Food Consumption in Austria
Driving Forces and Environmental Impacts

National case study for
the OECD Programme on Sustainable Consumption

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1. Introduction

Similar to most of the highly industrialised countries, the food system is one of the largest sectors of Austria's national economy. It represents a highly heterogeneous and complex system of structures and relations, which reaches from input deliveries into agriculture up to consumers and the waste disposal infrastructures. The food system covers the whole food chain (from the stable to the table). It includes the agricultural production of foods, the processing of foods in small-scale firms and big factories, the distribution by wholesale trade, retail chains and groceries, the preparation of food in various types of out-of-home kitchens, households, consultants, intermediary agents, and official supervisors (Culinar 1997, Green et al. 1999, Tansey and Worsley 1995). Although the food economy of Austria, in terms of globalisation, is a marginal market, it is often linked up with some very well known names such as Wiener Schnitzel, Sachertorte, Mozartkugel, Red Bull, and the marvellous white wines. Beyond that handful of culinary superstars, however, there is an unfortunately less known, but huge variety of regional specialities, which, considering the country's small size, offer a great range of regional tastes and culinary styles. In the past decade a great deal of innovative power has arisen to combine traditional culinary knowledge with a modern life style.

During the past few decades the food system has been, and still is, regularly challenged by tremendous structural changes, which have moved the traditional patterns of production and consumption into completely new modes. But, the meaning of the food system as a core sector of the national economy has not changed – even in the running societal transition into a knowledge-based economy. In Austria, the food chain is a major employer contributing considerably to the economy. It gives work to about 650,000 people, which is about 20% of all gainfully employed people, or, to put it into other words, every fifth gainfully employed person finds his/her workplace in the food sector. The gross product of the food sector is about 14% of the GDP, and it is strongly connected to a number of further sectors of the economy such as the engine building industry, the fertiliser industry, the packaging industry, public utilities, tourism etc. The food chain in Austria can be described in brief as: small-scale agriculture with a high share of pasture land, only a few large processing companies and a lot of small and mid-scale enterprises, with one of the most extremely concentrated retailing sectors in Europe. In comparison to other countries, it still has a relatively low market volume in the out-of-home sector.

The ecological problems connected with the food chain are manifold and quite complex. The figure below just gives a brief overview of a few of the core pressures on the environment. There is no doubt that the final consumption influences the trends in the food processing, distribution and preparation sectors through the consumers' choice of diet and their demand for food-related services. Household food choices also have direct environmental impacts related to how households purchase, store and prepare their food and how much organic and packaging waste they generate. It is the aim of the Austrian case study to explore these issues. The study is part of the international project on Household Food Con-

sumption Patterns of the OECD Environment Directorate. It is accompanied by three further case studies on Poland, Sweden and the United States.

Section 2 of the study describes the major trends in the household food demand and the key forces driving consumption patterns. These include the rise of the ratio of older people to the population as a whole, increasing incomes, shrinking time budgets, preferences for convenience and variety, and attitudes towards wellness and general security. Section 3 describes direct environmental impacts from consumer food choices at the household level in the areas of energy, transport and waste. This section also includes a methodological excursion on the contribution of material flow accounting to the measuring of the food related biomass flows at the national level. Section 4 delivers considerations of policy implications and recommendations for promising starting points for building capacity in favour of more sustainable food consumption.

Fig. 1: Ecological core problems in the food chain

	Agriculture	**Processing**	**Distribution**	**Out-of-Home Services**	**Households**
high medium low					
	energy intensity, use of pesticides, use of mineral fertilisers, inadequate use of animal manure, heavy metal emissions, intensive livestock farming, pressures upon ground water and surface water, pressures upon and destruction of biotopes, losses of biodiversity	energy intensity, water intensity organic emissions into water, intensive use of detergents and disinfectants intensive use of coolants, additives, packaging	transport intensity, energy intensity, area intensity, intensive use of coolants, intensive waste disposals, packaging	intensive waste disposals, energy intensity	intensive waste disposals, energy intensity, food miles by shopping drives

