

## **Time for a New – Sustainable – Food Policy**

(Open letter to the Slovenian Ministry of Health, National Institute of Public Health of the Republic of Slovenia – NIJZ, Slovenian Ministry of Agriculture, Forestry and Food, and Slovenian Ministry of the Environment and Spatial Planning)

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[Slovenian version](#) - Publication date: July 2018

English version - Translation date: April 2026

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## INTRODUCTION

The purpose of this article is to present scientifically supported findings to state authorities, showing that Slovenian and global production and consumption of meat, dairy products, and eggs are currently far too high. This causes significant harm to the environment, human health, and also severely violates socially accepted moral and ethical values regarding the treatment of animals.

The article presents the identified shortcomings of animal agriculture in environmental, health, and ethical domains. It also presents scientifically established multidisciplinary benefits that would result from reducing the production of animal products.

After presenting all findings in this article, it will be clear to the reader that the current production of animal products exceeds critical limits and must begin to be systematically reduced. This can only be ensured at the national level, by connecting relevant governmental bodies and preparing a coordinated long-term strategic plan that will, in the medium and long term, ensure a reduction in animal agriculture and thereby significantly contribute to mitigating environmental problems, improving human health, and strengthening societal respect for moral and ethical values in the treatment of animals.

The article also presents several recommendations that could serve state authorities as ideas and support in planning their activities.

Since animal agriculture threatens the safe operating limits of our planet (planetary boundaries) more than automobiles, it would be reasonable to set at least equally ambitious goals in this area as in the automotive sector: “In Slovenia, after 2030, the first registration of vehicles with a carbon footprint higher than 50 g of carbon dioxide (CO<sub>2</sub>) per km will no longer be permitted.” (Slovenian Ministry of Infrastructure, 2017)

Some important introductory quotations:

## World Scientists' Warning to Humanity: A Second Notice

15,364 scientist signatories from 184 countries

Ripple W. J., Wolf C., Newsome T. M., Galetti M., Alamgir M., Crist E., Mahmoud M. I., Laurance W. F., 2017

"As most political leaders respond to pressure, scientists, media influencers, and lay citizens must insist that their governments take immediate action as a moral imperative to current and future generations of human and other life. With a groundswell of organized grassroots efforts, dogged opposition can be overcome and political leaders compelled to do the right thing. **It is also time to re-examine and change our individual behaviors, including limiting our own reproduction (ideally to replacement level at most) and drastically diminishing our *per capita* consumption of fossil fuels, meat, and other resources.**"

## Healthy and sustainable diets for European countries

EUPHA - European Public Health Association

Birt C., Buzeti T., Grosso G., Justesen L., Lachat C., Lafranconi A., Mertanen E., Rangelov N., Sarlio-Lähteenkorva S., 2017

"**Meat production and consumption should be minimised** (for example, by decreasing frequency and portion size). In particular, red meat and processed meat products should be avoided. In addition, only limited quantities of other animal-origin foods should be consumed; **plant-based proteins should be preferred.**" /.../ "The EU must ensure that the Common Agricultural Policy (CAP) is fully reformed and properly integrated into the Strategy for Sustainable Healthy Nutrition and Sustainable Food Systems, so as to take seriously both nutritional and sustainability requirements, with **subsidy redirected away from meat production towards vegetables.**"

## Evaluating the environmental impacts of dietary recommendations

Behrens P., Kiefte-de Jong J. C., Bosker T., Rodrigues J. F. D., de Koning A., Tukker A., 2017

"Overall, our results show that in many cases, there are environmental impact benefits to adopting nationally recommended diets (NRDs). At present these benefits are smaller than other interventions in the environmental impact of food systems such as reductions in food waste. Further benefits from NRDs could be derived by incorporating sustainability further into the recommendations. **In general, in high-income nations, a reduction in the recommended intake of (nonred) meat, dairy, and fish products would be beneficial on both accounts.**"

## Report: Less Is More - reducing meat and dairy for a healthier life and planet. The Greenpeace vision of the meat and dairy system towards 2050

Greenpeace International, 2018

Greenpeace 2050 goal: "**Under the Greenpeace goal, we estimate a global consumption of meat of 16 kg per capita per year.** That relates to approximately 300 grams per capita per week of all meat products (**in carcass weight, meaning raw unprocessed products at the point of retail sale**). Similarly, for dairy, the 50% reduction results in **an estimated global consumption of dairy of 33 kg per capita per year in 2050**, which results in 630 grams per capita per week (a glass of milk is roughly 200 grams)."

## KEY WEAKNESSES ASSOCIATED WITH ANIMAL AGRICULTURE

### Key impacts of animal agriculture on the environment

Currently, global animal agriculture is responsible for 14.5% of all global anthropogenic greenhouse gas emissions (Gerber et al., 2013). This is comparable to the share of greenhouse gas emissions produced by the entire global transport sector (EPA, 2017). Animal agriculture (including aquaculture) contributes 18% of calories to human diets globally, yet its environmental footprint is disproportionately larger – it occupies 83% of agricultural land and is responsible for more than half of agriculture-related greenhouse gas emissions (Poore and Nemecek, 2018).

The environmental impact of producing animal-based foods is so significant that it threatens at least six of the nine key planetary boundaries. Scientists estimate that animal agriculture significantly contributes to exceeding already surpassed planetary boundaries in the following four areas (Campbell et al., 2017; Meier, 2017; Tirado et al., 2018; Greenpeace International, 2018):

- 1) land use,
- 2) biodiversity loss and ecosystem disruption,
- 3) disruption of nitrogen and phosphorus cycles,
- 4) climate change.

Animal agriculture also significantly affects the fifth planetary boundary related to water use. This boundary may not yet be exceeded, but recent research suggests that we have already entered a zone of uncertainty in this area. Animal agriculture also affects the sixth planetary boundary related to chemical and other forms of pollution in multiple ways. This boundary cannot yet be quantified, and the exact contribution of animal agriculture remains unclear. Agriculture also significantly affects the planetary boundary related to ocean acidification, which, at the time of writing this article (June 2018), had not yet been exceeded according to reviewed sources but is expected to be exceeded soon (Campbell et al., 2017; Meier, 2017; Tirado et al., 2018; Greenpeace International, 2018).

Western diets are characterized by high consumption of meat, dairy products, and eggs. Animal agriculture associated with these dietary habits requires large land areas and results in high emissions of nitrogen compounds into the environment as well as high greenhouse gas emissions (Westhoek et al., 2014).

Scientists estimate that in the European Union, reducing both the intake and production of animal-based foods by 50% and replacing them with plant-based foods would result in (Westhoek et al., 2014; Baroni et al., 2014):

- a 40% reduction in nitrogen emissions into the environment,
- a 25–40% reduction in agriculture-related greenhouse gas emissions,
- a 23% reduction in required agricultural land per capita.

Fuel and water use would decrease, deforestation would decline, agricultural land would be used more efficiently, more people could be fed, and the likelihood of soil acidification and water eutrophication would be reduced. The environmental footprint of diets depends primarily on the intake of animal-based foods (Westhoek et al., 2014; Baroni et al., 2014).

Studies comparing the environmental impacts of food production across different dietary patterns have found that a vegan diet is the most effective dietary pattern for reducing dietary carbon footprint and required agricultural land per person (Aleksandrowicz et al., 2016).

Experts estimate that, at a global level, a well-planned vegan diet would bring greater health benefits and greater benefits in terms of carbon footprint by 2050 than a well-planned vegetarian diet, while both would outperform current dietary recommendations (Springmann et al., 2016).

### **Key impacts of animal-based foods on human health**

There is an increasing amount of scientific literature identifying the beneficial health effects of vegetarian diets / diets based on plant-based foods / vegan diets compared to conventional omnivorous diets. Based on research findings, it can be concluded that reducing the intake of animal-based foods and replacing them with whole plant-based foods would reduce the risk of developing cancer, coronary heart disease, and type 2 diabetes, as well as the risk of premature death from any cause. Consuming a whole-food, plant-based diet before or after a diagnosis of breast cancer or colorectal cancer may also increase survival rates (Noto et al., 2013; Norat et al., 2015; Bodai and Tusso, 2015; Appleby and Key, 2016; Song et al., 2016; Lee and Park, 2017; Dinu et al., 2017; Bechthold et al., 2017; Schwingshackl et al., 2017a, 2017b, 2018; Tharrey et al., 2018).

Sufficient evidence indicates that high intake of fruits and vegetables reduces the risk of cancers of the respiratory tract, head, and neck, while high intake of dietary fiber reduces the risk of colorectal cancer (Norat et al., 2015). On the other hand, high consumption of processed meat products and red meat increases the risk of colorectal cancer, cardiovascular diseases, and type 2 diabetes, as well as the risk of premature death from any cause (Norat et al., 2015; Bechthold et al., 2017; Schwingshackl et al., 2017a, 2017b, 2018). Evidence also suggests that saturated fatty acids have undesirable effects on the most common diet-related causes of death (see chapter: “Saturated fatty acids and health”), and the main sources of excess saturated fatty acids in the Slovenian diet are animal-based foods.

Numerous studies and meta-analyses have found that, compared to omnivores, vegetarians on average have lower body mass index, lower total cholesterol levels in the blood (significantly lower LDL cholesterol and only slightly lower HDL cholesterol), lower triglyceride levels, and lower blood glucose levels (Dinu et al., 2017).

Compared to omnivores, vegetarians have a statistically significantly lower risk of developing (and/or dying from) ischemic heart disease (–25%) and a statistically significantly lower risk of developing cancer (–8%) (Dinu et al., 2017). They also have a significantly lower risk of developing type 2 diabetes (Lee and Park, 2017). Compared to omnivores, vegans have a statistically significantly lower

risk of developing cancer (–15%), and in preventing type 2 diabetes they currently appear to perform even better than vegetarians (Orlich and Fraser, 2014; Lee and Park, 2017; Dinu et al., 2017).

Most of the Slovenian nutrition and medical community remains quite cautious regarding vegan and vegetarian diets. The reason is likely that the Slovenian professional community has not yet found sufficient motivation to more seriously investigate the advantages and benefits of promoting vegetarian diets / whole-food plant-based diets / vegan diets. However, nutrition organizations in some Western countries (e.g., the world's largest nutrition organization – the Academy of Nutrition and Dietetics) have already recognized the potential of these dietary patterns for human health and have adopted clear official positions on the suitability of vegetarian and vegan diets for all stages of life. National health organizations (e.g., Kaiser Permanente in USA, which includes over 21,000 general practitioners and 11 million patients) have also begun to actively promote the benefits of such dietary patterns (Tuso et al., 2013; Kaiser Permanente Nutrition Services, 2015; Bodai and Tuso, 2015; Melina et al., 2016; Hever, 2016; Healthwise Staff, 2017; ...).

The position of the Academy of Nutrition and Dietetics (AND) is as follows: well-planned vegetarian and well-planned vegan diets are healthy, may provide health benefits in the prevention and treatment of certain diseases, are suitable for all stages of the life cycle and for athletes, and are also more environmentally sustainable – using fewer natural resources and associated with a lower environmental footprint – than dietary patterns high in animal-based foods (Melina et al., 2016).

The position of the British Dietetic Association (BDA) is as follows: a well-planned vegetarian diet has many advantages; well-planned vegetarian and well-planned vegan diets can support healthy living for people of all ages – children and adults, including pregnant and breastfeeding women (British Dietetic Association, 2016, 2017a, 2017b). [Authors' note: It is also worth mentioning the following: Phillips (2005): “Studies of UK vegetarian and vegan children have revealed that their growth and development are within the normal range.”]

The position that well-planned vegetarian and well-planned vegan diets are healthy and suitable for all stages of life is supported by several nutrition and health organizations in the USA, the United Kingdom, Canada, Australia, Italy, and Portugal, and such dietary patterns are also supported by the Nordic countries [Denmark, Iceland, Finland, Sweden, Norway, the Faroe Islands, Greenland, and the Åland Islands] (National Health and Medical Research Council, 2013; Dietitians of Canada, 2014a, 2014b; NCM, 2014; Programa Nacional para a Promoção da Alimentação Saudável, 2015; Melina et al., 2016; British Dietetic Association, 2016, 2017a, 2017b; Agnoli et al., 2017).

## **Animal agriculture and societal moral and ethical values**

In 2012, a group of neuroscientists signed The Cambridge Declaration on Consciousness, in which they expressed a strong position that non-human animals possess nearly the same level of consciousness and awareness as humans. A high level of awareness has been particularly confirmed

for all mammals and birds, and consciousness is not excluded even for octopuses and insects (Low et al., 2012).

In general, the purpose of rights is to protect interests or needs. Sentient beings possess consciousness, subjective will, feelings, desires, interests, subjective preferences, physiological and psychological needs, strive for well-being, and are aware of their own bodies (Bruers, 2015; Proctor, 2012). Positive and negative experiences are indicators of (un)satisfied interests (Bruers, 2015; Singer, 2016). Sentience is therefore a morally relevant criterion for assigning moral status and basic rights to a living being (Bruers, 2015; Puryear, 2016).

