SUFO:TROP

Sustainable Food Consumption: Trends and Opportunities

Final Report

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Zusammenfassung

Der vorliegende Bericht präsentiert Ergebnisse des zweiten Jahres des Global Change Projekts "Sustainable Food Consumption: Trends and Opportunities". Ziel des Projekts ist es, zu einem nachhaltigeren Lebensmittelkonsum in Österreich über eine Analyse des Nahrungsmittelkonsums, seiner Trends und damit verbundener Umweltfolgen beizutragen. Aufbauend auf diesen Ergebnissen werden mögliche Politikoptionen zur Stärkung nachhaltigen Lebensmittelkonsums diskutiert.

In Kapitel 2 werden sozioökonomische Ursachen der Muster des Nahrungsmittelkonsums identifiziert und für verschiedene Haushaltstypen und Nahrungsmittelkategorien untersucht. Nach einer Analyse des Lebensmittelkonsums des österreichischen Durchschnittshaushaltes wird der Konsum für verschiedene sozioökonomische Gruppen verglichen, und zwar nach den Faktoren Alter, Einkommen, Bildung, Erwerbsstatus und Familientyp. Ältere Personen konsumieren mehr Gemüse und Obst im Verhältnis zu Fleisch, als jüngere. Jüngere Personen zeigen eine höhere Präferenz für Wurst- und Selchwaren, Faschiertes, Reis, Teigwaren, Brot und Staudengemüse, als Folge von (zeitlicher) Bequemlichkeit. Haushalte mit niedrigem Einkommen reagieren meist auf Preise und suchen nach ergiebigen Nahrungsmitteln. Sie konsumieren einen höheren Anteil an Kartoffeln (anstellen von anderen Gemüsearten), Äpfeln und Birnen (anstelle von exotischen Früchten) und geringere Mengen an abgefüllten Getränken. Einkommensstarke Haushalte konsumieren einen höheren Anteil an Rindfleisch, einkommensschwächere eher Schweinefleisch. Reichere Haushalte reagieren stärker auf Zeitmangel durch verstärkten Konsum an Lebensmitteln, die schnell zubereitet werden können (Wurst- und Selchwaren, Käse, Topfen, Joghurt). Menschen mit höherem Bildungsniveau konsumieren vermehrt Gemüse, Früchte, Brot, Reis, Mehl und Teigwaren anstelle von Fleisch. Die Ernährungsgewohnheiten dieser Haushalte hängen im Wesentlichen ab von: Geschmack, Zeitverfügbarkeit, Gesundheitsbewusstsein und/oder ökologischem Bewusstsein.

Die Ernährung landwirtschaftlicher Haushalte besteht großteils aus traditionellen Lebensmitteln wie Brot, Mehl, Äpfeln, Birnen und Schweinefleisch. Ernährungsgewohnheiten Angestellter und Selbständiger werden vor allem durch Zeitbeschränkungen bestimmt, und damit einer Präferenz für Lebensmittel, die schnell zubereitet werden können. Einkommenseffekte führen dazu, dass Angestellte in hohen Positionen den größten Anteil an Rind- und Kalbsfleisch konsumieren. Der Nahrungsmittelkonsum spiegelt Familienstrukturen wider, die sich aus unterschiedlichen Geschmäckern und Ernährungsempfehlungen (z.B. erhöhter Kalziumbedarf von Kindern) ergeben. Daher konsumieren Haushalte ohne Kinder (Single- und Erwachsenenhaushalte) höhere Mengen an Gemüse, Obst und Fleisch als Alleinerziehende und Familienhaushalte. In Bezug auf Unterkategorien bestehen jedoch nur schwache Unterschiede. Ein relevanter Trend ist allerdings, dass Haushalte ohne Kinder mehr Rindfleisch und weniger Schweinefleisch und Geflügel konsumieren, die bei Familienhaushalten sehr beliebt sind.

Zur Berechung von Umwelteffekten des Lebensmittelkonsums in Kapitel 3 wurden zwei Indikatoren ausgewählt: CO_2 Äquivalente Emissionen für den Bereich Klimawandel und Materialinput für den Bereich Ressourcennutzung. Der Effekt auf beide Indikatoren wurde separat berechnet und dann verglichen. Als Basis wurden die Präferenzen der Haushaltsgruppen für verschiedene Fleisch-, Gemüse- und Obstarten genommen und diese mit den Präferenzeffekten eines Durchschnittshaushaltes verglichen. Hauptergebnis ist, dass die Umwelteffekte des Fleischkonsums jene der anderen Lebensmittelkategorien dominieren; das bedeutet dass nachhaltige Präferenzen in den Kategorien Obst und Gemüse unnachhaltige beim Fleisch nicht kompensieren können. Die stärksten Effekte bei beiden Indikatoren

haben Haushalte mit hohen Angestelltenstatus, hohem Einkommen, gefolgt von hoch gebildeten und Single Haushalten. Junge Haushalte haben ebenso negative Effekte, allerdings sind diese für den Indikator Materialinput wesentlich stärker. Landwirte und Haushalte mit unteren und mittleren Angestellten/Arbeitern tragen wegen ihrer traditionellen Essgewohnheiten wesentlich weniger zu Emissionen und Materialverbrauch bei.

Diese Ergebnisse geben jedoch keine Auskunft über die Umwelteffekte, die auf absolut konsumierten Mengen beruhen. Um einen ersten Eindruck dieser Wirkungen zu bekommen, haben wir die relativen Anteile von verschiedenen Lebensmittelkategorien nach sozioökonomischen Gruppen berechnet. Es zeigt sich hier, dass die obigen Schlussfolgerungen modifiziert werden müssen. Jene Gruppen, die schlecht abschneiden, haben einen höheren Anteil an Obst und Gemüse relativ zu Fleisch gemessen am Gesamtkonsum, was ihre Klassifikation als unnachhaltige KonsumentInnen relativiert.

Abschließend werden in Kapitel 4, basierend auf oben genannten Ergebnissen und einem Stakeholder Workshop, Empfehlungen für Maßnahmen entwickelt. Wir haben uns dabei auf zwei Hauptergebnisse konzentriert. Einerseits scheinen Maßnahmen, die vor allem das Verhalten von jüngeren und/oder wohlhabenden Haushalten in hohen Positionen beeinflusst sinnvoll, um den Trend hin zu nachhaltigerem Lebensmittelkonsum zu verändern. Diese Gruppen machen allerdings nur einen kleinen Anteil an den österreichischen Haushalten aus; daher ist es auch wichtig, Maßnahmen zu entwickeln, mit denen die große Gruppe der Haushalte mit niedrigen und mittleren Einkommen und Positionen ermutigt wird, ihre traditionellen Eßgewohnheiten beizubehalten UND mehr biologische Lebensmittel zu konsumieren, sowie den Fleischkonsum zu reduzieren. Auf der einen Seite sind Maßnahmen zu empfehlen, die zu einem verringerten Konsum jener Lebensmittel führt, die am unnachhaltigsten sind: Fleisch, hier vor allem Rindfleisch und Wurstwaren. Prinzipiell ist es wichtig, Maßnahmen zu setzen, die für die KonsumentInnen ansprechend sind, über "ihre" Medien eingesetzt werden und zur Verhaltensänderung motivieren.

Abstract

This report presents results from the second year of the Global Change project "Sustainable Food Consumption: Trends and Opportunities". The objectives of the project are to contribute to a transition to more sustainable food consumption in Austria through an improved understanding of food consumption patterns and trends and their direct environmental impacts, to identify and discuss key policy options for enhancing sustainable food.

In Chapter 2, we identify relevant socio-economic driving forces for food consumption and analyse these drivers for different household and different food categories. After analysing the household food consumption of an average household, we compare different socio-economic groups by the factors of age, income, education, employment status and family type. Older people consume more vegetables and fruits than meat in comparison to younger age groups. In particular, younger people have a higher (relative) preference for dried, smoked and salted meat, minced meat, rice, pasta products, bread and fruiting and flowering vegetables, which could reflect the time convenience dependency in the diets of young people. Lower income households respond mainly to price and look for filling foods. They have a higher relative consumption of potatoes (instead of root, fruiting and flowering vegetables), apples and pears (instead of exotic fruits) and lower absolute figures in bottled beverages. Income has no influence on total consumed quantities of meat, but only on the consumption of beef. High income households consume a higher share of beef, whereas low income households substitute beef with higher amounts of pork. Diets of higher income households respond to time scarcity with higher consumption figures for foods that can be quickly prepared (dried, salted and smoked meat, cheese, curd and yogurt). People with higher education consume more vegetables, fruits, bread, rice, flour and pasta in contrast to meat. The dietary choices of higher educated households are generally dependent on three factors: taste, time scarcity and health and/or environmental awareness.

Diets of rural households are largely made up of traditional foods like bread, flour, apples, pears and pork. Dietary choices of employees, irrespective of their position, and the self-employed are driven mostly by time constraints. This argument is based on a higher preference for food products that need less time for preparation (e.g. dried, salted and smoked meat instead of pork, fruiting and flowering vegetables instead of potatoes) by both labour force status groups. The income factor may be the reason why employees in top positions have the highest share of beef and veal consumption. Household food consumption reflects structures within families, due to different tastes but also because of nutritional aspects (e.g. higher recommended calcium intake for children). Accordingly, households without children (couple households, adult households) have highest consumption figures of vegetable, fruits and meat, whereas single parents, family households and single households consume markedly less. By focusing the analysis within the categories of vegetables, meat and fruits, it can be stated that the family type has only a weak influence on food preferences. The only relevant trend is that households without children have a stronger preference for beef, at the expense of pork and poultry, which are very popular among family households.

In Chapter 3, environmental impacts of food consumption are calculated according to two indicators: CO_2 equivalents emissions for the issue of climate change and material input for the issue of resource use. The effect on both was calculated separately and then compared. We have built on the preferences of household categories for different forms of meat, vegetables and fruits and then compared the impacts of those preferences to those of an average household. In general one can say that the preference effects of meat are much larger than the effects of fruits and vegetables, which means that being sustainable in the preferences for vegetables and fruits can not compensate being unsustainable in the category of

meat. The highest impacts for both indicators are given for top employee households and for high income households, followed by highly educated households and singles. Young households also have negative impacts compared to the average household; however they are much stronger in the case of material inputs. Farm households and households of low and middle position people contribute less to emissions and material use, because of traditional eating habits.

These results do not, however, give any indications about the environmental impacts due to quantities consumed; to get a first impression we have calculated the relative shares of different food categories by socio-economic groups. We have to modify the conclusion for those households who have a strongly positive preference effect (except for young households). While they consume less sustainable types of particularly meat, they have higher shares of vegetables and fruits relative to meat. In other words, their overall combination of meat, fruit and vegetables is more sustainable than on average, making their classification as unsustainable consumer groups more ambiguous.

Based on the results and on a stakeholder workshop, recommendations for (policy) measures are developed in Chapter 4. Thus policies, in particular aiming at influencing the behaviour of younger, wealthy people and those in high positions are seen to be a very efficient way of changing the trend. But as this group represents only a small share of all Austrian households, the big group of low and middle position households should be addressed as well and encouraged (via information campaigns, subsidies, CO_2 taxes etc.) to keep their traditional eating habits AND to consume more organic food and less meat. Besides giving recommendations for the most relevant socio-economic group we also focus on measures that lead to reduced consumption of the most unsustainable food category, which is meat, and here especially beef and dried, salted, smoked meat. Measures that raise awareness and change behaviour, that are given in an appealing way via the media that appeal to the different groups are recommended.

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1 Introduction

The current report presents results of the work done in the two years of the Global Change project "Sustainable Food Consumption: Trends and Opportunities" (September 2005 until June 2007).

The overall objectives of the project are to contribute to a transition to more sustainable food consumption in Austria through an improved understanding of food consumption patterns and trends and their direct environmental impacts, to identify key policy options for enhancing sustainable food consumption and to discuss those.

The overall aims of the project were to:

- describe changes of Austrian food consumption patterns over the last 20 years, and increase understanding of their driving forces and of their direct environmental impacts
- select indicators of sustainable food consumption based on previous work
- identify the relevant socio-economic driving forces for food consumption and analyse these effects for different household and different food categories based on data from the Austrian Consumption Survey, the official Austrian Nutrition Report etc. (Chapter 2)
- examine the relationship between household consumption expenditures and environmental impacts of Austrian food consumption (Chapter 3)
- identify key policy options for enhancing sustainable food (Chapter 4)
- presentation of result at conferences and publication of the results in peer-reviewed journal(s).

In the first year the focus was put on the first two aims, namely to describe the Austrian and international food consumption patterns and their trends, to describe general environmental impacts of food consumption based on a life-cycle approach, to decide on a definition for sustainable food consumption, and to derive indicators from that definition. These results can be found in the first interim and final year reports.

In the second year we analysed socio-economic determinants of food consumption and related household categories to consumption in the areas meat, fruits and vegetables. We found the following as important parameters: household size, age, net income, educational level, labour force status, family type.

Having the information about quantities and preferences of different household categories for different food classes, the next step was to calculate environmental impacts of those household categories. We have chosen two indicators, CO_2 equivalents to show the impacts on climate change and material input to show the resource intensity.

At the end of April (2007) the research team organised a stakeholder workshop with 13 participants from different institutions linked to food consumption and sustainability, such as the Chamber of Agriculture, Global 2000, and the Federal Ministry of Environment. The main aim of this workshop was to discuss possible suggestions for activities to foster sustainable consumption, based on our research results. This workshop together with a policy analysis led to a set of suggestions for activities on different levels and for different decision makers (politicians, chambers, NGOs, media, schools etc.).

We have presented our results at three international conferences (Launch conference of the Network Sustainable Consumption Research Exchange, November 23-25 2006, Wuppertal; 9th conference of the International Society for Ecological Economics, December 15-18 2006, New Delhi; 7th conference of the

European Society for Ecological Economics, June 5-8 2007, Leipzig) and at the above mentioned stakeholder workshop. A first paper will be submitted to Food Policy in summer 2007.

2 Socio-economic determinants of food consumption

2.1 Data Base

The Austrian Household Budget Survey contains a collection of data concerning total household income and expenditures of private households. The first survey in Austria was conducted 1954/1955 and contained 4,039 households. The inquiry was repeated at intervals of ten years (1964, 1974/75, 1984/85, 1993/94) before 1999/2000, and has been conducted at intervals of five years thereafter. All results reported below refer to the 1999/2000 survey.

The survey from 1999/2000 is based on 7,098 interviewed households, whereby each household included represents a given number of households in the Austrian population. The translation of sample households into the total number of households (3,241,303) is known as weighting. Several factors are involved in determining the weight for each household like the federal district and the level of urbanisation of the place of residence, type of household, the labour force status and social status of the household head, as well as the age and gender of household members.

Data availability and classification

The 1999/2000 survey compromises the expenditure figures (in ATS) of private households according to the COICOP[1] nomenclature (version from 1997) as prepared by the OECD after consultation with Eurostat, UNSD[2] and National Statistical Agencies of its member countries (European Commission and Eurostat, 2006). This nomenclature refers to a recognized international list of classifications, which groups individual (or household) consumption expenditures by purpose:

- foods and non-alcoholic beverages
- alcoholic beverages and tobacco
- clothing and footwear
- housing, water, electricity, gas, and other fuels
- furnishings, household equipment and routine maintenance of the house
- health
- transport
- communication
- recreation and culture
- education
- restaurants and hotels
- miscellaneous goods and services

Apart from expenditures, quantities consumed (in kilograms, litres or units) are available for the category of foods and beverages, both alcoholic and non-alcoholic. In addition to absolute household expenditure figures, the Austrian Household Budget Survey has also assigned each household an equivalence figure that enables the computation of equivalence expenditures. Equivalence expenditures are expenditures

[1] **C**lassification **O**f **I**ndividual **Co**nsumption by **P**urpose
[2] **U**nited **N**ations **S**tatistics **D**ivision (UNSD)

corrected for the size of the household and age of its members in order to make different household compositions comparable.

Furthermore, the consumption survey collects information with regard to socio-economic and demographic characteristics of the household and the household head[3]. The following socio-economic and demographic characteristics are collected, where attributes from 1-4 and 12-14 refer to the entire household and 5-11 only to the household head (Statistik Austria, 2004):

(1) total household expenditures

(2) total household net income

(3) household size

(4) number of children living in the household

(5) age

(6) educational level

(7) labour force status

(8) current participation in working life

(9) sector of economic activity

(10) labour time

(11) gender

(12) federal district

(13) living space in square meters

(14) population density

As one aim of the project is to find socio-economic and demographic differences in food expenditures and consumed quantities, this evaluation has taken the following characteristics into account: total household expenditures and net income, household size, age, educational level, labour force status.

COICOP classification of the category foods and non-alcoholic beverages and restaurants and hotels

Data on the COICOP group **foods and non-alcoholic beverages** and food expenditures in **restaurants and hotels** have been analysed. Therefore, it is important to know about the sub-categorisation according to COICOP.

- The category of **foods** consists of nine subcategories:
- bread and cereals
- vegetables
- fruits
- meat
- fish

[3] Statistik Austria (2004) defines the household head as the household member that contributes most to total household net income.

- milk, cheese and eggs
- oils and fats
- candies and sweets
- other foods

The category of **non-alcoholic beverages** is divided into two groups:

1 coffee, tea and cocoa
2 mineral water, soft drinks and juices

For information about which food products belong to which category see Pack (2006 ch. 4.2).

The COICOP category for **restaurants and hotels** (called **out-of-home consumption**[4] in this report) refers to food that is prepared outside the home but is to be eaten at home (take-away and delivery services) and to food that is prepared and consumed away from home. According to the international classification, three categories are distinguished: *gastronomic sites*, *communal settings* and *hotels*. The first term includes eating in cafés, bars, restaurants and fast food chains (including take-away and delivery services). '*Communal settings#* refers to eating in canteens of private (e.g. enterprises, firms) or public institutions (e.g. kindergartens, schools, hospitals, jails, etc.) on the one hand, and "meals on wheels" on the other[5]. The last term, *hotels*, accounts for expenditure figures spent on staying and eating in *hotels* or similar accommodations. Concerning out-of-home consumption, the Austrian Household Budget Survey gives only information about monthly expenditures but does not specify amounts or kind of meals consumed. In other words, the reader is not able to determine whether high expenditure figures on out-of-home consumption result from a higher frequency of eating out or from a higher quality of consumed meals.

We now investigate the consumption differences across household groups. Thus this chapter focuses on socio-economic determinants of (monthly) household and consumed quantities (Section 2.3). The following socio-economic and demographic characteristics are analysed:

- household size (persons)
- age of the household head
- total household net income
- educational level of the household head
- labour force status of the household head.

