

Food Sector Vienna: Action Lines Innovation Policy¹

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Growth and competitiveness...

In recent decades, economic policy has focused mainly on increasing economic growth (see Leo, 2022). Research, technology and innovation policy has been an essential element in achieving this goal, even if - and now increasingly again - solutions to societal challenges (climate change, ageing society, biodiversity loss, etc.) are also sought through mission-oriented programs.

The food sector has received more attention in recent years, and recent crises have intensified this interest. While policy interventions in agriculture focus on supply and food security and securing farmers' incomes, in the processing sector efforts are made to increase competitiveness. Increasingly, however, more holistic approaches are being used that incorporate the problematic side effects of the food sector into the decision-making calculus.

While innovations increase efficiency in the provision of products and services, the growth effect they trigger and the rebound effect overcompensates for these savings and leads to increased GHG emissions, resource use, and growing social imbalances (Leo, 2022).

...and its side effects

The food sector is - and this is still a surprising statement for the general public - globally responsible for about 1/3 of man-made GHG emissions. More than half of these emissions come from the livestock sector, which requires about 80% of agricultural land for feed production (Poore - Nemecek, 2018). The food sector is thus one of the most important drivers of climate change as well as of changes in the biosphere because it causes biodiversity losses, consumes a lot of water, affects nitrogen and phosphate cycles, causes chemical pollution, changes land use, and overfishes the oceans (see for example The Lancet Commission, 2019). Addressing food issues is as important to the planet as moving away from fossil fuels. Also, meeting the commitments made under the Paris Climate Agreement is not possible without action in the food sector.

Although the food system has kept pace with the steady increase in the world's population, as measured by calories per capita, more than 800 million people are still undernourished. The number of overweight people, on the other hand, has passed the 2 billion mark. Unhealthy diets are a greater risk for morbidity and mortality than unprotected sex, alcohol, drug, and tobacco use combined (The Lancet Commission, 2019).

Nutrition has major implications for population health and nutrition-related costs in the healthcare system. Springmann et al. (2016) calculate that the cost of treating diet-related diseases (treatment and care costs, productivity decline) would fall sharply if dietary behaviour followed the minimal consensus among nutrition experts. With this dietary style, life expectancy increases at the same time. Variations in this diet can reduce health care costs by up to 3.3% of GDP. Nutrition thus has a

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massive influence on the costs incurred in the health care system and should be a decisive "variable" in the mix of instruments of healthcare policy.

That a trend reversal in dietary habits is necessary to reduce the negative impact is obvious: because the world population continues to grow, and Western dietary habits continue to spread, greenhouse gas emissions from the dietary sector will most likely increase by another 51% by 2050 (compared to the 2005/2007 period, Springmann et al. (2016)) if present dietary trends continue.

The Lancet Commission (2019) has developed dietary proposals that both respect planetary boundaries and consider contemporary recommendations for healthy diets. Sun et al. (2022) calculate that following the *EAT-Lancet* planetary health diet recommendations would result in a 76% reduction in diet-related greenhouse gas emissions in the 54 most developed countries. The accompanying reduction in animal food consumption reduces the amount of agricultural land needed for fodder production: an area the size of the European Union would be freed up and available as a carbon sink through renaturation or reforestation. Consequently, by the end of the 21st century, 1.5 times as much CO₂ as the direct GHG reduction could be sequestered as a result of the changes in diet. If this approach would be implemented, global warming could be limited to 1.5 degrees.

Interventions must anticipate side effects

The climate and health impacts of nutrition can be addressed at different levels. Broad interventions (carbon levy, emissions trading system, taxation of food, etc.) play a role, as does influencing dietary behaviour through information and education campaigns. In any case, the side effects of governmental interventions have to be taken into account. This applies both to nutrition and health policy decisions, agricultural policies and to research, technology and innovation (RTI) policy, insofar as it sets interventions in this area.

Action line 1: Interventions in the nutrition sector must take into account the associated side effects. Effects exist on greenhouse gas emissions, population health, and the biosphere. Changing diets can contribute significantly to reducing greenhouse gas emissions and lowering costs in the healthcare system as well as restoring the biosphere of the planet.

