad types of public expenditure – Pillar I support (direct payments and national coupled voluntary payments) and Pillar II support (rural development funds) – there are also some other public support categories available to the sector, including education, research, extension services, diesel fuel subsidy, subsidized credit lines and guarantees, administration and general costs etc.).

5.1.1 Pillar I support (direct payment)

Strictly speaking, Pillar I support includes two major payment categories with aim of supporting farmers' incomes and production: i) Decoupled direct payments based on so-called payment entitlements and ii) Voluntary Coupled Support (VCS). This analysis also includes IACS (*Integrated Administration and Control Systems*) and other national vulnerable-sector support as additional direct payment categories, since the nature of these payment categories is very similar to those for coupled and decoupled payments.

⁵ A detailed explanation of each sub-measure is explained in World Bank, 2020.

⁶ Based on: European Commission, 2019a and b; European Parliament, 2013; Ministry of Agriculture, 2016, 2018a, 2018b, 2019a, 2020; and Paying Agency for Agriculture, Fisheries and Rural Development, 2015.

An overview of available direct payment categories is provided in Table 7.

Decoupled payments are paid on the basis of land use according to which payment entitlements are issued (one hectare of arable land = one entitlement).⁷ A basic payments is owed to all active farmers who hold at least one entitlement; redistributive support is additional support for small farmers, green payment is additional support for particular obligatory environmental practices, while farmers below 41 years of age receive additional support. Although these payments can represent a significant source of income support for farmers, they are based on the production area, and not the number of animals, which implies that livestock farmers without their own fodder or pasture area will not be able to benefit from this support category.

The most widely used IACS scheme payment measure was under measure M13 (areas with natural limitations) as almost half of the production area is officially categorized under some sort of area with limitation. This measure is similar to the decoupled support paid for the production area (fodder area or pasture). However, IACS measures M14 (Animal welfare), M10 (Agri-environment-climate) and M11 (Organic farming) were not used by a significant share of livestock farmers.

Voluntary coupled support (VCS) represents an important source of income support for cattle farmers, in contrast to pig farmers for whom no VCS payments at all are available. VCS is paid on the basis of the number of livestock units instead of per-hectare payments. The largest share of Croatia's total coupled payment envelope (around 65% of a total EUR 47 million) goes to beef fattening, dairy, and cow-calf farms.

Payment for vulnerable sectors is an additional payment scheme supporting agricultural subsectors that are identified as less profitable and at risk of a significant drop in production. Less than 7% of the national direct payment envelope goes into the vulnerable subsectors scheme, of which approximately 50% is reserved for dairy farms and some 15% for breeding sows; the rest is paid to non-livestock producers. This is the only coupled support available for pig farms. However, it is limited by the European Commission's *de minimis* support constraint to a maximum of EUR 20 000 over a three-year period, which limits it to smaller farms.

⁷ Entitlements are also provided for pastureland, but the area is downscaled by up to 60% based on particular acceptance criteria (bare land, rocks, non-accessible land, etc.).

Table 7. Pillar I support

CATEGORY	MEASURE	AMOUNT
Decoupled direct support (payment entitlements)	Basic payment scheme	EUR 169.90/ha
	Redistributive support (up to 20 hectares)	Approx. EUR 60/ha
	Green payment (applying environmentally friendly practices)	70% of basic payment
	Young farmers support (younger than 41 for up to 50 hectares)	25% of basic payment
IACS scheme (Technically Pillar II, but provides income support for particular practices)	Payment for agri-environment (M10) including payment for autochthonous pig and cattle breeds	From EUR 267.69 to 445.08/LU
	Organic farming (M11)	From EUR 258.30 to 347.80/ha
	Areas with natural limitations (M13)	From EUR 82 to 226/ha
	Animal welfare payment (M14)	Various activities from 4.93 to 52.10Eur/LU
Voluntary coupled national support	Milk production	Approx. EUR 260/LU
	Suckler cow (Cow-calf system)	Approx. 137 per suckling cow
	Cattle fattening farms	Approx. EUR 103/LU
National support for vulnerable sectors	Dairy cows	Approx. EUR 130/LU
	Breeding sows	Approx. EUR 70/LU
		Both have a three-year ceiling of EUR 20 000 per farm (<i>de minimis</i> support)

Note: LU stands for Livestock Units which differs from the number of animals (for instance one fattening pig = 0.3 LUs, Fattening cattle between 6 and 24 months = 0.6 LUs, or milking cow above 24 months = 1 LU).

Source: Payments based on data from the Paying Agency for Agriculture, Fisheries and Rural Development (APPRRR), Ministry of Agriculture annual review for 2018, and related legislative acts.

5.1.2 Pillar II support (rural development funds)

Pillar II includes a wide set of Rural Development Measures that usually include one-off payments for investment projects with a long-term impact on the productivity of a farm or a wider impact on other priorities in rural areas. While Pillar I payments have an income-support role, the aim of Pillar II measures is to assist farmers and rural areas to meet a wide range of economic, environmental, and societal challenges in rural areas across the EU. For Pillar II funds, irregular open calls are made for every sub-measure and farms with specific characteristics can apply to these calls to seek co-financing of their investment project. It is important to recognize that total amounts paid from rural development funds are usually less stable across years because they depend on specific sub-measures in a particular year, with different sub-measures not always being available in every year.

The five-year envelope for rural development support amounts EUR 2.4 billion, out of which 2.03 billion are financed from the EU (European Agricultural Fund for Rural Development – EAFRD) and 0.37 from national sources.

A total of 20 Measures are established for rural development, of which at least four, are particularly relevant to livestock producers: Investment in physical assets (M4), Farm and business development (M6), Producer groups (M9) and Risk management and insurance support (M17). M4 can be used by livestock farmers to finance various investment projects related to restructuring, modernization and increasing the competitiveness of agricultural holdings, handling and use of manure fertilizer, for renewable energy sources, and generally increasing the value added of agricultural products. Measure 6 focuses more on specific farmers as does, for instance, sub-measure 6.1.1 that supports projects for young farmers, and 6.3.1 for small farmers, while 6.2.1 and 6.4.1. can be used for non-core agricultural activities on farms.

Since most of the rural development measures can be used for farm modernization and investment, these funds represent an important instrument through which the competitiveness of Croatian farms could be supported.

5.1.3 Other public support

Other public support categories for Croatian livestock farmers – including subsidized fuel, extension services, expenditure on agriculture-related universities and research institutes, and other general services related to agriculture – are rather indirect and apply to all farmers, so their impact on livestock producers is hard to evaluate precisely. Nevertheless, this report focusses on those most important for the sector.

Subsidized diesel fuel (*blue diesel*) is currently available for any farmer (livestock and crop producer) who applied for direct payments in the current year; the number of eligible litres of diesel is based on the production area and number of animals. The subsidy is indirect because the price difference in diesel paid by the farmers represents a tax exemption. According to estimates based on official fuel price data, the diesel subsidy for the sub-sectors analyzed in this report could be worth some EUR 30 million.