2.2 Household expenditures and consumed quantities

2.2.1 Total household expenditures by COICOP

Before focusing on food-related expenditures, a short overview of the allocation of total monthly household expenditures (€ 2,437) of an average Austrian household across COICOP categories is given (Figure 1). The highest share of total household budget is spent on housing, water, electricity, gas and other fuels (24%), followed by transport, which constitutes a share of 15%. In line with the trend of declining household expenditures on nutrition in high income countries (OECD, 2002a), Austrians spend

[4] In the following chapters, the term out-of-home consumption excludes expenditures in hotels.
[5] The project *meals on wheels* refers to home delivery services for homebound, frail or disabled people, who are unable to purchase and prepare foods on themselves. The participation of numerous volunteers and the preparation of larger quantities make it affordable even for low income households.

a rather low percentage of their total household budget on foods and beverages (13%). By including expenditures on out-of-home consumption (i.e., expenditures on eating in hotels or restaurants), the share rises by 6% to 19%.

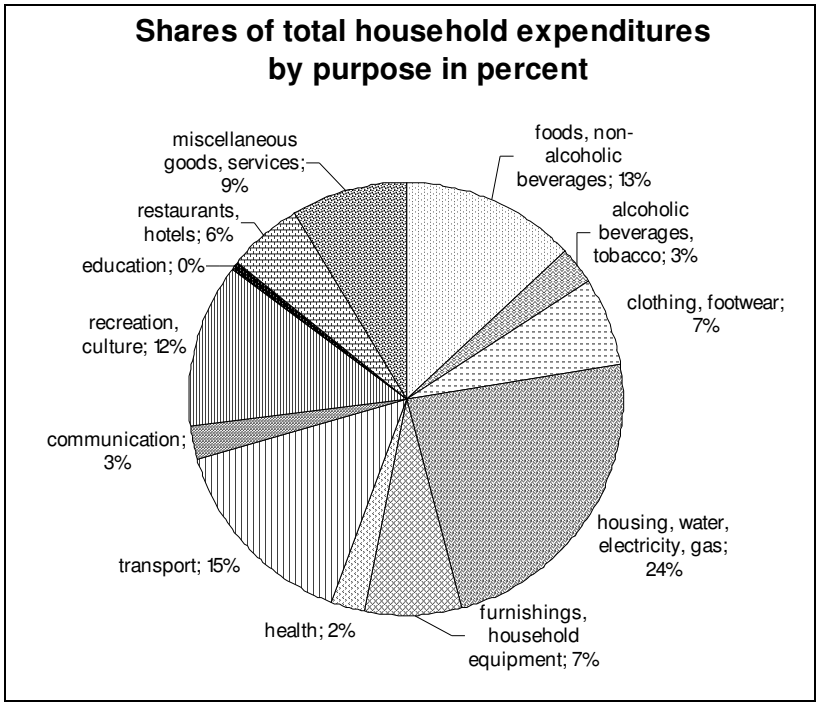


Figure 1: Shares of total household expenditures by purpose (COICOP categories) in percent (STAT, 2004; own calculation)

2.2.2 Expenditures on and consumed quantities of foods and beverages

The total household expenditures on foods and non-alcoholic beverages amounts to € 321 per month (€ 289 is spent on foods and € 32 on beverages). About one fifth of total expenditures on the aggregate of foods and beverages is attributable to meat expenditures (22%). Bread and cereals account for 15%, milk and milk products for 13%, whereas expenditures on fruits and vegetables each constitute a share of 8%. Relative expenditures on candies and sweets (8%) are as high as on vegetables or fruits. The remaining 26% is attributable to non-alcoholic beverages (10%), fish and seafood (2%), oils and fats (3%) and other foods (12%).

By looking more closely at the consumed quantities of different food and beverage categories (Table 1), Austrian consumption patterns are found to be in line with international trends mentioned by OECD (2002a), for example the shift to increased consumption of vegetables (with a large share of frozen products), fruits, bottled beverages, cereal products (result of higher consumption of fast food, pizza and pasta), and meat (in particular pork and poultry). Animal fats are increasingly substituted by vegetable oils. A decline can be observed in consumption of potatoes and dairy products, except cheese. Another strong trend is the increasing consumption of easy-to-prepare or pre-prepared meals and the increase of out-of-home consumption. Due to the increasing share of people over 60 in future, it is expected that the demand for food will decline, because older people have lower energy requirements.

Concerning out-of-home consumption, the Austrian Household Budget Survey gives only information about monthly expenditures but does not specify amounts or kind of meals consumed. Therefore, consumed quantities out-of-home cannot be considered in our calculations.

Table 1: Monthly household consumption of and expenditures on selected foods and non-alcoholic beverages of an average Austrian household in kilogram, litre, units and Euro (EUR-ATS); Source: STAT, 2004; own calculation

	quantities consumed	expenditures
Food		**in EUR-ATS**
carbohydrates (rice, bread, flour, pasta)	12.1 kg	21.3
Vegetables	14.1 kg	18.2
Fruits	13.0 kg	21.4
Meat	9.8 kg	66.4
Fish	0.6 kg	6.7
Yogurt	2.7 kg	6.5
cheese, curd	2.0 kg	14.2
Milk	13.7 l	10.6
Eggs	37.0 units	6.3
animal fats	0.9 kg	4.3
vegetable fats	0.7 kg	2.2
candies (sugar, jam,…)	4.5 kg	6.1
beverages (non-alcoholic)		**in EUR-ATS**
coffee, tea, cocoa	1.6 kg	11.5
mineral water, soft drinks, juices	29.0 l	20.2

*) Expenditure figures are available for all food categories, but for some categories information on consumption data is not available (in total, for 30% of expenditures figures). Therefore, the table shows only expenditure figures for which corresponding quantities are available.

2.3 Household food consumption in quantities according to socio-economic parameters

In order to evaluate the sustainability of food consumption (which was one of the remaining project tasks), it is necessary to differentiate the food groups and categories. Before investigating the differences across socio-economic and demographic groups, selected food and beverage categories and applied methods are presented.

Selected food and beverage categories

It is important to note first that some food and beverage categories lack representative consumption figures (in quantities). In other words, only a low percentage of households taking part in the survey indicated consumed quantities for these categories. The factor of convenience for the recording person or a lack of adequate quantity information on packaging material may be reasons for this limited data availability. Another reason could be the fact that households simply did not purchase some products.

Since data availability is limited for several food categories, the following analysis is restricted to the following categories, which are well represented:

- rice, bread, flour and pasta
- vegetables (fresh)
- fruits (fresh)
- meat (fresh or frozen)
- fish and seafood (fresh, frozen, dried and smoked)
- yogurt
- cheese and curd
- animal fats
- vegetable fats
- candies (sugar, sweetener, jam, honey)
- coffee and cocoa
- mineral water, soft drinks and juices

Average consumption figures (in quantities) are listed in each sub-section. Corresponding expenditure figures are determined by price. These figures depend on food origin (domestic versus overseas production, for example) and quality (organic versus conventional farming, etc.). In general, expenditure figures of food categories correlate well with trends in consumption and therefore are not discussed separately.

Concerning out-of-home consumption, Statistik Austria offers data covering monthly expenditures, but does not indicate the amount or the nature of meals consumed. Therefore, further analysis in the area of out-of-home consumption is not feasible. The trends in out-of-home consumption by socio-economic characteristics covered in Section 2.1 should be kept in mind, since they explain the absolute high/low consumed quantities of households having different structures. In the strictest sense, it is assumed that high expenditures on out-of-home consumption result in a lower need for foods and beverages purchased for consumption at home and vice versa.

Equivalence scale

As the aim of Section 2.3 is to compare socio-economic characteristics of households and their preference for food and beverage categories purchased for consumption at home, it is necessary to eliminate the influence of household size. A simple adjustment might be to divide expenditure and consumption figures by the number of people living in the household and to calculate per capita figures. However, this method ignores the impact of economies of scale in consumption. In other words, it is true that household needs grow with additional members, however not in a proportional way. A two-person household, for example, cannot live as cheaply as a single-person household, but two people living together are likely to spend less (e.g. larger households could benefit from purchasing in bulk) than if they lived separately in order to attain the same standard of living. However, not only the number of people living in the household is considered but also their age. It seems reasonable to postulate that a three-adult household has higher needs than a two-adult and one-child household. Equivalence scales assign each household type a value in proportion to its needs. Standardised figures are obtained by dividing expenditure and consumption figures of each household by the corresponding equivalence value. Thus, the basis of standardisation is the one-person household (Statistik Austria, 2004).

As mentioned above, the factors taken into account are household size and the ages of its members. While a variety of scales exist, for example the OECD Scale or the EU Scale, the Statistik Austria standard scale is used in this analysis.

The Statistik Austria Scale assigns a value of 1 to the first household member, of 0.7 to each additional adult and values of 0.33 to 0.8 for children according to their age (Table 9). A household with 2 adults and 2 children aged 16 and 7 is thus assigned a value of 2.95 (1+0.7+0.7+0.55).

The following sub-sections present a detailed description of equivalence consumption figures of selected food and beverage categories by various socio-economic and demographic household characteristics.

2.3.1 Household size

The fact that household size determines consumed food quantities is beyond question. As expected, quantities increase with each additional member living in the household, however not in a proportional way. In a strict sense, total consumption increases but per capita food consumption declines slightly, so that food does not have to be replaced in proportion to the number of household members. This effect can be explained by the different structure of households (number and age of household members), discussed in the preceding section.

Increases in consumption figures of food and beverage categories occur in differing amounts. The consumption of **rice, bread, pasta and flour** products, for example, nearly quadruples from single-person households to five or more-person households, 7 kg versus 26 kg. The consumption of **vegetables** increases steadily with each additional household member. A five or more-person household consumes three and a half times more vegetables (25 kg) than a single-person household (7 kg). Within the category of vegetables (Figure 2), potato consumption, which accounts for 45% to 47% of total fresh vegetable consumption, dominates irrespective of household size. Fruiting and flowering vegetables are slightly below one quarter of total fresh vegetable consumption. The consumption of leaf vegetables and herbs is about 11%, the consumption of root vegetables around 14%. Only households with five or more members have higher figures in relative leaf vegetable (14%), but consequently have lower figures in root vegetable (12%) consumption.

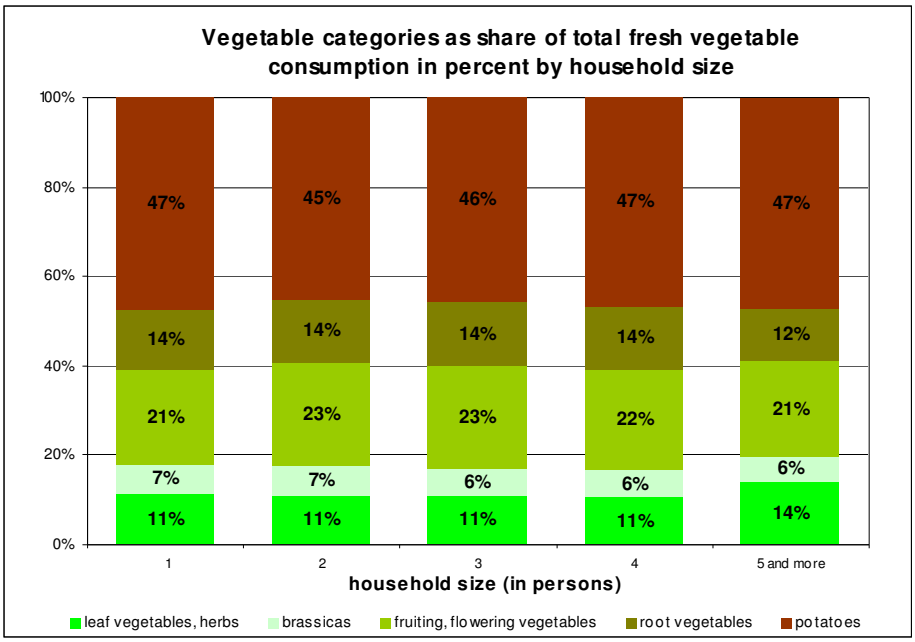


Figure 2: Vegetable categories as share of total fresh vegetable consumption (in quantities) in percent by household size; Source: raw data from Statistik Austria, 2002; own calculation

Fruit consumption increases from 8 kg in single-member households to 24 kg in households with five or more-persons.

Maximum differences in consumption figures are observed within the **meat category**, which nearly quintuples from 4 kg (single-person households) to 22 kg (five or more-person households). In addition to total meat consumption, the aim of this report is to identify trends within the category of meat, if they exist. Figure 3 shows the relative consumption of various meat categories (beef, pork, poultry, sheep, goat, dried, salted and smoked meat, minced meat and other meat) as a share of total of fresh and of frozen meat consumption by household size. The consumption of beef and veal, which varies between 13% and 14%, does not change significantly according to household size. A well-defined trend can be identified with pork as well as with dried, salted and smoked meat consumption. As household size increases, relative figures of pork consumption grow, from 20% to 31%, but at the same time the category of dried, salted and smoked meat declines by 5%, from 36% to 31%. A slight downward trend can be observed in poultry: numbers fall from 17% (single household) to 14% (five or more person household). The category of sheep and goat, which varies between 1% and 2%, plays only a minor role in Austrian diets.

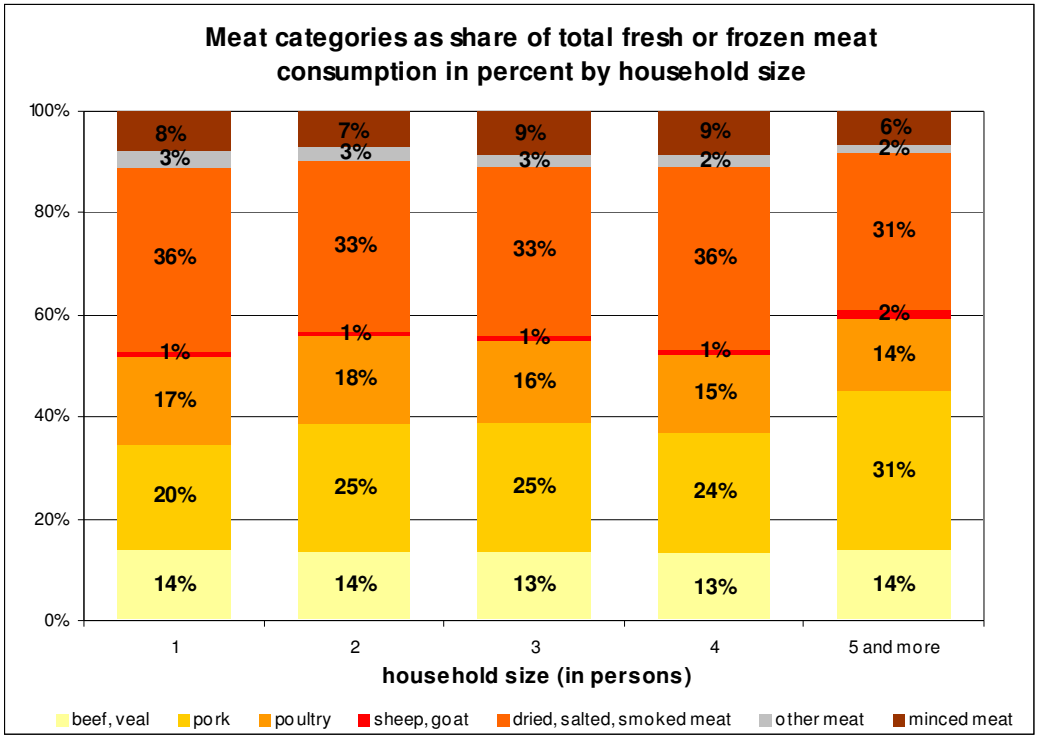


Figure 3: Meat categories as share of total fresh or frozen meat consumption (in quantities) in percent by household size; Source: raw data from Statistik Austria, 2002; own calculation

Another category on the increase is **fish**. Although absolute quantities of fish consumption are comparatively quite low, the category of fish increases by 1 kg from single-person to five- (or more) person households. Higher increases are found with the consumption of **milk**, which goes up by 4 litres from single-person to two-person households and by 6 litres from two-person to three-person households. Milk consumption of three- and four-person households differs only by 2 litres, 17 versus 19 litres. However, between four-person and five or more-person households, the consumption of milk rises considerably, from 19 to 32 litres. A quadrupling in consumption from single-member households to five or more-person households can also be observed in the categories of **cheese, curd**, **eggs**, **animal** and **vegetable fats**. Lower increases can be found with **candies**, followed by **yogurt** and hot infusion drinks like **coffee and cocoa**.

Comparing absolute consumption of **bottled beverages** with milk, mineral water exceeds milk consumption irrespective of household size. In single- and two-person households mineral water consumption out-paces milk consumption by only a few litres. In five or more-person households, milk consumption is only two thirds that of mineral water, in four-person households only half that of mineral water. The consumption of soft drinks and fruit juices increases continuously from single- to four-person households, but remains constant between four and five- (or more) person households. The consumption of vegetable juices plays only a minor role.

2.3.2 Age

The literature survey, which was given in the final report of year 1, has identified older people as being more health-orientated, whereas younger people adjust their diet more to time constraints (Hayn et al., 2005). This section further investigates that issue by focusing on consumed quantities of several food and beverage categories. Table 2 presents equivalence consumption figures of food and beverage categories by age groups. Consumption figures of the main food categories, namely rice, bread, flour and pasta, vegetables, fruits and meat respond positively as the age of the household head increases.

Table 2: Monthly household equivalence consumption of selected foods and non-alcoholic beverages in kilograms, litres and units by age groups; Source: raw data from Statistik Austria, 2002; own calculation

age groups	**29 and younger**	**30-39**	**40-49**	**50-59**	**60 and older**	**units**
number of households (in 1,000)	*326.8*	*718.1*	*625.7*	*577.3*	*992.2*	
FOODS						
rice, bread, flour, pasta	3.8	4.2	5.0	4.8	5.5	kg
vegetables (fresh)	3.9	5.3	5.9	8.2	10.0	kg
fruits (fresh)	4.6	5.3	5.9	7.6	9.5	kg
meat (fresh or frozen)	2.8	3.9	4.6	6.1	5.8	kg
fish (fresh, frozen, dried, smoked)	0.2	0.3	0.3	0.4	0.4	kg
yogurt	1.6	1.6	1.5	1.5	1.3	kg
cheese and curd	1.0	1.0	1.1	1.1	1.1	kg
milk	6.1	6.2	6.6	6.9	8.2	litre
eggs	11.4	14.9	17.2	22.0	24.4	units
animal fats	0.3	0.3	0.4	0.5	0.6	kg
vegetable fats	0.2	0.3	0.3	0.4	0.5	kg
candies	1.2	1.7	1.8	2.6	3.3	kg
NON ALCOHOLIC BEVERAGES						
coffee, cocoa	0.6	0.8	0.9	0.9	0.9	kg
mineral water, soft drinks, juices	14.9	15.3	16.8	16.2	13.2	litre

mineral water	4.7	6.3	7.8	9.2	7.9	litre
soft drinks	5.6	5.1	5.5	4.1	2.8	litre
fruit juices	4.5	3.8	3.4	2.8	2.4	litre
vegetable juices	0.1	0.1	0.1	0.1	0.1	litre

The consumption of **rice, bread, flour and pasta**, for instance, increases from households with heads aged below 30 to those with heads aged 60 or older, from 4 kg to 6 kg.

