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Performances of dairy farms under geographical indications

The aim of geographical indications is to ensure better remuneration of the farmers committed to the corresponding specifications, through market differentiation resulting from better consumer information. For several years, it has been envisaged to mobilize them for the agro-ecological transition. However, their performance remains little studied. This note analyzes the performances of dairy farms under geographical indications on three axes: economic, environmental and animal welfare.

The initial objective of geographical indications (GI) is to enhance the value of agricultural products through market differentiation resulting from compliance with specifications and through consumer information, by guaranteeing the quality and authenticity of products from a given area. Organoleptic quality of the products and respect of traditions are the main objectives of these approaches. By meeting consumer expectations, they should also allow committed farmers to obtain a better valuation of their production. In response to societal expectations, it has also been envisaged for several years to use them to promote the agro-ecological transition, as indicated in article 48 of the EGAlim law. This implication would contribute to respond to rising consumer expectations regarding the social and environmental impacts of their purchases: despite the current health crisis, 72% of French people say they are in favor of responsible consumption[1] and 69% believe that politicians do not sufficiently defend animals.[2]

Studies on the economic performance of GIs show that these products can be sold at a higher price, but this does not always compensate for higher production costs.[3] In terms of environmental and animal welfare (AW) aspects, the few existing studies suggest that GI farms do not perform better than other farms.[4] However, these results vary from case to case, with the Comté Protected Designation of Origin (PDO), for example, being recognized as particularly efficient economically and environmentally.[5]

The first part of this note statistically analyzes whether GI dairy farms have a better economic performance than non-certified farms. The second part presents their environmental performance and the third part presents their AW performance.

1 - Some GI dairy farm show a better economic performance

The profit before taxes (PBT)[6] per non-salaried annual work unit (PBT/AWUns) is used to compare the economic performance of GI and non-GI farms (box 1). It represents the sum of the operating and financial income that the farm generated during the accounting period, and is therefore often used to approximate the farm income of farmers. However, this indicator has limitations because it can be subject to accounting optimizations. A similar analysis was therefore conducted on Gross Operating Surplus (GOS);[7] the results obtained are similar and are not presented here.

The median income (PBT/AWUns) is significantly[8] higher for GI farms (30 k€ compared to 23 k€ without GIs) (graph 1), but with significant disparities according to GI. In fact, the PBT of farms in Charente-Poitou PDO butter (BCP), Savoie PDOs and Franche-Comté PDOs (FC) is higher than that of farms without GIs, and the FC group is particularly strong among certified farms, with a median income of 46 k€, *i.e.*, twice that of farms without GIs. The performance of the Munster PDO farms and the Auvergne-Rhône-Alpes (AR) group is not significantly different from that of non-certified farms.

As there is a lot of heterogeneity between farms, it is interesting to control for structure effects to obtain a net effect. Propensity score matching shows, after controlling for structure and location effects, that the

1. ADEME, 2021, *14e baromètre de la consommation responsable 2021* : https://presse.ademe.fr/2021/05/14e-mebarometre-de-la consommation-responsable-2021.html
2. IFOP, 2021, *Les Français et le bien-être des animaux* : https://www.ifop.com/wp-content/uploads/2021/01/IFOP117840-Pr%C3%A9sentation-30MA.pdf
3. Jeanneaux P., Gillot M., Payen A. *et al.*, 2019, *La compétitivité hors coût des exploitations agricoles françaises : une analyse des effets des signes de qualité et d'origine, Analyse*, n° 135, CEP, MAA : https://agreste.agriculture.gouv.fr/agreste-web/disaron/Ana135/detail/
4. Bellassen V. *et al.*, 2021, "The Carbon and Land Footprint of Certified Food Products", *Journal of Agricultural & Food Industrial Organization* : https://www.degruyter.com/document/doi/10.1515/jafio-2019-0037/html Henningsen A. *et al.*, 2017, "The Relationship between Animal Welfare and Economic Performance at Farm Level: A Quantitative Study of Danish Pig Producer", *Journal of Agricultural Economics* : https://onlinelibrary.wiley.com/doi/10.1111/1477-9552.12228
5. Husson E. *et al.*, 2019, "PDO Comté Cheese in France", in Arfini F., Bellassen V. (eds), *Sustainability of European Food Quality Schemes. Springer*, p 405-426 : https://link.springer.com/chapter/10.1007%2F978-3-030-27508-2_21
6. In the French agricultural statistic system, the Profit Before Taxes is close to the European Family Farm Income (FADN SE420 indicator), but excluding exceptional results.
7. The Gross Operating Surplus indicator is close to the European Gross Farm Income (FADN SE410 indicator), yet with paid wages deduced.
8. Mood's median test, here considered as significant if the *p-value* < 10%.