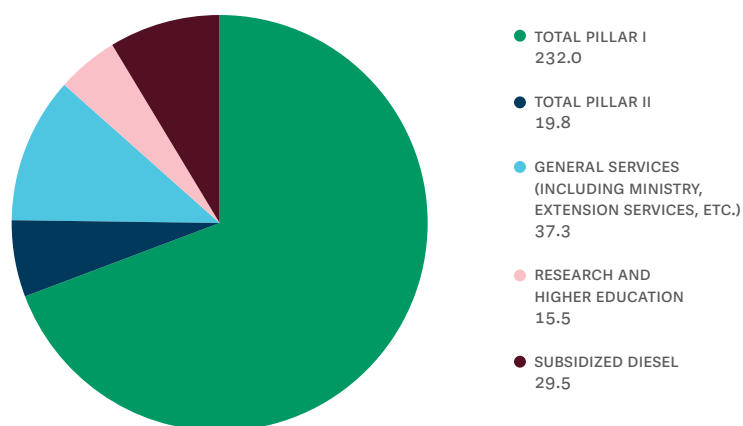
An additional source of investment financing is the provision of subsidized loans and guarantees to Croatian farmers by the Croatian Bank for Reconstruction and Development (HBOR) and the Croatian Agency for SMEs, Innovations and Investments (HAMAG-BICRO). This report shows that these loans are not widely used by Croatian farmers and one of the main conclusions is that loan programs should focus more on facilitating access to financing, rather than on lowering the cost of credit.

A detailed analysis of general service expenditure (administration, Ministry, etc.) and knowledge expenditure related to agriculture (extension service, universities, education, and research) can be found in STARS background documents⁸.

5.1.4 Overview of all public payments to the pig and cattle subsectors

Around EUR 334 million annually is spent on the livestock sector including direct and indirect support, (Figure 19 and Annex Table A4). More than two thirds (EUR 232 million) of this amount is spent on Pillar I support which, therefore, represents the largest expenditure category, by far. Slightly more than 10% (around EUR 37 million) is spent on general services. The third most important expenditure category is subsidized diesel fuel which covers almost 10% of total public support (EUR 29.5 million). The remaining amount is related to Pillar II payments and research and education expenditure.

Figure 19. Estimate of all public support to pig and cattle subsectors in 2017 (EUR million)



Source: WB staff calculations based on data from APPRRR, Ministry of Agriculture and Animal register. See Table A4 note for more details on data sources, estimation and assumptions.

These results demonstrate that the system is largely based on income support (Pillar I), while investment and innovations support is rather limited. Moreover, the rather high amount reserved for diesel subsidies could, instead, be channeled towards less environmentally harmful energy.

⁸ According to World Bank, 2019c.

5.2 A bird’s-eye view: Comparison with other countries

Croatian dairy and cattle farmers have a relatively high income dependency when compared to other EU countries. For dairy farms, the share of direct support in gross income equals on average around 40%, while this ratio reaches 50% for cattle farms. On the other hand, direct support adds only 10% to Croatian pig farmers income, which is, although low in a cross-sector comparison, in line with other EU countries and the result of the absence of coupled support for pig farms. This means that pig farmers can rely only on decoupled payments or on support categories related to some specific practices (support for animal welfare – M14, organic farming – M11 or autochthonous breeds – M10).

Figure 20. Direct payment per gross income (2014-2018 average)

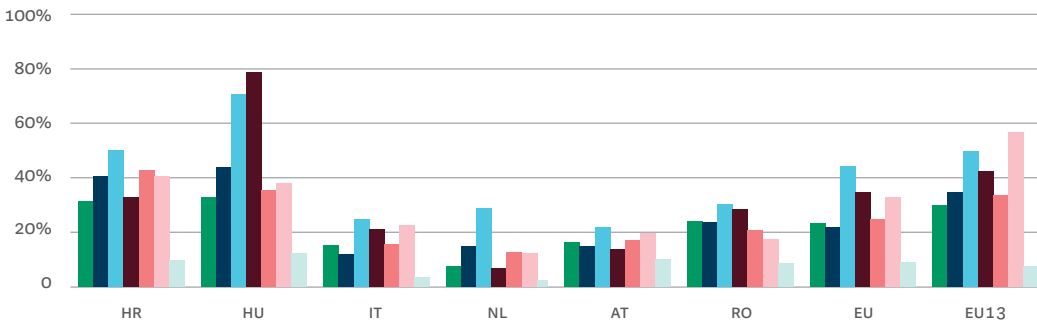
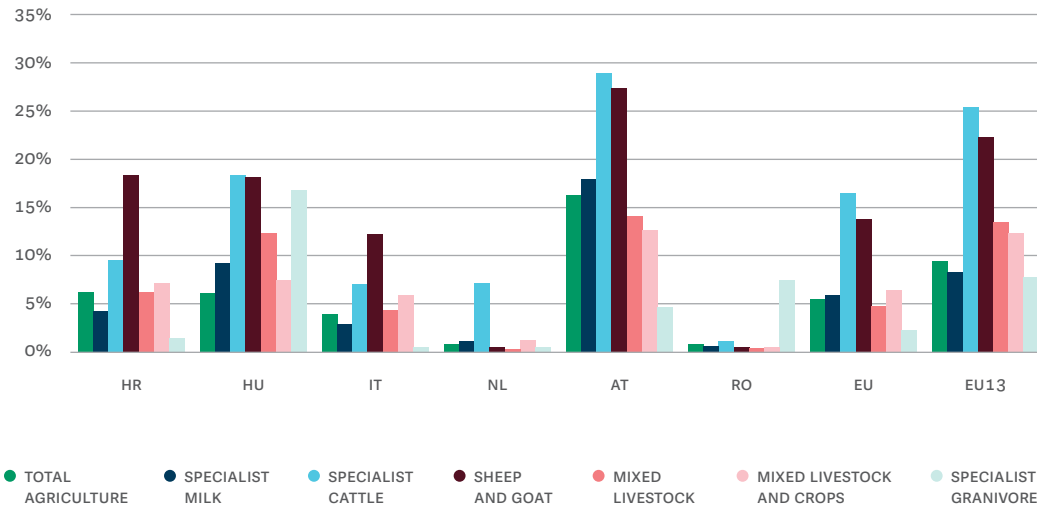


Figure 21. Rural development per gross income (2014-2018 average)



Source: World Bank calculations based on FADN data. Note: Total direct payments (FADN code: SE606) is used as the relevant direct payment indicator. All rural development funds (code: SE624) are included (also IACS scheme payments). These indicators are divided by Farm Gross Income (SE410). Specialist granivores category includes pig and poultry farms.

The income dependence for dairy and cattle farms does not necessarily point to excessive direct support. Croatian farmers' incomes are significantly below the EU average: the average income of Croatian granivore, dairy and cattle farms is only 23%, 39% and 53% of the respective EU averages. Moreover, the absolute unit amount of decoupled support for Croatian farmers is actually below the average for other EU countries (Figure 22). Coupled support for the dairy and cattle subsector is in line with the EU average but significantly below some other new EU member states such as Hungary or Romania.

Although Croatian livestock farmers (with the exception of granivore farms) exhibit high income dependence, this, to a large extent, is driven by low income, rather than by inflated direct payments.