Similarly, **vegetable** consumption of the oldest age group is more than twice that of the youngest age group, 10 kg versus 4 kg. The preference for different vegetable categories (in relative figures) is shown in Figure 4.

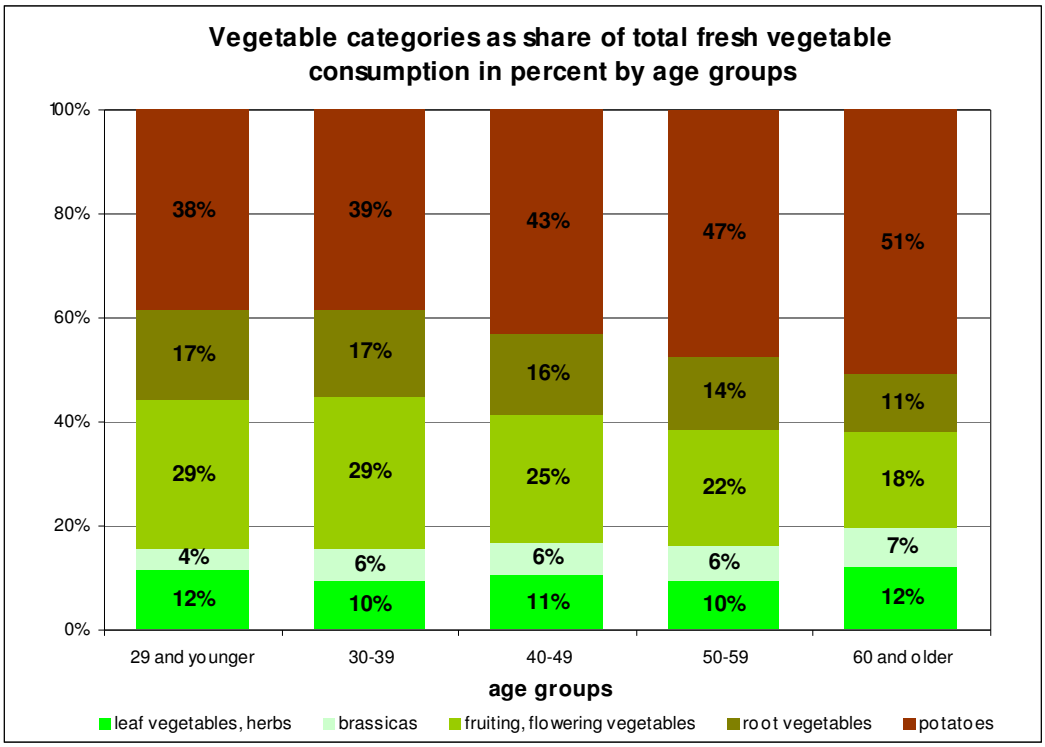


Figure 4: Vegetable categories as share of total fresh vegetable equivalence consumption (in quantities) in percent by age groups; Source: raw data from Statistik Austria, 2002; own calculation

In fact, a strong tendency towards higher potato consumption with increasing age can be observed. Fresh vegetable consumption of the oldest age group is dominated by potatoes (51%). In contrast, potato consumption of household with heads aged 39 and younger amounts roughly to 39% of total fresh vegetable consumption. Low relative potato consumption in younger age groups is compensated for by higher relative figures for fruiting and flowering vegetables (29%) and root vegetables (17%). The preference for fruiting and flowering vegetables instead of potatoes within younger age groups can be explained by the time consuming preparation needed for potatoes, as younger age groups demand more foods that can be quickly prepared. Older consumers adhere more to traditional eating habits, which are characterised by a high relative intake of potatoes due to low price, nice taste and their satiating character.

Similar to vegetable consumption, fruit consumption responds positively with increasing age: consumed quantities of fruits rise from 5 kg to 10 kg. The relative consumption of fresh **fruit** categories by age groups is presented in Figure 5. Clearly, older age groups have maximum relative figures in the consumption of apples and pears, around 50% of their total fresh fruit consumption, whereas younger groups have only a share value of 34%. Lower relative consumption figures of apples and pears in younger age groups are compensated for by higher values in exotic fruit consumption. Exotic fruit consumption within the 29 and younger age group constitutes a share of 45% of total fresh fruit consumption. The elderly, with heads of household aged 60 or older, consume only 23% exotic fruits. The preference for apples and pears in older age groups can again be explained by tradition. As the diet of the older population is mostly closely tied to traditional, deep-rooted eating habits, apples and pears play a major role in fruit consumption. Younger age groups, on the contrary, may prefer more diversity in their diets. As exotic fruits have become less expensive and are at the same time very sapid, younger age groups prefer them to apples.

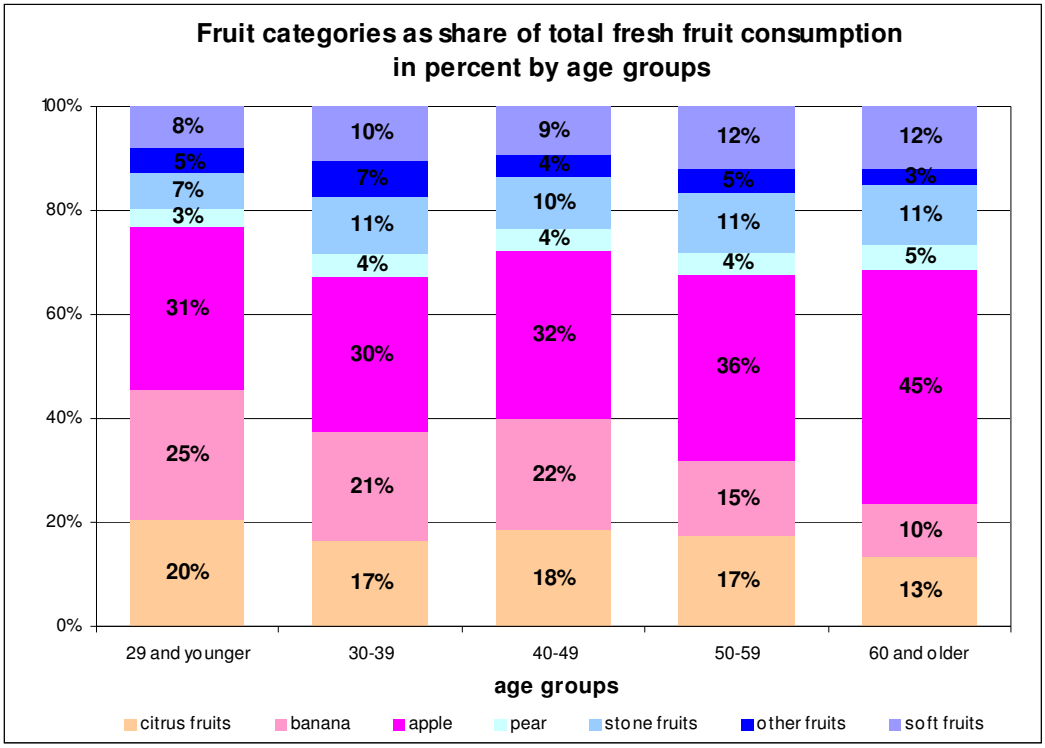


Figure 5: Fruit categories as share of total fresh fruit equivalence consumption (in quantities) in percent by age groups; Source: raw data from Statistik Austria, 2002; own calculation

Meat consumption varies from 3 kg in the youngest age group to 6 kg in the oldest. The (relative) preference for different meat categories is shown in Figure 6. Pork consumption responds positively to increasing age, and constitutes a share of 26% in the 60 and older group. The youngest age group, on the contrary, has only a share of 20%. Negative trends can be observed with dried, salted and smoked meat. Of their total meat consumption, the youngest age group consumes more than 40% of meats from this group, whereas the oldest group consumes only 32%. Relative consumption of poultry, on the other hand, declines only slightly with increasing age of the household head, from 18% (29 and younger) to 17% (60 and older).

High relative figures of dried, salted and smoked meat and lower values for pork within younger age groups may be attributable to time restrictions. As the majority of members in younger households are employed, time for hot meal preparation is restricted. Therefore, it could be assumed that the preference

for dried, salted and smoked meat within the younger age group results from an increase in snack consumption. Interestingly, the consumption of minced meat accounts for 12% of total meat consumption within the youngest age group, which is more than 5% higher than in all other age groups. Again low prices as well as the easy preparation of minced meat may address the needs of younger age groups. Beef and veal consumption is more or less balanced between all age groups. Only households with young heads (29 and younger) show very low figures, 7% of total meat consumption. It may be that the high prices of beef and veal are responsible for this low share.

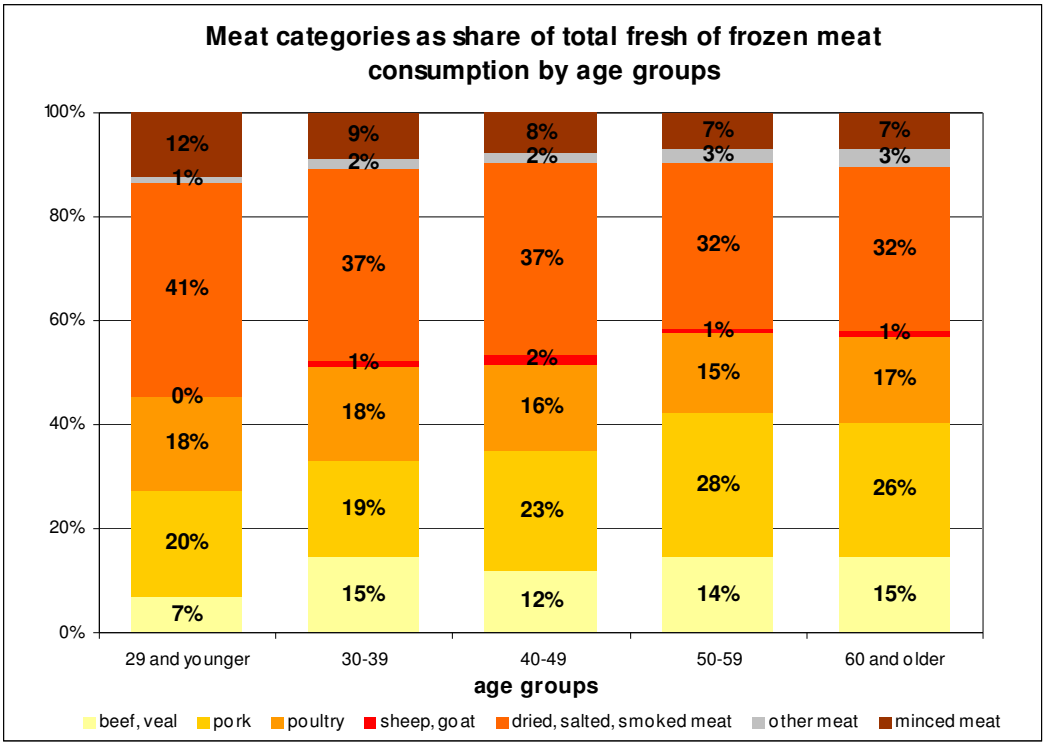


Figure 6: Meat categories as share of total fresh or frozen meat equivalence consumption (in quantities) in percent by age groups; Source: raw data from Statistik Austria, 2002; own calculation

Egg consumption appears to respond extremely positively with age. The age group over 60 consumes more than twice as many (24 eggs) as the youngest age group (11 eggs). Additional increases can be observed with **candies**, **fats**, **fish**, **coffee and cocoa**. The categories of **yogurt**, **cheese and curd** seem to be mostly independent of age. Also, the consumption of **milk** seems to be relatively stable across age groups. Only the oldest group consumes on average 2 litres more monthly than all other groups.

Concerning **bottled beverages**, mineral water consumption increases from the youngest age group to the age group between 50 and 59, from 5 to 9 litres, but then declines again. The mature age group consumes on average 8 litres monthly. The consumption of soft drinks and fruit juices decreases as household heads become older, whereas age has no influence on vegetable juice consumption, which shows very low figures across all age groups.

2.3.3 Household net income

In this section the finding that lower income households respond more to price and the filling quality foods, made by Hayn et al. (2005) and Trichopoulou et al. (2002), is investigated for the case of Austria.

Table 3: Monthly household equivalence consumption of selected foods and non-alcoholic beverages in kilograms, litres and units by quartiles of monthly household equivalence net income; Source: raw data from Statistik Austria, 2002; own calculation

income quartiles	1st (under € 870)	2nd (€ 870 - € 1,172)	3rd (€ 1,173- € 1,549)	4th (over € 1,549)	units
number of households (in 1,000)	*811.3*	*811.3*	*811.3*	*811.3*	
FOODS					
rice, bread, flour, pasta	6.8	6.6	6.0	5.6	kg
vegetables (fresh)	7.8	7.5	7.3	6.6	kg
fruits (fresh)	7.7	6.9	6.4	7.2	kg
meat (fresh or frozen)	5.3	5.2	4.7	4.5	kg
fish (fresh, frozen, dried, smoked)	0.3	0.3	0.3	0.4	kg
yogurt	1.3	1.4	1.5	1.6	kg
cheese and curd	1.0	1.1	1.1	1.1	kg
milk	8.0	7.7	6.6	5.6	litre
eggs	20.9	21.4	17.4	17.1	units
animal fats	0.5	0.5	0.4	0.5	kg
vegetable fats	0.4	0.4	0.4	0.3	kg
candies	3.0	2.3	2.0	2.0	kg
NON ALCOHOLIC BEVERAGES					
coffee, cocoa	0.8	0.9	0.8	1.0	kg
mineral water, soft drinks, juices	15.0	15.2	14.9	15.4	litre
mineral water	7.1	7.4	7.3	7.9	litre
soft drinks	4.6	4.6	4.5	3.9	litre
fruit juices	3.2	3.1	3.0	3.5	litre
vegetable juices	0.1	0.1	0.1	0.1	litre

The consumption of **rice, bread, cereals and flour** declines by one kilogram, from 7 kg to 6 kg, from the lowest to the highest income group. The consumption of **vegetables** shows a similarly low decline as household net income rises. Households belonging to the first quartile purchase 8 kg per month whereas households in the highest income group buy 7 kg. Changes in consumption within the category of vegetables are shown in Figure 7.

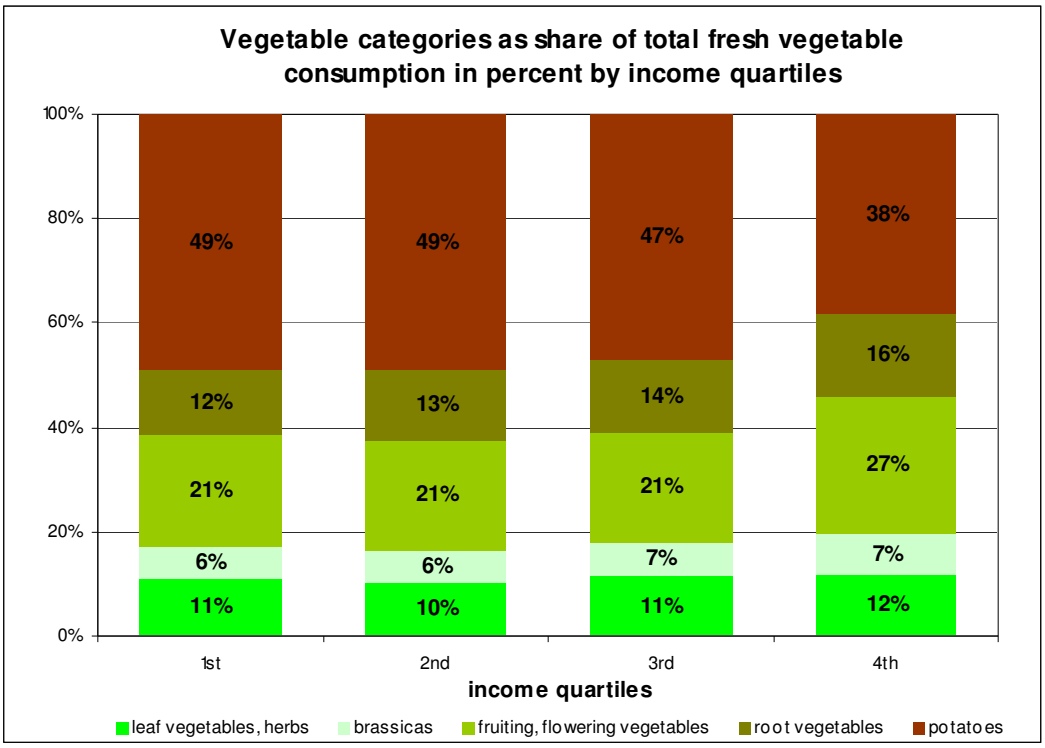


Figure 7: ***Vegetable categories as share of total fresh vegetable equivalence consumption (in quantities) in percent by quartiles of monthly household equivalence net income; Source: raw data from Statistik Austria, 2002; own calculation***

Two trends can be identified. First, relative consumption of potatoes as share of total fresh vegetable consumption decreases considerably as income grows Second, relative figures of fruiting, flowering, leaf vegetables and herbs (as share of total fresh vegetable consumption) become higher as income increases. Maybe this trend is determined by both the price and time effect: potatoes are inexpensive and satiating, but require costly preparation time in comparison to fruiting, flowering and leaf vegetables, which can be consumed cold as snacks and in salads.

Similar to vegetables, fresh **fruit** consumption decreases as household income grows, from 8 kg (first quartile) to 6 kg (third quartile). Between the third and the fourth quartile, however, fruit consumption increases by 1 kg, from 6 kg to 7 kg. The relative distribution of individual fruit types as a share of total fresh fruit consumption shows two trends. First, the (relative) consumption of apples decreases from the first to the third quartile, from 40% to 35% and then grows moderately again, to 37% in the fourth quartile. Second, the consumption of exotic fruits (banana and citrus fruits) as a share of total fresh fruit consumption, increases slightly with growing income, from 30% (first quartile) to 32% (fourth quartile).

