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Implementation of True Cost of Food Accounting in selected Swiss Agricultural Value Chains: *The Case of Swiss Pork*

Overview

Consumption Trends in Switzerland and abroad

With a share of 41.1 % of total meat consumption in Switzerland pork remains the most popular meat mainly due to its high share of charcuterie products. 50.3 percent of pork meat was sold in the retail trade and 49.7 percent in outdoor catering[1].

Swiss average per capita consumption of pork reached around 21 kg/capita/year in 2022 – almost half of the total meat consumption per capita (48kg) in Switzerland. Yet, compared to Austria (36.4 kg) and Germany (33.8 kg) pork per capita consumption remains relatively low.

Even though average pork consumption per capita in OECD countries (currently 23 kg/capita) has been declining over the past decade, overall global consumption (current average 14kg/capita) has increased with the largest increases in the growing markets of Asia. For example, China accounts for 50% of the global pork consumption. It currently consumes around 38 kg/capita but is expected to eventually reach similar levels of consumption as currently observed in more affluent Hongkong (55 kg/capita). But there are also reverse trends that may have to be taken into account such as an aging and stagnating population as well as shifting consumer preferences.

Environmental challenges and how they are addressed

Ammonia (NH3) and phosphorus emissions are the main environmental challenges in the pig industry. To protect ecosystems, the Swiss federal government aims to reduce nitrogen losses from agriculture by 20% by 2030 compared to the average value for the years 2014-16.

Ammonium emissions occur as result of the breakdown of nitrogen-rich urea from the excrement of farm animals leading potentially to over-fertilization and acidification of the soil and biodiversity loss. In addition, ammonia may contribute to the formation of particulate matter and is therefore harmful to human health.

Yet, the sector has also improved its environmental footprint over the past decades in many ways: For example, ammonia emissions caused by the pig industry decreased by almost 50% since 1990, mainly due to the fact that the number of pigs in Switzerland decreased by 28% over the same period. But the lower footprint is also due to significant technical innovations designed to reduce

The state of Swiss pork production

https://www.swiss-meat.com/en/swiss-pork

Pig farming is dominated by small-scale family businesses, often specialised in breeding and fattening pigs.

Pork is the most popular meat (total turnover around CHF 11 billion, self-sufficiency rate around 90%) even though consumption/capita is declining (below 20kg/year)

Numerous technologies in pork breeding, production and processing have been adopted in response to strict environmental and animal welfare standards

External costs of pork production vary between economic units within each part of the value chain.

Since pig is a non-ruminant and pork meat rich in high-quality protein, B-complex vitamins, and essential minerals, it may contribute to a healthy and sustainable diet, if consumed moderately.

[1] 50 percent of the total turnover of Swiss agriculture (CHF 11.4 billion) is generated by farmers with the production of milk, meat, eggs and other animal-based products.

emissions: between 2010 and 2022, diffuse inputs of dissolved phosphorus have fallen by around 165 t (-18%), mainly due to the adoption of phosphor saving technologies as will be further illustrated. Ironically, NH3 and phosophorus emissions per pig have decreased to a much lesser degree on pig farms that have embraced more animal-friendly multi-surface pens and exercise yards for pigs. A potential trade-off between animal welfare and environmental performance is not taken into account in True Cost of Food Calculations.

Upstream emissions:

Life Cycle Assessments revealed that the import of pig feed is the largest contributor to the overall environmental footprint in the pig supply chain. This is due to the global network of crops which are used in the production of feed. Since pig feed is also the largest cost factor, great efforts are undertaken in pig farming to make use of domestic food waste. Around 150,000 tons of by-products from the food industry are recycled per year. This includes cheese and other dairy waste, as well as potato and grain waste products. Since pigs are omnivores by nature, thermally treated animal waste from slaughterhouses as a domestic substitute for imported soy is being considered to further close the nutrient cycle.

Downstream emissions:

Emissions of the pig value chain beyond the farm are difficult to capture: Once pigs are sold on the market, labels and prices per unit are assigned by traders and certifiers, followed by transportation to the slaughtering locations. Slaughtering, cutting and processing is dominated by two large Swiss companies, Micarna and Bell. Due to the high share of charcuterie products there is a great degree of market segmentation. The different products are then packaged and sold to retailers and gastronomy catering. Downstream emissions and waste mainly result from transport and cold value chain management. They are difficult to estimate on an aggregate level because they may vary greatly depending on the sustainability performance of the different companies operating in the value chain. Finally, emissions are caused by consumer households and guests in the hospitality sector not just in regard to food waste but also packaging and human waste. The respective cost of disposal and the potential to recycle the nutrients must also be taken into account in a holistic life-cycle assessment. But there are still significant regulatory barriers to re-cycle and re-use sludge for sanitary safety reasons.