Figure 22. Decoupled direct support (in Eur per ha - left scale and per farm – right scale)

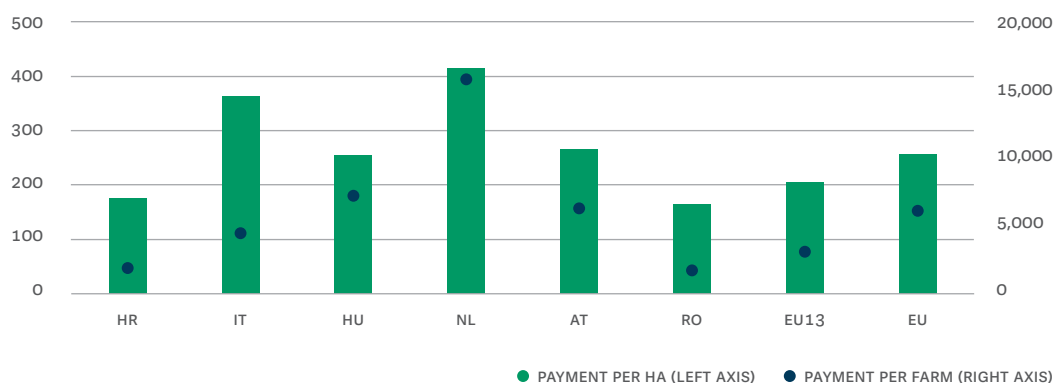
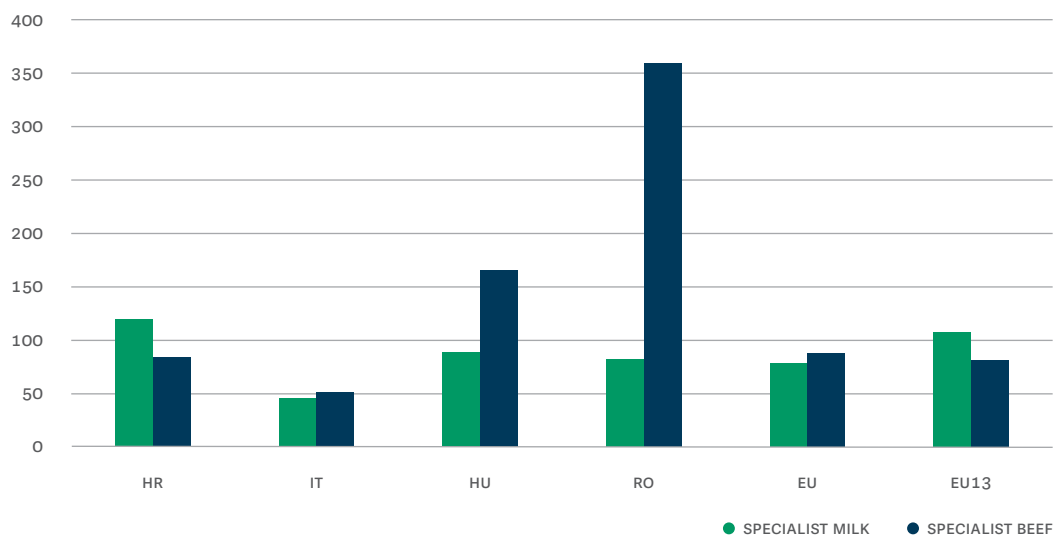


Figure 23. Expected unit amounts of national voluntary coupled support for beef and dairy farms (EUR/head)



Source: World Bank calculations based on European Commission DG-agri data.

The share of rural development support in livestock farmers' income in Croatia is relatively low, compared to that in other EU countries (Figure 21). Hence, livestock farmers are not able to absorb sufficient Pillar II funds. This confirms the findings of Subsection 5.1, in which Pillar II support represented a minor part of total livestock-related public expenditure. This conclusion holds for all three subsectors analyzed in this report, although cattle farms are slightly more successful in that respect, while granivore farms are again the least subsidized ones.

Since rural development support is mainly used for investment and farm modernization, one conclusion might be that, since investment and improvement expenditure on livestock farms is low, livestock farming is losing competitiveness. Moreover, the rest of the economy is not benefitting from higher spillover effects; STARS background documents showed that relative positive economy-wide impacts of rural development measures are higher than those from Pillar I support.

One potential reason for underperformance in the absorption of rural development funds is certainly related to the relatively high cost of capital for Croatian farmers (Annex Figure A2), compared to their EU peers.

5.3 A farm-level view: Who is receiving Pillar II support and why is the absorption rate low?

This subsection uses farm-level data and comments from farmers in focus-group meetings to analyze how rural development funds are distributed.

In per-farm payments, small cattle and dairy farmers in Croatia received relatively more rural development support, while large livestock farms received a higher aggregate share of the total rural development funds available (Annex Figures A3, A4 and A5). This is in line with the rules of fund assignments - for example only small farmers are eligible to apply for sub-measure 6.3.1 (Support to the Development of Small Farms) and many of them received this support. It is also clear that in the livestock sector, larger farms usually have relatively large investment projects to finance. A more rigorous analysis of farm characteristics driving Pillar II fund absorption on the basis of a probit regression and FADN data is provided in Table A5.

Pig and dairy farms were less likely to obtain rural development support than other livestock farmers according to the probit model estimates. Furthermore, large farms (in terms of Standard Economic Output and pasture area), financially more stable farms (lower interest expenses and higher net income), while farms that receive relatively more total Pillar I and vulnerable sector support, farms with a high share of rented land as well as young farmers are more likely to receive rural development support according to table A5 shown in the appendix.

These results are, however, not able to determine whether those characteristics are affecting the likelihood of rural development fund absorption due to selection criteria (supply factors) or due to farmer's interest in applying for rural development measures (demand factors). Data on rural-development measure tender results was not made available and thus the analysis could not disentangle the impacts of those two factors and differentiate livestock farms from other farms.

Based on comments received from farmers during focus group meetings, supply factors were mentioned as the most important constraints for a more efficient rural development fund absorption rate. More precisely, some of the most important issues repeatedly mentioned by the producers are the following: general administrative burden and complicated application procedures, tight lending conditions and – despite some reductions - continued higher interest rates in commercial banks than observed across the EU, slow-decision making processes (very long period until a final decision for project selection is made), frequent changes in selection criteria, administrative issues for investment that include construction and working permits, land ownership issues and non-accessibility of state-owned land, align criteria with regional specificities, regulations that favor certain larger producers, misguided programs (lack of solar, bio fermenter, etc. programs), tender ranking through the development index of municipalities that are not always suitable, the issue of not taking into account the suggestions of farmers' representatives when designing measures and selection applications, and general lack of understanding of the real situation on farms.

6. The New CAP – an opportunity for the Croatian livestock sector⁹



All EU member States must draw up a CAP¹⁰ strategic plan for Pillars I (direct support payments to farmers, which makes up the bulk of the CAP budget) and II (support for wider rural development) according to the situation of their territory and its needs. This report and the NARDS will provide inputs and policy suggestions regarding the livestock sector in order to facilitate the preparation of documents and legal acts for successful implementation of the new 2021-2027 CAP. The new CAP was initially planned to start in January 2021 but its implementation has been postponed most likely until January 2023, leaving the current CAP in place for 2020 and 2021.

The new CAP introduces a shift towards environmental and climate objectives, while preserving the long-term objectives related to farmers income, rural area support and guaranteed food supply, under nine headings:

- I. Environmental and climate objectives;
 1. Preserving landscapes and biodiversity
 2. Acting against climate change
 3. Protecting the environment

⁹ Information about the new CAP presented in this section is based on information from European Commission 2020a, b and c.

¹⁰ The CAP covers all EU countries. It is managed and funded at European level from the resources of the EU's budget and represents a partnership between the Union and its farmers to support and improve agricultural productivity, ensure a stable supply of affordable food, provide EU farmers with a reasonable standard of living, help tackle climate change and the sustainable management of natural resources, maintain rural areas and landscapes across the EU, and to keep the rural economy alive by promoting jobs in farming, agri-food industries and associated sectors. National agricultural policies must in general be aligned with the EU CAP, but some degree of freedom regarding specific national policies is allowed.

II. Other objectives;

1. Ensuring a fair income for farmers
2. Increasing competitiveness
3. Rebalancing power in the food supply chain
4. Supporting the renewal of generations
5. Energizing rural areas
6. Guaranteeing food quality and health

Final decisions about specific rural development and direct payments had still to be made at the time of writing¹¹ and the COVID-19 pandemic further slowed down the process. However, some important details have become available from the European Commission.

The Commission proposes to simplify and modernize how the CAP works, shifting the emphasis from rules and compliance towards results and performance. Overall rules are to be kept at a minimum within a toolbox of broad policies provided by the Commission. Member states will base their strategic plans on this toolbox but with a large degree of freedom over the implementation of specific policies.