Consumed quantities of **meat** are independent from income. Meat consumption reaches a level of 5 kg across all income quartiles. Again the analysis of meat consumption is focused on single meat categories as the share of total fresh or frozen meat consumption (Figure 8). Beef and veal appear to respond positively to increases in household net income, as already argued by Gossard and York (2003). Low-income households consume only 13% beef and veal, whereas high-income households consume a share of 16%. Another meat category that rises considerably with household income is the category of dried, salted and smoked meat, again attributable to time scarcity. The consumption of this category amounts 37% of total meat consumption for the highest income quartile, but only 30% for the lowest income group. Conversely, the consumption of pork decreases from low-income households (first quartile: 28%) to high-income households (fourth quartile: 18%). Relative consumption of poultry, on the contrary, seems to be quite independent from income and varies between 16% and 17%. Somewhat

surprisingly, the first quartile has high relative figures concerning sheep and goat consumption (2%), for which there is no easy explanation. Maybe the cause is the dietary preferences of (low income) immigrants.

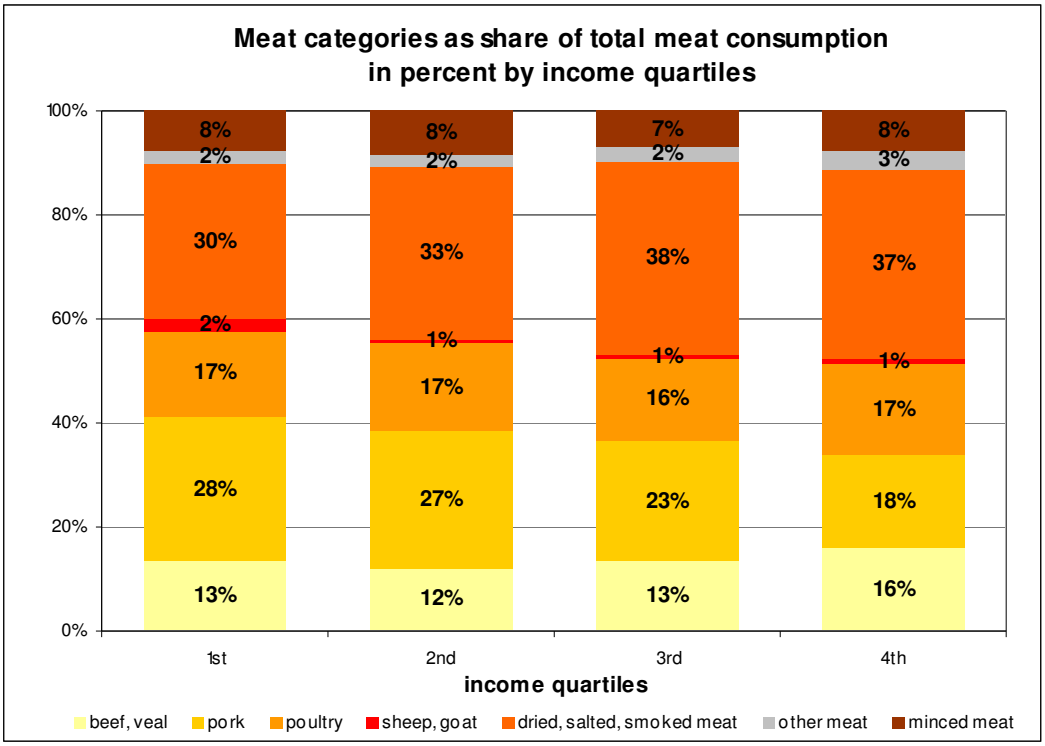


Figure 8: ***Meat categories as share of total fresh or frozen meat equivalence consumption (in quantities) in percent by quartiles of monthly household equivalence net income; Source: raw data from Statistik Austria, 2002; own calculation***

Up to this point, food categories decreased with rising household income. However, the categories of **fish**, **yogurt**, **cheese and curd**, **coffee and cocoa** grow slightly from the first to the fourth quartile. Except for fish, these categories are important ingredients in snack meals. Therefore, rising consumption figures of these categories could result from increasing snack consumption (cold dishes) with income. The increase in fish consumption may derive from the price effect. The consumption of **fats** seems to be free from income effects.

The remaining categories to be discussed are bottled beverages and milk. Whereas the category of milk decreases by 2 litres from the lowest to the highest income quartile, income has no impact on the consumption of **mineral water, soft drinks and juices**. Differences of consumption figures stay below the one litre level.

2.3.4 Educational level

As argued by Trichopoulou et al. (2002), education is the strongest determinant of peoples' diet, because education is a precondition for the understanding of health- and environment-related information. The validity of this finding for Austrian consumers is examined carefully in this section by analysing the food categories consumed by different educational levels.

As with the case of income, the categories of rice, bread, flour and pasta, vegetables, fruits, meat and eggs appear to respond negatively to increases in educational level of the household head. Table 4 presents absolute consumption figures for the main food categories.

Table 4: Monthly household equivalence consumption of selected foods and non-alcoholic beverages in kilograms, litres and units by educational level; Source: raw data from Statistik Austria, 2002; own calculation

educational level	maximum secondary school (A)	vocational school/ apprentice-ship (B)	high school degree (C)	college/ university degree (D)	units
number of households (in 1,000)	*829.1*	*1,640.2*	*482.0*	*282.6*	
FOODS					
rice, bread, flour, pasta	8.0	6.0	5.2	4.9	kg
vegetables (fresh)	9.1	7.1	5.7	5.8	kg
fruits (fresh)	8.2	6.8	6.3	6.3	kg
meat (fresh or frozen)	6.2	5.0	3.5	3.0	kg
fish (fresh, frozen, dried, smoked)	0.3	0.3	0.3	0.4	kg
yogurt	1.3	1.4	1.6	2.1	kg
cheese and curd	1.0	1.1	1.1	1.1	kg
milk	8.6	6.9	5.7	5.3	litre
eggs	23.4	19.4	15.9	11.5	units
animal fats	0.5	0.4	0.4	0.4	kg
vegetable fats	0.5	0.4	0.3	0.2	kg
candies	3.1	2.3	1.6	1.2	kg
NON ALCOHOLIC BEVERAGES					
coffee, cocoa	0.9	0.9	0.7	0.9	kg
mineral water, soft drinks, juices	15.1	15.5	14.5	13.7	litre
mineral water	8.2	7.4	6.9	6.0	litre
soft drinks	4.4	4.7	3.9	3.3	litre
fruit juices	2.4	3.3	3.6	4.2	litre
vegetable juices	0.1	0.1	0.1	0.2	litre

Households with heads that have attained maximally secondary school qualification (A) consume on average 8 kg of **rice, bread, flour and pasta** products monthly. From those households with lowest educational level (A) to college/university-educated households (D), this category declines by 3 kg, from 8 kg (A) to 5 kg (C).

Vegetable consumption of the lowest-educated households is about 4 kg higher, 9 kg, than that of high-school or college/university-educated households (5 kg). The results of the analysis of single vegetable categories (Figure 9) shows that the trends identified in the preceding section appear again, however in a more pronounced manner. Clearly, the consumption of potatoes decreases dramatically with higher educational achievement, from more than 50% (A) to 31% (D) of total fresh vegetable consumption. More educated households substitute potatoes with higher relative amounts of fruiting and flowering vegetables

on the one hand, 34% (D) versus 18% (A), and of root vegetables on the other hand, 20% (D) versus 11% (A).

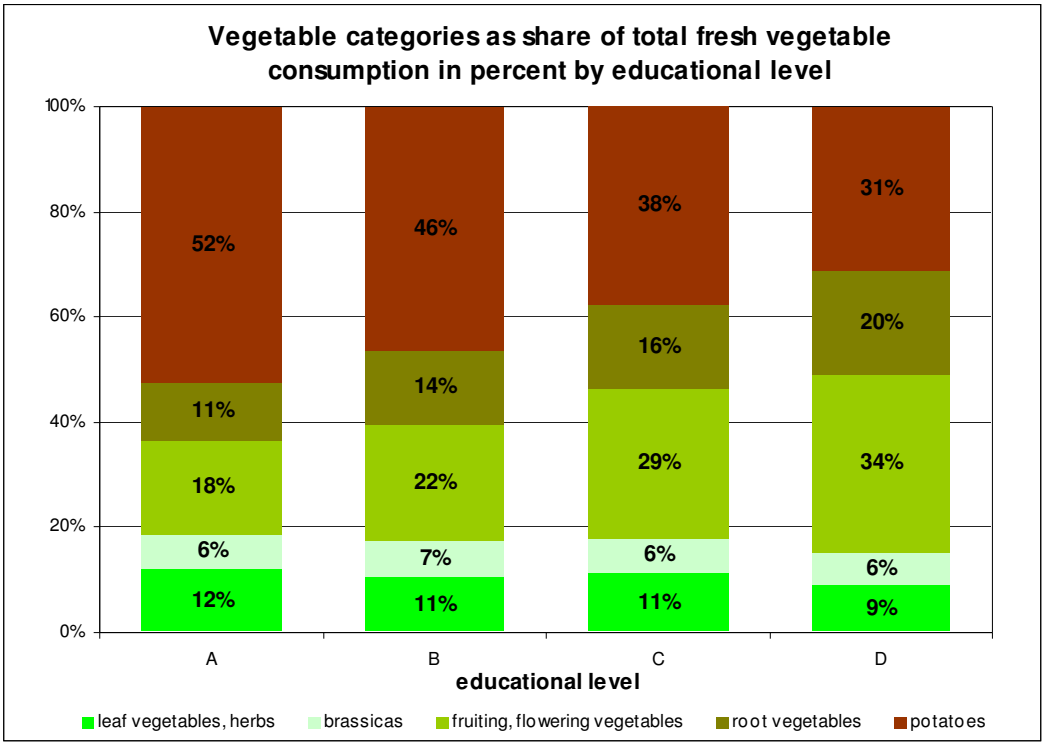


Figure 9: Vegetable categories as share of total fresh vegetable equivalence consumption (in quantities) in percent by educational level; Source: raw data from Statistik Austria, 2002; own calculation

The reasons for these consumption habits by educational level are again time and price effect. The categories of brassicas, leaf vegetables and herbs do not present a definite trend: brassicas consumption amounts between 6% (D) and 7% (B), leaf vegetables and herbs between 9% (D) and 12% (A) of total fresh vegetable consumption.

The consumption of fresh **fruits** decreases from lowest-educated households to highest educated household by 2 kg, from 8 kg to 6 kg. The relative consumption figures show that households with heads who attained maximum secondary school have the highest relative figures in apple consumption, 45% of total fresh fruit consumption. Between household heads who attained maximum secondary school (A) and high school-educated households (C), relative apple consumption decreases from 45% to 29% but then rises again to 36% (D). Furthermore, the higher educated households in the high school (C) or college/university-educated (D) groups consume a higher share of exotic fruits than lower educated households, 39% (C) and 35% (D) versus 26% (A). The category of soft fruits, stone fruits and pears decreases slightly (by around 2%) with increasing educational level.

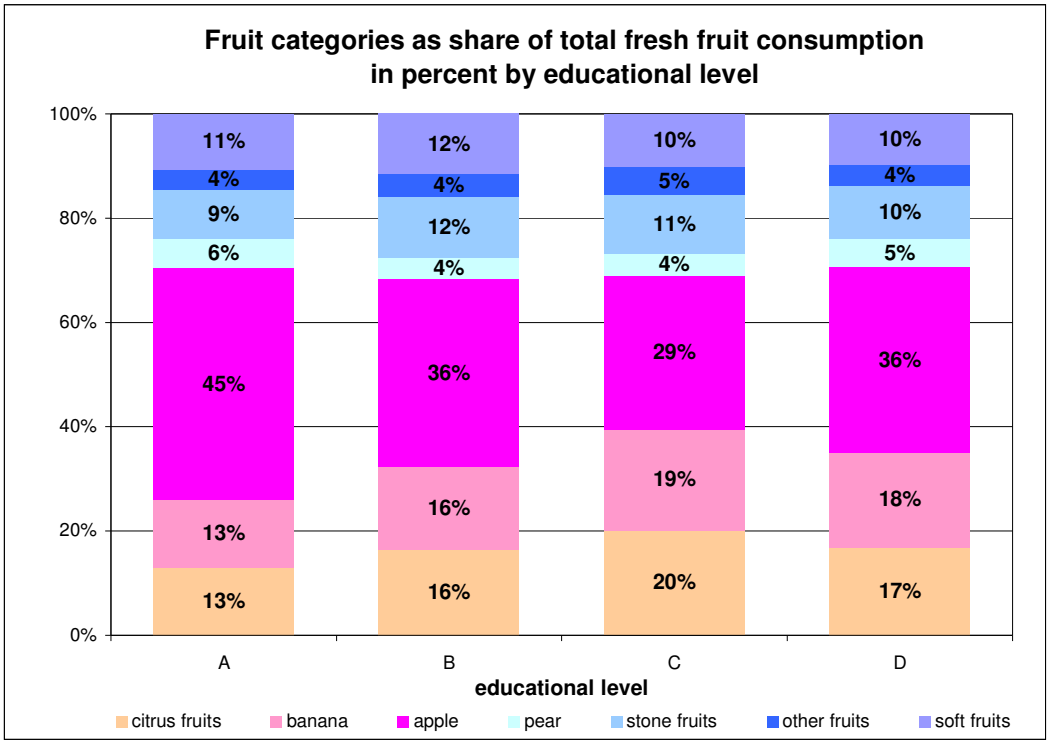


Figure 10: Fruit categories as share of total fresh fruit equivalence consumption (in quantities) in percent by educational level; Source: raw data from Statistik Austria, 2002; own calculation

The category of **meat** falls approximately by one half from lowest-educated with 6 kg to the highest educated households with 3 kg. The percentage distribution of total meat consumption in single meat categories is presented in Figure 11. At least three trends can be gleaned from this diagram. First, relative consumption of dried, salted and smoked meat rises dramatically from lesser (A), 31%, to higher educated households (C), 40%, but declines to 36% in college/university-educated households (D). Secondly, pork consumption declines by nearly a half, from 29% (A) to 16% (D). Thirdly, poultry consumption as share of total meat consumption rises with higher educational level of the household head. Beef and veal appear to not follow any trends. College/university-educated as well as low educated households have high relative beef consumption figures, 16% (D) and 15% (A) respectively. Only the household groups with heads, who attained vocational school or an apprenticeship (B) and high school educated households (C), show lower values, at around 13% in each case. Whereas increases in dried, salted and smoked meat result from time constraints, higher shares of poultry consumption by educational level may be due to higher health and environmental awareness.

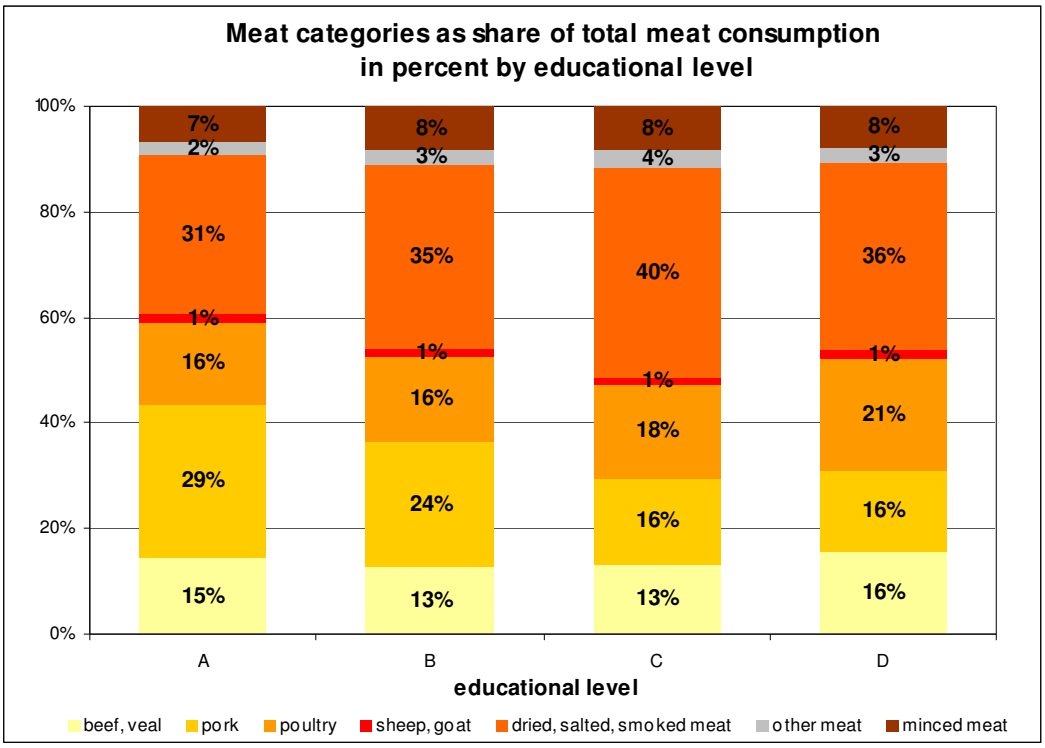


Figure 11: Meat categories as share of total fresh or frozen meat equivalence consumption (in quantities) in percent by educational level; Source: raw data from Statistik Austria, 2002; own calculation

Furthermore, educational level seems to have no influence on the consumption of **fish**, which varies between 0.3 kg and 0.4 kg. Also, the categories of **cheese, curd**, **coffee and cocoa** are stable. Increases in food categories can only be witnessed with **yogurt** consumption, which rises from 1 kg for low-educated households to 2 kg for high educated households. The consumption of **milk, egg** and **fat**, however, responds negatively to educational level.

Concerning bottled **beverages**, lower educated households consume 8 litres of mineral water, 0.4 litres less than milk. With increasing educational level the consumption of mineral water decreases from 8 (A) to 6 (D) litres, but always exceeds milk consumption. Similarly, the consumption of soft drinks declines by around one litre, from 4 (A) to 3 litres (D). Only fruit juice consumption increases, so much so that highest educated households consume nearly twice as much fruit juices, 4 litres monthly, than lowest-educated households, 2 litres.

2.3.5 Labour force status

Differences in consumed quantities of food and beverage categories by selected labour force status groups (farming households, self-employed households and workers/employees in low, middle or high positions) demonstrate that the group of workers/employees in middle and high positions have the lowest consumption figures for vegetables, fruits, meat and the aggregate of rice, bread, flour and pasta. In contrast, farming households have the highest figures within these categories. In the following, a detailed description of consumption figures is given.