Box 1 - **Quantifying economic, environmental and animal welfare performances of dairy farms**

The analysis of the economic performance of each GI farm is conducted here using the main economic indicators of the French Farm Accountancy Data Network: Réseau d'informations comptables agricoles -Rica (e.g., Current Income Before Taxes - PBT, Gross Operating Surplus - GOS, Total output - TO).

The analysis of the environmental performance of each GI farm relies on a matching of the 2019 Rica, the National Institute of Origin and Quality (INAO) database[9] and the Graphic Land Register. The resulting database contains 1,038 farms from 2019 Rica specialized in dairy or mixed cattle, including 245 in GI. The evaluation of environmental performance uses the eleven indicators developed by A. Kirsch[10]: share of grassland, low-productivity areas, legumes, and irrigated areas, crop diversity index, fertilizer and phytosanitary product expenses per hectare, external feed and veterinary products per capita, direct energy expenses and organic nitrogen pressure. Two new indicators complete them: average size of arable land parcels and share of gross product from renewable energy. For each of these indicators, farms are divided into deciles and given a score according to their position. Then, scores obtained on the different indicators are summed, with equal weight for each, resulting in the overall environmental performance score of each farm.

To analyze animal welfare performance (AWP), data from the 2015 Livestock Practices Survey and the INAO database are matched. The resulting base includes 3,416 farms with dairy cows, including 737 under GI. Ten AWP indicators are developed: duration and area of grazing per dairy cow, practice of dehorning and systematic analgesia, reduction of veterinary treatments and use of alternative products, loose (vs. tied-up) housing systems, frequency of litter and effluent evacuation, presence of an exercise area. As before, each farm is scored for each of the ten indicators, which are added up to an overall score, without weighting.

Descriptive statistics were then used to compare the economic, environmental and AWP of GI and non-GI farms, first for the whole of France, then by groups of homogeneous GIs, in order to gather comparable farms with sufficient numbers. Two GIs and three groups of GIs were determined on the basis of the forage criteria in the specifications, the overlap of production areas, the number of farms in each group, and the geographical areas (figure 1).

In addition, in order to analyze these performances "all other things being equal", an econometric approach of propensity score matching was carried out.[11] This approach controls for the effect of structural characteristics of the farms (UAA, organic farming, mountain area, region, age and education of the farmer, legal status, direct sales), by matching each GI farm with its closest non-GI counterpart, with an exact match on the criteria "mountain area" and "organic farming". The performance gap between the two was then measured.

income of all GI dairy farms is 9 k€ higher than it would have been if these farms had not been certified. In particular, the FC group shows a surplus of income per AWU of 22 k€ (table 1). Further analysis shows that a higher turnover, linked to a better milk price,[12] explain this surplus. Outside of those FC farms, the surplus of PBT/AWUAns would amount to 4 k€ for GI farms.

The analysis also reveals a significant income surplus for farms in the AR group (+6 k€/AWUns), less important than in Franche-Comté (+22 k€/AWUns), due in particular to a lower turnover reflecting a lesser valorization in this group.[13] For the Savoie PGI, the income difference with neighboring farms is positive (+8k€), a sign of better valuation,[14] but not significant, probably due to the small sample size. The Munster and BCP PDOs do not show any difference with the closest farms. In Munster, intermediate consumption is more important than in non-GI farms, penalizing their added value. Significantly higher subsidies allow them to bring the PBT/AWUns back to the level of the non-certified farms. In BCP, intermediate consumption is higher than in the closest non-GI farms, which affects the economic result.

GI farms therefore generate higher incomes overall, but there are strong disparities between appellations. The final value of the products and its transmission in the price of milk do not always compensate for the higher production costs induced by the specifications.[15]

2-Above-average environmental performance, but not caused by the geographical indication

Taken as a whole, French GIs farms have a significantly higher median environmental score (see box 1) than non-GI farms (graph 2). However, the results vary according to the GI. For example, farms in the FC, Savoie PGI and AR groups have a higher score than all non-certified farms, while BCP farms have a lower environmental score than other GIs, but also than non-GI farms. There is no significant difference between the farms in Munster PDO and those outside GI, which is probably explained by the strong dispersion observed in their scores.