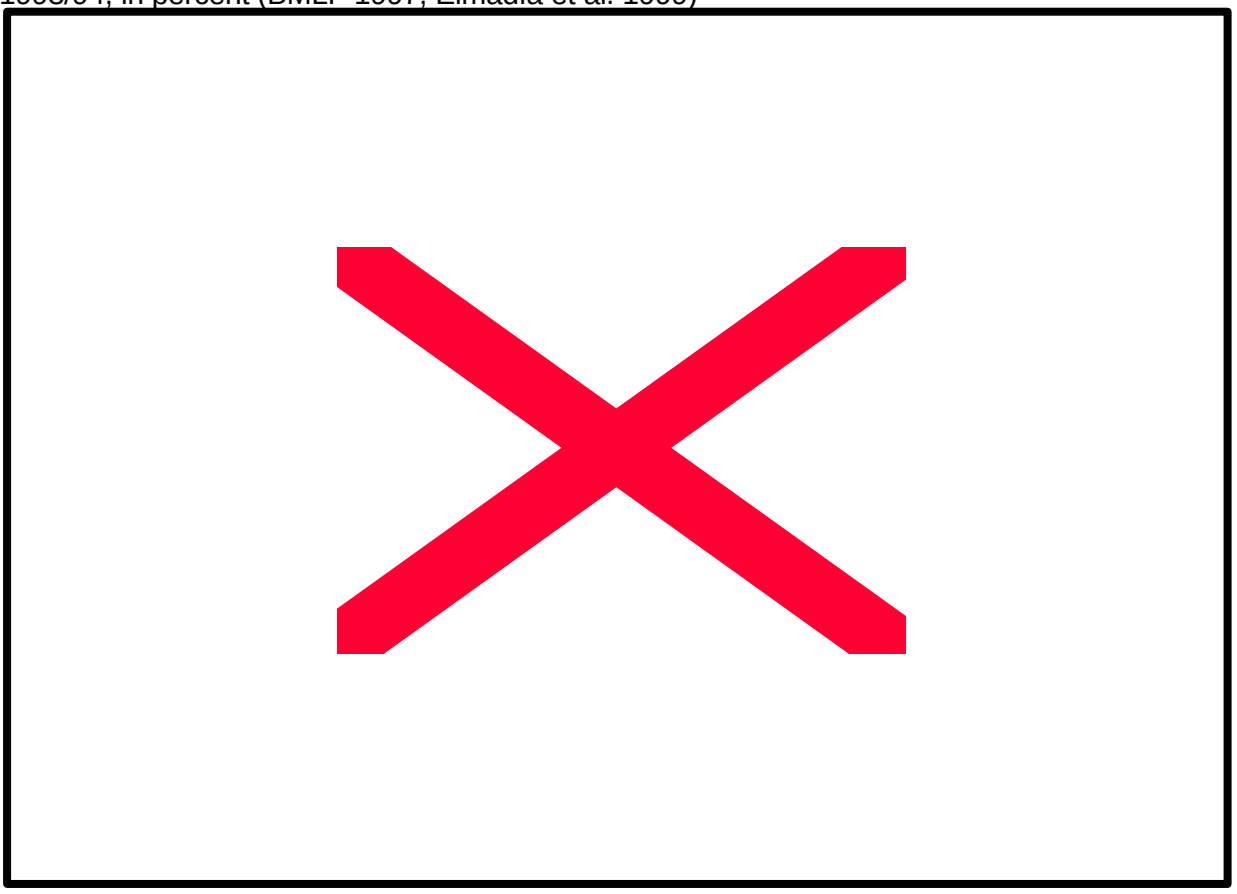
2. Food consumption patterns in Austria: trends and driving forces

2.1. What do the Austrians eat?

Data on food consumption in Austria are reported in national food balance sheets mainly derived from agricultural, production and foreign trade statistics. The data present chronological development and changes in consumption behaviour thus allowing the possibility to estimate and compare trends. Methods of data sampling for most foods have changed since Austria joined the European Union (EU) in 1995. Thus interpretation of developments in food consumption during 1947-1994 differs from interpretations of 1995 onwards. Accordingly, calculated consumption figures are numerically higher than the actual amounts of food which are available to the single household or person, as losses due to scraping, spoilage or pet feeding are not accounted for. To estimate the available amounts of foods, food-group specific correction factors were developed and applied.

The table below shows the relative changes in the average consumption of food categories for the period from the mid-1980s to the mid-1990s. Furthermore, the appendix of the study includes time series starting from the 1950s, which offer a more detailed picture of the long-term changes in consumption of all food categories.

Fig. 2: Relative changes in the average consumption of food categories from 1983/84 to 1993/94, in percent (BMLF 1997, Elmadfa et al. 1999)



The highest increases in the quantities of food products (more than 20% increase) concern fruit juices (plus 49%), followed by barley, oat and corn (plus 35%), nuts (plus 31%), rice (plus 30%), cheese (plus 27%) and legumes (plus 23%). The growing demand for these food groups can be regarded as a consequence of still growing health awareness among broad consumer groups. However, it should be taken into account that this is only one of a great number of further possible reasons. The focus on the quantitative changes within the food consumption basket only reflects quantitative shifts within the consumption structure on a highly aggregate level. It cannot provide any information about the qualitative dimension of the products themselves.

Slight increases (up to 20%) are recorded for the consumption of cream, curd, fish, poultry, plant oils, vegetables, fresh fruit, pork, beer and wheat. A rather stable development can be noticed for the consumption of potatoes, sugar and confectionery, wine and milk. Up to 3% reduction in consumption is calculated for butter, citrus fruits, bread cereals and eggs. Less and more significant decreases concern the consumption of veal, beef and honey (minus 5%) as well as rye and cocoa (up to more than minus 20%).

Apart from these rough average data, there are relatively strong differences with regard to gender, age and professional categories. For example, women tend to consume more vegetable foods (fruits, vegetables, and cereals). Men eat more meat and eat it almost daily. But whereas men eat more pork, beef and sausages, the consumption of poultry is rather independent from gender. People in education, people keeping the household and freelancers eat less meat than other professional categories. The highest consumption of meat is recorded for farmers, blue-collar workers and managers (Döcker et al, BMLF 1997, Elmadfa and Godina-Zarfl 1994).

From a nutritional point of view, the long-term decreases in consumption of bread cereals, mainly whole grain products, potatoes and milk (see also the appendix), might lead to a long-term insufficient supply of some nutrients such as fibre and calcium among the population. Although increased consumption of vegetables, fruits and certain fruit products can be useful with regard to supplying vitamin A and C, this, however, does not compensate for poor nutrient intake from the former mentioned food groups. The supply of calcium might be compensated by remarkable increases in cheese consumption. The increasing consumption of low-fat meat such as poultry, vegetable fats and oils as well as fish has to be seen positively as well. Fish, for example, delivers a variety of important nutrients such as highly unsaturated fatty acids, vitamin D and iodine – which are all very rarely found in the Austrian diet. However, it ought to be taken into account that sometimes the nutritional recommendation does not meet the ecological challenge. It is especially the increase in fish and poultry consumption that causes a lot of ecological problems (waste, emissions, and transport) if the products come from intensified production systems. In Austria, the demand for fish is mainly filled by imports of seafood and ocean-fish.