Swiss regulatory environment

Swiss animal husbandry is subject to strict regulation. Animal welfare has been enshrined in Article 80 of the Swiss Federal Constitution since 1973. Since 2005, the state recognizes the dignity of animals and grants them the right to protection (animal protection law). There is also a federal ordinance with respect to pig farms designed to minimize the risk of diseases as well as increase the well-being of the pigs throughout their lives.

Swiss livestock policies also contain many incentives and direct financial contributions for pig farmers to lower their environmental foodprint. Certified labels beyond QM, the standard quality, enable farmers to fetch a better price, yet they are also associated with substantial costs and tend to disregard the trade-offs between animal welfare and emissions.

Value Chain Challenges

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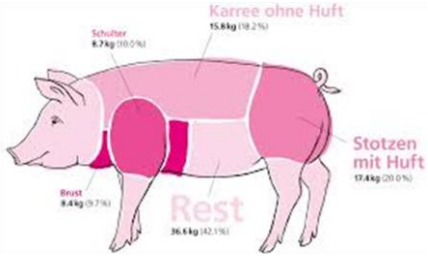
The schematic beliefs of Swiss consumers about pig farms and pork meat produced in Switzerland rarely match the reality. Pork meat may be problematic when consumed in large quantities. But Swiss pork meat consumption is comparatively moderate and its quality is high due to small but well-run family-based pig farms. However, Swiss pork meat producers are price takers in the value chain; and, quite often, prices on the market do not cover the costs of production, which have increased due to investments required to make farms more sustainable and animal friendly. Downstream actors in the value chain who usually enjoy higher margins will have to assume more responsibility in efforts to further improve the sustainability of Swiss pig production.



The positive environmental impact on technological change

The most significant improvements in emissions reductions that also resulted in improved animal welfare have been achieved primarily thanks to advances in technology and innovative practices adopted in the industry; for example:

(1) Multi-phase feeding reduces the burden on the environment in terms of nitrogen and phosphor emissions thanks to the targeted use of crude protein.
(2) The genetic improvement of pigs designed to make them more resilient, healthy and productive accounts for up to 7.5% of greenhouse gas emission reduction.
(3) Chemical and biological types of exhaust air washers are able to separate and dispose ammonia, odours and dust by almost 90%.
(4) The genetically modified enzyme 'phytase' enables monogastric bacteria in pigs to break down and utilize the phosphorus in feed in a much more efficient way resulting in a reduction of phosphor excretions per animal and day by up to 50 %.
(5) New buildings are increasingly being equipped with feces and urine separation. This prevents the urease in the feces from converting the urea of urine into volatile ammonia

Economic constraints of pig farms are a sustainability challenge

Even though professionally run modern Swiss pig farms have improved performance in terms of productivity, sustainability and animal welfare, this did not translate into an improved public perception of the sector or a higher return on investment. One challenge is to communicate the sustainability value of the highly differentiated and innovative ecosystem of pork production, which involves at its core farmers, breeders and scientists who collaborate at three different levels to produce high quality meat under the best-possible conditions: the nucleus breeders, the fattening piglet producers and the fatteners. The wider economic ecosystem also involves fodder producers, technology providers, users of secondary products extracted from organic waste as well as the actors further down the value chain. Uncertain economic perspectives associated with declining pork consumption/capita in affluent economies make it difficult for farmers to earn a decent return on investment. But switching from livestock to crops is in most cases not an economically viable option because land that is suitable for livestock is often not suitable for crop cultivation. Due to economic uncertainty and lack of social recognition, the number of pig farms has decreased from 35'000 in 1985 to 5000 in 2023. The positive aspect of this structural change is that emissions decreased while pig health and productivity significantly increased. The improvements in performance are also due to the fact that actors who survived in the difficult regulatory and economic environment were able to remain competitive because they became more professional, resilient and sustainable.

What sustainability labels reveal – and what they conceal

The best known sustainability label among Swiss consumers is 'certified organic' (Bio) that follows the strict Swiss standard 'Bioknospe' (Biosuisse).

The Perspective of Suisseporcs on True Cost of Food (TCF)

Suisseporcs offers its members services concerning animal health, animal genetics, sales and marketing, political communication and education of the public. It is organized as a corporately organized association.