Table 5: Monthly household equivalence consumption of selected foods and non-alcoholic beverages in kilograms, litres and units by farmers, self-employed people and employees (including public servants and clerks) in low, middle and high positions

labour force status	Farmers	Self-employed	Workers and employees …in low positions	…middle positions	…high positions	units
number of households (in 1,000)	*162,1*	*279,5*	*1141,1*	*920,3*	*570,1*	
FOODS						
rice, bread, flour, pasta	9,9	6,0	6,7	5,7	5,0	kg
vegetables (fresh)	9,6	6,4	7,8	6,7	5,9	kg
fruits (fresh)	8,9	7,2	7,0	6,9	6,3	kg
meat (fresh or frozen)	6,8	4,8	5,5	4,6	3,6	kg
fish (fresh, frozen, dried, smoked)	0,3	0,3	0,4	0,4	0,3	kg
yogurt	1,0	2,1	1,4	1,4	1,6	kg
cheese and curd	1,1	1,2	1,1	1,0	1,1	kg
milk	11,7	6,4	7,5	6,2	5,6	litre
eggs	26,2	17,0	20,8	18,7	13,8	units
animal fats	0,8	0,4	0,4	0,4	0,4	kg
vegetable fats	0,4	0,2	0,4	0,4	0,2	kg
candies	4,3	1,9	2,4	2,4	1,5	kg
NON ALCOHOLIC BEVERAGES						
coffee, cocoa	0,9	0,9	0,9	0,8	0,8	kg
mineral water, soft drinks, juices	14,9	14,3	15,9	14,7	14,4	litre
mineral water	9,0	6,6	7,8	6,8	7,3	litre
soft drinks	3,9	4,0	4,9	4,6	3,4	litre
fruit juices	2,0	3,5	3,1	3,2	3,6	litre
vegetable juices	0,0	0,2	0,1	0,1	0,1	litre

As stated above, farming households are the greatest consumers of **bread, rice, flour and pasta**, with 10 kg per month. That maximum is attributed to a higher consumption of bread and raw flour. In particular, farming households consume 5 kg of bread and 4 kg of flour per month, which is more than twice as much as all other household types. The higher consumption of bread could arise from traditional eating habits, since bread used to be an important component of each meal, especially among the rural population. Those traditional eating habits are still present, particularly among the elderly. The higher quantities of flour may stem from a preference for the self-preparation of meals which contain flour, like breads, tarts, cakes, sauces, side dishes, etc.

High numbers for **vegetable** consumption (in quantities) again occur in farming households (10 kg), whereas self-employed households and workers/employees consume markedly less, between 6 kg and 7 kg. The percentage distribution of various vegetable types as share of total fresh vegetable consumption across selected labour force status groups is shown in Figure 12. Potato consumption within farming households and those led by workers/employees in low positions amounts to between 48% and 51%. Figures below 40% can be found in self-employed households and households with employees in

high positions, which substitute fruiting and flowering vegetables (around 28%) and root vegetables (between 12% and 18%) for potatoes. The highest share in leaf vegetable, herb and brassica consumption, at 14% and 9% respectively, can be found in farming households.

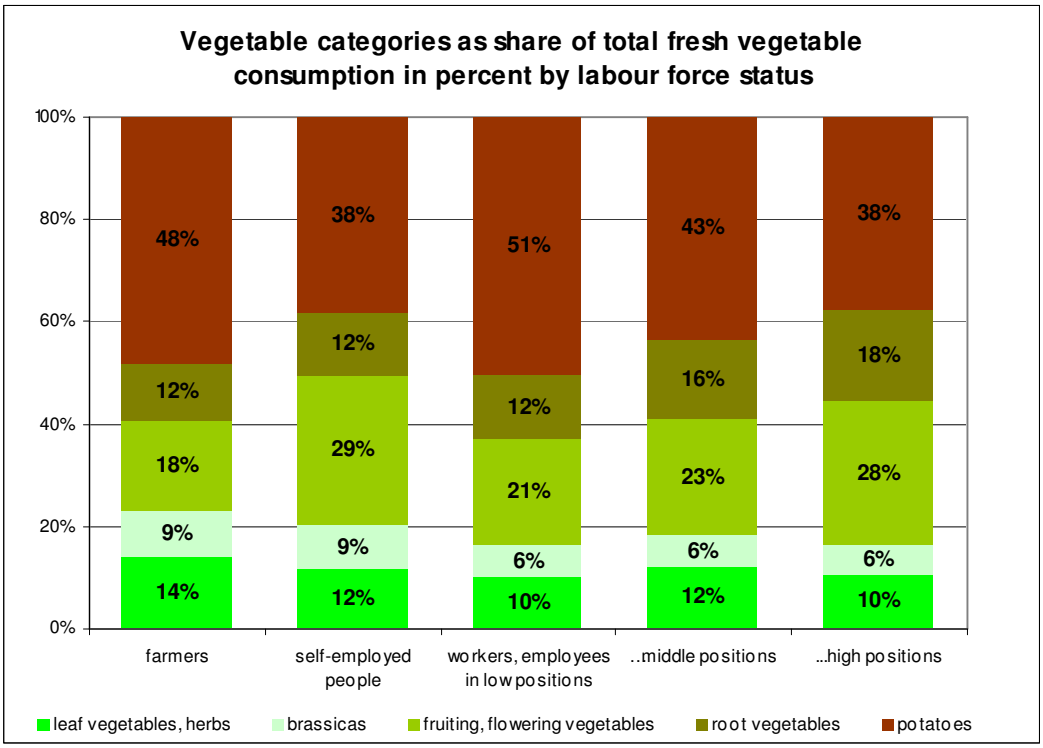


Figure 12: Vegetable categories as share of total fresh vegetable equivalence consumption (in quantities) in percent of farmers, self-employed people and employees (including public servants and clerks) in low, middle and high positions; Source: raw data from Statistik Austria, 2002; own calculation

Concerning **fruit** consumption, it has already been stated that farming households have the highest observed absolute levels of fruit consumption, whereas employees in middle and high positions have the lowest. More interesting, however, is the percentage distribution of fruits as share of total fresh fruit consumption by labour force status. From Figure 13 it becomes clear that fruit consumption habits of the farming households stand out from other groups. Farming households are the maximum consumers of both, apples and pears, 53% and 11%, respectively. At the same time they seem to put less importance on exotic fruits, like bananas or citrus fruits (16%). Again, traditional eating habits can be responsible for this preference. In worker/employee households, irrespective of position, and self-employed households relative consumption of exotic fruits almost exceeds apple consumption, 32% to 38% for apples versus 30% to 36% for exotic fruits. As for the other groups, the relative pear consumption across labour force status groups remains quite low, under 5%, stone and soft fruit consumption varies between 9% and 13% (stone fruits) and 7% and 11% (soft fruits), respectively.

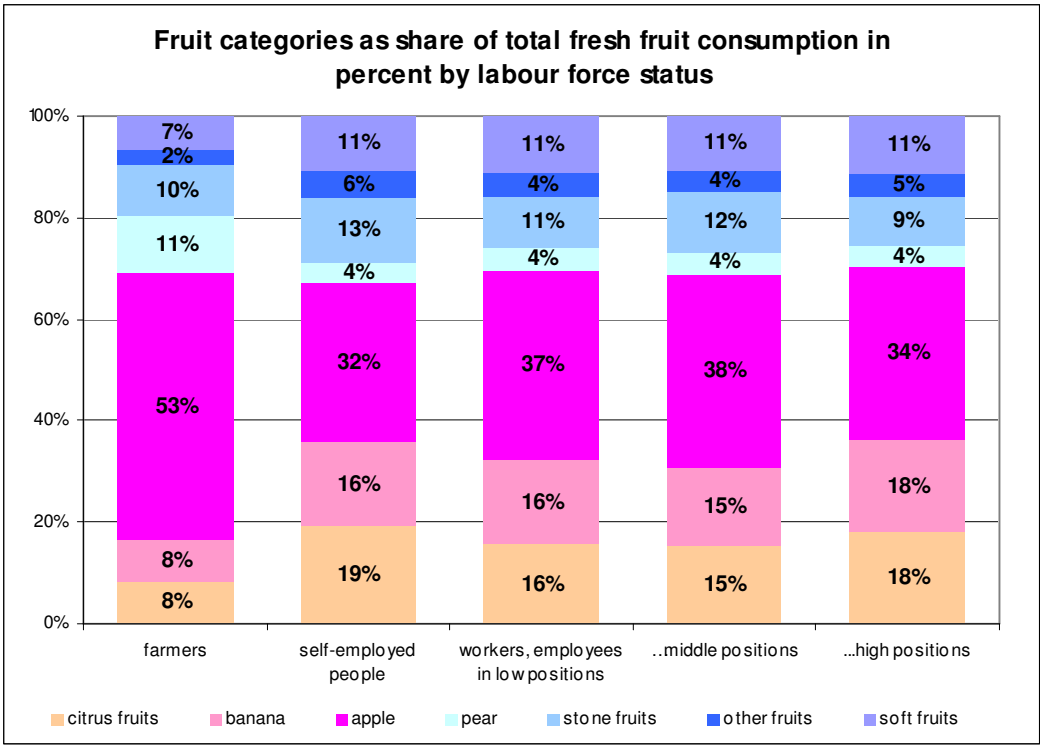


Figure 13: Fruit categories as share of total fresh fruit equivalence consumption (in quantities) in percent of farmers, self-employed people and employees (including public servants and clerks) in low, middle and high positions; Source: raw data from Statistik Austria, 2002; own calculation

With respect to consumed quantities of meat, farming households consume 7 kg monthly, the self-employed and workers/employees between 4 kg and 6 kg. The impact of labour force status on the consumption of various **meat** categories in relative figures is presented in Figure 14. At least two trends can be identified. First, pork consumption shows high relative figures in farming (31%) and low-positioned worker/employee households (26%), but is notably less important in self-employed or employee households in higher positions, where pork consumption accounts for between 15% and 24%. Second, the lower consumption of pork by self-employed and employee households in higher positions is compensated by a higher intake of dried, salted or smoked meat (between 33% and 43%). The consumption of beef, veal and poultry seems to be mostly independent of labour force status. Only the group of employees, public servants and clerks in high positions consume relatively more beef and veal (15% of total fresh or frozen meat consumption) than the other labour force status groups, due to their higher income level. Somewhat surprisingly, relative sheep and goat consumption accounts for 2% within employee households in middle positions, whereas all other labour force status groups show relative figures that are for the most part below the level of 1%.

Food categories like **eggs** and **candies** again are most prominent in farming households, whereas worker/employee households have the lowest absolute figures in both eggs and candy consumption. **Yogurt** consumption is lowest in farming households (1 kg). For the rest, consumption figures seem to be quite independent from labour force status, so that variations remain below a level of 0.5 kg and 0.2 litres respectively.

Finally, the class of mineral water, soft drinks and juices as well as the category of milk is covered. **Milk** consumption peaks at 12 litres in farming households, whereas the other households consume markedly less, between 8 and 6 litres. Labour force status grouping seems to have no influence on consumed quantities of **mineral water, soft drinks and juices**.

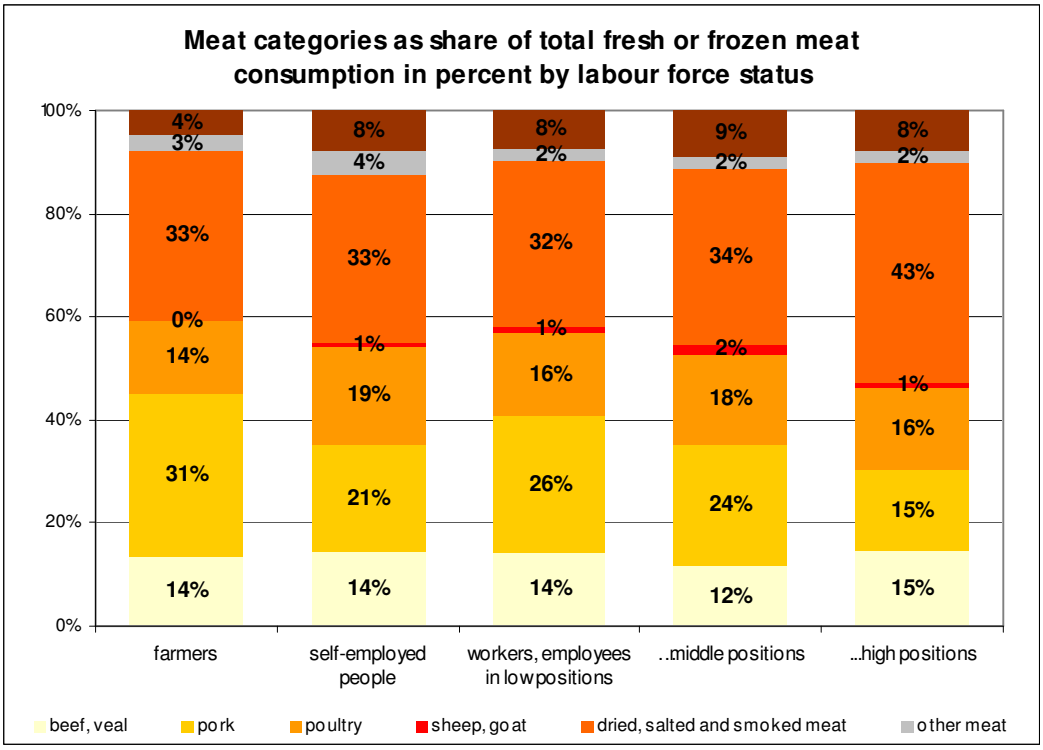


Figure 14: Meat categories as share of total fresh or frozen meat equivalence consumption (in quantities) in percent of farmers, self-employed people and employees (including public servants and clerks) in low, middle and high positions; Source: raw data from Statistik Austria, 2002; own calculation

2.3.6 Family type

Household food consumption reflects structures within families, due to different tastes but also because of nutritional aspects (e.g. higher recommended calcium intake for children). Accordingly, families with young children consume differently than couples or single households. From the data of the budget survey, we were able to combine different characteristics (number of adults, number and age of children) to form a new variable "family type". The categories of this variable are as follows: single households, couples (two adults, without children living in their homes), families (two adults with children younger than 18), single parents (one adult, at least one child younger than 18), and adult households (more than two adults, e.g. parents and children of 18 years and older). The quantities of selected foods and beverages (in equivalent scale) consumed by households with different family types are given in Table 6.

The consumption of **rice, bread, flour and pasta** is highest in households without children (single households, adult households), around 7 kg per month, whereas households with children show between 1 kg to 2 kg less per month.

With respect to consumed quantities of **vegetables** and **fruits**, we find that single and couple households have high consumption figures of both, vegetable and fruits. Monthly consumption figures of vegetables are around 9 kg in couple households and 7 kg in single households, consumption figures of fruits are around 8 kg. In contrast, family and single parent households have the lowest figures of vegetables and fruits. Only adult households show higher figures for vegetables (9 kg), but lower one for fruits.

Focusing the analysis on **meat**, high figures of meat consumption occur in adult households (7 kg) but also in couple households (6 kg), whereas single parents, family households and single households consume markedly less, between 4 kg and 5 kg.

Table 6: Monthly household equivalence consumption of selected foods and non-alcoholic beverages in kilograms, litres and units by age groups

Family type	Singles	Couples	Families	Single Parents	Adult house-holds	units
number of households (in 1,000)	*977,2*	*885,1*	*932,4*	*135,5*	*276,7*	
FOODS						
rice, bread, flour, pasta	6,9	6,5	5,5	5,1	7,0	kg
vegetables (fresh)	7,1	9,0	5,9	5,3	8,8	kg
fruits (fresh)	7,7	8,0	5,8	6,2	6,5	kg
meat (fresh or frozen)	4,2	5,6	4,6	3,8	6,7	kg
fish (fresh, frozen, dried, smoked)	0,3	0,5	0,3	0,4	0,4	kg
yogurt	1,6	1,4	1,4	1,4	1,2	kg
cheese and curd	1,1	1,2	1,0	1,0	1,1	kg
milk	6,8	6,6	7,0	7,5	8,4	litre
eggs	19,5	20,5	16,8	16,1	23,2	units
animal fats	0,4	0,5	0,4	0,3	0,5	kg
vegetable fats	0,3	0,5	0,3	0,3	0,4	kg
candies	2,5	2,6	1,8	2,1	2,7	kg
NON ALCOHOLIC BEVERAGES						
coffee, cocoa	1,0	0,9	0,7	0,8	0,9	kg
mineral water, soft drinks, juices	14,6	15,0	15,2	15,2	16,2	litre
mineral water	7,4	8,2	6,7	5,9	8,5	litre
soft drinks	4,1	3,9	4,9	5,3	4,5	litre
fruit juices	2,9	2,9	3,6	4,0	3,2	litre
vegetable juices	0,2	0,1	0,1	0,0	0,0	litre

For the categories of vegetables, meat and fruits, the family type has only a weak influence on food preferences. **Vegetable** consumption, for example, remains unchanged across single, couple and family households, where potato consumption accounts for 45% to 47%, root vegetables for 14%, fruiting and flowering for 21% to 23%, brassicas for 6% and leaf vegetables and herbs for 11%. Only consumption patterns of single parents with children show slightly lower figures for potatoes (42%) but significantly higher amounts of fruiting and flowering vegetables (29%).