Over the past four decades, interest in the relationship between humans and animals has significantly increased in both public and academic spheres: the philosophy of animal rights has developed, the animal liberation movement has grown, cognitive science of animals (animal cognition) has emerged, and in the past decade political debate has also begun to develop (Boyer et al., 2015; Milburn, 2016). Political debate on animal issues is still neglected. To support such debate, the scientific journal *Politics and Animals* was launched in 2015 (Boyer et al., 2015).

In Europe, farm animals were defined as agricultural commodities in the 1970s. Only in 1997 were animals defined in European legislation as sentient beings (Ornik and Volk, 2010; Treaty of Amsterdam..., 1997). This was a breakthrough step for animals, but only “on paper”. In practice, animal agriculture has not significantly changed in favor of animals (Pedersen, 2009; Proctor, 2012; Berg and Yngvesson, 2012; Sobbrío, 2013; Civil society statement..., 2017).

Rossi and Garner (2014), through a review study, presented a multifaceted moral critique of industrial animal agriculture. The authors argue that the justification of industrial animal agriculture can no longer be defended and that it causes substantial and unnecessary harm to currently existing people, future generations, currently existing animals and their future generations, and the environment. Most of the negative impacts of industrial animal agriculture could be eliminated by transitioning to plant-based agriculture. A somewhat less acceptable alternative would be sustainably oriented animal agriculture, where there would be far fewer animals than in industrial systems, animals would have access to outdoor areas (pasture-based systems), and animal welfare would be genuinely respected. The main arguments favoring plant-based agriculture over sustainably oriented animal agriculture are: the high cost of animal-based foods from such systems and the unethical nature of killing animals to satisfy non-essential human needs (Rossi and Garner, 2014).

Since animal-based foods are not necessary for a healthy life, every killing of a farmed animal is unnecessary, and allowing animals to be treated as waste is completely unacceptable (first example of treating animals as waste: grinding live surplus day-old chicks [typically all male chicks] in the egg industry; second example: killing millions of infected animals in the event of avian influenza outbreaks).

## SOLUTIONS: HOW TO REDUCE ANIMAL AGRICULTURE AND ITS NEGATIVE IMPACT ON THE ENVIRONMENT, HUMAN HEALTH, AND ANIMALS

In Europe, a general consensus has emerged that reducing meat consumption will play a key role in the transition toward more sustainable diets (Birt et al., 2017; Ripple et al., 2017). Vegetables, fruits, and grains consistently occupy a significant share of modern dietary plates and pyramids. Legumes (beans, peas, lentils, soy, fava beans, chickpeas, and peanuts from as nearby regions as possible), nuts, seeds, and products made of them deserve greater promotion than they currently receive, as they are more sustainable sources of protein and fat than animal-based foods and refined/cold-pressed oils.

Sustainability-oriented dietary plates and pyramids should be important for the Slovenian Ministry of Health, the Slovenian Ministry of Agriculture, Forestry and Food, the Slovenian Ministry of the Environment and Spatial Planning, and food policy in general (which should address multiple aspects of nutrition, not only the impact of diet on human health). The adoption of sustainable and evidence-based dietary guidelines would provide a sensible foundation for further governmental measures (redirecting agricultural subsidies from animal agriculture and the wine sector toward the production of sustainable and healthy crops; taxing foods based on their impact on health and/or environmental footprint; Westhoek et al. (2014) suggest that taxes on animal-based foods could also be introduced based on ethical considerations (depending on the level of animal welfare ensured); health warnings on packaging, ...). Dietary plates and pyramids that include animal-based foods should clearly indicate that foods from industrial animal agriculture are discouraged. Interspecies ethics is currently the missing link in most dietary guidelines.

A good example of a step in the right direction was the update of the dietary plate *The Eatwell Plate* (2007) to *The Eatwell Guide* (2016), as it is the first British dietary guide to incorporate the sustainability aspect. From a sustainability perspective, the 2016 British guide appears to be a better guide than the 2014 Slovenian dietary pyramid “*Z zdravo prehrano in gibanjem do zdravja*” (NIJZ, 2014; Public Health England, 2016).

In practice, people change their dietary habits very slowly. Therefore, it is unrealistic to expect that overly radical changes could be introduced into dietary guidelines for omnivores, even if such changes would be better from health, environmental, and ethical perspectives. However, a review of the scientific literature shows that alongside every official omnivorous dietary plate or pyramid, it would be sensible to also publish vegan versions. Vegan versions of dietary plates and pyramids would gain greater value if they were created and promoted by established experts, institutes, organizations, and ministries, rather than by only a small number of dietitians/nutrition experts who are themselves vegan. Such an approach would provide greater motivation for existing vegans and vegetarians, who are currently a rather neglected target group by official institutions. At the same time, this approach would promote vegan diets among the omnivorous public, which often views such diets negatively due to traditional prejudices and outdated health misconceptions.

A good practice example in this area is the collaboration between national nutrition organizations and vegan societies. In 2014, the British Dietetic Association (BDA) entered into its first formal cooperation agreement with The Vegan Society; the agreement was renewed in 2017. The aim of the collaboration is to provide appropriate information, evidence-based recommendations, and support to all citizens who already follow a vegan diet or are considering transitioning to it (British Dietetic Association & The Vegan Society, 2017).

In Slovenia, we have a very well-organized Slovenian Vegan Society, which promotes vegan nutrition and provides appropriate information and support to interested individuals. It would be reasonable for the National Institute of Public Health to collaborate with the Slovenian Vegan Society, following the British example, and establish a similar partnership.

If the perception of animal-based foods does not change in official dietary guidelines, we cannot expect a shift in the majority opinion of Slovenians. Public opinion also depends on statements made by experts about veganism and vegetarianism in the media. The generalized statement “A vegan diet is not suitable for children,” which experts often present in the media, is misleading and casts a negative light on veganism and vegetarianism. If Slovenian experts disagree with the position that well-planned vegetarian and vegan diets are suitable for all stages of the life cycle, they should issue a position statement specifying for whom such diets are appropriate. If they believe that well-planned vegetarian and vegan diets are suitable for the majority of Slovenians aged between 18 and 65, they should also clearly state this. Debates about the “unsuitability” of vegan and vegetarian diets for a small segment of the population (e.g., children) distract from addressing the key questions that are more important for sustainable development: Is a (well-planned) vegan diet suitable for the majority of Slovenians? Is a (well-planned) vegetarian diet suitable for the majority of Slovenians? Is a (whole-food) plant-based diet suitable for the majority of Slovenians?

Healthcare institutions in Slovenia could take inspiration from:

- One of the largest American healthcare organizations, Kaiser Permanente (with over 21,000 general practitioners and 11 million patients). For prevention and as support in treating chronic non-communicable diseases, it promotes whole-food plant-based diets, well-planned vegan diets, and well-planned vegetarian diets (Tuso et al., 2013; Kaiser Permanente Nutrition Services, 2015; Bodai and Tuso, 2015; Hever, 2016; Healthwise Staff, 2017; ...).
- The Physicians Committee for Responsible Medicine (PCRM), which brings together 12,000 physicians. Its mission is to raise awareness and educate physicians in order to shift traditional approaches to treating chronic non-communicable diseases such as type 2 diabetes, cardiovascular diseases, obesity, and cancer, placing greater emphasis on prevention and treatment through nutrition rather than medication. The organization is led by physicians and scientists in nutrition and medical fields who actively conduct clinical research on the prevention and treatment of chronic diseases using whole-food vegan diets (primarily randomized controlled trials in their clinics). They also prepare professional materials to inform

physicians and healthcare workers about the benefits of vegan nutrition for patients. Membership in their program is available to interested physicians and patients worldwide. Slovenian physicians, healthcare workers, and medical institutions could also collaborate with this organization to obtain appropriate information and support for more effective prevention and treatment of chronic diseases (<http://www.pcrm.org/about/about/about-pcrm>; <https://pcrm.widencollective.com/portals/gr0kpkol/factsheets>).

Scientists have found that consumers are more willing to reduce meat consumption if they are aware of multiple benefits of doing so (e.g., lower food costs, ethical advantages, reduced environmental footprint, and health benefits). They suggest that governments, food producers, retailers, restaurants, and catering companies should collaborate in actively promoting changes in dietary habits. They also suggest that taxes on animal-based foods could be introduced based on ethics (animal welfare) or environmental footprint (e.g., carbon footprint) (Westhoek et al., 2014; O’Keefe et al., 2016).

Sigle (2016) proposes the following approach to reducing animal product consumption in the United States: by 2020, civil society and market actors should primarily raise awareness about the connection between animal-based foods and negative health impacts (with an emphasis on health, unless environmental or ethical arguments prove more persuasive); in 2020, governmental bodies should adopt sustainable and evidence-based dietary guidelines (many believe this was prevented by lobbying in 2015); and by 2024 or 2029, the federal government should begin redirecting agricultural subsidies from animal agriculture and feed production toward sustainable and healthy crop production. Governments should also consider taxing foods based on their impact on health and/or carbon footprint, as well as introducing health warnings on packaging (Sigle, 2016).

Probyn-Rapsey et al. (2016) argue that universities, in order to optimize the health and well-being of staff and students, should promote diets free of animal-based foods and adopt a broader definition of sustainability that includes interspecies ethics and dietary carbon footprint. Some universities (e.g., University College London, University of Exeter, University of Central Lancashire, University of Leicester, Yale University, and Boston University) already recognize that reducing the use of animal-based foods in university settings is an important part of sustainability strategies (Probyn-Rapsey et al., 2016).

In Slovenia, it would be reasonable to introduce a course on “Sustainable Nutrition” in all nutrition-related faculties/study programs, as this field is completely neglected, at least at the Biotechnical Faculty. Can someone truly be considered a nutrition expert if they know nothing about interspecies ethics and planetary boundaries?

Some propose reducing the environmental impact of diets by decreasing the consumption of products from ruminants and replacing them with eggs and poultry meat. From a moral and ethical perspective, this proposal is not appropriate, as the significantly smaller average body size of poultry (compared to cattle) would result in a substantial increase in the number of sentient farm animals killed annually (first reason for opposing the proposal). Additionally, since poultry production is predominantly industrial, this would also increase the amount of unnecessary suffering (second reason for opposing

the proposal). Industrial farming is more ethically problematic than pasture-based systems. In poultry production, there is also the unavoidable issue of feeding animals with “food-competing feedstuffs” (see chapter: “Social justice”) – an inefficient use of natural resources (third reason for opposing the proposal). This issue is more likely to be avoided in cattle farming than in poultry farming. The fourth reason for opposing the proposal is that legumes are a more appropriate substitute for ruminant products than eggs and poultry meat, both from environmental and moral-ethical perspectives (see chapter: “Environmental arguments for halving the production, recommended intake, and actual intake of animal-based foods in Slovenia/Europe”). A better proposal for reducing the environmental footprint of diets is therefore a shift toward a well-planned vegan diet.

Finally, it is necessary to highlight a serious issue occurring in Slovenia. In recent years, the Ministry of Agriculture has repeatedly launched large promotional campaigns encouraging the consumption of animal-based products (a decade ago, the campaign “Red meat – the body needs it,” and in 2017–18 the campaign “Super meat/milk – super food”). Such campaigns are entirely inappropriate from two perspectives. The first perspective is health: the Ministry of Health already notes that Slovenians, on average, consume too much meat, processed meat products, and saturated fatty acids (Ministry of Health, 2017a, 2017b). Reducing saturated fatty acid intake has been a public health goal in Slovenia for more than 10 years and has still not been achieved (Resolution..., 2005; Resolution..., 2015). The second perspective is environmental: despite global warnings that animal agriculture significantly burdens the environment and strong appeals from scientists that production must be reduced, our Ministry of Agriculture continues to act in the opposite direction. It focuses only on the short-term protection of livestock farmers instead of preparing a long-term strategic plan to transition livestock farmers and feed crop producers toward the production of plant-based foods for human consumption.

Slovenian ministries should cooperate more closely and define coordinated actions to ensure long-term improvements in the health of Slovenians, a less burdened environment, and a reduced environmental footprint of the average Slovenian, ideally in ways that also support the development of the Slovenian agricultural economy.

## Reasonable targets for Slovenia:

- Halving the recommended intake of animal-based foods by 2020.
- Gradual redirection of environmentally harmful agricultural subsidies from animal agriculture/industrial animal agriculture and animal feed production toward sustainable and healthy crop production between 2020 and 2030.
- Halving the production of animal-based foods by 2030.
- Halving the actual intake of animal-based foods by 2030.
- Reducing the recommended intake of animal-based foods fourfold by 2030.
- Gradual taxation of foods based on their carbon/environmental footprint between 2030 and 2050.

[Note: Revenue from food taxes could, for example, be used to increase agricultural subsidies for the production of sustainable and healthy crops; foods that are both sustainable and healthy could be taxed at a lower rate than today.]

- Reducing the production of animal-based foods fourfold by 2050.
- Reducing the actual intake of animal-based foods fourfold by 2050.
- Slovenia should become a carbon-neutral society no later than by 2050 (low-carbon is not an ambitious enough goal).
- Abolition of industrial animal agriculture by 2060.