In sum, the Lancet Commission (2019) estimates that the potential for reducing GHG emissions in the dietary sector is highest by eliminating animal-based food: about 80% of the potential savings can be realised this way. Another 10% of GHGs could be saved in production; 5% by reducing food waste.

Action Line 2: Animal foods are mostly responsible for the high GHG emissions of the food system and also for diet-related diseases. Reducing animal food consumption is therefore a necessary condition in the design of food system interventions to reduce negative impacts on climate, biosphere, and health.

Intervention logic: holistic not only on paper

Do you have to do everything yourself?

Traditional lines of reasoning - focused solely on increasing economic growth - are increasingly unhelpful in designing government interventions. Focusing only on growth effects overlooks the massive side effects - not only in the food sector (Leo, 2022). If the strong interactions between nutrition, health, climate, biodiversity, etc. are to be integrated into the decision-making calculus, the first thing to do is to measure them.

Emissions from the food system are virtually absent from the Vienna GHG targets. Only emissions from agriculture (0.3% of Vienna emissions) are reported. The reason for this is the production-based collection of GHG emissions in Vienna, as mandated by international agreements (see UIV, 2019). However, for cities, most of the products consumed are "imported" and not produced locally: C40 Cities (2019) estimates that about 85% of all products consumed in cities are produced outside of cities.

Using Austrian food-based emissions and applying these to Vienna via the population key shows that the consumption-based emissions from the food sector alone account for around 40-80% of Vienna's production-based emissions. An order of magnitude that is difficult to ignore. In other words, if the present target values of Vienna's climate policy are used as a benchmark, then the food sector is not a problem. If, on the other hand, consumption-based figures are the basis, then the food sector is one of the central sectors.

One could retreat to the fact that those countries have to take care of the GHG emissions where the production takes place. This would have some justification - as far as producers within the EU are concerned - because they are also committed to the Green Deal and the Farm to Fork strategy, but it does not apply to non-European products. However, the "track record" of European agricultural policy in avoiding greenhouse gas emissions is so unconvincing that one would not want to delegate this task to them. In addition, the preferences of consumers have a strong influence on the production of the food sector. Consequently, one has to intervene at the point of consumption if one wants to contribute to solving this problem.

Action line 3: To capture the effects of dietary behaviour on climate and health goals, the status quo and changes must be measured. Based on this, goals can be formulated and it can be verified that interventions are helping to achieve the goals. In favour of local interventions is the fact that there is little hope that the side effects of the food sector will be "mitigated" at the European level and that consumer preferences also influence the products that are in demand.

Innovation projects or system innovation

When designing interventions, the key question is whether sufficient impetus for change can be achieved with individual measures alone, or whether a system innovation - i.e., a fundamental change in the food system - is necessary. A system innovation should seek to make the food system both more climate-friendly and kinder to the biosphere, as well as reduce costs from diet-related diseases in the health system, by increasing the proportion of plant-based foods (Springman et al., 2016, Stamulis et al., 2004, Lancet Commission, 2019). Similarly, food waste reduction could be targeted, regionalization and direct interaction between producers and consumers could be intensified, etc.

Moberg et al. (2021) show that food system changes always succeed when the government, businesses, and research institutions act in a coordinated manner. Meanwhile, changing preferences among some consumers are an important driver of food system innovation.

A prerequisite for system innovation is a sufficient understanding of the ecosystem in which it is to take place. The concept of the ecosystem has established itself as a fruitful approach for the representation and explanation of interrelationships and interactions in thematically delimited areas. Structures can be traced that go beyond the sectoral classification of economic activities and focus on the interaction of different actors and conditions.

The ecosystem for the food sector can be defined as a set of partially interconnected actors and contextual factors pursuing their goals and objectives under the given framework (borrowing from the definition of startup ecosystems - see for example Isenberg, 2011, Förlinger, 2016).