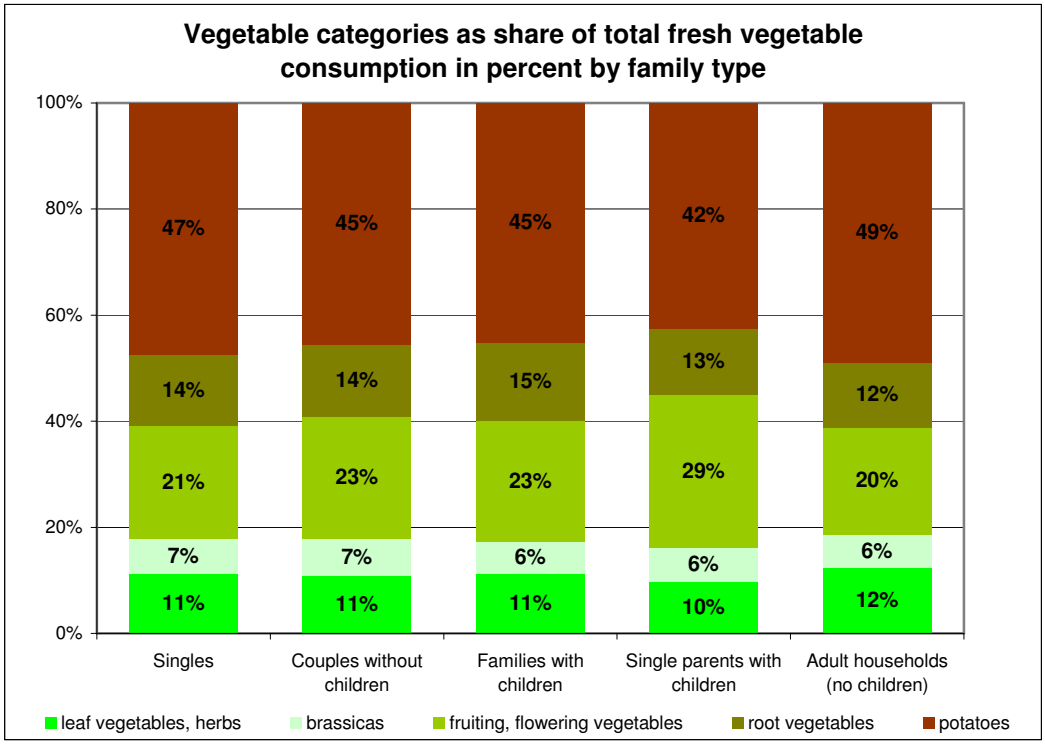


Figure 15: Vegetable categories as share of total fresh or frozen vegetable equivalence consumption (in quantities) in percent of singles, couples, families, single parents and adult households; Source: raw data from Statistik Austria, 2002; own calculation

For the category of **meat,** slightly different consumption patterns are found for households without children (single and couple households) and households with children. The former have significantly higher figures for beef, 14% compared to 12% for family and 8% for single parent households. Higher figures for beef are at the expense of pork consumption in single households (20% as compared to 25% in couples households), whereas couple households show reduced figures for dried, salted and smoked meat (33% as compared to 36% in single households). Family households compensate lower consumption figures for beef by higher figures of both pork (25%) and dried, salted and smoked meat (35%). Single parent household put less importance on pork (20%), but have a higher preference for poultry (23%), minced meat (11%) and dried, salted and smoked meat (35%).

Regarding **fruit** consumption, consumption patterns depend on whether children are living in the household or not. Households without children prefer apples (40%) and pears (14%) to exotic fruits (30%). Households with children, however, have higher figures for exotic fruits (40%) compared with apples (30%) and pears (4%).

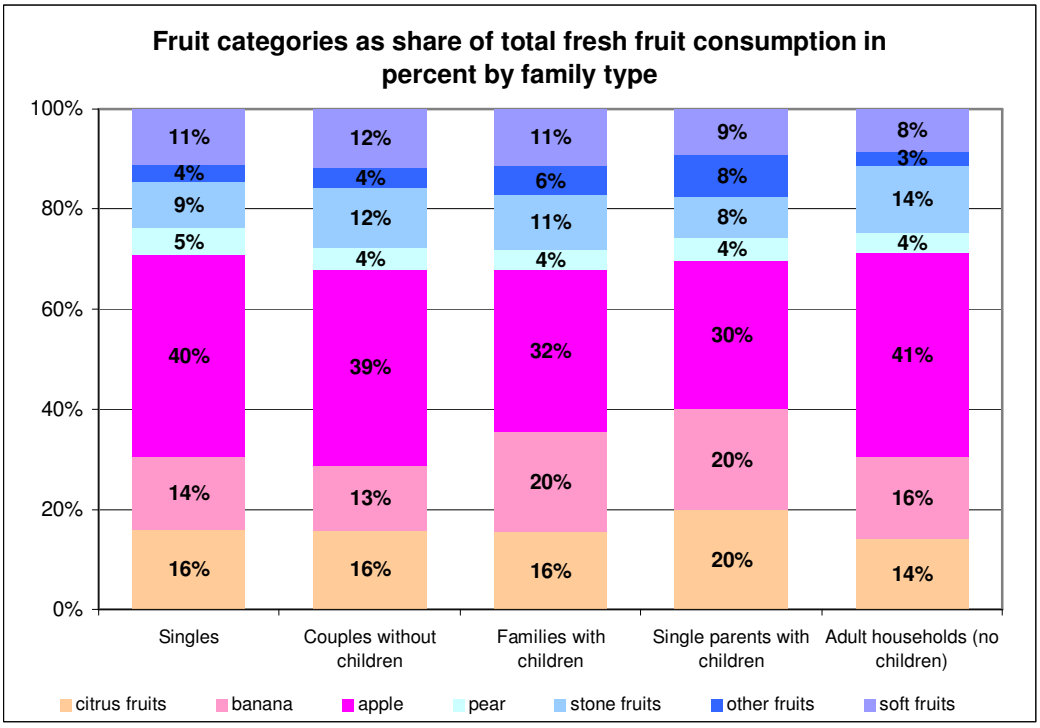


Figure 16: ***Fruit categories as share of total fresh or frozen vegetable equivalence consumption (in quantities) in percent of singles, couples, families, single parents and adult households; Source: raw data from Statistik Austria, 2002; own calculation***

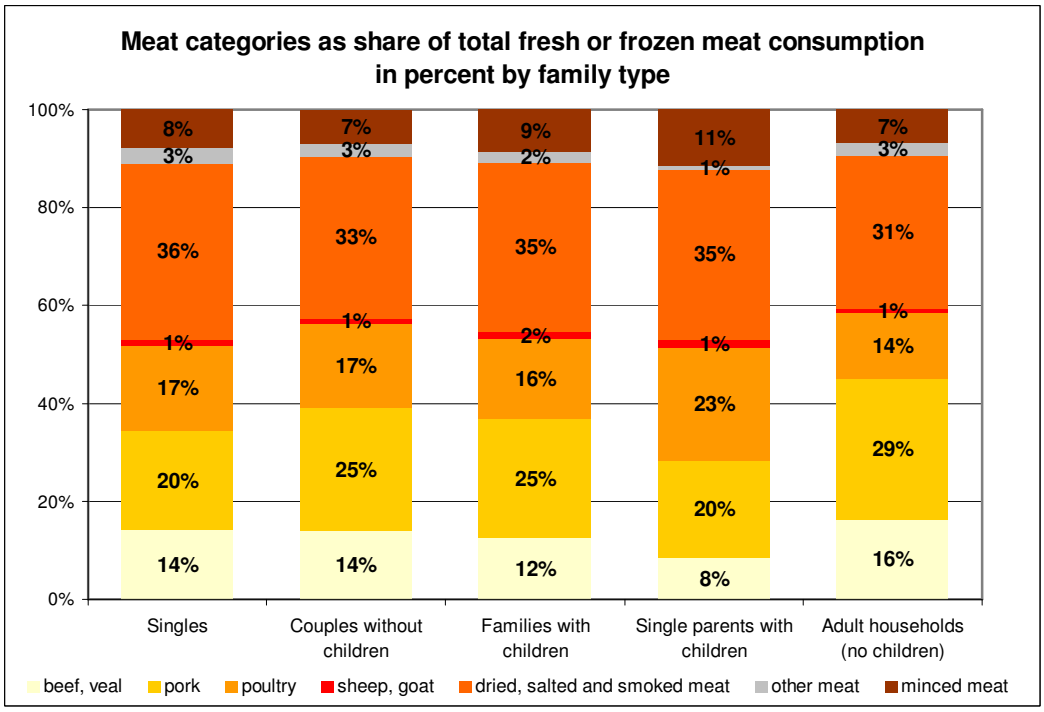


Figure 17: ***Meat categories as share of total fresh or frozen meat equivalence consumption (in quantities) in percent of singles, couples, families, single parents and adult households; Source: raw data from Statistik Austria, 2002; own calculation***

The remaining food categories listed in Table 6 can be discussed briefly. The consumption of **fish**, yogurt, cheese, curd, fats and candies seem to be independent of the type of family. Fish consumption is around 0.4 kg per month, **yogurt, cheese and curd** around 1 kg per month and candies around 2 kg. Also the categories of fats, animal and vegetable fats, remain nearly constant at a level of 0.4 kg per month.

Concerning **milk** and **eggs**, higher differences across family types can be observed. Interestingly, the highest consumption figures of both milk and eggs are found in adult households without children, 8 litres of milk and 23 eggs per month, respectively. Single and couples households consume around 20 eggs, family and single parent households only 16 per month. The consumption of milk is around 7 litres. Finally, the family type has also no influence on consumed quantities of **mineral water, soft drinks and juices, coffee and cocoa**. On average coffee and cocoa consumption is around 1 kg per month, whereas the consumption of mineral water, soft drinks and juices is much higher, at a level of 15 litres per month.

3 Environmental impacts of food consumption

The previous section showed that younger, higher income and educated households, families and single parents, as well as employees in middle and high positions, show lower consumption quantities of meat, vegetables and fruits, but prefer within these categories food types with higher environmental pressure. We are now interested in what this result implies for environmental impacts across these groups. Thus, we calculate the environmental effects of meat, vegetable and fruit consumption due to preferences across socio-economic groups and compare them to the emissions of an average household. As indicators for environmental effects CO_2 equivalent emissions (generated through production and processing) and material intensity (biotic and abiotic) are used.

Based on differences across socio-economic groups, we discuss the following socio-economic groups in more detail: household with heads of age 29 and younger with those with age 60 years and older; households in the first income quartile with those in the fourth quartile; households with secondary school attainment with those with university; farm households, employees in low, medium and top positions, and finally single households, couples, family households and single parents with children. Figure 18 gives an overview of the consumption quantities of these groups.

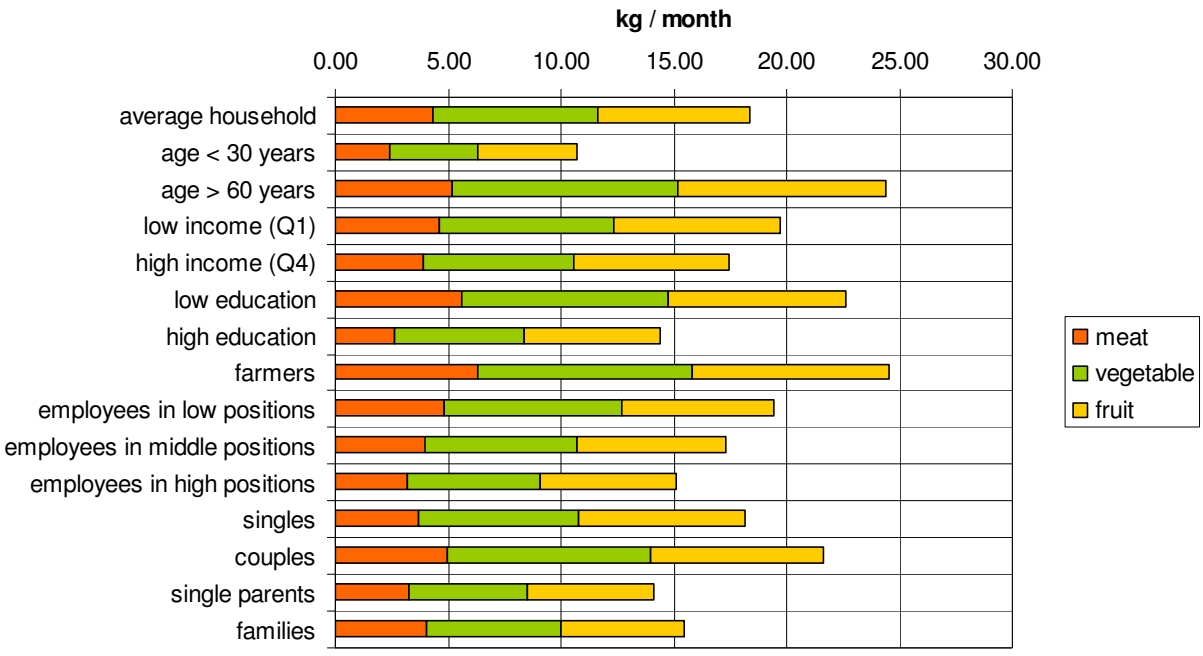


Figure 18: Food consumption (in kg / month, equivalence scale) by socio-economic group

3.1 Environmental impacts for different food categories[6]

3.1.1 CO_2equivalent emissions

In assessing the environmental sustainability of household food consumption by different socio-economic groups, we refer to emissions of **CO_2 equivalents** (CO2e) generated through production and processing of specific food categories. CO_2 effects were calculated from specific emissions in CO_2 equivalents (units in gram per kg food) per food category (for meat, vegetables and fruits), based on Taylor (2000). Since the consumption database does not distinguish organic from conventional production, we refer to emission coefficients for conventional production. For meat, estimates based on life-cycle analysis were available for beef, pork, dried, salted and smoked meat, and poultry. Due to non-availability of data, other meat categories could not be considered in the analysis. Regarding vegetables, specific emissions are available for potatoes, fruiting and flowering vegetables (as a proxy for fruiting and flowering vegetables we generate a mean emission coefficient from tomatoes, leek, peas and green beans), a selection of root vegetables (mean value is taken for root vegetables), salad and spinach (1/2 each is assumed to contribute to leaf vegetables), selection of brassicas (mean value is taken for brassicas). Concerning tomatoes, we assume that 1/3 is grown on field and 2/3 in greenhouses. For fruit, we have data on apples, oranges (for citrus fruits), cherries, grapes and plums (for stone fruit) and strawberries (for soft fruits). As a proxy, we take the apple coefficient for pears as well. Table 7 summarizes the coefficients used and illustrates the large differences across food categories.

[6] The data to calculate the CO_2 and MI coefficients are taken from German sources. The authors are therefore assuming that the coefficients are directly transferable to Austrian conditions. This might not be the case for all food categories, as pointed out by one of the workshop participants, since for beef production there is presumably a difference between beef produced through intensive agriculture (main share in Germany) an beef produced through grazing in Alpine meadows (higher share in Austria than in Germany).

Table 7: CO_2e emission coefficients for meat, vegetable, and fruit consumption (per kg)

		CO_2 in kg / kg*)	relative to lowest subcategory
meat	beef	10.69	3.7
	pork	3.12	1.1
	poultry	2.92	1.0
	dried, salted, smoked meat	10.09	3.5
vegetables	leaf vegetables, herbs	0.14	2.5
	brassicas	0.10	1.8
	fruiting, flowering vegetables	0.36	6.5
	root vegetables	0.12	2.2
	potatoes	0.05	1.0
fruit	citrus fruit	0.18	3.2
	banana	0.18	3.2
	apple	0.06	1.0
	pear	0.06	1.0
	stone fruits	0.14	2.5
	soft fruit	0.15	2.6

*) Adapted from Taylor (2000)

3.1.2 Material intensities

In addition to CO_2 emissions we also looked at "ecological rucksacks" of food consumption expressed in **material inputs** (MI) per food categories. Ecological rucksacks and material inputs measure the amount of resources needed for the production of certain goods (Schmidt-Bleek, 1997). MI values are based on data by the German Wuppertal Institute for Climate, Environment and Energy (Schütz, 2007). As the values express material inputs in kg per kg of food category, the amounts of consumed foods have been multiplied with the corresponding MI values. Table 8 gives an overview of the MI values used.

The MI values contain the following material inputs for the production of the food categories:

Meat:

- Biotic raw materials: Indirect flows as biotic materials were derived from German agricultural standard tables as biomass not harvested (straw, leaves, harvest residuals) for feedstuff.
- Abiotic raw materials: These coefficients contain the following abiotic materials in agricultural production of plant feedstuffs in Germany 1995: nitrogen fertilizers, phosphate fertilizers, potassic fertilizers, calcium fertilizers, pesticides, fossil fuels, lubricants, and electricity (i.e., its equivalent in abiotic material requirements). Further they include energy carrier use in the producing nutrition industries: coal, light fuel oil, medium and heavy fuel oil, gas, and electricity (i.e., its equivalent in abiotic material requirements).

Fruits and vegetables:

- Biotic raw materials: Indirect flows as biotic materials were derived from German agricultural standard tables as biomass not harvested (straw, leaves, harvest residuals).
- Abiotic raw materials: These coefficients include the following abiotic materials in agricultural production in Germany 1995: nitrogen fertilizers, phosphate fertilizers, potassic fertilizers, calcium fertilizers, pesticides, fossil fuels, lubricants, and electricity (resp. its equivalent in abiotic material requirements).

- Citrus fruit and banana: These categories also contain MI for transport. This methodological inconsistency has been accepted to recognise the environmental effect through transport for these two categories which are transported over long distances.

Table 8: MI values for meat, vegetable, and fruit consumption (per kg)

		MI in kg / kg*)	relative to lowest subcategory
meat	beef	17,70	3,9
	pork	5,10	1,1
	poultry	4,58	1,0
	dried, salted, smoked meat	32,76	7,1
vegetables	leaf vegetables, herbs	1,06	2,6
	brassicas	1,06	2,6
	fruiting, flowering vegetables	3,23	7,9
	root vegetables	0,41	1,0
	potatoes	1,45	3,6
fruit	citrus fruit	1,82	7,3
	banana	0,54	2,2
	apple	0,25	1,0
	pear	0,25	1,0
	stone fruits	0,89	3,6
	soft fruit	0,57	2,3

*) Schütz (personal communication), Banana: Giljum (1999) and Schütz (personal communication)

3.1.3 The calculation of environmental impacts by socio-economic group

In order to derive the emissions for meat, vegetable and fruit consumption by different socio-economic groups, we multiply these specific emissions by the consumed quantities in the respective food category (as discussed in Section 2). Since the total quantities consumed at home differ a lot across households (see Figure 18), we normalize the quantities consumed per food category to the levels of the average household. Thus, we take the total quantity consumed by an average Austrian household and the preference held by the socio-economic group (i.e., the shares per food subcategory). We refer to this effect as "preference effect", because it shows how different tastes and preferences, for a given total consumption quantity of e.g. meat, results in higher or lower emissions. The preference effect thus targets at differences in taste, expressed by demand shares, within the food categories (namely, preferences for specific types of meat or vegetable).

The preference effect is calculated in two steps. First, the deviation in emissions caused by consumption by a specific socio-economic group (x) to emissions by the average Austrian household is calculated for food sub-category i (meat, fruit, or vegetable) as follows:

$$PE_i^x = \frac{e_i \left(\left(s_i^x \sum_j \overline{q}_j \right) - \overline{q}_i \right)}{\sum_j e_j \, \overline{q}_j}, \qquad \sum_i s_i^x = 1$$

where e_i is the emission coefficient of food sub-category i, s_i^x the share of demand by socio-economic group x for food sub-category i. Furthermore, $\overline{q}_j$ denotes the average quantity consumed of food sub-category j (mean of all households). For instance, the preference effect by group x for pork is positive if the quantity demanded after adjusting for total meat consumption (normalized to the level of the average Austrian household) exceeds the quantity demanded of pork by the average household. As a

consequence, the resulting level of emissions would exceed the average level and the preference effect for pork was positive. The total preference effect (sum of meat, fruit and vegetable) by socio-economic group is derived by summing over all sub-categories i.