Tab. 1: Average food consumption per capita — Austria in comparison to the EU (ÖSTAT, EUROSTAT)

	Average consumption per capita, in kilogram	
	Austria (1997/98)	**EU (1995/96)**
milk and dairy products, total	112,4	123,2
cheese	17,4	15,4
butter	5,0	4,7
meat, total (fish excluded)	94,4	94,8
pork	57,4	41,3
beef and veal	18,5	20,3
poultry	17,2	20,4
grain, total	83,1	80,6
sugar	42,1	33,1
eggs	14,1	13,0
honey	1,1	0,5
wine (in litre/p.a.)	30,9	34,7

Sources: ÖSTAT, EUROSTAT

Alternatively – lacking consistent intake data for different age groups – it is also possible to estimate energy and macronutrient intake by calculating the necessary values from the consumption data above by multiplying the amounts consumed by average energy and nutrient contents for the respective food category. Differences between food consumption and food intake were estimated using well-established, food-group specific correction factors (Erard et al. 1986). They take into account losses due to spoilage, processing in the kitchen (e.g. peeling), scraping, leftovers and pet feeding. Poultry shows particularly low intake figures compared to consumption, because waste due to bones, skin and the like is highest. Also, consumption data for fat and oil cannot be included totally in nutrient intake estimations as a lot of it is lost by roasting and frying or thrown away with salad marinades etc, consequently entailing high correction factors.

The table below shows the results of such a calculation. Although based on a quite superficial method or maybe because of the rough estimation, the findings show a highly satisfactory intake of energy, carbohydrates, proteins and fat for the average Austrian.

Tab. 2: Estimation of energy and macronutrient intake in Austria according to per capita consumption taken from Austrian food/supply balance sheets 1998/99[1]

	Consump. (kg/ a)	Intake (kg/)a	Intake (g/d)	Energy (kcal/d)	Carbo-hydr. (g/d)	Protein (g/d)	Fat (g/d)
wheat	54,9	46,7	127,8	393,8	78,0	14,6	2,6
rye	10,9	9,3	25,4	89,4	20,1	1,8	0,2
barley, oat, maize	9,4	8,0	21,9	72,9	13,7	2,4	0,9
rice	4,2	3,6	9,8	33,6	7,7	0,6	0,1
legumes	0,3	0,3	0,7	2,0	0,3	0,2	0,0
potatoes	58,6	49,8	136,5	95,5	20,2	2,7	0,1
vegetables	93,6	79,6	218,0	48,0	5,0	5,2	0,7
fish	6	5,1	14,0	16,3	0,0	2,5	0,7
milk	98,6	83,8	229,6	147,0	11,0	7,6	8,0
butter	5,1	2,8	7,7	57,9	0,1	0,1	6,4
cream	7	6,0	16,3	50,4	0,6	0,4	5,2
cheese, curd	16,4	13,4	36,8	142,2	0,0	10,6	11,1
pork	57,7	31,7	86,9	91,3	0,0	19,1	22,9
beef/veal	19,3	9,8	27,0	26,6	0,0	5,9	1,0
poultry	17,2	7,6	20,7	49,1	0,0	3,8	3,8
eggs	13,4	11,4	31,2	49,6	0,2	4,0	3,7
plant oil	11,1	6,0	16,4	147,6	0,0	0,0	16,4
oilseeds	1,9	1,6	4,4	24,9	0,5	0,8	2,2
fresh fruits	73,7	42,7	117,1	63,2	13,4	0,4	0,7
citrus fruits	14,2	8,2	22,6	9,5	1,9	0,2	0,0
shell fruits	4,4	2,6	7,0	37,1	1,1	1,1	3,2
sugar	40,4	34,3	94,1	376,3	94,1	0,0	0,0
honey	1,4	1,2	3,3	10,6	2,6	0,0	0,0
beer	113,3	96,3	263,8	113,5	8,2	1,3	0,0
wine	30,6	26,0	71,3	51,3	1,9	0,1	0,0
Total	**763,6**	**587,8**	**1610,3**	**2199,7**	**280,3**	**85,4**	**89,8**

[1] Consumption data from food/supply balance sheets (kg/capita/y) were reduced by correction factors (between 18 and 55%, Erard et al. 1986), intake data (kg/capita/y) were transformed to g/d (divided by 365 and 1000). For every food and/or food group average values for energy and macronutrients (per 100 g food) were taken from nutrient tables (Elmadfa et al. 1998) and correlated with the intake amount in g. Intake of energy, carbohydrates, fat and protein per single food (group) were added to get results on total per capita intake of energy and respective nutrients in Austria.

The Austrian Study on Nutritional Status (ASNS) aimed to record and document information on the nutritional status in Austria. Within sub-studies of this project, several methods were applied for the determination of nutrient intake of: school-children (n=2173), adults (n=2488), pregnant (n=350) and lactating women (n=43) and elderly people (n=78) as well as the laboratory assessment of nutrient concentrations in blood and urine of these population groups. Results are extensive and presented in the Austrian nutrition report 1998 in more detail. Fig. 3 gives a short and simplified summary of the most outstanding results of the comprehensive material.

