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# How climate-friendly does Tyrol eat?<sup>1</sup>

## Analysis of nutrition-related greenhouse gas emissions in a population in Western Austria compared to national dietary recommendations

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### Abstract

Using consumption data from the first Tyrol Nutrition Survey 2015 (*erste Tiroler Ernährungserhebung 2015* [TEE2015]), nutrition-related CO<sub>2</sub> equivalents (CO<sub>2</sub>eq) were calculated. In addition, a diet that corresponds to the Austrian nutrition recommendations was analyzed with regard to CO<sub>2</sub>eq and compared to the TEE2015 values. In Tyrol, milk and dairy products along with meat and meat products account for 42% of nutrition-related greenhouse gas emissions. The results show once again that healthy and sustainable diets require, above all, the reduction of meat consumption.

**Keywords:** sustainable nutrition, nutritional recommendations, CO<sub>2</sub> equivalents, carbon footprint, greenhouse gas emissions, ecological sustainability

### Method

In a cross-sectional study, food intake of 463 adults in Tyrol (235 women, 228 men) aged between 18 and 64 years was assessed by two non-consecutive 24-hour recalls. The recommendations of the Austrian nutrition pyramid [4], and the data from the TEE2015 were analyzed using secondary data from Life Cycle Assessments (LCA) to determine CO<sub>2</sub> equivalents for each food group. Various LCAs were used as a reference from a study by the Worldwide Fund for Nature (WWF), which had already reviewed the data for Austria [5]. In order to facilitate the comparison of the results, the values were standardized to an energy intake of 2000 kcal. The average CO<sub>2</sub>eq and the nutrient intake of the study population were calculated and compared using ANCOVA and t-Test.

### Results

With a diet in accordance with the recommendations a total of 4.74 kg CO<sub>2</sub>eq/day arise. Within the Tyrolean population, the calculation showed an average of 4.04 kg CO<sub>2</sub>eq/day per person. The three food groups of milk and dairy products, cheese as well as meat and meat products account for 42.1% of the nutrition-related CO<sub>2</sub>eq/day in Tyrol, making them the main sources.

### Introduction

The first Tyrol nutrition survey (TEE2015) was conducted in 2015 at the Health University of Applied Sciences Tyrol with its results incorporated into the Austrian Nutrition Survey's report which was published in November 2017 [1]. The requirements for an appropriate modern diet should take both health and sustainability aspects into account, including the dimensions of health, ecology, society, economy, and culture [2, 3]. Therefore, as we are looking at both health and ecological aspects, we must not only ask how healthy Tyroleans eat, but also how their eating habits contribute to greenhouse gas emissions. In addition, the data from the TEE2015 regarding environmental effects was compared with the data from the national nutrition recommendations.

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<sup>1</sup> Updated version of a poster from the 2017 Conference of the Austrian Nutrition Society in Vienna

| Food group  | average consumption in g/day | CO <sub>2</sub> eq/day in kg | Amount of total CO <sub>2</sub> eq in % |
|---|------------------------------|------------------------------|---|
| nonalcoholic beverages (water and mineral water, fruit juices, soft drinks; without coffee and tea) | 1,899                        | 0.36                         | 8.7                                     |
| coffee and tea  | 615                          | 0.25                         | 5.9                                     |
| vegetables and pulses   | 184                          | 0.15                         | 3.6                                     |
| fruit   | 140                          | 0.12                         | 2.8                                     |
| bread   | 111                          | 0.17                         | 4.0                                     |
| cereal and cereal products  | 140                          | 0.33                         | 7.9                                     |
| potatoes  | 47                           | 0.03                         | 0.7                                     |
| milk and dairy products   | 219                          | 0.47                         | 11.1                                    |
| cheese  | 58                           | 0.43                         | 10.2                                    |
| plant oils, nuts, seeds and margarine   | 16                           | 0.03                         | 0.7                                     |
| butter  | 8                            | 0.12                         | 3.0                                     |
| eggs and egg products   | 16                           | 0.04                         | 1.0                                     |
| meat and meat products  | 82                           | 0.88                         | 21.0                                    |
| fish and seafood  | 28                           | 0.16                         | 3.9                                     |
| candy, dessert and snacks   | 103                          | 0.21                         | 5.0                                     |
| instant meals and fast food   | 7                            | 0.03                         | 0.7                                     |
| alcoholic beverages   | 178                          | 0.12                         | 3.0                                     |
| soy products  | 7                            | 0.01                         | 0.2                                     |
| other foods (sauces, dressings, meal replacements, protein shakes, sweeteners)                      | 123                          | 0.29                         | 6.8                                     |
| <b>total CO<sub>2</sub>eq</b>   |                              | <b>4.20</b>                  | <b>100 %</b>                            |