These differences disappear when comparing farms with similar structure and location (table 1). The GI farms show very similar environmental scores to their non-GI "twins", with the exception of the BCP farms, whose score is significantly lower than that of their non-certified neighbors by 7%. No significant differences were observed for the other groups.

A detailed analysis for each environmental indicator shed some light on these results. The GI farms performed better than the most similar non-GI farms in terms of the proportion of grassland (+11%) and crop protection products (-19%); however, their fertilizer costs were not significantly different. External feed costs (per livestock unit, LU) are 11% higher overall on GI farms. The difference rises to 21% for farms in the FC group and 33% for those in the Savoie and BCP PGIs. This counter-intuitive result is probably linked to the particular circumstances of the year 2019 studied: the droughts that occurred in the Centre-Ouest, Auvergne and Grand Est regions led to numerous purchases of compensatory external feed,[16] authorized by derogation for certain PDOs. Cost increases are probably

9. Enhanced with various data sources: Organic farming agency (Agence bio) 2015, zoning map for Compensatory Allowances for Natural Handicaps scheme, BALSA datum november 2015, Agricultural Mutual Social Fund (MSA) (2017, 2016, 2015, 2014, 2013, 2012 et 2011) et Agricultural Census 2010.

10. Kirsch A., 2017, Politique agricole commune, aides directes à l'agriculture et environnement : analyse en France, en Allemagne et au Royaume-Uni, thèse de doctorat, université de Bourgogne : https://www2.dijon.inrae.fr/cesaer/wp-content/uploads/2017/06/These-AKIRSCH.pdf

11. Givord P., 2010, *Méthodes économétriques pour l'évaluation des politiques publiques*, Document de travail de l'Insee, G2010 (08). Quantin S., 2018, *Estimation avec le score de propension sous R*, document de travail de l'Insee, M2018 (01).

12. With an average selling price of 587 €/1,000 L for the FC group in conventional, against 366 €/1,000 L for all non-GI farms (Rica- INAO 2019, processed by the authors).

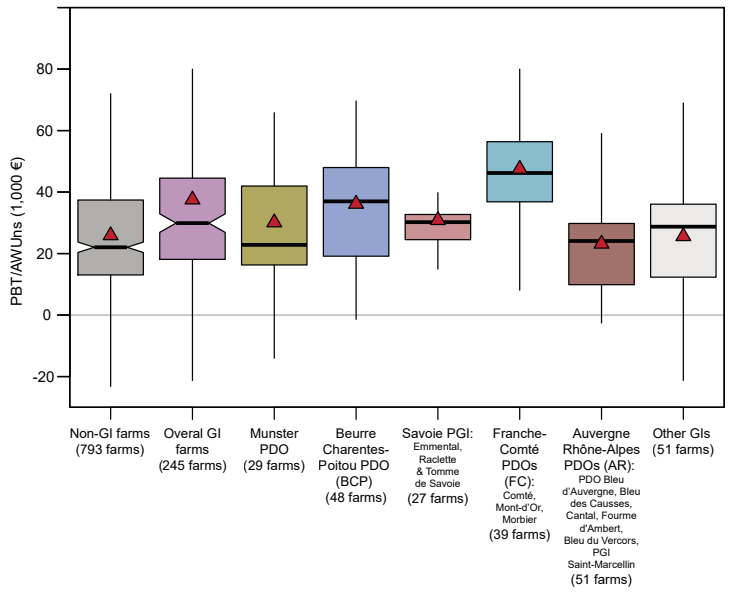
13. Average sales price observed in conventional production for the AR group: 370 €/1,000 L in 2019 (Rica-INAO 2019).

14. Average conventional sales price for the Savoie PGI group: 475 €/1,000 L (Rica-INAO 2019).

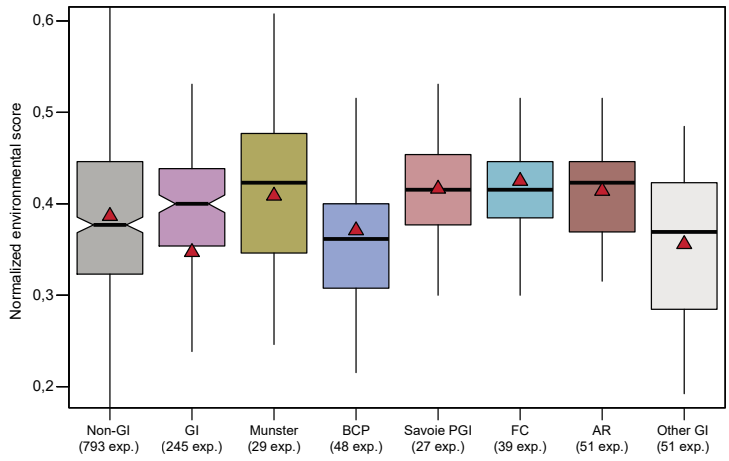
15. Jeanneaux P., Gillot M., Payen A. *et al.*, 2019, *La compétitivité hors coût des exploitations agricoles françaises : une analyse des effets des signes de qualité et d'origine, Analyse*, n° 135, CEP, MAA : https://agreste.agriculture.gouv.fr/agreste-web/disaron/Ana135/detail/