3.2 CO_2e impacts by socio-economic group

Table 9 shows the results for meat, vegetable and fruit consumption across socio-economic groups. A positive effect stands for higher emissions than the average household, and a negative effect for lower ones. The column "Δ row %" gives the change in emissions per food subcategory (i.e. meat, vegetable, fruit) while the column "Δ total %" refers to the change in emissions relative to the aggregate of meat, vegetable and fruit. Since meat consumption causes much higher emissions than fruit or vegetable consumption, the total effect is generally dominated by meat consumption. Note that the socio-economic groups are only mutually distinct within a socio-economic variable (like age, income, etc.) but not across variables.

The general trends are as follows. First, the highest CO_2e effects from meat, vegetable, and fruit consumption in total, as measured by the preference effect, can be observed for top employee households (+11% compared to average household), and for high income households (+6%), while the lowest environmental effects emerge for low income households (-4.4%) farm households and low educated households (-4% each). Moreover, the effects within the subcategories usually point in the same direction as the total effect: for instance, low income households have a negative preference effect for meat, vegetable and fruit separately and in total. Moreover, if the effects for the subcategories point in opposite directions, the sign of the total effect is dominated by the effect of meat consumption. This case is illustrated for people in low and middle positions who have positive effects for fruit or vegetable, respectively, but negative effects for meat and in total. Thus, while these households have preferences which lead to lower emissions than the average preferences, they prefer fruit (or vegetable) types which are less environmental friendly than the average household. For instance, high position people prefer more exotic fruits instead of apples, and middle position people consume more leaf and fruiting and flowering vegetables instead of potatoes.

Let us now discuss the results in more detail. Starting with the effect of age, older people consume more vegetables and fruits in proportion to meat. Younger ones, on the other hand, have a higher (relative) preference for dried, smoked and salted meat, minced meat, fruiting and flowering vegetables. In addition, older households choose their diet in line with traditional eating habits (potatoes, apples, pork) whereas younger ones compose their diet more diversely (exotic fruits). With respect to the CO_2e effects of food consumption, older age groups are more environmentally sustainable than younger ones (2.1% less CO_2e emissions compared to the average household), based on older people's preference for apples, instead of exotic fruits, and potatoes instead of fruiting and flowering vegetables.

Table 9: Change in CO_2e emissions from meat, vegetable, and fruit consumption of selected socio-economic groups relative to average Austrian household

	change in CO_2 emissions relative to average Austrian household (preference effect)			
	Δ row %	Δ total %	Δ row %	Δ total %
income	**low (quartile 1)**		**high (quartile 4)**	
total (Δ%)	**-4.4%**	**-4.4%**	**+6.0%**	**+6.0%**
meat (Δ%)	-4.4%	-4.2%	+6.0%	+5.7%
vegetable (Δ%)	-2.9%	-0.1%	+10.6%	+0.3%
fruit (Δ%)	-3.3%	-0.1%	+0.7%	+0.0%
education*	**low (primary school)**		**high (university)**	
total (Δ%)	**-4.0%**	**-4.0%**	**+4.9%**	**+4.9%**
meat (Δ%)	-3.7%	-3.5%	+4.3%	+4.0%
vegetable (Δ%)	-9.6%	-0.3%	+25.6%	+0.8%
fruit (Δ%)	-7.7%	-0.2%	+2.2%	+0.1%
age*	**< 30 years**		**> 60 years**	
total (Δ%)	**+1.9%**	**+1.9%**	**-2.1%**	**-2.1%**
meat (Δ%)	+1.2%	+1.1%	-1.7%	-1.6%
vegetable (Δ%)	+14.2%	+0.5%	-8.5%	-0.3%
fruit (Δ%)	+10.6%	+0.3%	-8.2%	-0.2%
labor force status*	**farmers**		**employees low position**	
total (Δ%)	**-4.1%**	**-4.1%**	**-1.6%**	**-1.6%**
meat (Δ%)	-3.5%	-3.3%	-1.6%	-1.5%
vegetable (Δ%)	-8.6%	-0.3%	-4.8%	-0.2%
fruit (Δ%)	-20.9%	-0.5%	+0.6%	+0.0%
labor force status*	**employees middle position**		**employees high position**	
total (Δ%)	**-1.4%**	**-1.4%**	**+10.8%**	**+10.8%**
meat (Δ%)	-1.5%	-1.4%	+10.9%	+10.3%
vegetable (Δ%)	+2.1%	+0.1%	+13.3%	+0.4%
fruit (Δ%)	-0.7%	-0.0%	+4.7%	+0.1%
family type	**single**		**couples**	
total (Δ%)	**+2.8%**	**+2.8%**	**-1.3%**	**-1.3%**
meat (Δ%)	+3.1%	+3.0%	-1.4%	-1.3%
vegetable (Δ%)	-2.3%	-0.1%	+1.1%	+0.0%
fruit (Δ%)	-2.7%	-0.1%	-1.9%	-0.0%
family type	**single parents**		**family**	
total (Δ%)	**-3.7%**	**-3.7%**	**-0.1%**	**-0.1%**
meat (Δ%)	-4.6%	-4.3%	-0.3%	-0.3%
vegetable (Δ%)	+11.9%	+0.4%	+1.5%	+0.1%
fruit (Δ%)	+8.8%	+0.2%	+5.6%	+0.1%

*) refers to household head

The effect of income on sustainability is as follows. As discussed above, total emissions of high income households increase by 6%, due to a positive preference effect (more beef, more fruiting and flowering vegetables). Low income households contribute to emissions by 4.4% less than the average household, which can be regarded as a strong negative preference effect. While the consumed quantities of vegetables decline from the first to the fourth quartile, preferences for fruiting and flowering vegetables (in particular tomatoes) rather than potatoes cause emissions of CO_2 equivalents to rise. However, this increase of 10.6% in emissions from vegetable consumption translates into an increase of +0.3% in total only. A similar trend can be observed for emissions from fruit and meat consumption.

The effect of labour force status can be best understood by investigating four groups which are quite different in their food choices: farm households, workers and employees in low, middle and high positions. From a sustainability perspective, farm households and, to a lesser extent, households of low and middle position workers contribute considerably less to emissions, because of traditional eating habits. On the other hand, workers in high positions contribute far more to emissions from meat, vegetable and fruit consumption, due to a preference for more environmentally harmful meat, fruit and vegetable categories relative to the average Austrian household.

Finally, we investigate the impact of family types on CO_2e emissions. Couples, families and single parents show lower CO_2e emissions than the average household, while single households have emissions above average (total preference effect +2.8%). This is caused in particular by a higher preference for dried, salted and smoked meat as well as for beef. Interestingly, the positive preference effect of meat consumption by single households is not compensated by negative preference effect from fruit and vegetable consumption, again due to the much higher specific emissions of meat compared to fruit and vegetables. On the other hand, family households and single parents have higher emissions from vegetable and fruit consumption than the average household, but again this effect is dominated by a negative preference effect from meat consumption (which is due to a very low share of beef consumption).

3.3 MI impacts by socio-economic group

Table 10 summarizes the results of the calculation of the material inputs associated with food consumption for different household categories. As before, a positive effect stands for higher material inputs than that of the average household, and a negative effect for lower ones. The column "Δ row %" gives the change in inputs per food subcategory (i.e. meat, vegetable, fruit) while the column "Δ total %" refers to the change in inputs relative to the aggregate of meat, vegetable and fruit. Since meat consumption requires much higher material inputs than fruit or vegetable consumption, the total effect is generally dominated by meat consumption.

Table 10: Change in MI impacts from meat, vegetable, and fruit consumption of selected socio-economic groups relative to average Austrian household

	change in MI relative to average Austrian household (preference effect)			
	Δ row %	Δ total %	Δ row %	Δ total %
income	**low (quartile 1)**		**high (quartile 4)**	
total (Δ%)	**-4.7%**	**-4.7%**	**+5.3%**	**+5.3%**
meat (Δ%)	-7.0%	-4.3%	+6.7%	+4.1%
vegetable (Δ%)	-0.0%	-0.0%	+3.1%	+0.7%
fruit (Δ%)	-2.4%	-0.3%	+3.2%	+0.5%
education of household head	**low (primary school)**		**high (university)**	
total (Δ%)	**-6.2%**	**-6.2%**	**+5.3%**	**+5.3%**
meat (Δ%)	-6.5%	-4.0%	+4.6%	+2.8%
vegetable (Δ%)	-3.1%	-0.7%	+9.2%	+2.2%
fruit (Δ%)	-10.3%	-1.5%	+2.1%	+0.3%
age of household head	**< 30 years**		**> 60 years**	
total (Δ%)	**+8.2%**	**+8.2%**	**-4.2%**	**-4.2%**
meat (Δ%)	+9.1%	+5.6%	-3.7%	-2.3%
vegetable (Δ%)	+4.8%	+1.1%	-3.3%	-0.8%
fruit (Δ%)	+10.3%	+1.5%	-8.2%	-1.2%
employment of household head	**farmers**		**unskilled workers**	
total (Δ%)	**-7.9%**	**-7.9%**	**-2.2%**	**-2.2%**
meat (Δ%)	-4.9%	-3.0%	-3.3%	-2.1%
vegetable (Δ%)	-5.1%	-1.2%	-0.6%	-0.1%
fruit (Δ%)	-25.4%	-3.7%	-0.2%	-0.0%
employment of household head	**skilled workers**		**top employees**	
total (Δ%)	**-0.6%**	**-0.6%**	**+11.5%**	**+11.5%**
meat (Δ%)	-0.4%	-0.2%	+15.8%	+9.8%
vegetable (Δ%)	-1.0%	-0.2%	+3.8%	+0.9%
fruit (Δ%)	-1.0%	-0.1%	+5.5%	+0.8%
family type	**single**		**couples**	
total (Δ%)	**+2.1%**	**+2.1%**	**-1.3%**	**-1.3%**
meat (Δ%)	+4.3%	+2.7%	-2.4%	-1.5%
vegetable (Δ%)	-1.1%	-0.3%	+0.6%	+0.1%
fruit (Δ%)	-2.2%	-0.3%	+0.2%	+0.0%
family type	**single parents**		**family**	
total (Δ%)	**+2.6%**	**+2.6%**	**+0.8%**	**+0.8%**
meat (Δ%)	-1.5%	-0.9%	+0.7%	+0.4%
vegetable (Δ%)	+7.9%	+1.9%	+0.1%	+0.0%
fruit (Δ%)	+11.7%	+1.7%	+2.3%	+0.3%

Table 11: A comparison of environmental effects for CO_2 emissions and material inputs

	preference effect (Δ total %)			
	CO_2	**MI**	**CO_2**	**MI**
income	**low (quartile 1)**		**high (quartile 4)**	
total (Δ%)	**-4.4%**	**-4.7%**	**+6.0%**	**+5.3%**
meat (Δ%)	-4.2%	-4.3%	+5.7%	+4.1%
vegetable (Δ%)	-0.1%	-0.0%	+0.3%	+0.7%
fruit (Δ%)	-0.1%	-0.3%	+0.0%	+0.5%
education of household head	**low (primary school)**		**high (university)**	
total (Δ%)	**-4.0%**	**-6.2%**	**+4.9%**	**+5.3%**
meat (Δ%)	-3.5%	-4.0%	+4.0%	+2.8%
vegetable (Δ%)	-0.3%	-0.7%	+0.8%	+2.2%
fruit (Δ%)	-0.2%	-1.5%	+0.0%	+0.3%
age of household head	**< 30 years**		**> 60 years**	
total (Δ%)	**+1.9%**	**+8.2%**	**-2.1%**	**-4.2%**
meat (Δ%)	+1.1%	+5.6%	-1.6%	-2.3%
vegetable (Δ%)	+0.5%	+1.1%	-0.3%	-0.8%
fruit (Δ%)	+0.3%	+1.5%	-0.2%	-1.2%
employment of household head	**farmers**		**unskilled workers**	
total (Δ%)	**-4.1%**	**-7.9%**	**-1.6%**	**-2.2%**
meat (Δ%)	-3.3%	-3.0%	-1.5%	-2.1%
vegetable (Δ%)	-0.3%	-1.2%	-0.2%	-0.1%
fruit (Δ%)	-0.5%	-3.7%	+0.0%	-0.0%
employment of household head	**skilled workers**		**top employees**	
total (Δ%)	**-1.4%**	**-0.6%**	**+10.8%**	**+11.5%**
meat (Δ%)	-1.4%	-0.2%	+10.3%	+9.8%
vegetable (Δ%)	+0.1%	-0.2%	+0.4%	+0.9%
fruit (Δ%)	-0.0%	-0.1%	+0.1%	+0.8%
family type	**single**		**couples**	
total (Δ%)	**+2.8%**	**+2.1%**	**-1.3%**	**-1.3%**
meat (Δ%)	+3.0%	+2.7%	-1.3%	-1.5%
vegetable (Δ%)	-0.1%	-0.3%	+0.0%	+0.1%
fruit (Δ%)	-0.1%	-0.3%	-0.0%	+0.0%
family type	**single parents**		**family**	
total (Δ%)	**-3.7%**	**+2.6%**	**-0.1%**	**+0.8%**
meat (Δ%)	-4.3%	-0.9%	-0.3%	+0.4%
vegetable (Δ%)	+0.4%	+1.9%	+0.1%	+0.0%
fruit (Δ%)	+0.2%	+1.7%	+0.1%	+0.3%

Environmental effects for CO_2 and MI correspond for most socio-economic groups so that effects point into the same direction (increase or decrease compared to an average household). This is the case for the following socio-economic groups:

- **Income**: Low income households show lower material inputs than the average household, high income household show higher material inputs.
- **Education**: Households with low education cause lower material inputs than the average household; households with high education higher ones.

- **Age**: Younger households show higher material inputs than an average household whereas older households show lower material inputs.
- **Employment**: Unskilled workers show lower material inputs through their food consumption than an average household, while top employees show higher ones. This last group has the highest environmental impacts due to preferences within all analysed categories.
- **Family type**: Singles and single parents households show higher material inputs than the average household. However concerning CO_2e only single households have higher emissions than the average household.

The different size of the effects in material inputs and CO_2 can be explained by the different ratio of environmental effects of different food categories.

For two socio-economic groups effects in CO_2 and MI go into opposite directions. For single parent households and family households CO_2 emissions are lower but material inputs are higher than those of an average household. This effect is stronger for single parent households for which CO_2 emission decrease by 3.7% but material inputs increase by 2.6%. This effect can also be explained by the different relationship between the ratios of CO_2 and MI for different food categories. Table 11 shows the difference between environmental effects for CO_2 emissions and material inputs.

3.4 Discussion

Our results confirm the result of White (2000) that the ecological footprint triggered by meat consumption is higher than by vegetarian consumption. According to Carlsson-Kanyama (1998), however, if the vegetarian diet consists of a high share of exotic foods, it can be more environmentally harmful than a mea -based one. We find that this latter effect is not able to reverse the sign of the preference effect in CO_2e emissions from meat consumption: single parents, couples and families have a positive preference effect for vegetables, a negative one for meat, and a negative total effect.

Across household groups, the deviations in CO_2e emissions as measured by the preference effect can be explained by the relative emission intensity of meat as opposed to vegetable and fruit (see Table 9) and the preferences within these categories. While a stronger preference for imported and greenhouse-grown vegetables increases the environmental effects (see, e.g., the positive preference effect for vegetables by high income households) these can be compensated by lower environmental effects from meat consumption, as the opposing signs for family households, couples and single parents illustrate, who have a high preference for poultry (and a lower one for beef). Thus, preferences make a difference, even if overall consumption quantities are normalized to average household levels.

A natural next step would be to look into absolute differences in consumption levels as well. If highly educated levels show the lowest consumption levels of meat (as indicated by Figure 18), but within meat they prefer less sustainable categories – what is the overall effect of both preference and absolute consumption quantities on CO_2 emissions? Unfortunately, we cannot answer this question directly, since total quantities consumed are highly dependent on the level of out-of-home consumption and Household Budget Surveys do not provide consumption quantity data for out-of-home consumption. If we had this kind of data to adjust total consumption quantities, we would be able to distinguish a preference effect and a quantity effect when decomposing the differences in food consumption across socio-economic groups.

Thus, as a first indication we can look into the relative shares of different food categories (meat, vegetable, and fruit) by socio-economic groups. Figure 18 summarizes the total quantities consumed for selected socio-economic groups. In order to be able to analyze these differences, Table 12 shows the vegetable to meat ratio and fruit to meat ratio, which indicate the amount of consumed vegetables and fruits (in kilograms) in proportion to one kilogram of meat.

	Ratios by socio-economic group			
	vegetable to meat ratio	fruit to meat ratio	vegetable to meat ratio	fruit to meat ratio
income	low (quartile 1)		high (quartile 4)	
	1.48	1.46	1.48	1.62
education*	low (primary school)		high (university)	
	1.46	1.31	1.92	2.10
age*	< 30 years		> 60 years	
	1.40	1.63	1.72	1.62
labor force status*	farmers		employees low position	
	1.40	1.30	1.44	1.29
labor force status*	employees middle position		employees high position	
	1.46	1.50	1.63	1.74
family type	single		couples	
	1.68	1.82	1.61	1.43
family type	single parents		family with children	
	1.40	1.64	1.29	1.26

*) refers to household head

Table 12: Mean ratios between vegetable, fruit and meat consumption by socio-economic groups (STAT, 2004; own calculation)

In fact, the vegetable to meat and fruit to meat ratio of the oldest age group is higher compared with middle or younger aged households. In other words, the age group of those 60 and older proportionately consumes more vegetables and fruits per kg of meat and thus consumes more sustainably than the young households.

With rising income, the vegetable to meat ratio and fruit to meat ratio do not change significantly. On the other hand, with higher educational level we find the vegetable to meat and fruit to meat ratios increase. On the basis of the Duncan test about mean equivalence, the group means of the vegetable-to-meat ratios differ significantly (error statistic $p < 0.05$) across educational groups, and the same applies to the fruit to meat ratio. These results clearly meliorate the assessment of the previous section where the preference effect was strongly negative for high income and highly educated households.

Regarding labour force status, no general trends can be observed, except that the vegetable to meat ratio as well as the fruit to meat ratio is highest for employees in high positions. Across family types, single households have higher shares of vegetable and fruit consumption as opposed to family households and single parents with children.

Thus, we have to modify the conclusion for those households who have a strongly positive preference effect (high income, employees in high positions, singles etc.). While they consume less sustainable types of meat in particular, they have higher shares of vegetables and fruits relative to meat. In other words, their overall combination of meat, fruit and vegetables is more sustainable than on average, making their classification as unsustainable consumer groups more ambiguous. The only exception to

this observation is the group of young households which has both a positive preference effect and low fruit to meat and vegetable to meat ratios.