Interviews were conducted on 19.8. 2024 with Stefan Müller (CEO) and Adrian Schütz (Vice-CEO) of Suisseporcs. They expressed their views on the TCAF concept as follows:

Adrian Schütz: True Cost of Food is becoming increasingly relevant as a way to capture the externalities of agricultural practices, but there needs to be more transparence about the underlying baseline assumptions. Rather than making use of highly aggregated data on a product-level, there should be a focus on farm-level performance. Overall, Swiss pig farmers have become more professional and innovative over time with a positive impact on animal welfare, resource-efficiency and emission reduction. All these achievements may be irrelevant if 'True Cost of Food' Concept' starts from the implicit assumption that meat as such is not desirable from an environmental, human health and animal welfare point of view – also reflected in the recently launched national referendum on the promotion of plant-based food (Vegi Initiative). It fails to consider that a lot of farm land in Switzerland is simply not suitable for crop cultivation. Moreover, pork meat can be healthy if consumed in responsible quantities.

Even though organic has its advantages in terms of animal welfare, biodiversity and the environment, it may be misleading to portray it as the leading sustainability standard in view of many unresolved challenges in organic farming practices associated with production cost as well as trade-offs between animal welfare and environmental footprint. Despite the fact that pig producers of certified organic pork usually obtain a price that is almost double as high as the price of pork produced according to the QM standard, the share of certified organic pork in Switzerland is below 2 per cent. This is not just due to the reduced demand for the more expensive alternatives but also the fact that farmers who switch to certified organic must transform the entire system of production, which massively increases costs. Moreover, other business-to-business (B2B) sustainability labels, such as IP Suisse, have caught up in terms of concrete and measurable output-based performance compared to organic. This may be due to the general resistance of the organic sector to acknowledge the value of technology in improving animal welfare and reducing emissions into the environment. At any rate, more than 60% of the Swiss pig farmers meet the sustainability standards of IP Suisse and many of the remaining ones who produce according to QM, follow the RAUS standard (exercise areas for animals between inside and outside the buildings) and the BTS standard (conforming resting places for animals). It may therefore misleading to simply equate 'organic' with sustainable and 'conventional' with unsustainable.

Capturing the true cost of Swiss pork production

True Cost Accounting of Food (TCAF) aims to internalize external costs into the market price of products. Based on Life Cycle Assessments (LCA) potential negative externalities of food production for society and the environment are taken into account.

The challenge of introducing differentiation

However, the underlying monetarization approaches mainly rely on available product-related data on a highly aggregated level that often disregard the concrete sustainability performance of a farm. They may distinguish between conventional and organic farming methods, but they do not reveal the actual sustainability performance of a farm based on concrete output indicators. This lack of differentiation may not do justice to farms that are committed to improve their sustainability performance through a combination of best practices and technologies that are most suitable in the particular context. Many of the sustainable pig producers struggle to make ends meet because of a lack of social recognition and a lack of return on investment on measures that generate positive impact for society and the environment.

The value of measuring concrete output performance per farm

This may change if there would be a credible and practical tool for farmers to capture and compare their sustainability performance based on the measurable outputs. Such an approach would also provide farmers with clear incentives to further improve their performance.

The Perspective of Suisseporcs

Stefan Müller: Suisseporc has developed a cost calculator on each level of production. It shows that the high quality production of pork rarely covers the costs of farmers, and it is them who are most affected by the market risks. Despite the massive reduction of the stock of pigs in Switzerland over the past four decades, Switzerland reaches a self-sufficiency level in pig production of roughly 90% - thanks also to tariff quota. But quotas do not protect farmers against price fluctuations, as recently caused by the end of the COVID-19 crisis and the growing shopping tourism for cheaper meat across the border. Shopping tourism also reveals the gap between rhetoric and action of consumers. Many argue that meat consumption should be reduced and that the remaining livestock farmers should produce according to the highest sustainability standards. But the reality is that very few are willing to pay a higher price for meat as a result of the additional farm-based investments in sustainability. This may also be the problem with the 'True Cost of Food' Concept. You increase the price of the product to reflect the 'true cost' and consumers may simply go elsewhere to buy their pork meat. There may be a slight shift toward plant-based alternatives but they are still expensive and therefore represent a niche market. The government may support pig farmers in their efforts to become more sustainable, but this comes at the price of excessive bureaucracy. Reducing bureaucracy may help pig farmers to improve their sustainability as well as their economic performance.