A key characteristic of the new CAP is a combination of flexibility of application for each country and conditionality. Conditionality is system of linking CAP payments (for both rural development and direct payments) to a range of farmers' obligations regarding environmental and climate-protection goals. When recipients of these payments do not meet the obligations, the payments may be reduced. How conditionality will be implemented in practice will be defined by each member state's Strategic Plan.

Direct payments as a means of income support will remain an important ingredient of the new CAP, but with a stronger emphasis on small and medium sized farms, generally focusing on a more even distribution of direct payment funds. One strongly debated proposal foresees decreasing amounts for direct payments above EUR 60 000 per farm and even places a EUR 100 000 ceiling on total direct payments per farm. Coupled support (where payments are "coupled" to production of a specific crop or product) is likely to be decreased even further, while more focus will be placed on organic farming and environmentally friendly practices.

¹¹ December 2020

Eco-schemes will be introduced, which will support and incentivize farmers to undertake agricultural practices beneficial to the climate, biodiversity, and the environment in line with the European Green Deal (see below). Member states will be obliged to spend a pre-determined minimum share of their direct payment envelopes on these eco-schemes (most likely 30%), which will be entirely financed by the EU budget without national co-financing. Some of the sustainable farming practices included in eco schemes include minimum requirements for the use of fertilizers and plant protection products, as well as enhanced animal-welfare conditions, which could present an opportunity for livestock farmers. Another important focus remains on encouraging the younger population to stay in rural areas and pursue agricultural activities; this objective should receive at least 2% of the total payment envelope in each country. Stronger controls should ensure that only genuine farmers receive support.

Moreover, the new CAP is compatible with the Green Deal and is one of its key elements. The first three CAP objectives (above) are the main elements connecting the CAP and the Green Deal. It is also important to mention that the Farm-to-Fork strategy also represents an important ingredient of the Green Deal with new market opportunities for European farmers. The Commission expects higher returns (linking production methods to premium consumer demand), a stronger role for farmers in the food supply chain (tools to improve farmers' position), new business opportunities (plant protein sector, bioeconomy), lower costs (technology, innovation, digital solutions), a stronger connection with consumers, new global markets (labeling and marketing initiatives raising awareness of EU high standards) to accrue to European – and, therefore, Croatian – farmers.

6.1 Opportunities for Croatian livestock farmers

It is already clear that the new CAP will bring numerous changes for all European livestock farmers. Among them, some will offer opportunities to the livestock sector in Croatia, while others may have negative consequences.

The environment objectives and eco-schemes will open additional financial opportunities for livestock farmers in Croatia through animal welfare support and payments for transitioning to organic farming or introducing environmentally friendly practices. In particular, farmers in the cow-calf system and other pasture livestock farmers may reach organic certification with a much lower transition cost to benefit from the eco-shift of the new CAP. Since about 10% of the national area is classified as grassland, this represents a huge potential for pasture-based livestock farmers.

The Farm-to-Fork strategy that will foster a stronger role of agricultural producers in food supply chains could present an opportunity for all livestock sectors but especially for the dairy subsector as dairy producers are currently dependent on a small number of large processors to which most farms are supplying their milk. Dairy hubs and cooperatives could strengthen the position of farmers in the value chain and allow for a larger part of the value creation to be captured by the farmers in line with the strategy aim.

Feed is one of the most expensive inputs for dairy farmers, so better linking the livestock sector to cropping systems through feeding strategies (including crop residues and processing by-products) and nutrient management, in coherence with the principles of circular economy, is a possible future option for the sector in line with the Green Deal and new CAP.

The downside is that livestock farms may face slight reductions in direct income support as coupled payments are reduced. Under the current CAP, a large share of the coupled-payment envelope goes into the dairy and cattle subsector, so these subsectors could be affected more than the pig sector, which was already excluded from any means of coupled support. Since a large proportion of Croatian livestock farms are relatively small (Section 3) and the 2021-2027 CAP is skewed towards small and medium sized farms, Croatian livestock farmers are likely to be significantly less affected by the EUR 100 000 direct payment ceiling than their larger EU colleagues.

Croatia has large territories categorized as areas with natural limitations which would qualify for exceptions and leave more flexibility for application of the CAP policies. This could be an opportunity to design new rural development measures suitable for these areas and enhance livestock sector development in subsequent years.

7. Policy recommendations



These policy recommendations are based on the analyses presented in this report and insights from discussions with stakeholders and Ministry officials. The first set of recommendations applies more generally to the entire livestock sector, while the second set provides some additional subsector-specific advices.

7.1 General recommendations

The livestock sector should make use of the eco shift of the New CAP and European Green Deal by an increased use of payments for agri-environment (M10), organic farming (M11), areas with natural limitations (M13) and enhanced animal welfare (M14), but also of environmentally focused rural development measures. Those measures simultaneously address environmental, social, and economic goals and can help the sector to invest in the technological and management improvements that can boost productivity. Low productivity remains a cross-cutting issue in the sector, hampering competitiveness and contributing to the significant trade deficit for most livestock commodities, despite fodder crop exports.

A very low percentage of farmers used M13 under the current CAP and there is room to increase this substantially in CAP 2021-2027 by orienting the rules towards farmers' needs and aligning them with Croatian specificities. Rural development measures used for investment support (measures M4 and M6 or their equivalent successors under the new CAP) should also be targeted towards environmental goals (solar energy and similar projects), which was something mentioned by the producers as an opportunity for the sector, based on the experience of other EU countries.

The administrative burden for rural development fund assignments should be reduced and the decision-making process should be simplified and accelerated, with the rules stabilized over a longer (multi-year) period. Livestock producers cited these elements as needing correction to remove obstacles to their more intensive use of those funds.

The rules for land use, land ownership and land accessibility should be made more transparent and efficient to reduce the large areas of arable land and pasture currently out of use for various administrative and legal reasons.

All livestock subsectors are relatively fragmented, and they are not sufficiently using the advantages of organizing and grouping. Producers would gain from grouping into producer organizations and cooperatives, especially give the potential economies of scale. There is also a good case for linking dairy farmers to calve-fattening farmers to develop synergies and economic complementarities that could reduce costs for both and, thus, raise the prospect of higher profitability.

7.2 Pig subsector

For the pig subsector, additional marketing initiatives for pig meat and traditional pig products are needed for both local and tourist markets, especially to support farmers with medium-sized operations. Moreover, for this sector M14 should be made even more accessible and designed according to farmers' needs, as this might be the only way for producer to receive support paid per animal, in the absence of coupled support. The below-average rural development fund absorption rate should be boosted which could, in addition to the general recommendations, also include more sub-measures specifically designed for pig producers. The stability of the rate of domestic pig meat consumption provides an important market opportunity. To improve the competitive position, market specifications for product quality (backfat thickness) and processing quality (fatty acid composition) will have to be met. Hence, farmers should be persuaded to use the appropriate genetics (source breeds) and feed inputs. This implies the maintenance of stable vertical relationships within the pork supply chain as an important condition. Farm level income can be improved with management measures that require investment, although not, necessarily, at great cost. For example, appropriate indoor climate management (ventilation) for both suckling piglets and weaners reduces concentration levels of CO₂ and NH₃ and results in better health with less call for antibiotic treatment and better overall performance.