16. Institut de l'élevage, 2019, *Dossier annuel. Économie de l'élevage bovins lait*, p 12-13.

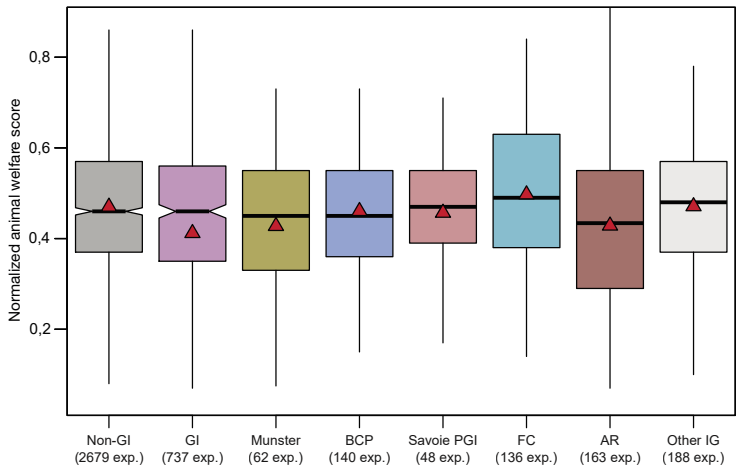
Graph 1 - **Distribution of the profit before taxes per AWU**



Graph 2 - **Distribution of the environmental score**



Graph 3 - **Distribution of the animal welfare score**



Sources: INAO data, Rica 2019, livestock practices survey 2015, processed by the authors.

Reading: for each group, the number of farms in the sample is given in brackets, the horizontal bar represents the median, the triangle represents the mean, the ends of the box the first and third quartiles, the vertical lines the dispersion, and the notch the 95% confidence interval around the median.

all the more important under GIs because of the restrictive specifications.

BCP farms show lower environmental performance than others. This can be explained by the fact that the specifications for production systems are not very restrictive, mainly with regard to the geographical area and the processing phase. In addition, as this is a lowland PDO, the zoning implies few agronomic constraints, particularly with regard to grass use. However, the evolution of these specifications from 2021, with more requirements on the origin of the herd's feed ration, could contribute to improve the environmental performance of the farms involved.

Dairy farms that are members of GIs therefore have a better environmental score than farms that are not involved in these approaches. However, this is more related to their structural characteristics and location than to the commitment as such. The GI specifications, especially the most demanding ones, through their respect for "local, fair and constant practices", ultimately select farms that are more environmentally efficient, due to their structure, their practices and their location.

While this analysis shows that GIs do not have a direct environmental effect on farms, through their economic value, they can nevertheless contribute to the sustainability of these farms with the most interesting practices and consolidate milk production in their areas, by limiting flows to the most intensive dairy basins.

Besides, GIs can possibly have positive knock-on effects. These so-called halo effects benefit more than just the farms involved, notably through the development of references and technical advice on the production and use of grass in these geographical areas. On the other hand, higher economic performance can also have the opposite effect by encouraging (in the absence of control measures) a local development of production that puts more pressure on the environment.

3 - No difference in animal welfare performance

For all GIs, the overall AW scores (box 1) reveal equivalent overall animal welfare performance, whether the farms are certified or not (graph 3), even after taking into account the effects of structure and location.