Note: The proposed targets for Slovenia are partly based on targets from the following sources:

- Tirado, R., Thompson, K.F., Miller, K.A., Johnston, P. 2018. *Less is more: Reducing meat and dairy for a healthier life and planet*. Greenpeace Research Laboratories Technical Report (Review) 03-2018. ISBN: 978-1-9999978-1-6. 86 pp.
- CAN Europe. 2018. *Delivering Paris: CAN Europe key priorities for the new EU long term climate strategy*. Brussels, Climate Action Network (CAN) Europe: 8 pp.
- Coalition for Higher Ambition. 2018. *Statement from the Coalition for Higher Ambition – A Letter to Policy Makers*: 3 pp.
- CAN Europe. 2017. *MEPs call for reducing EU emissions to net zero by 2050 the latest*. Brussels, Climate Action Network (CAN) Europe: 1 pp.
- Sigle Z. 2016. *Reducing animal product consumption in the United States with state interventions: possibilities, limitations, and recommendations*. A thesis submitted to the University of Colorado at Boulder in partial fulfillment of the requirements to receive Honors designation in Environmental Studies. Boulder, University of Colorado Boulder, Environmental Studies: 75 pp.
- CIWF. 2009. *Beyond Factory Farming: Sustainable Solutions for Animals, People and the Planet*. Godalming, CIWF – Compassion in World Farming, ISBN 1-900156-46-6: 16 pp.

**Open letter from civil society to the European Institutions - LESS AND BETTER: A CALL FOR POLICY ACTION ON ANIMAL FARMING**

Authors: a large and diverse range of European civil society organisations, active in the areas of farming, pastoralism, animal welfare, environment, social justice, climate, forestry, health, consumers, development, fair trade and cooperatives, 2018

"If we are to meaningfully tackle some of the most serious societal and environmental crises of our time, **we need to significantly reduce the production, consumption and export of meat, dairy and eggs.**"

## **DETAILED ARGUMENTS FOR HALVING THE PRODUCTION, RECOMMENDED INTAKE, AND ACTUAL INTAKE OF ANIMAL-BASED FOODS IN SLOVENIA/EUROPE**

### **Environmental arguments for halving the production, recommended intake, and actual intake of animal-based foods in Slovenia/Europe**

Agriculture significantly threatens most of the main planetary boundaries. Globally, agriculture is responsible for approximately 80% of deforestation. It is also responsible for around 80% of biodiversity loss and ecosystem disruption. Agriculture accounts for approximately 85% of disruption of the nitrogen cycle, at least 90% of disruption of the phosphorus cycle, around 78% of water eutrophication, approximately 84% of water use, about 25% of climate change, and about 25% of ocean acidification (Campbell et al., 2017; Poore and Nemecek, 2018).

Animal agriculture (including aquaculture) contributes 18% of calories and 37% of protein to human diets globally (Note: due to the use of crops as feed for farm animals, current animal agriculture in reality contributes no net calories or protein to human diets; see chapter: “Social justice”), yet its environmental footprint is disproportionately larger – it occupies 83% of agricultural land and is responsible for more than half of agriculture-related greenhouse gas emissions and more than half of agriculture-related water eutrophication. A diet without animal-based foods would reduce the need for agricultural land by 76%, reduce arable land use by 19%, halve the dietary carbon footprint, halve agriculture’s impact on water eutrophication, and reduce water use in agriculture by 19% (Poore and Nemecek, 2018).

In the European Union, animal agriculture occupies 65% of agricultural land. It accounts for 78% of the negative impact of European agriculture on terrestrial biodiversity loss, 81% of its negative impact on climate change, 73% of its impact on nitrogen and phosphorus cycle disruption, and 55% of its impact on water use (Leip et al., 2015; Vanham et al., 2013).

Currently, global animal agriculture is responsible for 14.5% of all anthropogenic greenhouse gas emissions (Gerber et al., 2013). This is comparable to the share of emissions produced by the entire global transport sector (EPA, 2017). In addition to the study attributing 14.5% to animal agriculture, two other frequently cited sources include a study attributing 18% (Steinfeld et al., 2006) and a pseudo-study attributing 51% (Goodland and Anhang, 2009, 2012). Goodland and Anhang arrived at the 51% figure using questionable methodology, and this figure is likely exaggerated (Herrero et al., 2011). Nevertheless, it should be recognized that even the 14.5% and 18% figures underestimate the potential impact of dietary changes, as eliminating global animal agriculture would greatly increase the potential for reforestation of unused land, thereby increasing carbon sequestration and enhancing the potential to achieve carbon neutrality in the agri-food sector.

Baroni et al. (2014) found that a shift of Americans toward plant-based diets would benefit human health (through healthier diets and improved air quality) and climate change mitigation, reduce fuel

and water use, decrease deforestation, enable more efficient use of agricultural land, allow more people to be fed (see chapter: “Social justice”), and reduce the likelihood of soil acidification and water eutrophication. The environmental footprint of diets depends primarily on the intake of animal-based foods (Baroni et al., 2014).

Aleksandrowicz et al. (2016), in a systematic review, examined the environmental footprint of fourteen sustainability-oriented dietary patterns and the health impacts of eleven. They concluded that all studies assessing the effect of such diets on mortality showed a protective effect. Vegan diets were found to be the most effective in reducing dietary carbon footprint and land use per person. There are currently too few studies assessing the water footprint of realistic vegan menus or well-planned vegan diets. In terms of reducing water footprint, vegetarian diets were found to be the most effective. Reduction of dietary environmental impact is largely proportional to the reduction in consumption of products from ruminants (Aleksandrowicz et al., 2016).

Springmann et al. (2016) estimate that a well-planned vegan diet at the global level by 2050 would yield greater health benefits and greater carbon footprint benefits than a well-planned vegetarian diet, and both would outperform current dietary recommendations. From this study, it can be inferred that, from a carbon footprint perspective, a recommendation limiting red meat consumption to 300 g per week is not sufficiently strict at the global level, and even 230 g per week is still approximately twice as high as optimal (the extent of excess depends on the success of non-dietary strategies for reducing carbon footprint). A global recommendation limiting the consumption of products from ruminants should be established, as health-based recommendations for red meat are not sufficiently relevant to carbon footprint (red meat is not sourced exclusively from ruminants). An example of progress in this direction is the update of *The Eatwell Plate* (2007) to *The Eatwell Guide* (2016), which incorporates sustainability (Buttriss, 2016). However, it still lacks stricter limits on ruminant products (allowing up to 490 g of red and processed meat per week) and does not include interspecies ethics.

Van Dooren et al. (2014) compared six dietary patterns in terms of both nutritional adequacy (health protection) and sustainability (land use and carbon footprint): the average Dutch diet (1998), Dutch dietary guidelines (2006), a partially vegetarian diet, a well-planned vegetarian diet, a well-planned vegan diet, and a Mediterranean diet. They found that vegan and vegetarian diets performed best in terms of sustainability, while Mediterranean and vegan diets performed best in terms of nutrition. If both aspects were combined into a single metric ( $[\text{sustainability score} + \text{health score}]/2$ ), a well-planned vegan diet would be optimal, followed by the Mediterranean diet. If interspecies ethics were included in the sustainability assessment, as suggested by Probyn-Rapsey et al. (2016), the vegan diet would gain an additional advantage. Castañé and Antón (2017) similarly found that a well-planned vegan diet outperforms the Mediterranean diet when evaluated from both nutritional and environmental perspectives.

Various studies show that among all analyzed food products, ruminant meat has the highest carbon footprint per kilogram, followed (in no fixed order) by processed/deli meats, cheese, pork, poultry, mixed meals (containing both plant and animal foods), butter/cream, fish/shellfish, eggs, and desserts

(Hamerschlag, 2011; Bertoluci et al., 2016; van Dooren et al., 2017). One kilogram of organic beef (bull) has approximately the same environmental impact, in terms of carbon footprint, as driving 113 km in a car (BMW 118d: 119 g CO<sub>2</sub> per km). One kilogram of conventional beef (bull) has a similar impact as driving 71 km (the same applies to 1 kg of conventional cheese). One kilogram of conventional winter wheat has a smaller impact than driving 4 km, and one kilogram of organic winter wheat has a smaller impact than driving 2 km (Foodwatch, 2008). The carbon footprint of 1 kg of beef is approximately 4 times higher than that of 1 kg of chicken meat, about 14 times higher than that of 1 kg of tofu or dry beans, and about 30 times higher than that of 1 kg of lentils. Locally produced meat does not have a significantly lower carbon footprint than non-local meat (Hamerschlag, 2011; EEA, 2016). If all Americans instantly became vegetarians, the environmental impact (in terms of carbon footprint) would be roughly equivalent to removing 46 million cars from the roads—even though vegetarian diets still include cheese, which has one of the highest carbon footprints per kilogram (Hamerschlag, 2011).

Studies consistently show that vegan diets have a lower carbon footprint than other sustainability-oriented dietary patterns. A 2016 meta-analysis found that vegan menus from 14 different studies had, on average (median), a 45% lower carbon footprint than average diets (Aleksandrowicz et al., 2016). Scarborough et al. (2014) found that British vegans have a 60% lower dietary carbon footprint than high-meat omnivores (more than 100 g/day), 49% lower than medium-meat omnivores (50–99 g/day), 38% lower than low-meat omnivores (less than 50 g/day), and 24% lower than vegetarians. Bryngelsson et al. (2016) showed that the dietary pattern closest to vegan diets in reducing carbon footprint is one that excludes products from ruminants (lower footprint than vegetarian diets but higher than vegan diets). If the European Union aims to meet its climate targets by 2050, reducing consumption of ruminant meat by at least 50% will likely be unavoidable. The necessity of reducing dairy consumption will depend on technological developments in the coming decades (Bryngelsson et al., 2016).

Because vegan diets require the least agricultural land per person, a transition to such diets would create significant potential for reforestation of unused land. Increased forest vegetation has strong potential for carbon sequestration, contributing to climate change mitigation. Thus, a shift toward vegan diets offers a dual advantage: the lowest dietary carbon footprint among all studied diets and the highest theoretical maximal potential for carbon sequestration (Rao et al., 2015; Bryngelsson et al., 2016; Rööös et al., 2017). Rööös et al. (2017) suggest that only scenarios involving cultured meat and dairy products made from biotechnologically produced milk proteins could potentially match or exceed these benefits in the future.

Farmers, livestock producers, agronomists, fruit growers, forest owners, foresters, dietitians, and nutrition advisors play an important role in climate policy (Abbas et al., 2017; EC, 2016b, 2016c; Hawkins et al., 2015; Kumar et al., 2010). We believe that planting tall trees (or trees with high biomass per hectare) with edible fruits/nuts (e.g., walnut trees, chestnut trees, fruit trees, almond trees, etc.) has great potential for sustainable development, as it increases the production of healthy whole plant foods with a low carbon footprint, while trees contribute to carbon sequestration. On agricultural

land, crop rotations should necessarily include legumes and other plants for green manure (FAO, 2016a, 2016b; Foyer et al., 2016; Li X. et al., 2015). Sranacharoenpong et al. (2015) compared the environmental footprint of producing one kilogram of edible protein from five Californian foods—beans, almonds, eggs, chicken, and beef—and found that bean production performed best across all observed parameters, requiring the least land, water, fuel, fertilizers, and pesticides. In all observed parameters—except pesticide use—beef performed worst (Sranacharoenpong et al., 2015). Because beef production consumes large amounts of natural resources, diets with fewer animal-based foods (more legumes, nuts, and fruits) require less water, energy, fertilizers, and pesticides than diets with more animal-based foods (fewer legumes, nuts, and fruits) (Marlow et al., 2015).

Agriculture is globally responsible for 92% of the total water footprint (Hoekstra and Mekonnen, 2012). Vanham et al. (2013) showed that Europeans could reduce the agriculture-related water footprint by 23% if they followed dietary recommendations. If they adopted a well-planned vegetarian diet, the reduction would be 38%. Vegetarian diets perform better than dietary recommendations across all three types of water—green, blue, and grey. Animal-based foods are the primary contributors to the high total water footprint of Europeans; therefore, reducing meat consumption is the most effective measure for reducing Europe’s water footprint (Vanham et al., 2013; Vanham et al., 2016). A 2016 meta-analysis found that vegetarian diets from nine different studies had, on average (median), a 37% lower water footprint than average diets, while adherence to dietary recommendations resulted in only a 6% reduction (Aleksandrowicz et al., 2016). There are currently too few studies on the water footprint of vegan diets to determine whether they outperform vegetarian diets overall; however, it is certainly possible to design well-planned vegan diets that perform better, as shown by Jalava et al. (2014) and Ruini et al. (2015). Between 1961 and 2003, due to increased consumption of animal-based foods, the agriculture-related water footprint per capita in China increased more than threefold; before 1992, starchy foods dominated the water footprint, while after 1992 animal-based foods became the dominant contributor (Gustafsson and Lundqvist, 2012). If we aim to eliminate poverty and hunger globally in the coming decades (despite population growth) while also increasing carbon sequestration (e.g., through reforestation), reducing water footprints in developed countries will be unavoidable. Efficient management of water resources is therefore a prerequisite for achieving these goals (Rockström et al., 2014).