Minding the human health aspect:

There are various methods for evaluating the quality of proteins. One method that is now established in the scientific community is the so-called DIAAS (Digestible Indispensable Amino Acid Score). We will explain this complex method as briefly as possible here: proteins are important building blocks for our body. They consist of different amino acids. The body needs the different amino acids to be able to produce its own proteins. There are 21 different amino acids, and our body cannot produce nine of them itself. That is why we have to consume these nine amino acids through our diet. Proteins with a DIAAS of over 100 have an optimal protein quality and provide the body with all the amino acids it needs in sufficient quantities. Sounds complicated? It is a complex topic. The higher the DIAAS value, the better the protein can supply the body with the necessary amino acids and be further utilized by the body.

Furthermore, the prices and costs of pig farming in sales from the stable and their share of the consumer franc and of the total production costs up to the retail stage are to be clarified.

References:

FAO (2023), Pathways towards lower emissions – A global assessment of the greenhouse gas emissions and mitigation options from livestock agrifood systems. Rome (Available online: https://doi.org/10.4060/cc9029en

Python,P., Gresset, F., Réviron,S. (2022). Wertschöpfungskette Schweinefleisch. Agridea, Lindau (Available online: https://www.agridea.ch/de/themen/maerkte-agrar-und-lebensmittelsektor/wertschoepfungsketten-und-ernaehrungssysteme/

Harrison, M. T., & Liu, K. (2024). Holistic systems analyses accelerate progress towards Sustainable Development Goals. 5, 544–545.

Kupper, T., Bonjour. C., Menzi. H., Bretscher, D. and Zaucker, F. (2022) Ammoniakemissionen der schweizerischen Landwirtschaft 1990-2020. Berner Fachhochschule Hochschule für Agrar-, Forst- und Lebensmittelwissenschaften, Bern (available online: https://agrammon.ch/de/downloads/)

McAuliffe, G. A., Chapman, D. V., & Sage, C. L. (2016). A thematic review of life cycle assessment (LCA) applied to pig production. Environmental Impact Assessment Review, 56, 12-22.

Michalke, A., Köhler, S., Messmann, L., Thorenz, A., Tuma, A., & Gaugler, T. (2023). True cost accounting of organic and conventional food production. Journal of Cleaner Production, 408, 137134.

Philippe, F. X., & Nicks, B. (2015). Review on greenhouse gas emissions from pig houses: Production of carbon dioxide, methane and nitrous oxide by animals and manure. Agriculture, Ecosystems & Environment, 199, 10-25.

Rizwanuddin, S., Kumar, V., Singh, P., Naik, B., Mishra, S., Chauhan, M., et al (2023). Insight into phytase-producing microorganisms for phytate solubilization and soil sustainability. Frontiers in microbiology, 14, 1127249 (Available online: https://doi.org/10.3389/fmicb.2023.1127249)

Sumberg, J., & Giller, K. E. (2022). What is 'conventional'agriculture?. Global Food Security, 32, 100617.

von Wyl, H., Küng, T., Kupper, T., & Spring, P. (2023). Rohproteingehalte in Schweinefutter: Bestandsaufnahme 2021. Agrarforschung Schweiz 14: 116–121.

Vicente, F., & Pereira, P. C. (2024). Pork Meat Composition and Health: A Review of the Evidence. Foods, 13(12), 1905.

Yang, P., Yu, M., Ma, X. and Deng, D. (2023) Carbon Footprint of the Pork Product Chain and Recent Advancements in Mitigation Strategies. Foods. 2023; 12(23):4203 (Available online: https://doi.org/10.3390/foods12234203)

Links:

https://www.agrarmarktdaten.ch/blog/fleischabsatz-detailhandel-schweiz-2022

https://de.statista.com/statistik/daten/studie/557333/umfrage/schweinehalter-in-der-schweiz/

https://www.proviande.ch/de/ueber-uns/nachhaltigkeitsbericht/die-fleischbranche-in-zahlen

https://www.schweizerbauer.ch/tiere/schweine/zukunftsaussichten-der-schweinebranche

https://www.blw.admin.ch/blw/de/home/markt/marktbeobachtung/fleisch.html

https://www.blw.admin.ch/blw/de/home/politik/agrarpolitik/agrarpolitik30plus.html

https://www.ufarevue.ch/nutztiere/betriebsstrategie-fuer-den-absenkpfad-naehrstoffe

https://www.pig333.com/

https://schweizerfleisch.ch/herkunft/facts-figures-schweizer-schweinefleisch

https://www.deuka.de/aktuelles/2021-01-07-optimierung_der_phosphorverwertung_durch_phytase/

https://www.agrarforschungschweiz.ch/2023/06/stickstoff-und-phosphoreintraege-in-gewaesser-neue-schaetzungen-fuer-die-landwirtschaft/