An indicator-by-indicator analysis allows us to study the differences in practices between certified and non-certified farms. It shows that certified farms practice dehorning as much as non-certified farms, but use analgesics more systematically

Table 1 - **Average effect of a geographical indication on economic, environmental and animal welfare performance**

Average effect on GI farms	Rica sample size	PBT by AWUns surplus	Environmental score gap	AW sample size	Animal Welfare score gap
Overall GI	245	+ 41% (+ 9 k€) ***	- 2% --	737	0% --
PDO Munster	29	+ 1% (+ 0,3 k€) --	0% --	62	- 2% --
Charentes-Poitou PDO butter (BCP)	48	+ 1% (+ 0,4 k€) --	- 7% *	140	- 5% *
PGI Savoie	27	+ 33% (+ 8 k€) --	- 5% --	48	- 11% *
Franche-Comté group (FC)	39	+ 85% (+ 22 k€) ***	*+ 3%* --	136	+ 9% --
Auvergne–Rhône-Alpes group (AR)	51	*+ 33%* *(+ 6 k€)* ***	*+ 1%* --	163	- 11% ***

Sources: INAO data, Rica 2019, livestock practices survey 2015, processed by the authors.
Reading: The table presents the average effect of GIs estimated by propensity score matching: the gap between the observed performance of GI farms and the estimation of what they would have had if they had not been certified. Its significance is indicated: *** highly significant (p-value ≤ 5%), * significant (5% < p-value ≤ 10%) and–not significant (p-value > 10%).

to reduce pain. They also use alternative veterinary treatments (aromatherapy, homeopathy, physiotherapy, etc.) more often. The evacuation of livestock effluents from buildings is more commonly practiced (at least weekly) in GI farms. Finally, GI farms have 16% more grazing area per dairy cow than their non-GI counterparts, but the duration of grazing is not significantly greater. In contrast, dairy cows on GI farms are more often in stanchion barns and less often have exercise yards.

After matching the farms with non-certified "twins", the group analysis shows that the AW performance is significantly lower in AR, and to a lesser extent in Savoie PGI and BCP. There are no differences for the Munster and FC groups (higher score but not significant for the latter). An analysis by indicator shows that, for an equivalent AW score, the GI farms in AR have significantly different practices from their non-certified neighbors. Fewer of them systematically apply painkillers during dehorning and use alternative treatments. Tethered stalls are also more common, probably because the buildings are older and less recently renovated than at the national level,[17] and weekly effluent disposal is less common. However, the dairy cows on these farms graze 36% longer during the year and have a larger grazing area (+20%). The specifications of the Bleu d'Auvergne PDO (the majority in the AR group) impose mandatory grazing as soon as weather conditions allow it, which may explain this greater use of pasture. This practice reduces the time spent in buildings, limiting the amount of manure to be evacuated and the negative impacts of tied-up housing (although the indicator used here cannot account for this).

This grazing requirement is also present in the Comté PDO specifications, but the results show no difference in average grazing area or duration between these farms and their non-certified counterparts. The practice of grazing is in fact widespread in the area, thanks to the favorable soil and climate conditions, and probably to the collective dynamics of grazing around the PDO. The latter allows all farms to take advantage of the agro-economic benefits of grazing (less mechanization, less purchase of protein concentrate, less litter to be evacuated), whether they are in PDO or not.

GI farms therefore favor more grazing, but they perform slightly less well on stabling conditions, obtaining overall AW scores at the same level as non-certified farms. Ongoing changes in specifications could have a positive impact on animal welfare. For example, the Comté PDO will soon impose a minimum number of cow exits throughout the year in the case of stanchion barns.

*

The results presented above indicate that, for the year 2019, GI dairy farms would, as a whole, perform better economically, thanks to better value creation of milk. However, this is not the case for all kind of GIs.

The commitment to GI may have a stabilizing effect on income that is not captured in this analysis. GI milk is essentially intended for products whose prices fluctuate less than industrial products subject to world markets, or even than standardized products widely traded at the European level. If their valuation is not always higher, it is normally more stable, reducing producers' exposure to price volatility and improving farm resilience. However, this effect could only be measured with an analysis over several years.

If GI farms show better environmental scores, this would be the result of already better performing farms entering GI, with performance depending more on their structure and location. In terms of animal welfare, apart from grazing, the differences are not in favor of GIs, partly because of the age of the buildings.

Citizens' and consumers' concern for the environment and animal welfare is growing, and agricultural and agri-food actors are increasingly taking up these issues. New private initiatives seek to highlight environmental benefits or those related to animal welfare. Beyond the guarantees they provide to consumers on the quality of products, if GIs for dairy cattle want to keep their favorable position on the market, they will have to reinforce the consideration and the promotion of these aspects. Some recent developments are moving in this direction, such as the PDO Munster which, since May 2021, reinforces the use of grass all year round, grazing and forage autonomy.

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17. Agreste 2019, *Enquête pratiques d'élevages 2015, bâtiments et gestion des effluents d'élevage bovins*, Agreste Auvergne-Rhône-Alpes, Flash Info n° 10.

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