Novak (2017), in a small sample of Slovenian participants (9 vegan females and 1 vegan male; 8 vegetarian females and 2 vegetarian males; 4 omnivore females and 6 omnivore males; note: gender was an uncontrolled confounding variable), analyzed the water footprint of different dietary patterns and found that vegetarians had a 2.5-times lower water footprint than omnivores, while vegans had a 2.2-times lower footprint. The study also examined carbon footprint and found that vegetarians had a 3.4-times lower carbon footprint than omnivores, while vegans had a 3.3-times lower footprint (Novak, 2017).

In the European Union, agriculture is currently among the main sources of water and air pollution from nitrogen compounds (due to excessive fertilization, surplus manure, inefficient land uses such as growing “food-competing feedstuffs”, etc.). Reducing the production and consumption of animal-

based foods by 50% and replacing them with plant-based foods would reduce nitrogen emissions into the environment by 40%, significantly improving water and air quality. This would also reduce the likelihood of eutrophication (nutrient over-enrichment leading to excessive algal growth followed by hypoxia, resulting in lifeless rivers, lakes, or coastal areas) (Westhoek et al., 2014).

Incorporating legumes into crop rotations significantly improves nitrogen efficiency and reduces nitrogen losses. Although growing feed legumes can acidify soil around the roots (because the aboveground biomass is consumed by animals rather than returned to the soil), growing legumes for human consumption does not have this effect, as stems and leaves can be returned to the soil, restoring most of the base-forming substances (Kocjan Ačko and Mihelič, 2017). Livestock production is responsible for the majority (80%) of the negative impact of European agriculture on soil acidification (Leip et al., 2015). Ammonia emissions (which contribute to soil acidification and are precursors of fine particulate matter that cause respiratory diseases) in Europe are almost exclusively the result of animal agriculture (Meier and Christen, 2013; Verbič, 2015). Meier and Christen (2013) estimated that in Germany, a vegan is responsible for approximately five times fewer ammonia emissions than a vegetarian, seven times fewer than an omnivore following dietary recommendations, and nine times fewer than the average person.

An important agricultural cause of water eutrophication, in addition to excess nitrogen, is excess phosphorus (Leip et al., 2015; EEA, 2016). In developed countries, excess phosphorus is primarily caused by intensive livestock production and excessive fertilizer use (Nesme and Withers, 2016). Phosphate rock, on which agriculture has heavily relied since the 1960s, is a non-renewable resource; if current wasteful practices continue, global commercial reserves of phosphorus are expected to be depleted within 50–100 years. Therefore, efficient management of phosphorus must become a priority in the coming decades (Cordell et al., 2009). Globally, animal agriculture is one of the largest consumers of phosphorus—meat consumption accounts for 72% of the average dietary phosphorus footprint (Metson et al., 2012). Cordell et al. (2009) estimated that phosphorus use in vegetarian diets is 2.7 times lower than in omnivorous diets. Meier and Christen (2013) estimated that in Germany, phosphorus consumption for a vegan diet is 1.9 times lower than for a vegetarian diet, 2.4 times lower than for an omnivorous diet that follows dietary recommendations, and 2.7 times lower than for an average diet. Metson et al. (2016) estimated that in Australia, the phosphorus footprint of a vegan diet is 3.6 times lower than that of an average diet. In China, between 1963 and 2008 – during a period of increasing consumption of animal-based foods – the number of farm animals increased approximately tenfold, phosphorus consumption in agriculture also increased approximately tenfold, and phosphorus efficiency significantly decreased due to excessive use (surpluses are washed away by water), resulting in increased losses (Li G. et al., 2016). Meat production requires large amounts of phosphorus because the use of “food-competing feedstuffs” represents inefficient use of natural resources, and in addition, animal excreta are not managed efficiently by farmers (Metson et al., 2012). Reducing the consumption of animal-based foods reduces the need for phosphorus because it reduces the need for crop production (“food-competing feedstuffs”), fertilization of grassland, and the use of dietary supplements/additives for livestock (e.g., mineral feed mixtures) (Neset et al., 2016). Using the online tool *Interactive future phosphorus scenarios for the global food system v.1.1*, we can estimate that the

extraction of phosphate rock would theoretically not be necessary if population growth were halted, if livestock were not fed with “food-competing feedstuffs” and dietary supplements/additives (and sufficient animal excreta were returned to the land where grass for feed is grown), if human feces and urine were returned to agricultural land, and if all phosphorus from crop residues were successfully returned to fields (Phosphorus Futures, 2017). It is not yet clear which strategies Europe will adopt to prevent the development of a phosphorus crisis (phosphate crisis), although calls for solutions have been emerging for approximately 20 years (Abelson, 1999).

Pimentel D. and Pimentel M. (2003) found that producing one kilogram of edible plant protein from grains and certain legumes requires less fuel than producing one kilogram of edible animal protein (1.8 to 26 times less fuel when comparing corn and various animal products). Sranacharoenpong et al. (2015) found that in California, producing one kilogram of edible protein from beans requires approximately 1.9 times less fuel than producing one kilogram of edible protein from almonds, 1.9 times less than from eggs, 2.3 times less than from chicken meat, and 8.6 times less than from beef. Fazeni and Steinmüller (2011) found that energy consumption in Austrian agriculture would decrease by 30–38% if Austrians followed dietary recommendations that limit meat and sugar intake and increase vegetable and fruit intake. Marlow et al. (2015) found that in California, diets low in animal-based foods (high in legumes, nuts, and fruits) require approximately 3.3 times less energy than diets high in animal-based foods (lower in legumes, nuts, and fruits). Meier and Christen (2013) estimated that in Germany, energy consumption for a vegan diet is approximately 1.2 times lower than for a vegetarian diet, 1.3 times lower than for an omnivorous diet that follows dietary recommendations, and 1.4 times lower than for an average diet.

Machovina et al. (2015) estimate that the current type of human omnivory is likely the main driver of species extinction, as it contributes to biodiversity loss in multiple ways: deforestation, soil degradation, pollution (air and water), climate change, overfishing and by-catch, the spread of invasive species (domesticated livestock and the microorganisms associated with them and their waste), loss of key wild predators (due to habitat loss, hunting, and protection of livestock), and loss of large wild herbivores (due to habitat loss, hunting, and loss of natural resources caused by animal agriculture). In addition, feed production for livestock is typically characterized by low biodiversity (industrial animal agriculture). Livestock production is responsible for the majority (78%) of the negative impact of European agriculture on terrestrial biodiversity loss (Leip et al., 2015). Globally, between 1974 and 2013, the share of overfished fish stocks increased from 10% to 31%. The share of fish stocks that are not overfished but are fully exploited (meaning that fishing capacity cannot be increased sustainably) was 58% in 2013. The combined share (overfished + fully fished fish stocks) increased from approximately 60% to approximately 90% between 1974 and 2013 (FAO, 2016c).

Golja (2016), in his thesis titled “*The Environmental Impacts of Animal Agriculture: Security Challenge of the 21<sup>st</sup> Century*”, explained and confirmed the following hypothesis: “Global animal agriculture represents one of the greatest security challenges of the 21<sup>st</sup> century, as it is the main driver of rainforest deforestation, excessive water use, and air pollution.”

Sustainable dietary patterns are those with a low environmental footprint that ensure food security and healthy lives for all current and future generations. In sustainable dietary patterns, biodiversity is respected; natural and human resources are used optimally. Sustainable diets are culturally acceptable, affordable, and economically fair (FAO, 2011). A systematic review of literature on indicators of sustainable diets shows that researchers most commonly include dietary carbon footprint, required agricultural land area, and consumption of animal-based foods (especially meat intake) as indicators of sustainability (Jones et al., 2016). The definition of sustainability should also include interspecies ethics/animal welfare/animal well-being (Shields and Orme-Evans, 2015; Probyn-Rapsey et al., 2016; Jones et al., 2016; Broom, 2017). In Europe, a general consensus has emerged that reducing meat consumption will play a key role in transitioning to more sustainable diets (Birt et al., 2017; Ripple et al., 2017). Vegetables, fruits, and grains consistently occupy a significant share of modern dietary plates and pyramids. Legumes (beans, peas, lentils, soy, fava beans, chickpeas, and peanuts from as nearby regions as possible), nuts, seeds, and products made from them deserve greater promotion than they currently receive, as they are more sustainable sources of protein and fat than animal-based foods and refined/cold-pressed oils. From a sustainability perspective, the British dietary guide *The Eatwell Guide* (2016) appears to be a better guide than the 2014 Slovenian dietary pyramid “*Z zdravo prehrano in gibanjem do zdravja*” (NIJZ, 2014; Public Health England, 2016). The reasons are as follows:

- In the Slovenian dietary pyramid, the category name “Meat, fish and alternatives” places meat first, while alternatives (eggs and legumes) are listed last (NIJZ, 2014). In the British dietary guide, the category name (“Beans, pulses, fish, eggs, meat and other proteins”) intentionally places beans and legumes first, followed by fish and eggs, and only then meat; other protein sources are listed last, including nuts, tofu, plant-based “cottage cheese,” protein foods from microorganisms, shellfish, squid, and crustaceans. Below the category, there is also a note: “Eat less red and processed meat” (Public Health England, 2016).
- Unlike the Slovenian dietary pyramid, the British guide encourages consumers to support sustainable fishing and/or sustainable aquaculture (NIJZ, 2014; Public Health England, 2016).
- In the Slovenian dietary pyramid, no plant-based alternatives are mentioned in the dairy category (NIJZ, 2014). In the British guide, the category is named “Dairy and alternatives” (Public Health England, 2016).
- In the British guide, the dairy segment was halved in size in 2016: previously it occupied 15% of the space, now it occupies 8% (Buttriss, 2016; Public Health England, 2016).
- In the Slovenian dietary pyramid, oils, margarine, butter, olives, seeds, and nuts are grouped into a single category (“Foods to be consumed in smaller quantities”; the category name is written in red capital letters, creating a sense of danger) (NIJZ, 2014). In the British guide, nuts are grouped with legumes, butter is grouped with ice cream, and oils and margarines form a separate category (“Oil and spreads”) (Public Health England, 2016).

If interspecies ethics were also taken into account in the British guide and the Slovenian dietary pyramid, it would be ideal to have official vegan versions of both. In omnivorous versions, consumers should be encouraged to support organic/sustainably oriented animal agriculture, as the current versions imply that consumption of animal-based foods from industrial animal agriculture is acceptable — although it should not be. Organic animal agriculture places greater emphasis on animal welfare than conventional systems (Regulation on organic production..., 2001).

In this regard, NIJZ could follow the example of the British Dietetic Association (BDA), which in 2014 established a formal cooperation agreement with The Vegan Society. The two organizations developed guidelines for balanced vegan nutrition. It would be reasonable for NIJZ to collaborate with the Slovenian Vegan Society in a similar way. This would formally and practically ensure the promotion of sustainable diets and provide professional support for individuals who wish to adopt such dietary patterns (British Dietetic Association, 2016, 2017a, 2017b; British Dietetic Association & The Vegan Society, 2017; The Vegan Society, 2018).

## Health arguments for halving the production, recommended intake and actual intake of animal-based foods in Slovenia/Europe

There is an increasing number of studies showing that the consumption of animal products (meat, eggs, and dairy products) carries certain risks for the development of various chronic diseases compared to the consumption of a whole-food plant-based diet. This chapter presents a more detailed overview of research in this field.

An increasing number of countries are recognizing the growing body of evidence indicating that animal products are not the most recommended source of protein and fats. Accordingly, they are adjusting dietary guidelines, which place increasing emphasis on the consumption of whole plant-based foods and include more recommendations to limit animal products. Vegetables, fruits, and grains consistently occupy a significant share of modern dietary plates and pyramids. Legumes (beans, peas, lentils, soy, fava beans, chickpeas, and peanuts from as nearby regions as possible), nuts, seeds, and products made from them deserve greater promotion than they currently receive, as they are healthier sources of protein and fats than animal-based foods and oils.

An exemplary case is the British update of the dietary plate “*The Eatwell Plate*” (2007) to “*The Eatwell Guide*” in 2016, as the new British dietary guide places greater emphasis on whole plant-based foods, while the promotion of other foods that are not whole or not plant-based is significantly reduced compared to before (Buttriss, 2016; Public Health England, 2016).

### Studies comparing health risks of different dietary patterns

58% of Slovenia’s population aged 25 to 74 are overweight, as are 70% of Slovenia’s population aged 55 to 74. Elevated blood lipids (cholesterol and/or triglycerides) are present in 26% of Slovenia’s population aged 25 to 74, and in more than 36% of Slovenia’s population aged 55 to 74. Elevated blood pressure is present in 25% of Slovenia’s population aged 25 to 74, and in more than 41% of Slovenia’s population aged 55 to 74. Elevated blood glucose concentration has already been measured at some point in 21% of Slovenia’s population aged 25 to 74, and in more than 32% of Slovenia’s population aged 55 to 74 (NIJZ, 2018).