7.3 Dairy subsector

The dairy subsector currently has a large number of small producers but a small number of large processors. **The market influence of producers should be increased by focusing on: 1) producer organizations 2) knowledge transfer and 3) boosting larger farms (30+ milking cows).** There are also opportunities in milk processing on farms with direct marketing to local markets but also to the tourism sector, with particular income gains possible for organic producers. Dairy is a less capital- and more labor-intensive livestock subsector. In all likelihood, a substantial part of national production will still come from farms with fewer than 50 cows for several years. Farmers essentially have two strategic

options: improving their gross margin through processing or market differentiation (e.g. organic); or substantially increasing milk productivity to levels comparable to EU standards, i.e. 9,000 kg per cow. Go-to-market strategies to enhance market penetration and enlarge the consumer base through business-to-business and business-to-consumer approaches, which the dairy subsector clearly needs, require clear concepts and communication, uniqueness, and customer insights. To achieve these aims, dairy farmers need professional support (legal, management, IT, and collaborative business-modelling) for successful market introductions. Building effective support structures is a crucial element, both for achieving connections to end user markets and for improving milk production. Farmers need support in identifying and selecting (cost-) effective measures for both strategies. It is important to note that such producers, mostly relying on on-farm processing and direct commercialization of their produce to secure higher margins were particularly affected by COVID-19 control measures and will need particular attention in the context of the resilience and recovery interventions.

7.4 Beef subsector

For beef fattening farmers, a proportion of direct payments should be reoriented towards more productive investment support which would boost the farmers' competitiveness and decrease their income dependence on dairy support. Fatteners should be better connected with milk and cow-calf producers, reducing the need for imported calves. For the cow-calf sector it is particularly important to improve land access for pasture whereby farmers could expand their production, while also contributing to the achievement of environmental goals, in line with the new CAP support. Third markets outside the EU provide an important market opportunity for the Croatian beef sector. The existence of third markets at limited geographical distance presents a potential competitive advantage. Utilizing this potential, however, requires concerted action from the beef sector, supported by public authorities. Farm-level income can be improved by setting targets for improvements in technical performance (higher daily weight gain). A new and better balance between relatively cheap corn silage and other feed products has to be found. This is also crucial to be able to compete with purchases of feed products by other EU member states.

8. Final remarks



This analysis of the pig, beef and dairy subsectors in Croatia included an overview of general sectoral trends, an economic analysis, public expenditure review, some general insights about the future of these subsectors under the 2021-2027 CAP, and some specific policy recommendations. The conclusions can, therefore, be grouped in the two categories with which the report began: subsector and farm level (Gap 1) issues; and public expenditure (Gap 2) considerations.

Despite relatively high public support for beef and dairy farming, in recent years there has been a strong and steady decline in the numbers of cattle farmers, pig farmers and farmed animals, a trend that can largely be attributed to a decrease in the number of mid-sized farms. Self-sufficiency in beef, pork and dairy products is also relatively low and has been decreasing. The analysis in this report shows that productivity and farmer's incomes are low on Croatian livestock farms, compared to elsewhere in the EU, which may be contributing factors to the negative trends.

Economies of scale and inequities in access to technology and financial support are pronounced for all three subsectors and larger farms are, therefore, more competitive. Moreover, the report also finds that the particularly large number of small farms in the dairy subsector, reduces their market power, compared to the more concentrated milk processors. Additional activities on smaller and medium-sized farms, such as milk processing in the dairy subsector or operating full-cycle operations in the beef and pig subsector, may also have a positive impact on farmers' incomes. This report provides a set of recommendations for boosting competitiveness of the sector and increasing the income of Croatian livestock farmers.

Public funds could be used in a more optimal way to improve productivity, competitiveness and achieve climate and environmental goals. While there is significant income dependence of beef and dairy farmers on direct payments, almost no pig subsector-specific direct support is available. Meanwhile, all three subsectors are underperforming in their absorption of rural development funds that should be used for investment, farm expansion and modernization. Furthermore, payments for organic farming, improved animal welfare and other environmentally friendly practices are not being used sufficiently by livestock

farmers, while a large share of the livestock sector support goes to diesel subsidies which is not in line with the ambitious environmental goals defined in the new CAP. This report provides a list of recommendations regarding use of public support in line with the new 2021-2027 CAP and at the same time improves the competitiveness of Croatian farmers.

The overall results of the analyses that inform this report indicate some consolidation of the three subsectors at the expense of the more traditional, but less efficient, family farms. The latter are able to compete successfully neither with Croatian larger-scale operation nor with large farms elsewhere in the EU that have been able to benefit from economies of scale and public support. These smaller farming units, according to this analysis, survive only because of financial transfers, to the detriment of higher efficiency in the industry, overall. The study reveals low technical performance on these production units, but also indicates room for efficiency gains in larger operations, especially in beef fattening and pig breeding.

The EU Green Deal and its impact on the new CAP offers opportunities for member states to allocate funds to new or enhanced efforts to preserve and protect the countryside. More efficient, environmentally respectful farming practices are to be privileged in the new CAP, as are improved animal welfare methods. This new emphasis on the environment and on sustainability could lead to job creation and the development of agro-industries with a “green” nature. There are, thus, positive outcomes than can be explored under the new CAP to attenuate the negative effects of farming consolidation in the pigs, dairy and beef subsectors. Beyond the CAP, the €100 billion *Just Transition Mechanism* offers funding to provide a cushion for those impacted by the Green Deal, while the Farm-to-Fork strategy is underpinned by a €10 billion fund for research and innovation that could also produce positive options for rural communities into sustainable farming outside of pigs, dairy and beef production.

Annex



About economic modeling and typical farms

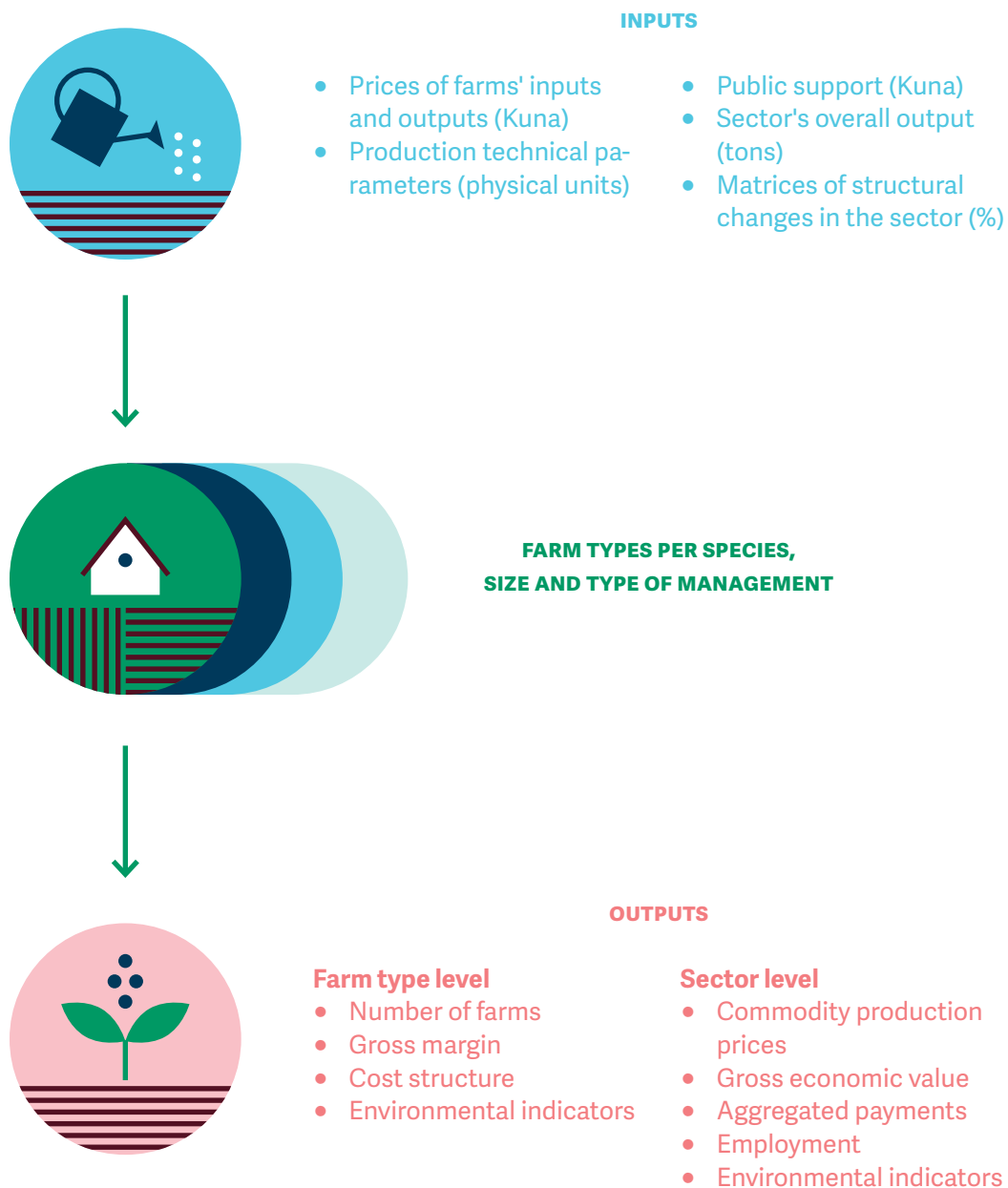
The economic modeling used for this report classified types of dairy, beef and pig farms based on farm assets, animal production practices and performance, and processing and marketing. Four farm types described small to large dairy farms, three types for beef production, and five for pig production. Time series data was collected when possible for analysis that included farms and animals, payments, sustainability indicators, and farm size and structure. A smaller part of the data is drawn from observations, but a larger part is based on inputs from farmers.