As with children and adults, it was noted that elderly people had an unsatisfactory intake of fat and a simultaneously unfavourable fat composition to the detriment of carbohydrate intake. Supply with vitamin D as well as B_6 and folic acid should be improved rapidly, the latter especially for pregnant women and the elderly. To a lesser extent, an optimisation is also required for the intake of β-carotene. As far as minerals and trace elements are concerned, the micronutrients of interest for improvement strategies are iron for pregnant women and additional zinc for the elderly.

Fig. 3: Simplified overview on supply with vitamins, minerals and trace elements in different Austrian population groups* (data taken from Elmadfa et al. 1999)

	Children	Pregnant	Lactating	Adults	Elderly
Vitamin A					
Vitamin D					
Vitamin E					
Vitamin B1					
Vitamin B2					
Vitamin B6					
Vitamin B12					
Folic Acid					
Calcium					
Magnesium					
Iron					
Zink					

*Reference values for intake data (= 100%) were taken from recommended daily allowances for nutrient intake of the DGE (2000).

Explanation:

>= 100%		sufficient supply
80 -100%		lower intake
60 - 80%		visibly lower intake
< 60%		deficient intake

In general, the trend in food consumption and consequently nutrient intake in Austria has shown some changes during the past few years indicating that although widely available, nutrition information may be reaching consumers, it is apparently not fully utilised. Whether or not the present unsatisfying nutritional situation endures will be confirmed in the following years as future nutrition reports will indicate changes in the nutritional status of the Austrian population.

2.2. Driving forces

2.2.1. Demographic and socio-economic features

Austria has about 8.1 million inhabitants, women constituting the narrow majority with 51%. The population outlooks for Austria foresee a sustained slight increase during the next two decades, which will be followed by a relatively short period of demographic stagnation and finally a moderate but certain decrease. The age structure of the population will change in favour of a growing portion of older people. By 2015 the share of people over 60 will increase to 25% whereas the share of children under the age of 15 will go down to 14% (ÖSTAT 1999, Fassmann and Münz 1998).

This means a more or less constant need of physiological energy (in kJ) and/or food products during the near future but a long-term decline in demand, mainly caused by the lower energy needs of older people. The total difference in energy requirements between now and the next fifteen years amounts to only a 1.4% increase (also see table), whereas there is a lower overall energy need for Austrian women (minus 147.6 kcal) compared to men (plus 36.4 kcal). This means that in spite of today's forecasts, no significant increases in nutrient and consequently food demand are expected for the next fifteen years.

Respective impacts on body weight cannot yet be predicted. Today the average Austrian man is 1.75 m tall and weighs 78 kg, the Austrian woman measures about 1.65 m and 64 kg (FESSEL+GfK 1998). More than half of the Austrian population shows normal weight (65%), but nearly one third (32%) is overweight. Eight and a half percent of the Austrian population over 20 years old are even obese when classified according to a body mass index (BMI) higher than 30 kg/m^2. In this group, 48% are male. Apart from age (highest amount of obesity among 45 to 75 year old Austrians) the level of education entailing social status also influences the percentage of obesity. Academics seem to contribute least to the number of obese people in Austria (Kiefer 2000).

Tab. 3: Estimated changes in average energy requirements (Megajoule, MJ[2]) for different age groups in Austria between 2000 and 2015 according to current Austrian nutrition recommendations (DACH 2000) as well as population outlooks of the Austrian centre of statistics (ÖSTAT 1999)

Age (years)	1999 (MJ)		2015 (MJ)		difference (%)	
	male	female	male	female	male	female
0 - < 5	1.002	0.891	0.857	0.756	-14.46	-15.09
5 - < 10	1.726	1.482	1.289	1.091	-25.30	-26.34
10 - < 15	2.467	2.033	1.993	1.616	-19.19	-20.54
15 - < 20	3.222	2.486	2.875	2.178	-10.77	-12.38
20 - < 25	2.973	2.310	3.162	2.421	+6.37	+4.83
25 - < 50	18.993	14.607	16.556	12.854	-12.83	-12.00
50 - < 65	7.290	6.079	9.222	7.457	+26.49	+22.66
> 65	4.522	5.837	6.394	6.729	+41.39	+15.28
Total	**42.195**	**35.725**	**42.348**	**35.103**	**+0.36**	**-1.74**

In any case, the competition in the food market will become even more intensive than today, especially the market for younger people. Whereby even the growing target group of the future seniors offers good chances for remarkable sales potentials.

The traditional family stereotype – with the father as "breadwinner," the mother as "homemaker" and at least two children – represents only a very small proportion of today's society in Austria. The number of households will continue to increase whereas the average size of the households will simultaneously decrease. At the beginning of the 1960s, in Austria there were just half a million single-households, but today they are already about one million, which is approximately one third of all households. There is a clear development towards a further boost, which in fact can be seen to be much stronger in the urban areas than in the provinces. In comparison, the number of multi-person households has grown by only 20%**.** This development in favour of single-households and the general trend to individualisation promotes the demand for convenience products, smaller packing units, rationalised cooking behaviour and for a stronger home meal replacement (Fassmann and Münz 1998, Nohel et al. 1999).