Dinu et al. (2017), using a meta-analysis of cross-sectional and prospective studies, showed that vegetarians, compared with omnivores, have on average a lower body mass index, a lower concentration of total cholesterol in the blood (a significantly lower concentration of LDL cholesterol and only slightly lower concentration of HDL cholesterol), a lower concentration of triglycerides in the blood, and a lower concentration of glucose in the blood. All of the listed advantages of vegetarians also apply to vegans.

Vegetarians have on average lower blood pressure than omnivores, and vegans may have an even lower risk of developing high blood pressure than vegetarians (Appleby et al., 2002; Orlich and Fraser, 2014; Garbett et al., 2016).

From the meta-analysis, it is evident that vegetarians, compared with omnivores, have a statistically significantly lower risk of developing (and/or dying from) ischemic heart disease (−25%) and a statistically significantly lower risk of developing cancer (−8%). Vegetarians also performed better than omnivores in other observed outcomes (mortality from any cause, incidence and/or mortality from cardiovascular diseases, incidence and/or mortality from cerebrovascular diseases, mortality from breast cancer, mortality from colorectal cancer, mortality from prostate cancer, mortality from lung cancer), but the differences were not statistically significant (Dinu et al., 2017).

From the meta-analysis, it is evident that vegans, compared with omnivores, have a statistically significantly lower risk of developing cancer (−15%). Vegans also show better outcomes than omnivores in mortality from any cause, but the difference in this meta-analysis was not statistically significant. The authors of the meta-analysis extracted controlled confounding variables from the reviewed studies and presented them in a summarized form (Dinu et al., 2017).

Vegetarians, compared with omnivores, have a lower risk of developing type 2 diabetes, diverticular disease of the colon, and cataracts (Appleby and Key, 2016; Lee and Park, 2017). Vegans currently appear to perform even better than vegetarians in preventing the development of type 2 diabetes, diverticular disease of the colon, and cataracts, but the differences between vegans and vegetarians in studies are not statistically significant (Crowe et al., 2011; Appleby et al., 2011; Orlich and Fraser, 2014).

In vegans, the potential renal acid load (PRAL) is usually significantly lower than in omnivores (Scialla and Anderson, 2013; Knurick et al., 2015; Jeran, 2018). The equation for calculating PRAL is as follows (Scialla and Anderson, 2013):

$$\text{PRAL [milliequivalents/day]} = 0.49 \times \text{B [g/day]} + 0.037 \times \text{P [mg/day]} - 0.021 \times \text{K [mg/day]} - 0.026 \times \text{Mg [mg/day]} - 0.013 \times \text{Ca [mg/day]}$$

Here, ‘B’ represents dietary protein intake, ‘P’ dietary phosphorus intake, ‘K’ dietary potassium intake, ‘Mg’ dietary magnesium intake, and ‘Ca’ dietary calcium intake (Scialla and Anderson, 2013). Although protein increases the acid load on the kidneys, some legumes — despite being a good source of protein — do not increase renal acid load due to sufficient levels of potassium, magnesium, and calcium (Trinchieri, 2012). A low average PRAL value likely plays an important role in preventing kidney disease, and may also play a role in preventing osteoporosis and sarcopenia (Trinchieri, 2012; Scialla and Anderson, 2013; Banerjee et al., 2014; Chen and Abramowitz, 2014; Knurick et al., 2015; Pizzorno, 2015; Ferraro et al., 2016; Gambaro and Trinchieri, 2016).

In the 1980s, the American Dietetic Association rightly doubted the nutritional adequacy and health benefits of vegetarian diets, as there were not yet enough studies on vegetarian and vegan diets at that time. Their position changed already in 1993. An important role in this shift was played by studies on American Adventists, as this population includes a high proportion of vegetarians and vegans who live in the same environment as omnivores and have a similar lifestyle to omnivores (due to the smaller influence of confounding factors, this group is very suitable for cohort studies) (Le and Sabaté, 2014;

Havala and Dwyer, 1993). In the 1990s, the literature already described in detail how to properly plan vegetarian and vegan diets for children (Coughlin, 1999).

### Diet and cancer

Wu et al. (2016), using four independent approaches, calculated the contribution of hereditary (intrinsic) and non-hereditary (extrinsic) risk factors to the lifetime probability of developing cancer. They found that all four approaches consistently estimate that non-hereditary risk factors account for at least 70–90% of the lifetime probability of developing the most common types of cancer (Wu et al., 2016).

Martin-Moreno et al. (2008) identified smoking and inappropriate diet as the most important avoidable risk factors for the development of cancer in Europeans.

If everyone followed the recommendations of the European Code Against Cancer, the International Agency for Research on Cancer (IARC) estimates that almost half of cancer deaths in Europe could be prevented (IARC, 2014). Since everyone would likely interpret the recommendation “Eat a healthy diet” differently, the more specific dietary recommendations in the European Code Against Cancer are as follows (Norat et al., 2015):

1. Eat plenty of whole grains, legumes, vegetables and fruit;
2. Limit high-calorie foods (foods high in sugar or fat) and avoid sugary drinks;
3. Avoid processed meat; limit red meat and foods high in salt.

From the literature review, we can conclude that adherence to the mentioned dietary recommendations would reduce the risk of developing cancer, coronary heart disease, and type 2 diabetes, as well as reduce the risk of premature death from any cause. Healthy eating before or after a diagnosis of breast cancer or colorectal cancer may also increase the likelihood of survival. Sufficient evidence indicates that a high intake of fruits and vegetables reduces the risk of developing cancers of the respiratory system, head, and neck; a high intake of dietary fiber reduces the risk of developing colorectal cancer; a high intake of processed meat products or red meat increases the risk of developing colorectal cancer; and a high intake of salt increases the risk of developing stomach cancer (Norat et al., 2015).

Grant (2014), through a review of incidence rates for 21 cancers in 157 countries, concluded that higher energy intake from animal-based foods is associated with a higher risk of developing 12 types of cancer and a lower risk of developing 2 types of cancer. Higher consumption of animal-based foods is not associated with increased incidence immediately, but the effect appears with a delay of 15–31 years, as observed in countries where the timing of major dietary changes is known. Mechanisms that could explain this association include the effect of higher protein intake on increasing plasma levels of insulin-like growth factor 1 (IGF-1), the effect of saturated fatty acids on increasing plasma insulin (indirectly through the induction of insulin resistance), the effect of higher intake of heme iron on the formation of free radicals, or the formation of mutagens during cooking (Grant, 2014). Potential

mechanisms may also include the use of salt (cheese, processed meat products) or nitrite salts (processed meat products).

Bodai and Tusso (2015) recommend, among other things, that women who have survived breast cancer adopt a whole-food, plant-based diet (WFPBD), increase their intake of n-3 polyunsaturated fatty acids, flaxseeds, and nuts, and reduce their intake of salt, saturated fats, and trans fatty acids in order to minimize the likelihood of cancer recurrence.

Recommendations for cancer prevention, regularly updated by the American Institute for Cancer Research (AICR), are similar to the European Code Against Cancer. AICR also promotes WFPBD, but their recommendations allow animal-based foods to make up to one-third of each meal (AICR, 2017a, 2017b). AICR regularly updates a list of protective foods that help reduce the risk of developing various cancers as part of a healthy diet, and this list does not include any animal-based foods (AICR, 2017c).

Strong evidence suggests that higher intake of milk and calcium is associated with a lower risk of developing colorectal cancer (AICR, 2017b). Suggestive evidence indicates that higher intake of dairy products is associated with a higher risk of developing prostate cancer (National Cancer Institute, 2018; AICR, 2017b; Aune et al., 2015).

Wouldn't it therefore be advisable, as a precautionary measure, to choose those calcium (abbreviation for calcium: Ca) rich foods that—as part of a healthy diet—help reduce the risk of developing colorectal cancer and at the same time do not pose a risk for the development of any type of cancer (foods from the AICR collection of protective foods)? Such foods include (AICR, 2017c; USDA, 2016; Golob et al., 2012):

- **soy** (calcium content in dry soybeans before cooking: 277 mg Ca/100 g) and defatted soy flour (241 mg Ca/100 g), and soy products
- **flaxseeds** (255 mg Ca/100 g)
- **white/black/red/mung beans** (calcium content in dry white beans before cooking: 147–240 mg Ca/100 g; in dry black beans before cooking: 123–160 mg Ca/100 g; in dry red beans before cooking: 143 mg Ca/100 g; in dry mung beans before cooking: 138 mg Ca/100 g)
- **kale** & savoy cabbage (calcium content in leafy kale before cooking: 232 mg Ca/100 g; in curly kale before cooking: 150–205 mg Ca/100 g; in savoy cabbage before cooking: 117 mg Ca/100 g)
- **lupin** (calcium content in dry lupin beans before cooking: 176 mg Ca/100 g)
- **amaranth** (calcium content in dry amaranth before cooking: 159 mg Ca/100 g)
- **Chinese/red/white cabbage** (calcium content in Chinese cabbage (pak-choi) before cooking: 105 mg Ca/100 g; in Chinese cabbage (pe-tsai) before cooking: 77 mg Ca/100 g; in red cabbage before cooking: 42 mg Ca/100 g; in white cabbage before cooking: 39 mg Ca/100 g)
- **red/green radicchio** (red radicchio: 88 mg Ca/100 g; green radicchio: 83 mg Ca/100 g)
- **walnuts** (87 mg Ca/100 g)
- **broccoli** (58–87 mg Ca/100 g)
- **endive** (54 mg Ca/100 g)

- carrots (35 mg Ca/100 g)
- whole plant-based foods and beverages that are (not yet) included in the AICR list of protective foods but do not pose a health risk (OPKP, 2017; USDA, 2016; Golob et al., 2012):
  - o **tahini made from unhulled sesame seeds** (960 mg Ca/100 g; for comparison – standard tahini: 426 mg Ca/100 g)
  - o **chia seeds** (631 mg Ca/100 g)
  - o **carob flour** (348 mg Ca/100 g)
  - o almond “butter” (347 mg Ca/100 g) and **almonds** (269 mg Ca/100 g)
  - o **hazelnuts** (226 mg Ca/100 g)
  - o **dried figs** (162 mg Ca/100 g) and fresh figs (54 mg Ca/100 g or 64 mg Ca/100 kcal)
  - o oranges (40 mg Ca/100 g or 87 mg Ca/100 kcal)
  - o kiwifruit (38 mg Ca/100 g or 69 mg Ca/100 kcal)
  - o mandarins (33 mg Ca/100 g or 72 mg Ca/100 kcal)
  - o calcium-fortified whole plant-based foods
  - o **calcium-fortified unsweetened plant-based milks** (120 mg Ca/100 mL)
  - o natural mineral water Donat Mg (38 mg Ca/100 mL), natural mineral water Radenska Classic (20 mg Ca/100 mL)

NOTES:

– Abbreviation for calcium: Ca

– **For comparison: semi-skimmed cow’s milk contains 118 mg Ca/100 mL**; low-fat cottage cheese from skimmed cow’s milk contains 61–92 mg Ca/100 g; Gouda cheese contains 809 mg Ca/100 g [note: approximately 1 L of cow’s milk is used to produce 100 g of Gouda cheese] (OPKP, 2018).

– Spinach and Swiss chard were not included in the list because the high content of oxalic acid results in poor calcium absorption from these sources (Weaver et al., 1999; Lanou, 2009; Golob et al., 2012).

– A varied whole-food plant-based diet rich in legumes, seeds, nuts, vegetables, and fruits provides adequate daily calcium intake. If necessary, the diet can be supplemented with calcium-fortified plant-based milks, which contain approximately the same amount of calcium as semi-skimmed or whole cow’s milk, and this calcium is similarly bioavailable (Weaver et al., 1999; Lanou, 2009; Stojanovska et al., 2015).

The association between intake of milk/dairy products and prostate cancer was examined in five meta-analyses between 2004 and 2016 (Aune et al., 2015; Huncharek et al., 2008; Qin L. Q. et al., 2007; Gao et al., 2005; Qin L. Q. et al., 2004). Four out of five found that higher intake of milk and/or dairy products is associated with a higher risk of developing prostate cancer (Aune et al., 2015; Qin L. Q. et al., 2007; Gao et al., 2005; Qin L. Q. et al., 2004). One of the five meta-analyses was co-financed by

the dairy industry (National Dairy Council, Rosemount, Illinois), and its conclusions were not consistent with the others (Huncharek et al., 2008). The most recent meta-analysis suggests that neither milk fat nor calcium may be responsible for the increased risk. The mechanism that could best explain the association between dairy intake and prostate cancer is the effect of dairy products on increasing plasma IGF-1 levels, as literature clearly indicates that IGF-1 likely plays an important role in the development of prostate cancer (Aune et al., 2015; Travis et al., 2016). Vegans have lower plasma IGF-1 levels than vegetarians and omnivores, and studies suggest that they also have a lower risk of developing prostate cancer compared to vegetarians and omnivores (Allen et al., 2000; Allen et al., 2002; Fontana et al., 2006; Fontana et al., 2008; Key et al., 2014; Tantamango-Bartley et al., 2016). Higher intake of (full-fat) dairy products likely also increases the risk of prostate cancer progression after diagnosis, although current evidence is less consistent than the evidence showing that higher body mass index and smoking increase the risk of progression [The risk of progression may also be increased by higher intake of processed red meat, eggs/choline, poultry (with skin), and animal sources of fats/saturated fatty acids] (Peisch et al., 2017).