Ecosystem representations help to discover elements that might be relevant but also critical for the further development of the ecosystem. One example is the nutrition guidelines developed through the National Nutrition Commission (Nationale Ernährungskommission - NEK) and the Supreme Sanitary Council (Oberster Sanitätsrat) - both within the sphere of influence of the Federal Ministry of Social Affairs, Health, Care and Consumer Protection (BMSGPK). The Austrian food pyramid, which is now 13 years old, has a significant influence on public procurement procedures and the range of products offered in communal catering. The link between nutrition and climate change is likely to have received little attention at the time, and there are also likely to be new findings in nutrition science. Existing dietary recommendations limit the options - including those of the Vienna ecosystem - to address the challenges posed by the climate and health impacts of the food sector.

Demand-induced innovation

The City of Vienna acts directly as a demand driver for food because about 100,000 meals per day are provided in schools, hospitals, retirement homes, and canteens through subsidiaries of the City of Vienna and external providers (Schlatzer et al. (2017)). Through this channel alone, the City of Vienna purchases about 44 tons of food per year (RMA (2020)). Catering in the institutions mentioned is the responsibility of kindergartens and day care facilities for children (Magistrate 10 - MA 10), all-day schools (MA 56), sustainability (MA 22) and health (MA 24). Within the sphere of influence of MA 24 are the Vienna Health Association (formerly the Hospital Association (KAV)), the General Hospital (AKH), the HERA Sanatorium, the geriatric day centres of the Vienna Social Fund and the residential homes of the Vienna Board of Pensionists (KWP).

Community catering for these institutions is in the direct sphere of influence of the city and can thus be a catalyst for a change in nutritional behaviour. Already so far, the public procurement of the City of Vienna within the framework of the Eco-Purchase Program (Ökokauf) has resulted in food being purchased from regional producers and being more than 50% certified organic. In order to be able to determine the procurement-related ecological effects of food production, a detailed life cycle analysis is necessary.

In the health sector, the Social, Health and Sports Department of the City of Vienna focuses mainly on the provision of health services, their planning, organisation and the provision of the necessary resources. It is surprising that nutrition plays only a marginal role in the priority fields of the Vienna Health Goals 2025, although it is known that unhealthy nutrition leads to high follow-up costs in the healthcare system and also reduces life expectancy.

Action line 4: The city of Vienna should promptly either develop its own nutrition guidelines or influence the nutrition guidelines of the federal government, because the currently valid guidelines make climate-friendly cooking and thus the implementation of climate-friendly communal catering more difficult. The obvious approach is to follow the *EAT-Lancet* planetary health diet, which simultaneously optimises environmental as well as health impacts (see Lancet Commission (2019)).

Plans are similar in the Finance, Economy, Labour, International Affairs and Vienna Public Utilities Department of the City of Vienna, where the "Health Metropolis Vienna" project is being pursued as one of six key themes as part of Strategy 2030. Here, the focus is on research and development, health and care innovations, high-quality care and health services, self-determination and high standards for data exchange. To the extent that these offerings are not predominantly aimed at service export, it is also possible to consider whether interventions in the nutrition system can help optimise the use of resources.

Action line 5: Food system interventions, especially if they are aimed at system innovations, require cross-institutional and cross-divisional alignment and coordination. Given the large number of

strategies in the City of Vienna area, this is likely to be rather commonplace. If the need for coordination for system innovations in the food sector is higher than expected, then either an institution can be entrusted with ecosystem management or set up specifically for this purpose.

Influencing the food system must go hand in hand with improved knowledge transfer and communication on nutrition issues and its impact on climate and health. This content must be taught across all levels of education, but especially as part of apprenticeship training in gastronomic professions. Vegan and vegetarian cooking is currently neglected and only offered in combination with traditional apprenticeship content, which can reduce interest in these apprenticeships. Here, it is important to refresh the teaching content in the short term. Demand for food technology know-how also arises in the startup sector, because many founders come from areas outside the industry. Here, too, consideration should be given to how subject-specific content can be taught quickly. One result of the focus groups was that further training offers for vegetarian and vegan cooking are lacking.