The ratio of children per household will continue to go down. The average European household size has fallen from 3.2 to 2.7 persons in the last fifteen years. This means more interest – even anxiety – on the part of the mothers, and more disposable income per child. What is lost in quantity will be made up in quality: on the one hand some mothers will compensate the little time they have for the children by spending more money on them. On the other hand, parents will also be able to afford to spend more on quality products if there are fewer children per household. Childhood is getting shorter, followed by a longer "youth period," ranging from more or less 10 to 30 years of age. Older adolescents stay in the paren-

[2] 1 kJ = 4,28 kcal

tal home longer and become information gateways, having more time and interest in commercials than working parents. The Austrian middle aged group – former “baby boomers” – is very concerned about health, striving to maintain, retain or regain its youth. The concept of healthy food as life prolonging and age delaying might receive more attention (AURORA 1998).

The number of working women with a higher education is still increasing whereas the number of women only acting as housewives is definitely going down. Together with the fact that the majority of men still only minimally participate in the housekeeping agenda, these factors will contribute to the growing demand for frozen foods, chilled ready meals, single serving packages, instant meals, sophisticated kitchen equipment, mobile delivery services and home meal replacement (domestic outsourcing).

The way people spend their time and the value given to time is closely related to the socio-demographic changes. There is a deeper involvement in increasingly varied activities and a new sense of precious ‘escape time’. “Downshifting” is another new trend where people change to a simpler life style, including the impact of increased interest in traditional dishes and the choice of ingredients (AURORA 1998).

2.2.2. Household food expenditures

As in many other countries, the relative share of food expenditure to total private consumption has decreased continuously: from 21.3% (1985) to 15.3% (1997) according to the results of national accounts. At least for the better off, this facilitates moving up to higher quality foods (AURORA 1998). The access to the EU in 1995 even caused a slight decline in absolute figures, namely a 3.9% decrease in total private food consumption. However, this sort of statistic takes into consideration only those expenditures directly connected to daily food consumption. It does not include indirect food-related expenditures like, for example cooking equipment expenditures or energy costs for cooking. However, the figures clearly underline the fact that the consumption of food has strongly lost its former nature of support of a basic need. Today there is no quantitative problem of food supply for the majority of the population. The flexible portion of the income available for food has gained a remarkable importance for the consumer goods markets. This income effect together with the enormously growing variety of the food supply has promoted a more situated and event-driven consumer behaviour (hybrid consumer, chameleon consumer), which gradually seems to be losing the former strong determination by social factors such as income, education and profession.

Tab. 4: Share of food expenditures (food, beverages, and tobacco) in total private consumption 1985-1997, in % (ÖSTAT 1999)

1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
21,3	21,4	20,6	20,1	19,0	18.6	18,5	18,1	17.8	17,2	16,6	15,6	15,3

Tab. 5: Average monthly food expenditures differentiated by food category 1993/94 (OSTAT 1999)

Categories	in ATS/month	in %
meat, fish	1220	17,06
milk, dairies, eggs	747	10,44
bread, cereals	582	8,14
fruits, vegetables	572	8,00
candies	462	6,46
non-alcoholic drinks	443	6,19
alcoholic drinks	381	5,33
others	465	6,50
equipment	630	8,81
out of home	1651	23,08
total	7153	100,00

A further but no less interesting facet, which cannot be seen at the level of average data, is the growing difference between rich and poor – even concerning the consumption of food. In this case the scissors of welfare means a polarisation of the food market into an increasing low-budget sector with extreme price competition and an increasing supply of higher quality products (delicatessens, regional brands, products with some kind of additional benefit), but also a decreasing middle-price sector. (Bayer et al.1999). However, today's premium products are no longer exclusively dedicated to the rich. It can be seen that mainly on special occasions, even households with lower incomes demand high price products (e.g. wine, champagne, ham) with high visibility.

2.2.3. The shopping habits

Austrian households make their food purchases 3.5 times a week on average. About one quarter of the households go food shopping every day or nearly every day, about 40% go twice a week at best. On weekends people want shopping to be an experience and a pleasant one. They demand an attractive shop environment and personal professional service. If there is enough time, interest in complex, high quality products is greater. The most important source of supply for nearly all food categories are supermarkets and discount markets. Only meats and baked goods are purchased more frequently from the specialised trade. The dominance of the super- and discount markets has the highest significance for milk, dairy products and cheeses, which are normally bought there by three-quarters of all consumers. Domestic supply and marketplaces have an important role for the purchase of fresh vegetables, salad ingredients, and fresh fruit. Eggs and wine are quite often bought directly from the farmers (BMLF 1997).

Apart from these traditional outlets, new forms of food shopping opportunities have begun to gain more importance during the last few years, namely petrol stations, mobile delivery services, bookshops, food slot-machines, and last but not least, electronic commerce. The rate of online-shopping has increased remarkably, also in the field of food sales, although the growth rates are not so extreme as in other fields. Fresh foods in particular require deep confidence on the part of the consumers, which in fact is not easy to satisfy via internet purchasing.

Tab. 6: Usual sources of food shopping in 1996, in % of the interviewees (2 nominations maximum per food category) (BMLF 1997)

	Super-markets,	Specialised trade	Self-supply	Marketplaces	Farmers
Meats	46	56	9	8	16
Poultry	51	34	6	10	10
Eggs	39	12	12	14	36
Fresh vegetables, salad	55	21	33	20	5
Fruit	64	24	24	18	4
Herbs	45	14	35	13	2
Fish	55	31	5	5	4
Milk and dairy	75	25	6	3	11
Bread and baked goods	41	75	4	4	2
Cheese	74	30	1	7	3
Wine	40	19	4	2	27

2.2.4. The meal organisation and cooking habits

Cooking is still a rather female domain in Austria. Nearly all women (96%) cook at least now and then, among men less than half (46%) concur with this statement. Twenty-two percent of Austrian men admit not being able to cook and a further 32% admit that they simply don’t do it (FESSEL+GfK 1998). Among those men and women who had stated they cook regularly, about one third (34%) likes doing so very much and another third (30%) just likes it. Only 5% confess that they don’t like cooking at all (AC Nielsen 1999).