Gonzales et al. (2014) suggest that, based on the precautionary principle, dairy intake should be limited (they recommend limiting or avoiding dairy products), and replaced with calcium-rich vegetables and legumes and calcium-fortified plant-based foods/milks. Approximately half the recommended intake compared to Slovenian recommendations for dairy consumption has been adopted, for example, in the *Healthy Eating Plate* (2011) and *The Eatwell Guide* (2016) (Harvard School of Public Health, 2013; Public Health England, 2016). The effect of dairy products on prostate cancer is not the only health-related reason to avoid dairy products, as they also increase the risk of developing acne and may increase the risk of ovarian cancer, hepatocellular carcinoma, non-Hodgkin lymphoma, and Parkinson's disease (Larsson et al., 2006; Melnik, 2015a; Qin B. et al., 2016; Wang et al., 2016; Fiedler et al., 2017; Cengiz et al., 2017; Yang et al., 2017; Hughes et al., 2017). They may also accelerate aging (Melnik, 2015b; Michaëlsson et al., 2017).

#### Therapeutic potentials of consuming a whole-food vegan diet

A whole-food vegan diet has unique therapeutic potential. A whole-food vegan diet and a whole-food diet in which the intake of animal-based foods is minimized are probably the most effective dietary patterns for reversing cardiovascular diseases (atherosclerosis and ischemic heart disease) after diagnosis (Ornish et al., 1990, 1998; Esselstyn et al., 2014; Greger, 2015; Massera et al., 2015, 2016; Chockalingam et al., 2016; Esselstyn, 2016; Fuhrman and Singer, 2017). An energy-restricted whole-food vegan diet and an energy-restricted whole-food diet in which the intake of animal-based foods is minimized may be more effective for reversing type 2 diabetes after diagnosis than an energy-restricted diet consistent with conventional recommendations for diabetic patients (Barnard et al., 2009; Kahleova et al., 2011; Lee et al., 2016). However, it must be added that the success of reversing type 2 diabetes probably depends more on the intensity of energy restriction and the number of kilograms lost than on the type of energy-restricted diet (Pierce, 2013; Sarathi, 2017). A whole-food diet in which the intake of animal-based foods is minimized, as part of a healthy lifestyle, probably helps reverse early-detected prostate cancer. Several small (but important) controlled studies on this

topic have already been conducted, while a larger randomized controlled trial examining the effect of such a diet on the progression of early-detected prostate cancer is still ongoing (Ornish et al., 2005; Saxe et al., 2006; Parsons et al., 2014). It is also worthwhile to continue researching the effects of different forms of whole-food vegan diets and WFPBD on weight loss and on alleviating symptoms of rheumatic and autoimmune diseases (Swank and Goodwin, 2003; Kadoch, 2012; Clinton et al., 2015; Sutcliffe et al., 2015; Lewis, 2016; Wright et al., 2017; Jakše et al., 2017).

Tuso et al. (2013) argue that physicians too often ignore the therapeutic potential of a healthy diet and healthy lifestyle and instead prefer to prescribe medication. They believe that a well-planned whole-food diet in which the intake of animal-based foods is minimized should become the new normal diet for physicians and all patients — especially those with high blood pressure, type 2 diabetes, cardiovascular disease, or obesity (Tuso et al., 2013).

### Animal agriculture and antimicrobial-resistant bacteria

Among the health arguments for halving the production, recommended intake, and actual intake of animal-based foods in Slovenia/Europe, one could also include the use of antibiotics in animal agriculture, since some resistant bacteria (e.g., the antimicrobial-resistant bacteria *Campylobacter* and *Salmonella*) can be transmitted from animals to humans through food, and can also be transmitted to humans through direct contact with animals or with animal manure (ECDC, 2017). In the European Union, the use of antibiotics for promoting the growth of farm animals is prohibited, but the legislation is very lax regarding the use of antibiotics for preventive purposes (Bevc Bahar and Peterman, 2016). Global animal agriculture consumes approximately half of all produced antibiotics (Consumers International, 2016; Bevc Bahar and Peterman, 2016).

### Saturated fatty acids and health

Unlike omnivores, vegans can more easily comply with the recommendation to limit saturated fatty acids (less than 10% of total daily energy intake) automatically — without special effort (Clarys et al., 2014; Kristensen et al., 2015; Elorinne et al., 2016; Sobiecki et al., 2016; Schüpbach et al., 2017; Jeran, 2018). In order to study the impact of saturated fatty acids on health as thoroughly as possible, we reviewed the literature on their effect on the leading causes of death among Europeans. The most common underlying causes of death in men that are relevant for us (they are related to diet) were the following in 2013 (Eurostat, 2016):

1. cardiovascular diseases, including cerebrovascular diseases
2. various cancers (especially respiratory cancers and colorectal cancer)
3. type 2 diabetes
4. chronic liver diseases
5. diseases of the urinary system

The relevant most common underlying causes of death in women were the following (Eurostat, 2016):

1. cardiovascular diseases, including cerebrovascular diseases
2. various cancers (especially breast cancer, respiratory cancers, and colorectal cancer)
3. type 2 diabetes
4. diseases of the urinary system
5. chronic liver diseases

Prevention of metabolic syndrome plays an important role in preventing the listed causes of death. Among other things, the prevention of metabolic syndrome includes reducing insulin resistance and other associated risk factors (high blood pressure, elevated concentration of LDL cholesterol and VLDL triglycerides in plasma, elevated concentration of plasma triglycerides) by reducing the intake of saturated fatty acids. These are recommended to be replaced with unsaturated fatty acids (Riccardi et al., 2004). Kaur (2014) also included reduction of saturated fatty acid intake in the multidisciplinary approach to metabolic syndrome. In people who follow the Mediterranean diet, metabolic syndrome is less common because the diet has a favorable effect on serum LDL and HDL cholesterol, plasma triglycerides, and blood glucose concentration. The DASH diet (Dietary Approaches to Stop Hypertension) also has a favorable effect on the parameters of metabolic syndrome. Among other things, both diets are characterized by a high ratio of unsaturated to saturated fatty acids (Kaur, 2014). Hosseinpour-Niazi et al. (2016), in a 3-year prospective study, showed a statistically significant association between the amount of butter consumed and the risk of developing metabolic syndrome. People in the tertile with the highest butter intake (average 23.5 g per day) had twice the risk of developing metabolic syndrome as people in the tertile with the lowest butter intake (average 0.83 g per day) (Hosseinpour-Niazi et al., 2016).

Because fats are the most energy-dense macronutrients, the usual strategy for reversing obesity and the diseases associated with it (including type 2 diabetes) has been a low-fat diet (less than 30% of energy from fat). However, research shows that in type 2 diabetes the composition of fats is more important than the quantity of total fats, and therefore both the Mediterranean diet and the low-fat diet are proven to be effective in prevention (more effective than diets with a low glycemic index) (Salas-Salvadó et al., 2011). Among other things, both diets are characterized by a low intake of saturated fatty acids. A diet with more than 10% of energy intake from saturated fatty acids can stimulate insulin resistance (Kargulewicz et al., 2014). Cross-sectional studies and case-control studies indicate that newly diagnosed patients with type 2 diabetes consume more saturated fatty acids than healthy individuals. This is also confirmed by epidemiological studies in which the concentration of saturated fatty acids in plasma or biological membranes was measured (Salas-Salvadó et al., 2011). Several studies indicate a consistent association between higher intake of saturated fatty acids and higher risk of developing hyperinsulinemia — the association is independent of body fatness (Riccardi et al., 2004). A meta-analysis showed a statistically significant association between higher intake of meat (especially processed meat products) and higher risk of developing type 2 diabetes, and higher meat intake is also associated with a higher risk of developing metabolic syndrome. Frequent egg consumption (more than 7 per week) is associated with a higher risk of developing type 2 diabetes (Salas-Salvadó et al., 2011).

Randomized controlled trials consistently show improved insulin sensitivity after replacing saturated fatty acids with n-6 or monounsaturated fatty acids. If fats account for around 40% of energy intake and are of plant origin, the probability of developing type 2 diabetes is lower than with a diet low in fats of plant origin. Most randomized clinical trials indicate that high-fat diets (less than 60 g of carbohydrates per day) based on plant-derived fats are more effective than low-fat diets in improving insulin sensitivity, and meals are also more palatable, which is why fewer participants withdraw from the planned diet (Salas-Salvadó et al., 2011). Von Frankenberg et al. (2017), in a randomized controlled trial in overweight people, showed that a high-fat diet with 25% of energy intake from saturated fatty acids already has an undesirable effect on insulin sensitivity after just one month, even when body weight remains stable.

High-fat meals (30–50 g of fat or more) are followed by an increase in blood triglyceride concentration. This represents a highly atherogenic state that is causally associated with insulin resistance. In this case, the composition of the fats is more important than the amount of fat in the meal, as blood triglycerides are increased most by saturated fatty acids (Salas-Salvadó et al., 2011). Studies in animal models and cell cultures have shown that plasma free saturated fatty acids (especially palmitic acid) enter the process of  $\beta$ -oxidation in cells with more difficulty, and therefore toxic lipid metabolites (diacylglycerols and ceramide) accumulate. By inhibiting insulin signaling, these cause insulin resistance in tissues and together with elevated glucose concentration synergistically worsen the function of pancreatic  $\beta$ -cells (this slowly leads to cell death). Experimental inhibition of ceramide formation blocks the ability of saturated fatty acids to cause insulin resistance (Salas-Salvadó et al., 2011; Heber and Henning, 2014). Unsaturated fatty acids prevent this cascade of events by directing fats into  $\beta$ -oxidation or into triglycerides instead of into the formation of toxic lipid metabolites (Salas-Salvadó et al., 2011).

Alcohol is a generally known risk factor for fatty liver and subsequent cirrhosis, but in the past 40 years the main cause of liver failure and transplantation has become non-alcoholic fatty liver disease, which is the hepatic manifestation of metabolic syndrome, as 71% of patients with metabolic syndrome have it (Nseir et al., 2010; Bray, 2013). From this, we can conclude that approaches for preventing metabolic syndrome are also effective in non-alcoholic fatty liver disease. Kargulewicz et al. (2014), through a review of dietary recommendations for patients with non-alcoholic fatty liver disease, showed that it would be reasonable to recommend a diet with 7–10% of energy intake from saturated fatty acids, as studies in animal models indicate that high intake of saturated fatty acids stimulates oxidative stress in liver mitochondria and thereby contributes to hepatocyte destruction. Patients with non-alcoholic steatohepatitis consume more saturated fatty acids than people in the control group, and studies in animal models also indicate that a higher ratio of saturated to unsaturated fatty acids accelerates the progression of fatty liver to steatohepatitis (Kargulewicz et al., 2014).

In 2010, the advisory committee for the American dietary guidelines published a comparison of dietary patterns with documented beneficial effects on cardiovascular disease. These included the DASH diet, three versions of the Mediterranean diet, the traditional Japanese diet, and the traditional Okinawan diet (the latter two are low-fat). All of these share an emphasis on plant-based foods, and therefore,

despite very different values of total fat intake (from 6 to 43% of energy), in all diets saturated fatty acids account for a smaller proportion (one-third or one-quarter) of total fat, namely 2 to 13% of energy intake (USDA, 2010). A meta-analysis of randomized controlled studies lasting at least 1 year (on average 4 years), which examined the effect of replacing saturated fatty acids with polyunsaturated fatty acids on the risk of developing cardiovascular disease, showed that each additional 5% of energy intake from polyunsaturated fatty acids reduces the risk of developing cardiovascular disease by 10%. It was also found that longer studies showed greater beneficial effects and that the results from observational studies were very similar (Mozaffarian et al., 2010).