4 Policy Recommendations

The scientific analyses during the two project years allow us to draw conclusions for policy recommendations that would invert the Austrian trend of food consumption towards more sustainable patterns. However, in addition we used the chance to include the opinions of stakeholders that are closer to decision making, implementation and policy than the research team. In April 2007 we organised a half-day stakeholder workshop with 11 stakeholders from different institutions (public, private, NGO)[7], where we first presented and discussed the results of our analyses. In the second part, within a group exercise, ideas for tailor-made instruments for the relevant household categories were developed. Thus, in this chapter we give recommendations based on our scientific work as well as the suggestions resulting from the workshop.

In order to support the environmental sustainability of food consumption, it is necessary to change the current unsustainable food consumption patterns. This is agreed knowledge that has been demonstrated in many reports and articles about sustainable consumption in general and food consumption in particular. The different policy options that they are suggesting can be divided into those addressing all consumers (general trends) and those differentiating consumers according to their specific consumption patterns. (OECD, 2001; OECD, 2002a, 2002b; Payer et al., 2000) In this chapter we focus on the latter, using the results of our analysis as starting point.

If consumption patterns are to change, the behaviour of consumers has to be targeted, directly as well as via the supply of retailers and the product range of producers. As a prerequisite for change, individuals (1) need to have adequate knowledge; but additionally (2) a positive attitude to change (willingness) is necessary as well as (3) access to sufficiently attractive alternatives (ability) (OECD, 2002b). Various types of policy instruments can influence those three factors, coarsely grouped into regulatory, economic and social instruments. According to the policy aim and the addressed group of people, different instruments are appropriate. In general a combination of instruments is most effective (Vogelsang and Lorek, 2004). Examples for *economic* instruments are charges or taxes (CO_2 tax, material input tax) and subsidies, e.g. for producers of organic products. *Social* instruments mainly focus on the knowledge and willingness of people through better education, information campaigns, and labelling, or voluntary agreements by producers for actions beyond legal requirements (an Austrian example are different organic food labels of supermarket chains). Those social instruments are in particular suitable to address different classes of households and influence their lifestyles. All instruments are influencing individual choices (OECD, 2002b), which are based on preferences, which themselves are determined by various factors such as biological needs and social factors (habits, culture, tradition, socio-economic characteristics). Thus, in order to change behavioural decisions it is necessary to influence preferences. If factors determining those preferences are taken into account, the success of policies can be increased. However, one has to be aware that those changes are of a mid-term to long-term character and thus need a long term strategy.

Consumer decision making in all times was driven by taste. Nowadays, additionally convenience and time constraints are taken into account. Employees in high positions usually have larger time constraints. As we have shown in our study, this causes a higher preference for environmentally harmful food like pre-prepared food and more environmentally burdening types of meat. Single parents also have stronger

[7] Among them are the chamber of agriculture, Federal Ministry of Agriculture, Forestry, Environment and Water Management, Global 2000, a supermarket chain, Greenpeace, Bioforschung, Klimabündnis.

preferences for food with high emissions than families or couples, due to time constraints; they remain however below the average household. Singles on the other hand have stronger preferences for food with high emissions than the average household due to other time management and preferences for quick-to-prepare food due to social reasons. They consider cooking in single portions as less attractive. These habits have to be met in a balanced policy mix. So it is desirable to increase the supply of sustainable products fulfilling the need to save time, both for in-home and out-of-home consumption (organic convenience food). Here the market activities of producers and retailers have to be addressed by regulatory instruments (bans, such as ban on certain pesticides in food), economic instruments (subsidies, taxes) or social instruments (voluntary agreements). With respect to out-of-home consumption, a more sustainable food supply by canteens of public institutions (ministries, schools, universities) by using x% organic ingredients, offering one organic meal per day etc. could set a good example in achieving sustainability.

Thus, in order to change the currently unsustainable trend in food consumption a lot of policy instruments are available from which to choose. Based on the project results we recommend a set of instruments, economic, social and regulatory ones, aiming at all consumers on the one hand and on households with socio-economic characteristics determining higher negative sustainability impacts on the other hand.

In this study we analysed socio-economic characteristics of certain food consumption behaviour. We concluded that concerning environmental effects, *high income households* and those in *high positions* have the highest material input due to their preferences, followed by single households. This is astonishing in so far as their share of vegetables and fruits relative to meat is relatively high. Nevertheless, their environmental effects are still among the high ones. This result is supported by the preferences of those households for easy-to-prepare-food and especially their preference for GHG- and material-intense categories of meat and of fruits and vegetables.

Concerning age, it can be shown that *young people* are less environmentally friendly than older ones; The consumption of organic food is higher the older, better educated and wealthier people are (Hinteregger, 2006). Thus policies, in particular aiming at influencing the behaviour of younger, wealthy people and those in high positions could be a very efficient way of changing the trend. A study with empirical findings in the Netherlands (Ferrer-i-Carbonell and van den Bergh, 2004) confirms these results (unsustainable consumption is in general positively related to income, education and high-status jobs).

By and large, our general results (i.e. for the average Austrian household) confirm trends previously identified in the literature and in more general studies on food consumption. So the purpose of policy recommendations that should be given in this chapter is not to highlight again what is known and recommended as necessary policies in other contexts. This does not mean we do not see it as valid or that it can be neglected. Thus, all general aspects - suggested for example by the European Environmental Agency - have to be taken on board for a nation-wide strategy. For instance, EEA (2005) states that “in any way the ability and willingness of individual consumers to change their food consumption patterns to products with lower environmental impacts depends on the availability of the necessary information, the availability of such foods in stores and the price.” Labels that give information on product origins and the environmental and energy intensity embodied within could serve to raise awareness. Other actions that can influence consumer behaviour include influencing prices through the use of market-based instruments, refund systems, education, and advertising and marketing campaigns (EEA 2005).

The novel contribution of the present study is the focus on the differences across socio-economic groups and the comparison among vegetable, fruit and meat consumption. Thus, we concentrate our

recommendations on two aspects: the most environmentally relevant food group and the socio-economic groups causing an exceptionally high environmental burden.

Regarding food groups it is recommended to concentrate on the food category with the highest environmental impacts: **meat consumption** and here especially **beef and dried, salted, smoked meat**. This is, however, not a popular notion and thus often not addressed very explicitly. However, the results show unquestionably the importance of this focus.

The most interesting socio-economic groups to focus on are households with **high income**, **high education**, and **high position** (of the household head), **singles** as well as **young** households. All of them cause environmental impacts above the Austrian average. This alone justifies putting the focus on them. Still for every group there are additional reasons why they play a special role for the overall food consumption behaviour.

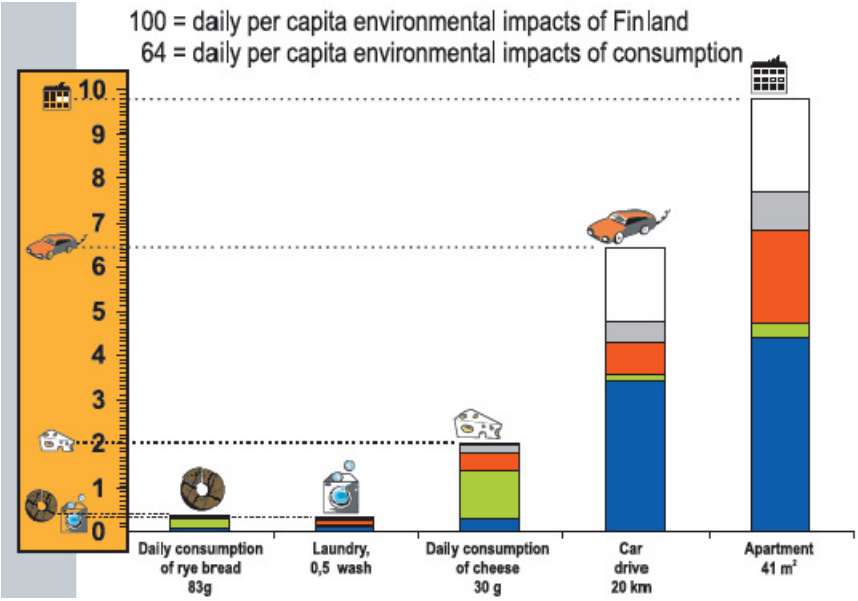
In young households the stage is being prepared for food consumption behaviour of future, not only because their households will potentially last for some decades but also, as they are the people who will educate and influence the next generation(s). High income, high education, and high position households are partly overlapping. High position and high income households are not only responsible for their own consumption behaviour but also in their position as providing a role model (multiplier) for other households or in the case of high educated households to educate others.

However, we have to be aware that the share of wealthy, well educated and high position households is below 20% and the share of younger households is only 10% (Statistik Austria 2002); thus measures directed at those groups address high environmental impacts but can only reach a small percentage of the Austrian population.

To address meat consumption for young households on the one hand and high income and high position households on the other, regulatory and economic instruments, information and voluntary agreements are available. But what we like to eat is a very personal and thus sensitive topic. People require regulation in those cases, where production conditions, ingredients or hygienic aspects might infect their health. Recommendations or even regulation from public authorities which force people towards an environmentally friendly diet can be expected to be extremely unpopular. Furthermore, economic instruments are most likely not the best strategies, at least for high income households. Their tendency is towards high quality and high price food anyway. Thus an increase in beef prices might not even be recognised by them, while it would affect lower income households and thus increase social inequity. The remaining category of instruments is that of social instruments, in the form of information and voluntary agreements.

General information has to start with awareness about the absolute importance of meat consumption compared to other food products or even other household activities and the different impacts of different meat products. This awareness raising has to include educators and opinion leaders in particular. The example in *Figure 19* exemplifies how such information can be prepared in an easy and understandable way. The figure illustrates the impacts of food consumption in relation to the overall consumption and within food the impacts of the different categories. This information helps consumers to put the impacts of their decisions about food consumption in relation to other products and allows them to get a feeling for the consequences of their behaviour.

Figure 19: Environmental impacts of consumption for Finland. Source: Eco-Benchmark (Nissinen, Ari et al. 2007), http://www.ymparisto.fi/download.asp?contentid=48962&lan=fi



More specific information campaigns for the different households groups have to ask how and where to reach its members best. Information for the high education group should be given in media they are interested in and take into account their ability to understand and to think in a larger context.

For the high position/income group an increase in prestige for reduced meat consumption might be another option. Those groups are frequently eating out of home. This makes it necessary to consider also activities at those places where their meals regularly are consumed. Instead of addressing the members of the household directly, the specific canteens - or more likely restaurants - should be involved in introducing changes in the food offered as well as ingredients and also in the "taste-sets". Canteen programs, for example, could be introduced via voluntary agreements with canteens/restaurants/caterers to establish the offer of more sustainable dishes - whether promoting this or just by doing it and not letting the costumers know.

While prestige raising and intelligent information provision are recommended for the more established household groups, addressing young households might focus on socializing aspects. This may reach from TV programs adapted to the adequate times of a student's life, to internet presence for short time cooking demonstrations.

Other general remarks were given in the discussion during the stakeholder workshop. Decision makers in Austria should increasingly implement policies that provide direction towards more sustainable food consumption, for instance by setting regulations, changing the subsidy scheme etc. In public communication the environmental benefit of sustainable food consumption should be combined with (or even hidden behind) the more popular health aspects. In general the experts believe that an emotional and pleasurable way of communication is more successful than pure provision of information. Specific measures developed in the group work in this workshop are given in Table 13.

Table 13: Specific measures developed in the group work in the stakeholder workshop. Bold issues were given high priority in an evaluation exercise

Young households	High income – high position	For different groups
Cooking and eating as social event (cooking parties à la Jamie Oliver)	Workshops, information on how to cook „exotically“ with regional products	Theme placement in TV series, films
No sweets in school canteens, but organic food, fruits and vegetables; “healthy snack“ or “healthy lunch”	All inclusive packages for vacations including organic, regional food	**Suggestions for menus based on local, organic, vegetarian food: better – healthier – cheaper, including vouchers for organic products**
Rules for leaseholders of canteens	Restaurant guide with awards for sustainable food, food culture (“slow food“)	**Taxes on CO_2, material input etc.**
Cooking parties for singles: „Anbraten“		Increased supply of organic, vegetarian take-away food
Trendy telecasts for young people on Thursday night: modern cooking with regional and seasonal products		

5 Conclusions and outlook

Based on the results of our research for sufo:trop we can conclude that average household consumption in Austria is dominated by traditional food categories like brown bread, potatoes, apples and pork. With respect to the project definition of sustainable food consumption, the results show that higher consumption figures of bottled beverages, exotic fruits, fruiting and flowering vegetables and meat could indicate a shift toward less sustainable patterns.

In terms of expenditures, we find that the household size seems to be the most influential determinant: with each additional member, total food budget increases, however not in a proportional way. Total expenditures grow but per capita figures decline due to the economies of scale in consumption. Within the total food budget, however, the relative distribution of expenditures on out-of-home consumption and on food purchased for consumption at home changes. As household size increases, out-of-home consumption decreases. Generally, the relative distribution of total food budget is determined by three factors: time constraints (depending on participation in working life and labour force status), income and household size. These factors cause younger households, small sized households, high income and educated households, self-employed and employee households to spend a higher share of their food budget on eating out (40%) and a smaller share on food purchased for consumption at home (60%).

Calculations show that the household size significantly influences absolute food quantities, which could be explained by rising food needs with each additional member. With respect to different food and beverage categories, however, consumption preferences (in terms of relative and absolute consumed quantities) cannot be observed. In contrast, preferences are more determined by age, household income, educational level and labour force status.

As far as age is concerned, we agree with Hayn et al. (2005), who argue that middle aged people are more interested in food that can be quickly prepared, whereas the aged put more emphasis on healthy food and generally have better understanding of nutrition. Furthermore, the trend towards lower meat consumption by older people discussed by Gossard and York (2003) is verified. In particular, the following results can be gleaned: older people consume more vegetables and fruits in proportion to meat than younger age groups. In particular, younger people have a higher (relative) preference for dried, smoked and salted meat, minced meat, rice, pasta products, bread and fruiting and flowering vegetables, which could reflect the time convenience dependency in the diets of young people. In addition, calculations have identified that older age groups have diets which are more in line with traditional eating habits (potatoes, apples, pork) whereas younger people have more diversity (exotic fruits, root vegetables). With respect to the definition of sustainable food consumption given in Chapter 1 of this report, it can be seen that older age groups have more environmentally sustainable habits than younger ones. This conclusion is based on older people's preference for apples instead of exotic fruits, potatoes instead of fruiting and flowering vegetables and lower consumption figures for bottled beverages.

The impact analysis of income confirms the trends found in several studies claiming that lower income households respond mainly to price and look for filling foods (Hayn et al., 2005; Trichopoulou et al., 2002). In particular, the calculations show that lower income households have a higher relative consumption of potatoes (instead of root, fruiting and flowering vegetables), apples and pears (instead of exotic fruits) and lower absolute figures in bottled beverages. These results relate to the price dependency of lower income households. Concerning meat consumption, we agree with Gossard and York (2003), who argue that income has no influence on total consumed quantities of meat, but only on

the consumption of beef. Indeed, calculations within this report indicate that high income households consume a higher share of beef, whereas low income households substitute beef (13%) with higher amounts of pork. In addition, diets of higher income households respond to time scarcity. This argument is based on higher (relative and absolute) consumption figures for foods that can be quickly prepared (dried, salted and smoked meat, cheese, curd and yoghurt) by high income households.

With respect to education, Trichopoulou et al. (2002) argue that the educational level is the strongest determinant affecting diet, because education is a precondition for the understanding of health and environmentally related information. Several authors agree that a higher educational level results in a reduced consumption of meat, potatoes and cereals but in a higher intake of fruits and vegetables (Gossard and York, 2003; Irala-Estevez et al., 2000; Trichopoulou et al., 2002). Indeed, our results confirm not only lower meat consumption, but also higher fruit and vegetable consumption. In particular, we find that people with more education consume more vegetables, fruits, bread, rice, flour and pasta in proportion to meat. The dietary choices of higher educated households are generally dependent on three factors: taste, time scarcity and health and/or environmental awareness. These arguments are based on higher (relative) consumption figures of exotic fruits (taste) and of foods that can be prepared quickly (time scarcity), like dried, salted and smoked meat, fruiting and flowering vegetables and yoghurt. Furthermore, the preference for poultry instead of pork, vegetable fats instead of animal fats, fruit and vegetable juices instead of soft drinks could come from a higher awareness for health and/or environmental issues.

The determinant labour force status has been neglected in most of the previous studies. Based on the argument of Payer et al. (2000) that farmers, blue-collar workers and managers show the highest meat intake, we have investigated how labour force status affects people's food choice. By focusing the analysis on farmers, the self-employed, employees, public servants and clerks in different positions we come to the following results: diets of farming households are largely made up of traditional foods like bread, flour, apples, pears and pork. Dietary choices of employees, irrespective of their position, and the self-employed are driven mostly by time constraints. This argument is based on a higher preference for food products that need less time for preparation (e.g. dried, salted and smoked meat instead of pork, fruiting and flowering vegetables instead of potatoes) by both labour force status groups. The income factor may be the reason why employees in top positions have the highest share of beef and veal consumption.

Family type as a determinant of food consumption is most relevant for the absolute quantities consumed. Accordingly, households without children (couple households, adult households) have highest consumption figures of vegetable, fruits and meat, whereas single parents, family households and single households consume markedly less. On the other hand, household food consumption reflects structures within families, due to different tastes but also because of nutritional aspects (e.g. higher recommended calcium intake for children). As a consequence, households without children (couples, adult households) consume higher amounts of beef but lower quantities of poultry and pork.

The analysis of environmental impacts (expressed through CO_2e emissions and material inputs) of those groups is, due to a lack of out-of-home consumption data, based only on preferences for different food categories for in home consumption and not on quantities consumed. The results show that high income households and those in high positions have the highest CO_2eemissions and material inputs, followed by singles according to their preferences. This result is supported by the preferences of those households for easy-to-prepare food. When comparing the relationship of vegetables and fruit to meat, their negative status is decreased: While these household groups show a preference for high impact food categories within meat, they consume large quantities of vegetable and fruit relative to meat. Overall, their

environmental effects are nevertheless among the high ones. A similar trend can be observed for age where young people are less environmentally friendly than older people.

When thinking about measures to change the trend towards more sustainable consumption behaviour, it is wise to address those groups with highest negative impacts with tailor-made activities that addresses them in their surroundings via their media and thus motivate a change in behaviour. Social instruments which raise awareness are seen to be preferred to regulations. However, they might not be sufficient by themselves and can be accompanied by economic instruments pricing material- and energy-intense products. A second important conclusion is the usefulness of changing to a meat-reduced diet through measures that make (organic, regional) vegetarian food more attractive.

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