Products used for cooking have also changed in the last decades. Three quarters of the population use whole-grain products at least occasionally. Even more, 79%, select organically grown products from time to time for preparing their meals (FESSEL+GfK 1998), whereby fruit and vegetables show the highest dissemination (79% of households use organically grown products), followed by milk and dairy products (65%) as well as meat and sausages (together 61%). Products directly from the farmer correspond to people's wishes for "adventure" foods, as the flair of the region and the utopia of a simple life are bought with them. Reasons for the above mentioned special importance of organically grown products are, for example, their ability to fulfil several needs – nature, safety, security, uniqueness, handicraft skills – all at the same time (BMLF 1997).

Among ready-to-eat meals, deep-frozen foods are used more frequently (16% once a week) than chilled products (13%) or dehydrated instant meals (10%). The least popular convenience-dishes are canned foods (only 8% use them regularly).

Austrian consumers enjoy 3.1 meals per day on average, 79% indicated that they eat very or at least rather regularly (AC Nielsen 1999). A different Austrian survey (FESSEL+GfK 1998) confirmed these data, stating that 76% of the Austrian population eats rather regularly, whereas the percentage of regular eaters is higher among elderly people over 60 (88%) and significantly lower among adolescents under 19 (61%).

As meal planning is declining – dinner choice is often not decided until late in the afternoon, convenience without the necessity of making choices, no risk of failure and no need to supervise will be an increasingly important factor as far as food choice is concerned.
The structural change of working hours and conditions also affects the organisation of daily meals. First of all, it must be stressed that in general the traditional three meals – breakfast, lunch and dinner – still dominate the daily meal structure of Austrian households. The majority of the households usually follow this meal time schedule. However, when family members have busy schedules with work, school, additional evening courses, leisure activities etc. a continued decline in sit-down, all together family meals can be expected in both quantity and quality of food. Dinner has gained a lot of social importance in comparison to former days. The often very different time schedules of the various family members has led to the replacement of the previously common family meal at midday to one in the evening hours. Dinner has therefore become the most intimate of all meals where all family communication can take place most easily.

Snacks between meals are still not very common, but their frequency is increasing markedly. The term “grazing” has been coined to describe the intermittent snacking that characterises eating for some consumers. About one half of consumers have a quick snack in the morning, about a third have a snack during the afternoon, and about a quarter regain their appetite some time after dinner. However, a remarkable portion of all consumers eat alone, mainly at breakfast and dinner, when nearly every second consumer has no partner at the table (BMLF 1997, Horx 1998, Nohel et al. 1999).

To evaluate the most popular meals in Austria a ranking was constructed which placed the traditional “Wiener Schnitzel” still at number one – being the favourite dish of 12% of the population and together with other meat meals constituting even 35%, closely followed by spaghetti and other pasta. Compared to average top preferences, the latter as well as pizza seem to be the preferred meals especially for 14 to 24 year old Austrians. When asking Austrians about their favourite garnishing, gender-related differences can be seen as women tend to prefer vegetables and potatoes whereas men prefer salads and french-fries (AC Nielsen 1999).

2.2.5. Out of home consumption

Out of home consumption has gained increased importance. It is estimated that about one quarter of total food expenditure of households is spent in favour of out of home supplies, which represent one of the most dynamic markets of the whole food chain. Since the second half of the 1990s the large kitchen market in Austria is characterised by an intensive structural change mainly dominated by the entrance of professional caterers and the widespread implementation of quality management systems. Moreover, some of the big chain stores have also started to enter into the out of home business. All over Europe, foodservice is growing at 2-3% per year, against recent retail market growth of 0.5%. The share of food expenditure is forecast at between 30 and 40%.

In Austria, currently about 3 million inhabitants have at least one meal per day out of the home. About two thirds demand different supplies of communal feeding, and about one third eats at one of the manifold gastronomic sites. More than a third of Austrians have their lunch and nearly a third their morning snack out of home. The most frequent kind of out of home consumption takes place directly at the work place. More than half of all working people has a meal at the work place, which is equivalent to a share of about 80% of all persons who are supplied within the frame of communal feeding (BMLF 1997). Supply of kindergartens, small hostels, and especially seniors is mostly performed by communal catering cuisine. Apart from commercial catering enterprises, also single communal feeding businesses have gained importance. Nursing homes have a big part in the out-of-home market mainly due to mobile catering systems, which enable the elderly to remain in their habitual environment for a prolonged time (AGÖ 1995).

However, in comparison to the importance of out of home supply, consistent data about the total economic turnover of the whole sector are not yet available. The contribution to gross domestic product by the gastronomic supply alone is estimated to be about 60 billion ATS. About 90% of all gastronomic enterprises are small-scale firms with less than ten employees (BMLF 1997).

As far as eating in restaurants is concerned, Austrians go out to eat on an average of thirty-six times a year according to a different survey method carried out with personal interviews. In more detail this means that 29% of the population – 20% of women and nearly twice as many men (39%) go to public places to have their meals. Household income influences this lifestyle factor a lot: Only 18% of people with a household-net-income of up to 15,000 ATS compared to 47% of people earning over 30,000 ATS frequently eat out of their homes (AC Nielsen 1999). When asked for locations of out of home consumption the simple Austrian restaurant/pub (“Gasthaus,” “Beisl”) ranges on top of the list, followed by the higher quality restaurant. Self-service and/or fast food restaurants have increased in popularity, especially among men, working people, families with children and younger Austrians (85% of 15-19 year old teenagers eat in such restaurants at least now and then). In Austria, the butcher is also a common place to have lunch or a fast snack (10% have a meal there at least once a week). The snack has also become more and more important for daily nutri-

tion (FESSEL+GfK 1998).