Saturated fatty acids significantly increase the concentration of LDL cholesterol in the blood, may increase VLDL triglycerides, and have no effect on HDL cholesterol. In insulin-resistant individuals, replacing saturated fatty acids with unsaturated fatty acids reduces both LDL cholesterol and VLDL triglycerides and improves the ratio between total and HDL cholesterol (Riccardi et al., 2004). The reduced probability of cardiovascular events due to choosing unsaturated fatty acids is not dependent only on the effect of fats on blood lipids, but replacing saturated fatty acids with unsaturated fatty acids also significantly reduces blood pressure and improves insulin sensitivity, while polyunsaturated fatty acids may also reduce systemic inflammation (Riccardi et al., 2004; Mozaffarian et al., 2010). In 2015, Hooper et al. conducted a meta-analysis with a design similar to that of Mozaffarian et al. in 2010 and likewise showed that, across different randomized controlled trials, reducing intake of saturated fatty acids reduced the risk of cardiovascular events by an average of 17%. Replacing saturated fatty acids with polyunsaturated fatty acids was especially beneficial. Greater reduction in saturated fatty acid intake and greater increase in unsaturated fatty acid intake led to a more substantial reduction in the risk of cardiovascular events (Hooper et al., 2015). Li Y. et al. (2015), in a 30-year prospective study, showed that what saturated fatty acids are replaced with is very important, suggesting that to maximally reduce the risk of developing cardiovascular disease, the quality of the entire diet must be improved and not just the intake of one macronutrient. Isocaloric replacement of 5% of energy intake from saturated fatty acids with polyunsaturated fatty acids reduces the risk of developing coronary heart disease by 25%, isocaloric replacement with monounsaturated fatty acids by 15%, isocaloric replacement with carbohydrates from whole grains by 9%, while isocaloric replacement with carbohydrates from refined starchy foods or added sugars does not change the risk of developing coronary heart disease (Li Y. et al., 2015). With the help of this study, we can explain the results of many controversial studies that showed that reducing saturated fatty acid intake has no notable positive health effects.

The European Food Safety Authority (EFSA) approved the following health claims for foods:

- “Reducing consumption of saturated fat contributes to the maintenance of normal blood cholesterol levels.” (Commission Regulation (EU) No 432/2012 ..., 2012)
- “Replacing saturated fats with unsaturated fats in the diet has been shown to lower/reduce blood cholesterol. High cholesterol is a risk factor in the development of coronary heart disease.” (Commission Regulation (EU) No 1226/2014 ..., 2014)

The Mediterranean diet is associated with slower decline in cognitive abilities, greater volume of certain brain regions, lower probability of developing Alzheimer's disease, and reduced mortality in Alzheimer's disease. Regardless of differences in research approaches, dietary patterns with high intake of fruits, vegetables, fish, nuts, and legumes and low intake of meat, full-fat dairy products, and sweets are consistently associated with reduced risk of developing Alzheimer's disease (Mosconi and McHugh, 2015). From this, one might conclude that saturated fatty acids represent a risk factor for developing Alzheimer's disease. By combining the Mediterranean and DASH diets, researchers created the MIND diet, which improves cognitive abilities and slows the progression of Alzheimer's disease. Among other things, the MIND diet limits animal-based foods (fish and poultry are considered protective) and foods with high saturated fatty acid content (Marcason, 2015). Barnard et al. (2014), through a systematic review, showed that saturated fatty acids were associated with increased risk of Alzheimer's disease in three of four relevant observational studies. In this case, likely mechanisms are the effects of saturated fatty acids on total plasma cholesterol, LDL cholesterol, insulin resistance, and type 2 diabetes, as all of these are risk factors for developing Alzheimer's disease (Barnard et al., 2014). The amyloid hypothesis states that Alzheimer's disease is caused by excessive accumulation of beta-amyloid (amyloid plaques), which can be directly neurotoxic, can induce oxidative stress, trigger an inflammatory response, cause vascular damage, and alter calcium homeostasis (Chen and Small, 2014). Saturated fatty acids accelerate the formation of amyloid plaques (Mosconi and McHugh, 2015). An increased amount of amyloid plaques is also present in the brains of patients with cardiovascular disease who are not (yet) demented (Chen and Small, 2014). Insulin resistance in the brain is associated with impaired functioning of nerve cells and with their death, with reduced concentration of acetylcholine, and with reduced concentration of proteins (transthyretins) that remove beta-amyloid from the brain (Encyclopaedia Britannica, 2017). From the literature review, we can conclude that approaches for preventing cardiovascular disease and insulin resistance are also effective in Alzheimer's disease.

There is suggestive evidence that higher intake of animal-derived fat contributes to the development of colorectal cancer, suggestive evidence that butter use and higher total fat intake contribute to the development of lung cancer, and suggestive evidence that higher total fat intake contributes to the development of postmenopausal breast cancer (AICR/WCRF, 2007). High fat intake can raise serum concentrations of free estrogens and contribute to the development of obesity, while high serum hormone concentrations and obesity are among the main risk factors for developing breast cancer. In addition, saturated fatty acids may increase the risk of breast cancer indirectly through their undesirable effect on insulin resistance (Khodarahmi and Azadbakht, 2014). Suggestive evidence also indicates that higher total fat intake — especially saturated fatty acids — increases the risk of developing prostate cancer and endometrial cancer, and that higher intake of saturated fatty acids increases the risk of developing ovarian cancer (Di Sebastiano and Mourtzakis, 2014; Schwab et al., 2014; Zhao et al., 2016). Stocks et al. (2015) showed a statistically significant association between the number of components of metabolic syndrome and the risk of developing any cancer. In men, the most reliable risk factors were high blood pressure and triglycerides, while in women it was fasting blood glucose. An even stronger statistically significant association was found between the number of components of metabolic syndrome and mortality from any cancer (Stocks et al., 2015). From this, we

can conclude that approaches for preventing metabolic syndrome are also effective in preventing cancer development and in increasing the likelihood of survival after a cancer diagnosis.

Because metabolic syndrome increases the risk of developing certain diseases of the urinary system, we can conclude that approaches for preventing metabolic syndrome are also effective in preventing diseases of the urinary system (Wasser et al., 2015). Saturated fatty acids may have an undesirable effect on diseases of the urinary system, but there are still not enough studies on this topic (Lin et al., 2010; Rouhani et al., 2016).

Reducing intake of saturated fatty acids below 10% of energy intake is one of the reasonable strategies for preventing the most common diet-related causes of death. A similar effect may perhaps also be achieved if we aim for saturated fatty acids to account for less than one-third of total fat intake. Since saturated fatty acids are not essential, no minimum required amount has been established. In the traditional diet of the Japanese island of Okinawa (their traditional diet is considered one of the successful dietary patterns), saturated fatty acids account on average for 2% of energy intake, which is even less than in vegans (USDA, 2010). The American Heart Association recommends that intake of saturated fatty acids should not exceed 5–6% of energy intake (American Heart Association, 2015). For successful reduction of saturated fatty acid intake, it is important to avoid palm oil and coconut oil as well, and not only to reduce the intake of fatty meat, full-fat dairy products, and eggs (Eilat-Adar et al., 2013).

## Moral and ethical arguments for halving the production, recommended intake and actual intake of animal-based foods in Slovenia/Europe

In general, the purpose of rights is to protect interests or needs. Sentient beings possess consciousness, subjective will, feelings, desires, interests, subjective preferences, physiological and psychological needs, strive for well-being, and are aware of their own bodies (Bruers, 2015; Proctor, 2012). Positive and negative feelings are indicators of the (non)satisfaction of interests (Bruers, 2015; Singer, 2016). Sentience is therefore a morally relevant criterion for assigning moral status and basic rights to a living being (Bruers, 2015; Puryear, 2016).

Over the past four decades, public and academic interest in the relationship between humans and animals has increased greatly: the philosophy of animal rights has developed, the animal liberation movement has grown, the cognitive science of animals (animal cognition science) has emerged, and in the last decade a political debate has also begun to develop (Boyer et al., 2015; Milburn, 2016). Political debate on the animal issue is still neglected. In order to support political debate, the scientific journal *Politics and Animals* began publication in 2015 (Boyer et al., 2015).

In Europe, farm animals were defined as agricultural goods in the 1970s. Only in 1997 were animals defined in European legislation as sentient beings (Ornik and Volk, 2010; Treaty of Amsterdam ..., 1997). This was a breakthrough step for animals, but only “on paper.” In practice, animal agriculture has not changed significantly in favor of animals (Pedersen, 2009; Proctor, 2012; Berg and Yngvesson, 2012; Sobbrío, 2013; Civil society statement ..., 2017). Because Europeans are unable to prevent avian influenza epidemics and thereby the killing of millions of infected animals, which in these cases are treated as waste, it is very difficult for anyone to defend the position that farm animals in Europe are treated as sentient beings. Since animal-based foods are not necessary for a healthy life, every killing of a farm animal is unnecessary, and allowing animals to be treated as waste is entirely unacceptable. If antiviral vaccines and/or medicines are not sufficiently effective or economical to prevent avian influenza pandemics, the number of poultry intended for human consumption should be drastically reduced. If, in poultry farming, only such farms were permitted where animals were kept exclusively free-range and where there were few enough of them that, in the event of an epidemic/pandemic, farmers could afford vaccination or treatment of endangered or infected animals instead of killing them, one could claim that poultry might perhaps be treated as sentient beings. Reality is far from that, as industrial-type farming predominates in poultry production in Slovenia (KGZS, 2010).

It is generally accepted that sentient beings are at least vertebrates (Proctor, 2012). Vertebrates with brains include all animals that humans most often keep as companions (cats, dogs, birds, horses, rodents, rabbits, and fish) and all animals that humans most often eat (poultry, pigs, fish, rabbits, cattle, sheep, goats, horses, rodents, dogs, camels, and donkeys) (Wullimann, 2016). At least all mammals, birds, and octopuses (octopuses are invertebrates) possess neurological substrates that generate consciousness (Low et al., 2012). The debate on fish sentience is still ongoing, and according to the precautionary principle it is more ethical to treat them as sentient beings (Proctor, 2012; Bass, 2016; Michaelson and Reisner, 2018). In cases where scientific consensus on the (non-)sentience of a living

being is still developing, we may use the precautionary principle (Bass, 2016; Michaelson and Reisner, 2018).

Science does not classify plants as sentient beings (Bruers, 2015).

In a professional essay, McPherson (2014) argues that if burning a live cat seems ethically unacceptable to us, then drinking cow's milk from conventional farming must seem equally ethically unacceptable. If we defend the unacceptability of one of these two acts, we cannot at the same time defend the acceptability of the other, because only in this way can we claim that our position is consistent. If we adopt the position that all sentient beings involved in the human-animal relationship deserve at least the basic right to life (the right prevents unnecessary and intentional killing; the current human right: "Everyone has the right to life."), the basic right not to be exploited (the right prevents unnecessary exploitation; the current human right: "No one shall be held in slavery or servitude."), and the basic right to well-being (the current human rights: "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services."; "No one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment."), then we have adopted vegan philosophy and must advocate drastic changes in Slovenian/European/global animal agriculture and in fishing & hunting. At least in developed countries, exploitation and/or killing of sentient beings and consumption of animal-based foods is not necessary for farmers/hunters/fishers and others involved (including consumers) to maintain their good health, therefore at least in developed countries (including Slovenia) veganism should be a moral duty for most people (until ethical animal-origin alternatives arrive on the market — e.g. cultured meat; see chapter: "Does ethical omnivorism exist?"). The current human rights in this paragraph are copied verbatim from the Universal Declaration of Human Rights (Human Rights Ombudsman of the Republic of Slovenia, 2009).

From the Rules on the Protection of Farm Animals (2010), the following is evident: "Farming and procedures involving animals that may cause unnecessary suffering to animals or adversely affect animal welfare, including health, are prohibited. Exceptionally, certain procedures are permitted that represent a short-term burden for the animal, but do not cause permanent injury." With the following facts, we can easily demonstrate that the principle of preventing unnecessary suffering and the principle of preventing harm exist only "on paper," but not in practice:

1. Humans do not need animal-based foods for a healthy life (Melina et al., 2016). From this it follows that all animal suffering and all harm to animals in animal agriculture are unnecessary.
2. Killing harms animal welfare, because it deprives the animal of a valuable future and of further opportunities to satisfy needs (Rossi and Garner, 2014; McPherson, 2014). This applies especially to young animals. In animal agriculture, the killing of young animals is permitted; for example, veal is the meat of calves up to 8 months old (Pograjc et al., 2008). Animal cognition science makes it clear that one cannot conclude that farm animals are incapable of anticipating and/or planning for the future (Marino, 2017; Probyn-Rapsey et al., 2016; Logan, 2014; Raby and Clayton, 2009; Correia et al., 2007). If the animal was sent to a farm sanctuary instead of to a slaughterhouse, this would be

immeasurably better for the animal's welfare — and for the first time in his/her life he/she would be in contact only with people who oppose killing.