For each farm type we have the most recent statistics on:

- average and total number of animals (cows, beef animals, sows, hogs),
- total number of farms,
- farm margin with and without payments,
- total allocated cost per animal (indication of productivity level)
- the development in number of farms and animals for 2014 – 2019
- other variables of interest (performance indicators of Farm-to-Fork)

For each scenario we describe how much of the payment measures will apply to which farm type. With all this information we can now estimate how each farm type will react (quit, expand or remain) between now and 2027 within the scenario. Having assessed how each farm type reacts within the scenario we can quantify the aggregate effect of the expected farmers' reactions within the scenario for variables of interest such as total number of farms, nutrient losses, cost structure, gross margin etc.

Figure A1. The model approach



Source: World Bank

It is noticeably clear that public payments are relatively low in general, but highest for Pig 5, because of the very large land area of this specific farm type. The feed represents between 59% to 63% of the allocated production costs. Economies of scale are the dominant driving factor in the pig business. Large farms have better nutrient efficiency and 10-20% lower allocated production cost per animal.

Table A1. Typical pig farms economics

	PIG 1	PIG 2	PIG 3	PIG 4	PIG 5
RETURNS AND PAYMENTS / ANIMAL					
Revenue per present sow	11,413	8,743	8,648	10,193	0
Revenue per delivered hog	0	1,137	1,034	1,034	1,034
Payments/farm	11,047	30,841	75,546	1,519,311	7,935,229
Total payments / farm and revenues per animal	22,460	41,858	85,228	1,530,538	7,936,263
COSTS/SOW					
Purchase gilts (6 months) (%)	1,100 (12.8%)	1,100 (14.8%)	1,100 (15.4%)	1,100 (15.7%)	0
Feed cost (gilts, sows, piglets) (%)	5,235 (60.9%)	4,403 (59.4%)	4,511 (63.1%)	4,372 (62.5%)	0
Boar (%)	12 (0.1%)	12 (0.2%)	12 (0.2%)	12 (0.2%)	0
Artificial insemination (%)	0	0	250 (3.5%)	250 (3.6%)	0
Health care (%)	1,000 (11.6%)	1,000 (13.5%)	800 (11.2%)	800 (11.4%)	0
Electricity, Heating and fuel, Water (%)	1,100 (12.8%)	800 (10.8%)	375 (5.2%)	365 (5.2%)	0
Other miscellaneous cost (%)	150 (1.7%)	100 (1.3%)	100 (1.4%)	100 (1.4%)	0
Total costs (excluding labor and capital) / sow	8,597 (100%)	7,415 (100%)	7,148 (100%)	7,000 (100%)	0
COSTS / FATTENER					
Feed (%)	0	609 (60.1%)	504 (56.7%)	491 (55.7%)	480 (53.9%)
Piglet costs(25kg) (%)	0	350 (34.5%)	330 (37.1%)	330 (37.5%)	350 (39.3%)
Mortality (%)	0	15 (1.5%)	15 (1.7%)	15 (1.7%)	24 (2.7%)
Transport (%)	0	0	0	0	12 (1.3%)
Other miscellaneous cost (%)	0	40 (3.9%)	40 (4.5%)	45 (5.1%)	25 (2.8%)
Total costs(excluding labor and capital) / fattener (%)	0	1,014 (100%)	889 (100%)	881 (100%)	891 (100%)

Source: World Bank

Table A2. Typical dairy farms economics

	DAIRY 1	DAIRY 2	DAIRY 3	DAIRY 4
INCOME AND PAYMENTS / COW				
Raw milk	9,200	9,200	19,125	23,400
Processed milk (cheese)	0	14,000	0	0
Payments	10,136	4,752	6,877	3,633
Total Income and payments	19,336	27,952	26,002	27,033
COSTS / COW				
Purchased and produced feed (%)	7,615 (74%)	7,385 (57.9%)	10,112 (74.9%)	9,737 (82.4%)
Paid labor (%)	0	0	818	1,000
Cattle (%)	1,080 (10.5%)	1,080 (6.4%)	1,417 (10.5%)	838 (7.1%)
Processing (%)	0	3,000 (17.8%)	0	0
Water and electricity (%)	745 (7.2%)	745 (4.4%)	1,326 (9.8%)	891 (7.5%)
Litter (%)	600 (5.8%)	300 (2.4%)	515 (3.8%)	216 (1.8%)
Cleaner/detergents(%)	250 (2.4%)	250 (2%)	136 (1%)	135 (1.1%)
Total allocated costs / cow (excluding labor and capital)	10,290 (100%)	12,760 (100%)	13,506 (100%)	11,818 (100%)

Source: World Bank

Cost structure per cow is fairly consistent across farm types, with overall cost per cow slightly lower on Dairy 1 farm type. There is a strong contrast in public payments per cow and milk yields. The large farms have a significantly larger milk yields per cow than other three types. Feed cost represents around 58% up to even 82% of allocated production costs. Strong economies of scale are at play in the dairy sector, just as in the pig sector.

Table A3. Typical beef farms economics

	BEEF 1: MEDIUM BEEF FATTENING OPERATION	BEEF 2: LARGE BEEF FATTENING OPERATION	BEEF 3: LARGE "COW - CALF" SYSTEM FARM (FULL CYCLE)
Revenue from sold animals	7,500	8,125	4,500
Public payments	1,052	1,138	1,574
Total revenues per animal	8,552	9,263	6,074
Purchase/cost of calves (%)	4,000 (56.2%)	4,000 (54%)	1,200 (42.3%)
Feed (%)	2,060 (28.9%)	2,651 (35.9%)	200 (7.1%)
Water and electricity (%)	160 (2.3%)	110 (1.5%)	750 (26.5%)
Mortality (%)	80 (1.1%)	80 (1.1%)	60(2.1%)
Healthcare (%)	520 (7.3%)	200 (2.7%)	625 (22%)
Transport (%)	300 (4.2%)	350 (4.7%)	0 (0%)
Total allocated costs (excluding labor and capital) (per animal)	7,120 (100%)	7,391 (100%)	2,835 (100%)

Source: World Bank

Production costs are highest on Beef 1 and Beef 2, since these two farm types produce feed. The total revenues per finished cattle are higher on Beef 1 and 2. Purchase of calves represents the highest cost in allocated production costs with 58%. The second highest cost is feed with around 30% in total production costs.