Tab. 1: Level of consumption and CO<sub>2</sub>eq per capita with an average energy consumption of 2,145 kcal/day (n = 463)

With an average intake of 492 g/day (calculated on the basis of the recommendations), milk and dairy products, including cheese, result in 1.68 kg CO<sub>2</sub>eq/day. Compared with the Tyrolean population the average intake with 205 g/day and 0.87 kg CO<sub>2</sub>eq/day is 51.8% lower than the figure based on the recommendations. The low consumption of this food group, which is one of the main sources of calcium in many countries, is notable in the nutrient profile: With an average daily intake of 981 mg (standard deviation [SD]: 413 mg) of calcium per day (in absolute figures), the intake of the study population differs slightly from the D-A-CH reference values of 1,000 mg/day [6], whereas women with an intake of 870 mg/day (SD:

323 mg) consume significantly less calcium than men with an intake of 1,095 mg/day (SD: 463 mg; p ≤ 0.001). Based on a diet in accordance with the recommendations, the calculated value for the calcium intake is 1,371 mg/day. More than half of the Tyroleans (56.6%) do not reach the dietary recommendations for calcium intake. The quantity of meat and meat products calculated on the basis of the recommendations is 51 g/day with an average production of 0.59 kg CO<sub>2</sub>eq/day. Meat consumption among the Tyrolean population is 26% above the recommendations with 76 g/day, producing 0.80 kg CO<sub>2</sub>eq/day, whereas men produce significantly more CO<sub>2</sub>eq/day with 0.98 kg than women with 0.74 kg

CO<sub>2</sub>eq/day (p ≤ 0.001). For comparison ♦Table 1 shows the absolute intake levels and the CO<sub>2</sub>eq/day.

## Discussion

Compared to the figures calculated on the basis of the national recommendations, 15% less CO<sub>2</sub>eq arise within the Tyrolean population despite the high meat consumption. This can be attributed to the low consumption of milk and dairy products.

Three portions of dairy products per day are recommended [3], but the study population consumes only half of this amount, whereas on the one hand the CO<sub>2</sub>eq produced remains low (36.6% vs. 21.3%), but

on the other hand 56.6% of the Tyroleans do not achieve the D-A-CH reference value of 1,000 mg of calcium [5] per day. Therefore, the results of the Tyrolean population are in line with those from Austria and Germany, which show that 50–75% of those surveyed did not achieve the recommended calcium intake [1, 7]. Consequently there is potential for interventions, especially in terms of reducing meat consumption which is currently too high in the population. In Tyrol, cutting the intake level of meat in half alone would save up 10.5%, and would help to contribute to a healthy and ecologically sustainable diet. In the course of interventions – either individual consultations or projects – alternatives to meat consumption can be demonstrated, and thus the population's awareness of how to achieve a diet that meets their needs and is also sustainable can be increased.

## Limitations

LCAs describe the overall environmental impact of a food product across its life cycle from the extraction of raw materials to the production and utilization phases, up to waste management, and point out possible environmental conflicts. The International Organization for Standardization (ISO) provides a general framework for LCAs, but these studies are repeatedly criticized for producing different results for the same products [8]. Furthermore, it was not possible to distinguish between organic and conventional products in this survey and the origin of the foods could not be determined. The values used in these calculations are therefore only estimations of possible nutritional environmental effects.

## Conclusions

As in many other countries, meat consumption in Tyrol is above the recommended levels, which poses

not only a health problem but also an ecological problem. Milk and dairy produce a proportionally high amount of CO<sub>2</sub>eq, however, they are also an important source of calcium in many countries. In light of the current intake figures in the population and in light of the environmental aspect, the focus still must be on reducing the consumption of animal-derived food, especially meat and meat products, in order to achieve a diet that is both healthy and sustainable.

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## Conflict of Interest

The authors declare no conflict of interest.

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