Tab. 7: Relative frequency of the use of out of home supplies, in % (BMLF 1997)

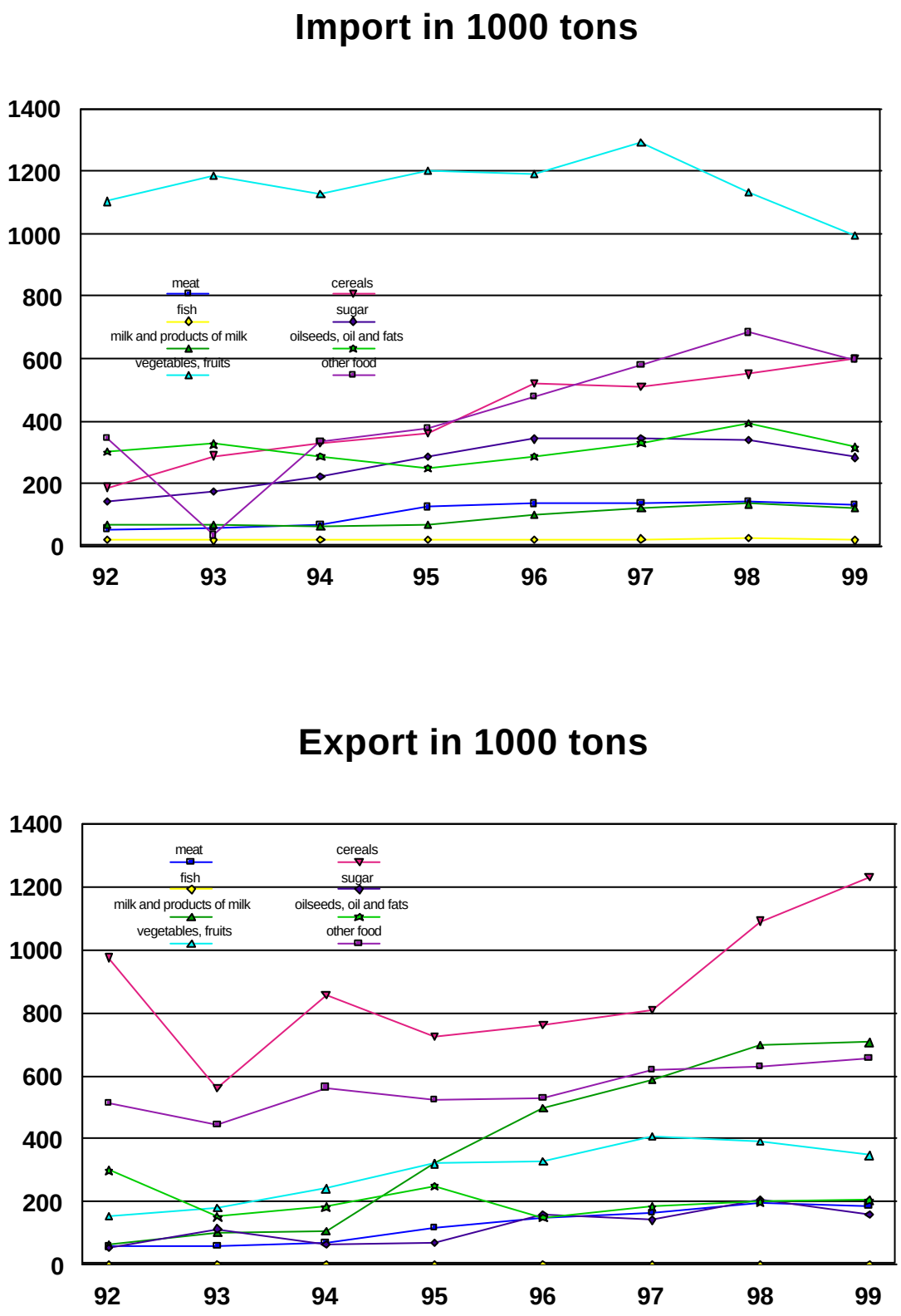
canteens at the workshop place	53 %
restaurants, bars, cafés, fast food chains etc.	23 %
inns, guesthouses	11 %
hospitals, nursing homes, sanatoriums, barracks, jails,	6 %
educational sites (universities, schools, kindergartens etc)	5 %
travel canteens (stations, airports, air catering etc.)	1 %
mobile meal services	1 %
total	100 %

2.2.6. Globalisation, regionalisation, and fusion kitchen

The increasing globalisation of life promotes crossover cultural development even in the field of nutrition. It is not surprising that the import quota of foods is rising continuously. In Austria the share of imported foods (raw materials and dressings) is estimated to be about 20% of total food consumption today (ÖSTAT). The range of different cuisine is growing and the different types are becoming more familiar. Traditional regional cuisine has to compete with an increasing variety of foreign cuisines. But simultaneously the boundaries between the different types are tending to lose their clarity.