Table A4. Overview of approximate values for all public expenditure on the pig and cattle sector in 2017 (EUR)

		TOTAL	NATIONAL FUNDS	EU FUNDS	
PILLAR I	EU decoupled	Basic payment	67,874,046	21,040,954	46,833,092
		Green payment	47,219,014	14,637,894	32,581,119
		Redistributed payment	16,444,096	5,097,670	11,346,426
		Young farmers	2,571,692	385,754	2,185,938
	IACS	Mountain areas	5,569,187	835,378	4,733,809
		Special limitations	738,436	110,765	627,671
		Severe limitations	16,491,216	2,473,682	14,017,534
		Organic	3,954,856	593,228	3,361,628
		Organic - conversion	5,527,789	829,168	4,698,620
		Autochthonous breeds (old scheme)	2,112,447	2,112,447	0
		M10 other	178,740	26,811	151,929
	Coupled	Cow-calf (coupled)	6,867,753	3,021,811	3,845,941
		Dairy cows (coupled)	21,163,692	9,312,024	11,851,667
		Protein crops (coupled)	6,824,257	3,002,673	3,821,584
		Fattening beef (coupled)	13,543,478	5,959,131	7,584,348
	Vulnerable	Breeding sows (vulnerable)	2,439,622	2,439,622	0
		Dairy cows (vulnerable)	7,233,140	7,233,140	0
	Other	Other direct support	5,294,656	1,747,236	3,547,420
		Total Pillar I	232,048,117.04	80,859,390.43	151,188,726.61

PILLAR II	M4	4.1	10,326,904	1,549,036	8,777,868
		4.2	1,990,838	298,626	1,692,212
		4.3	781,063	117,160	663,904
	M5	5.2	2,503,877	375,582	2,128,295
	M6	6.1	1,361,813	136,181	1,225,631
		6.3	689,848	103,477	586,370
		6.4	1,406,435	210,965	1,195,470
	M17	17.1	709,249	106,387	602,862
		Total Pillar II	19,770,026.22	2,897,413.30	16,872,612.92
	General services (including Ministry, extension service etc.)		37,331,186	29,864,949	7,466,237
Research and higher education		15,503,356	12,402,685	3,100,671	
Subsidized diesel		29,494,634	29,494,634	0	
Total public expenditure (excluding subsidized loans)		334,147,318.26	155,519,070.44	178,628,247.83	
Share in GDP (%)		0.68			

Source: WB staff calculations based on data from APPRRR, Ministry of Agriculture and Animal register.

Note: Most of the data shown in Table A4 relates to 2017 but information from other years may be included where data for some categories is missing or insufficient. Pillar I data includes payments in 2017, while Pillar II data includes average payments for the 2015-2018 period because a single year may give biased results as a result of infrequent calls for some sub-measures. Data shown for Pillar I and II includes computations based on farm-level data from APPRRR, combined with data from the Animal register; a pig or beef or dairy farm is defined as a farm holding with at least one livestock unit of cows. General services includes all general payments to the agriculture sector in 2017 (source: Calculations in STARS Background Document: Croatian Agricultural policy and CAP instruments) rescaled by the ratio of pig and cattle production in total agricultural production in Croatia (source: Ministry of Agriculture 2018 Annual Report) which equals 33% when pork, beef, milk and feed productions is added in. Research and higher education expenditure in 2017 represents the total amount spent on agriculture-related universities and research institutes, rescaled using the same data as for general services. The diesel subsidy is estimated based on the eligible number of litres per production area in 2019 and per animal, as well as the number of hectares and animals based on direct payments and the animal register, as used for the Pillar I and Pillar II amounts explained above. Subsidized loans and guarantees were excluded due to missing data. Nominal GDP for 2017 is shown. The distribution between EU and national funds is based on individual payments, whenever available, or estimated based on similar payments if not. Moreover, if APPRRR data pointed to varying percentages of EU co-financing for different farms and years, averages were used. For research and education and general services expenditure it is assumed that 20% of the funds is covered by EU sources and 80% by the national budget.

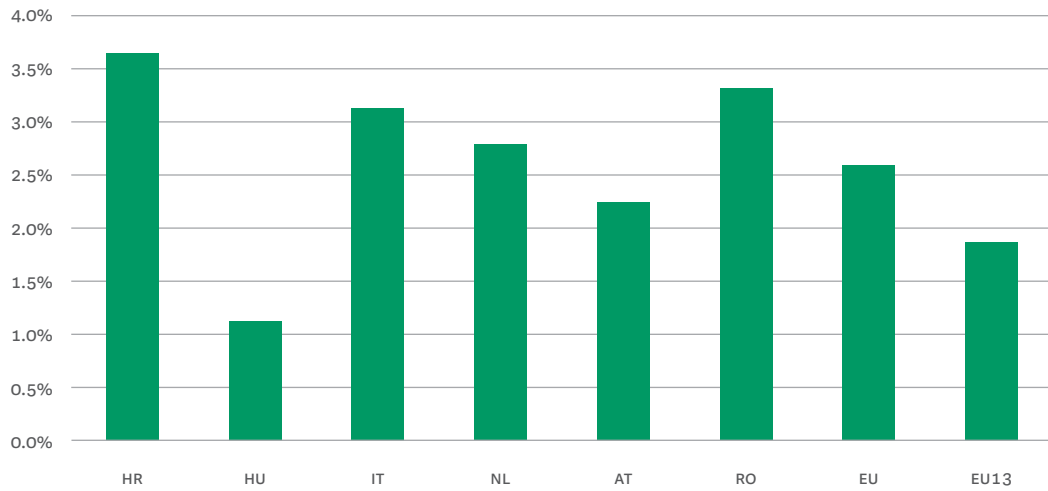
Table A5. Rural development support probit panel model results

EXO VARIABLE CATEGORY	EXO. VARIABLE	COEFFICIENT		STD. ERROR
Livestock subsector dummy	Pig	-0.4157	***	0.0838
	Cattle	-0.0229		0.0736
	Milk	-0.7357	***	0.0686
Size	Log(Standard Economic Output)	0.5542	***	0.0447
	Log(Arable)	-0.0037		0.0084
	Log(Pasture)	0.0297	***	0.0055
Financial indicators	Interest/liabilities	-0.00001	*	0.0000
	Long-t. loans/assets	-0.6966		0.4363
	Short-t. loans/assets	2.0676		1.8245
	Gross income	-0.0000		0.0000
	Net income/area	0.00001	***	0.0000
Productivity	Output/input	0.0200		0.0135
Direct payment	Log(Direct total)	0.0156	**	0.0064
	Log(Vulnerable pay)	0.0154	***	0.0026
Other indicators	Rented land/total land	0.5001	***	0.1018
	Farmers birth year	0.0061	**	0.0025
	Paid labour/total labour	0.1621		0.1205
	Constant	-21.532	***	4.9467

Source: WB staff calculations based on FADN data for the period from 2014 to 2018.