3. Many agree that animals are in practice still treated as non-sentient beings, even though they were defined as sentient beings in European legislation as early as 1997 (Proctor, 2012; Sobbrío, 2013; Civil society statement ..., 2017). 82% of Europeans (81% of Slovenians) believe that the welfare of farm animals should definitely or probably be better protected than it is now. Only 38% of Europeans (34% of Slovenians) believe that consumers in shops and supermarkets currently probably or definitely have a satisfactory choice of food products produced in an animal-friendly way; only 10% (Europe) or 8% (Slovenia) believe that the offer is definitely satisfactory (EC, 2016a).
4. In animal agriculture, it is permitted to permanently separate the mother (e.g. a cow) and her offspring (e.g. a calf). The killing of the young is allowed already in the first months of life. This seems unacceptable to many ethicists (McPherson, 2014; Borkfelt et al., 2015; Singer, 2016). Anyone, who has ever seen or heard how a cat or cow begins to behave when someone takes away her young or when she cannot find it, understands that intentional separation of mother and offspring (without their consent) causes psychological pain — unnecessary suffering — in both. And it would be very difficult to argue that this is only short-term psychological stress.
5. The maximum permitted stocking density is not determined with the aim of optimizing animal welfare, but rather with the aim of optimizing profit, and from the perspective of animal welfare this is often unacceptable (Berg and Yngvesson, 2012; Broom, 2017). In Slovenia, in battery and barn systems there are several barns where the maximum permitted number of animals (hens) in a barn exceeds 30,000 (UVHVVR, 2017). From the Rules on the Protection of Farm Animals (2010), the following is evident: “Stocking density must not exceed nine laying hens per m<sup>2</sup> of usable area for laying hens.” We can assume that a large proportion of consumers would not find a density of 9 hens per m<sup>2</sup> acceptable if they saw with their own eyes (or in a video) what this looks like (illustrative example: Meja Šentjur, November 2016: [http://meja.si/img/3\\_4160.jpg](http://meja.si/img/3_4160.jpg)). Producers usually avoid showing such visual information, which is evident from packaging, advertisements, and websites.
6. In order to prevent the worst consequences of excessively high stocking density, beak trimming is permitted in poultry to prevent feather pecking and cannibalism, while in pigs the measures of castration, tail docking, and clipping/grinding of canine teeth are permitted to reduce injuries (e.g. tail biting) (Rules on the Protection of Farm Animals, 2010). It is impossible to claim that these measures represent only a short-term burden and not permanent injuries. It is true that it is better to choose an almost greatest evil instead of the greatest evil, but if such farming systems did not exist at all, there would be no need to choose between two cruel options.
7. Maceration (instantaneous crushing of the entire animal) of chicks up to 72 hours old is permitted (Council Regulation (EC) No 1099/2009 ..., 2009). In most cases the reason is purely economic: “In the hatching of pullets for the production of table eggs, approximately half of the hatched animals are not suitable for further production, because they are males (cockerels), whose further rearing is not economical. Surplus day-old chicks are killed immediately after hatching in the prescribed manner” (MKGP, 2016). Since the ground-up males are not intended for food, these are under no circumstances ethical killings. If a male chick were sent to a farm animal sanctuary instead of to a maceration device, this would be immeasurably better for his welfare. Of course, there are not enough sanctuaries in Europe for millions of male chicks, so such a solution is not reasonable. There are several possible

- alternatives, also listed by MKGP (2016), but none is yet feasible under commercial conditions. Conscious consumers should not support egg production that has so many unnecessary victims.
8. Cages are not prohibited. Farming of animals without outdoor access is permitted (in such cases, the entire facility could be called a cage). It is permitted to tether animals and to severely restrict their movement. It is permitted to farm animals in such facilities where artificial light must replace natural light (Rules on the Protection of Farm Animals, 2010).
  9. The transport of live animals is permitted, and moreover, violations of legislation often occur in this context (Cussen, 2008).
  10. Painful marking of animals (e.g. with ear tags) is permitted (Broom, 2017).
  11. Diseases and deformities in animals are common, especially in industrial animal agriculture (Rossi and Garner, 2014).
  12. It would be very difficult to claim that farm animals live without fear and without psychological suffering and that they have the freedom to express species-specific behavior (Sobbrio, 2013).
  13. Artificial insemination of animals is permitted (Rules on Training ..., 2007). We doubt that the animal would consent to this if she had a choice. Would this not, in the case of a human victim, be treated as a criminal offense against sexual integrity?
  14. In beekeeping, clipping the wings of queens is permitted (Rules on Training ..., 2007).
  15. It is permitted to add dried pig blood and pig blood plasma to feed for piglets (Commission Implementing Regulation (EU) No 483/2014 ..., 2014; EAPA, 2016). This probably really isn't harmful and doesn't cause suffering, but — is this not forced cannibalism?
  16. The term “animal well-being” has the same meaning as the term “animal welfare” (Regulation on the animal welfare measure ..., 2016). Legislation offers animals only minimal protection from suffering (Berg and Yngvesson, 2012; Sobbrio, 2013). This is a sign of misunderstanding the terms “animal welfare” and “animal well-being.” This was best demonstrated by Proctor et al. (2013) in a systematic review of the literature on sentience in animals. They found that science focuses excessively on studying negative feelings/states in animals and neglects the studying of positive ones. If legislators/livestock farmers understood the term “animal welfare,” they would not focus only on preventing pain, suffering, and disease, but would strive to promote pleasure, joy, long-term friendships, and the physiological and psychological health of animals. By ignoring positive feelings, we ignore an important part of the meaning of life (Proctor, 2012; Proctor et al., 2013). Farm sanctuaries (and perhaps also organic farms) would be the most suitable locations for non-invasive studying of the positive feelings of farm animals. The well-being of animals in these sanctuaries should raise the meaning of the term “animal well-being” to a new level, and on the basis of their well-being new minimum ethical standards in animal agriculture should be established.

64% of Europeans (66% of Slovenians) would like to have more information about the conditions in which farm animals are raised (EC, 2016a). Producers know how consumers define the term “animal well-being” and design advertisements and websites on that basis. But they often do not reveal the real situations of most animals, as shown by Borkfelt et al. (2015) in their critique of marketing. When misleading producer marketing combines with the deliberate “turning a blind eye” of consumers, the true victims are the animals, who unfortunately can never protest themselves (Borkfelt et al., 2015).

If someone walked across the whole of Slovenia, they could, without the owners' consent, see how the production of most Slovenian plant foods takes place. The harvest would not remain hidden from their eyes. But without the owners' consent, they could not see the conditions in which most Slovenian farm animals live, and most slaughter would remain hidden from their eyes. In 2016 alone, more than 36 million animals were slaughtered in Slovenian slaughterhouses (Belec, 2017).

Ideally, cameras should be installed in industrial animal agriculture facilities (the poultry farm in Duplica near Kamnik, the Ihan farm, Meja Šentjur, the Ramuta farm, the Sušica farm, the Ravenca farm, etc.) and in slaughterhouses, enabling live web streaming — freely accessible to everyone. That this would be feasible is demonstrated by mountain webcams ([www.hribi.net](http://www.hribi.net)) and road traffic cameras ([www.promet.si](http://www.promet.si)). If owners objected to cameras, anonymity of the farm/slaughterhouse could be ensured. If they did not consider it fair to film only industrial animal agriculture, some cameras could show anonymous farms engaged in industrial animal agriculture, while some cameras could also show all other types of animal agriculture. Some livestock farmers already use video surveillance for their own purposes (Drevenšek, 2017). An advantage of live web streaming could also be the prevention of possible cruel treatment of animals, because workers would be aware that they are being observed not only by people interested in profit, but also by people interested in ethics. Supporters of cultured meat often point out that a major advantage of cultured meat will be transparent production — consumers will be able to visit and observe it, just as they can now visit breweries or ice cream factories (Ferrari and Lösch, 2017).

#### Does ethical omnivorism exist?

Milburn (2016) believes that veganism should at present be a moral duty for everyone who accepts the philosophy of animal rights. However, he anticipates that in the near future it will be possible to consume ethical animal-based foods that will be acceptable from the perspective of animal rights philosophy. Examples of such foods may be non-sentient animals (Which ones? This will depend on future consensus in cognitive science; insects and shellfish could be mentioned as examples, but for now it is more ethical to follow the precautionary principle.), cultured meat, “milk” from biotechnologically produced milk proteins (the company Perfect Day Foods), “egg whites” from biotechnologically produced egg proteins (the company Clara Foods), and animal-based foods from truly ethical modern farms (where a cow would be treated the way a cat would be treated) or from farm animal sanctuaries (some also mention modern companion animals as an example: e.g. a laying hen who would be treated the way a cat would be treated) (Ferrari and Lösch, 2017; Milburn, 2016; Hooley and Nobis, 2016; Meyer-Glitza, 2015).

But despite all these forthcoming ethical animal-based foods, it is very likely that due to high cost and small production scale these foods will not be able to become everyday staple foods for all people. Precisely for this reason, Fischer (2016) argues that relatively wealthy people should not fully support a solution to the moral problem if it is more expensive than switching to a vegan diet. Even if relatively wealthy people can afford animal-based foods that are much more ethical than those from industrial animal agriculture, they should still eat mostly vegan (Fischer, 2016). If the price of meat from industrial animal agriculture rises sharply in the future, cultured meat may become serious competition

to conventional meat, and every village could have its own bioreactor (van der Weele and Tramper, 2014).

Among ethical animal-based foods, Milburn (2016) also includes animals unintentionally killed on roads and free food from dumpsters (food whose expiration date has passed and which was not redirected into the hands of people in need). Bruers (2014, 2015), Milburn (2016), and Singer (2016) agree that killing animals is morally acceptable when survival is at stake (example: Inuit without access to a shop). But even in these rare cases, more ethical solutions should be sought (building a shop/moving closer to shops/moving to another country, ...).

### Social justice

Social justice may be included among the moral-ethical arguments for halving production, halving recommended intake, and halving actual intake of animal-based foods in Slovenia/Europe. Two separate arguments belong here:

- **1st argument:** Livestock farmers feed most farm animals with “food-competing feedstuffs” (abbreviation: FCFs; generalized explanation of the term: feed crops edible for humans, and feed crops inedible for humans that are grown on fields where crops for humans could be grown) (Schader et al., 2015). As long as hunger exists in the world, many do not consider this ethical (Janssen et al., 2016). The conversion of plant calories and proteins into animal calories and proteins is generally poor in animal agriculture, therefore far fewer plant calories and proteins would be lost in the food chain if people were fed directly with plant foods — without the wasteful intermediate step. If FCFs were used/grown for human food instead of for feeding farm animals, far more people could be fed than at present, since currently about one-third of produced plant calories and about half of produced plant proteins in the world become feed for farm animals (Cassidy et al., 2013; Pradhan et al., 2013; Schader et al., 2015; Smith, 2015; Shepon et al., 2016; Sabaté et al., 2016; Eshel et al., 2016; Erb et al., 2016; Sigle, 2016; Rööß et al., 2017). Because of the use of FCFs, animal agriculture is responsible for the largest amount of wasted food in the food supply chain (Alexander et al., 2017; Shepon et al., 2018). In addition to being a moral-ethical argument, this argument is also an environmental one, because the use of FCFs in animal feed represents inefficient use of natural resources. Besides a transition to veganism, there is another solution to the FCFs problem: sustainably oriented animal agriculture, in which there would be far fewer animals than in industrial animal agriculture and FCFs would no longer be used (Schader et al., 2015; Rööß et al., 2016). The main arguments favoring plant-oriented agriculture over sustainably oriented animal agriculture are: the high price of animal-based foods from sustainably oriented animal agriculture and the unethical nature of killing animals to satisfy non-essential human needs. The main argument favoring sustainably oriented animal agriculture is that pasture-raised ruminants transfer nutrients from plants inedible to humans (grass) into animal-based foods edible to humans; however, global food supply would increase in this way only if farmers did not simultaneously feed these animals FCFs. Animal-based foods originating from animals fed exclusively or almost exclusively on grass currently contribute only about 3% of animal protein and only

about 1% of total protein to the global food supply. The current average global intake of animal protein cannot be maintained without exploiting animals fed on FCFs, so from the perspective of food security it is unreasonable to maintain such a high intake of animal protein/animal-based foods (Garnett et al., 2017). Cassidy et al. (2013) predict that the availability of produced plant calories would increase enough to feed an additional 2 billion people already if, on the global level, intake of animal-based foods originating from animals fed on FCFs would be reduced by 50%. Jeke (2012), in a diploma project titled *How to Feed 9 Billion People?*, arrived at a conclusion similar to that of Cassidy et al. (2013).

- **2nd argument:** Working conditions in industrial animal agriculture, in the meat-processing industry, and in slaughterhouses are often poor. Frequent health problems and/or injuries and low pay are signs that this is a systemic violation of human rights (Rossi and Garner, 2014). Livestock farmers, slaughterhouse workers, and meat-processing workers are exposed to increased risk of zoonotic infections and increased risk of developing various respiratory diseases. Studies on slaughterhouse workers and meat-processing workers consistently indicate that these workers have an increased risk of cancer, and researchers in these studies also often found increased risk of death from any cause and increased likelihood of alcoholism/depression (Gubéran et al., 1993; Fritschi et al., 2003; McLean et al., 2004; Johnson and Zhou, 2007; Johnson et al., 2007; Johnson, 2011; Hall R. J. et al., 2013; Pal et al., 2013; Rossi and Garner, 2014; Jakobi et al., 2015; Stoleski et al., 2015; McClendon et al., 2015; Klous et al., 2016). People who live near industrial animal agriculture facilities also have more health problems because of polluted air (Rossi and Garner, 2014). Further reading: *Training Young Killers: How Butcher Education Might Be Damaging Young People* (Blaznik, 2018): <https://www.jstor.org/stable/10.5406/janimalethics.8.2.0199>

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