Action line 6: It is obvious to transfer the tasks resulting from interventions in the food system to the already responsible actors, to coordinate the implementation and to monitor the progress. Building on existing interventions is primarily about integrating climate goals into target systems and measures, rather than developing new interventions. For example, community catering in the sphere of influence of the City of Vienna, in coordination with the Eco-Purchase Program, should record the GHG emissions of the products purchased and set reduction targets by 2030.

A change in dietary behaviour requires knowledge about the effects and impacts of the food consumed on one's own health and the environment. Knowledge about this is still expandable in Austria. In particular, the effects on climate, soil consumption and biodiversity are hardly known. Equally obvious is a precautionary health policy that leads to a reduction in costs and investment requirements for infrastructure in the healthcare system via a change in dietary behaviour. Currently, the focus is limited to providing the necessary infrastructure and services to treat patients and neglects disease prevention.

Intensifying knowledge transfer and initiating discourse on these issues are part of the policy task portfolio. The experts invited to the focus groups emphasised the need for communication on nutrition issues and criticised the lack of communication.

Action line 7: Changes in the food system and in dietary behaviour must be accompanied by comprehensive information and education campaigns so that the goals and relevance are comprehensible to citizens. This task is currently neglected at all levels in Austria, but should be an integral part of activities aimed at the food system.

Innovation policy in the narrower sense

The promotion of innovation in food-producing companies has long been handled through non-specific funding programs. Companies can apply for funding from the FFG and the AWS. Scientific projects are supported by the FWF or the WWTF. Specific projects under the FFG's Comet program have been funded, and the Vienna Business Agency has established a program for Viennese food companies in 2021. Together with technology reports from the Vienna Business Agency, this has set a course in this area. Vienna is home to many universities and research institutions related to the food system, as well as educational and training institutions - all ingredients to build an active ecosystem.

However, large areas of the food sector are not very R&D intensive. Neither agriculture nor downstream sectors (i.e., retail, food service) do much research. Even in the food processing industry, it is often bought-in process technologies and non-technological innovations that lead to

new products. Surprisingly, despite the many university structures in Vienna, patenting activity in Vienna is lower than the Austrian average.

The low patent rate of the food sector is due to structural reasons. However, it is also apparent that Viennese patents are increasingly the result of international cooperation. This is a prerequisite for participating in international ideas and knowledge. Patent activities have also increased significantly in the last decade. Together with the stronger scientific orientation and the broader knowledge base of Viennese patents, there are good conditions for more radical innovation and a real transformation.

New developments

Action line 2 recommended the reduction of animal foods so that RTI measures in the nutrition sector do not counteract health and climate goals. This should be achieved through both behavioural change and the development of vegan alternatives for animal products.

Development and diffusion processes in the economy and nature usually follow an S-shaped diffusion curve: starting from a low base, it often takes many years until developments become visible. Above a certain threshold, there is an exponential diffusion of a technology or product. After that, the growth curve flattens out sharply.

In the case of animal food substitutes, it is not clear how far we are from the lower turning point and thus the exponential increase. In the USA, demand for vegan products increased massively at the beginning of the Corona crisis, but stagnated between 2020 and 2021 while Germany saw constantly high growth rates. In Austria, meat substitutes currently account for about 1% of the meat market. The potential market for meat substitutes is thus still very large. Current inflation is likely to accelerate the transition to less meat-heavy diets, as shown by data from Germany (comparable evaluations for Austria are currently not available).

Replacement products are either plant-, fermentation-, or cell-based GFI (2020a, 2020b, 2020c). The cell-based alternatives are concentrated in a few companies and countries (USA, Netherlands, Israel, Singapore) that have a high development advantage. Here, research is focused on the growth factors responsible for more than 80% of the cost of these products. In this area, it is only possible to gain a foothold in very specific niches. There may be opportunities for the Vienna Biotechnology Cluster to become more active here.

The opportunities are greater for plant- and fermentation-based substitute products because the barriers to market entry are much lower here. There are already startups pushing into this area and they are also supported by venture capital investors. Similarly, food processing companies are diversifying their offerings and offering vegetarian and vegan alternatives to their traditional product range.