Note: The endogenous variable is a dummy that equals 1 if the farm received rural development support (over HRK 30,000 in a given year) and 0 otherwise. Symbols *, ** and *** represent statistically significant levels for the respective parameter (Z-score) of 1%, 5% and 10%. The unbalanced sample includes 1,213 farms with 4,387 total observations. Only farms that hold at least one livestock unit are included in the sample (also mixed farms). Subsector dummy variables equal 1 if a farm holds at least one livestock unit of fattening cattle, milk or pig and zero otherwise. Log(SOE) is the natural logarithm of unified FADN standard economic output including financial estimates of the arable, pasture area and livestock units. Log(vulnerable pay) is the natural logarithm of the total amount of direct payments for very vulnerable sectors as described in sub-section 2.1.3. Log(direct pay) includes the natural logarithm of all direct payments as explained in sub-section 2.1 without the IAKS scheme. Međimurska county did not receive any rural development funds in the sample used. Zagreb city-county dummy is excluded and therefore parameters related to dummies of other Counties are interpreted relative to Zagreb dummy.

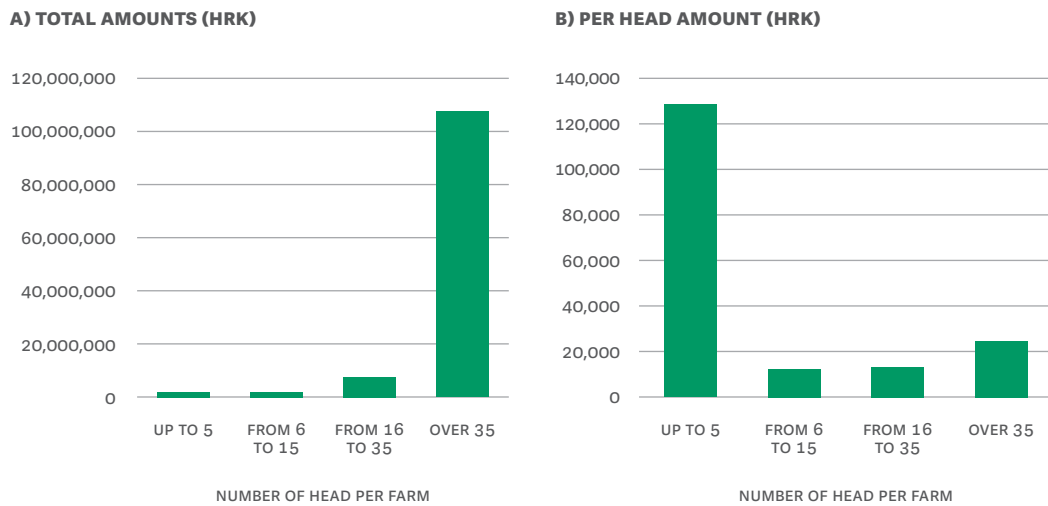
Figure A2.1 Share of interest expenses in total liabilities (2016-2018 average)



Source: World Bank calculations based on FADN data

Note: Average for 2016 and 2017 as for most countries data for 2014 and 2015 is missing. The FADN code used for Interest expenses is SE380 and for Total liabilities SE485.

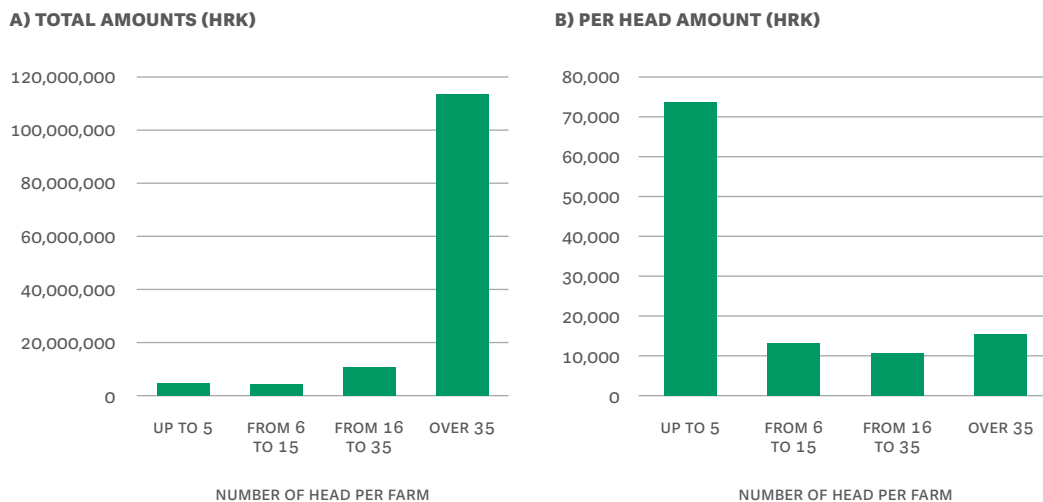
Figure A3. Rural development support (Measures 4, 5 and 6) to Croatian cattle farms by farm size paid out in the period 2015-2018



Source: World Bank staff calculations based on APPRRR, Animal register and ARKOD data.

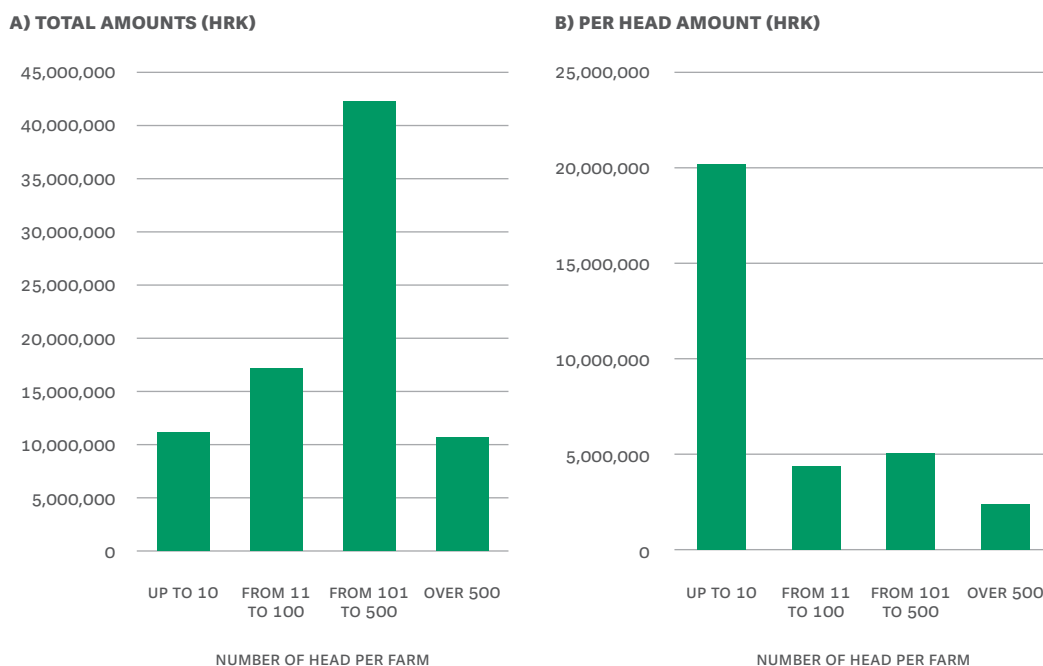
Note: All farms with fattening cattle are included, identified by the type of coupled support received.

Figure A4. Rural development support (Measures 4, 5 and 6) to Croatian milk farms by typical farm size paid out in the period 2015-2018



Source: World Bank staff calculations based on APPRRR, Animal register and ARKOD data.
 Note: All farms with milking cows are included whereas farms were identified based on the coupled support received.

Figure A5. Rural development support (measures 4, 5 and 6) to Croatian pig farms by typical farm size paid out in the period 2015-2018



Source: World Bank staff calculations based on APPRRR, Animal register and ARKOD data.
 Note: All farms holding at least one pig (sow or fattener) are included.

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