The obvious thing to do is to support startup activities in the area of substitute products for animal foods. Vienna has practically all the elements for this: research institutions and universities are concentrated here and the infrastructure for startups in the food sector is also available (e.g. Boku:Base). So are incubators, accelerators and business angels and venture capital investors. However, these elements appear to be poorly networked or focused on vegan substitute products.

Action line 8: The development of a functioning startup ecosystem for substitute products for animal foods should be actively supported or managed. This involves the networking of existing elements, the simple and cost-effective use of existing infrastructure, the activation of potential founders and access to financing instruments that are geared to the progress of the project. It is essential that this orientation is clearly communicated and thus attention is steered.

However, the relatively low patenting activities in the food sector could indicate deficits among established companies or the scientific institutions.

Action line 9: Because scientific excellence and access to scientific infrastructure are essential factors for the development of substitute products, it should be analysed whether there are deficits here that can be compensated for either through new research infrastructure, research projects or new professorships.

Action line 10: The city of Vienna is a major consumer in the food sector and can therefore shape the demand for innovative substitute products for animal foods. The city's communal catering can demand locally: an innovation-oriented procurement policy, can help young companies to ramp up their production and to increase economies of scale. Likewise, innovations in the field of vegan substitute products can be presented in the context of buffets of the city of Vienna.

Innovation-focused funding programs can be integrated into the portfolio of measures to stimulate substitute products. However, system innovation is only feasible if these support programs are synchronised with the other proposed interventions.

When designing innovation programs, it must be taken into account that the city of Vienna has an above-average number of actors, especially in downstream sectors (e.g., catering). If the proposed system changes are to be driven forward, then these companies must be brought along and, in some cases, supported. One example of this is the "Naturally Good Food" program as part of the Ökobusiness Wien initiative. Here, companies are supported in creating a sustainable product range and, depending on their level of ambition, are awarded a gold, silver or bronze seal of approval. To receive the gold or silver seal of approval, at least 50% of the food offering must be vegetarian. This program can be further developed so that the climate impact of the food offered is taken more into account when awarding the quality labels.

Furthermore, food labelling regulations should also be improved so that consumers can easily identify where products come from and what their climate impacts are. Recent research shows that the combination of labels and the disclosure of GHG emissions can change behaviour (Betz et al. 2022). Furthermore, quality labels are distinguishing features that make it possible to demand preferred products in the course of procurement.

Action line 11: When intervening in the area of nutrition, the downstream sector (e.g. gastronomy, trade) must also be taken into account. Appropriate - often low-threshold - support services must be developed here, or existing programs must be further developed, so that the desired changes also achieve the necessary broad impact that reaches wide sections of the population.

Innovation methods

Virtually all of the proposed lines of action call for innovation. The potential innovators are in the business sector, science or in the administration of the City of Vienna. Not in all cases does the public sector already use "state of the art" innovation methods as it is often overlooked that new public sector interventions have a lot in common with product and service innovations in companies: Innovations are always uncertain and success is virtually impossible to predict.

In the public sector, decisions are often risk-averse and characterised by reliance on expert knowledge. The latter may be helpful for the broad strokes, but when it comes to implementation - i.e. innovation - there are few risk factors that can be eliminated by abstract expert knowledge.

Therefore, modern innovation methods (e.g., design thinking, lean startup) attempt to reduce risks through the formulation of hypotheses and their subsequent testing. This involves trying to develop functioning products and services with the least possible waste of resources: Innovation success means that a problem is actually solved with acceptable resource input and that the solution can be scaled. Instead of extensively discussing which alternative might solve the problem, nowadays the best alternative is determined via experimentation. However, this thinking is not yet very widespread.

Action line 12: Within the City of Vienna, innovation coaches should support employees in the use of modern and agile innovation methods so that the change processes lead to functioning solutions both promptly and in a way that conserves resources. With these methods it is much easier to deal with risks in the design of government interventions and to counteract the - often quite understandable - risk aversion of the public sector.

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