With regard to the eating culture, the complex dynamics of globalisation and regionalisation determine the evolution of the kitchen styles. The first trend is the appearance of a globalised market kitchen, which is composed of an easy-to-survey number of ingredients and dressings providing nearly standardised tastes and culinary feelings all over the world (Schwendter 1997). The second trend clearly supports regional taste. Moreover, with the speed and uncertainty of economic and cultural globalisation, national identities have begun to lose their previous importance whereas the preferences for regional differentiation and identification seem to be gaining in attraction. Although cultural differences are still very strong there is a trend to new traditional values along with globalisation. The demand for foods and dressings with regional or local brands has obviously remained stable. Different consumer inquiries within the last few years regularly highlight the importance of regional origin as one of the quality criteria with the highest rankings (BMLF 1997, Fessel+GfK 1998, AC Nielsen 1999). And even the globally acting food producers often have to provide the same product with different regional tastes. The motto “Think global, act local!” seems to be highly pertinent. Thus it is no wonder that 55% of the Austrian population still prefers plain fare, with people over 60 constituting the major part of that figure. Italian cooking is quoted as the favourite meal choice by 12%, Asian cooking by only 2% (AC Nielsen 1999).

Fig. 4 Food foreign trade of Austria 1992-1999



2.2.7. The consumers knowledge about nutrition

Due to the collapse of the "information float" especially through TV and the World Wide Web as well as higher levels of education, there is much greater awareness of possibilities available. Higher choice awareness will have wide-ranging effects and develop "creative" consumers who are smarter and more self-reliant than ever before (AURORA 1998). Many more Austrians compared to other EU citizens (60% compared to 37%) state that they use labels as the only possibility to get information about the food they eat and the nutritional facts. Only 9% knew advertising,[3] 8% brochures and 4% newspapers when asked for other sources for food-relevant information other than labelling. The aim of this EU-wide study was to evaluate the differences in information needs among countries and people's attitudes towards food labelling. In total, more than 13,000 questionnaires were distributed, over 1000 in Austria. The survey was mainly conducted in super- and hypermarkets (Fraselle and Lacoste 1998). Forty-four percent of Austrian men and women – similar to figures for other EU countries – stated they read food labels and/or data found on goods sold without packaging (see also chapter 2.2.8).

Accordingly, 80% of Austrians regard their level of nutritional knowledge as sufficient, 13% as absolutely sufficient and only 1% as insufficient. The most positive self-estimation could be noticed for the 30 to 50 year old men and women, the most negative for adolescents under 20 (BMLF 1997).

However, according to studies within the scope of the Austrian Nutrition Report, 1998 results on nutritional knowledge of Austrian adults (questions about nutrients, calorie contents etc.) show in part very low levels among those interviewed. This indicates that measures are required for a target group with specific information for disinterested, informational passive groups. Written nutritional information can only reach well-informed and interested population groups. Thus, the use of mass media should be considered for effective and objective nutrition information (Elmadfa et al. 1999).

The importance of nutrition in daily life differs between age groups and is also dependent on body weight. In general, 41% of Austrians regard eating as very important, 44% as important and only 2% as completely unimportant. Only 36% of Austrians over 60 years confirm that nutrition is very important to them, whereas 46% of the 25 to 39 year-old Austrians hold this opinion. Being asked the same question, 48% of underweight people consider their diet as very important compared to only 39% of overweight people (AC Nielsen 1999).

The main criteria for consumption are the taste (very important for 79%) and the naturalness in terms of not having been genetically manipulated (69%). The awareness of healthy

[3] The annual advertising expenditures related to food products and beverages are estimated at about 2.5 bio ATS (180 mio EURO), that is about 12 % of the total advertising expenditures. By far the biggest part is spent for TV advertising (Media Focus Research GesmbH 2000).

nutrition, however, is still not very dominant in Austria: Only every fifth person stated that they pay attention to a healthy diet, two thirds regard their daily nutrition as normal and another 20% only follow their taste preferences (FESSEL+GfK 1998).

According to a different survey – part of the Austrian Nutrition Report 1998 previously mentioned – the majority of the population (72%) defines its daily nutrition as a normal, mixed diet including meat nearly every day. Less than a quarter of Austrians claim that their daily diet consists of a lot of fruit, vegetables and whole-grain cereals, with only sporadic consumption of meat. Only 2% stick to a vegetarian diet, this group mainly consists of young women and higher educated people. The latter also constitute the majority of those who eat less meat within a "normal" diet (Elmadfa et al. 1999).

Forty-four percent of the Austrian population is completely convinced that good food in the sense of taste is part of a real, adequate lifestyle. Moreover, there is not much agreement with statements such as “I don’t care much about food” or “it is important not to lose much time with eating.” In contrast, not many Austrians consider themselves as gourmets (FESSEL+GfK 1998).

2.2.8. Food safety and the consumers’ attitudes towards wellness

The portion of consumers who are afraid of the health hazards of foods has grown remarkably. However, the estimation of nutrition-related risks among scientists and the population differs greatly. Consumers feel that residues and contaminants pose the highest hazard attributable to food, followed by food additives. The latter constituted a health hazard to 65% of Austrian adults according to a recent survey (Popp-Hadalin 1997). In contrast, today’s scientists know that nutrition behaviour and pathogenic microorganisms due to bad hygienic conditions followed by natural food toxins pose a much higher risk (Federal Ministry of Women’s Affairs and Consumer Protection 1999/Culinar 1999).

The reasons for the wide-spread feeling of insecurity are manifold, including the general decreasing confidence in the arguments of experts, the often inferior information policy of producers, the growing alienation from highly processed products, and the frequent headlines about food scandals. For example, food scandals connected with BSE and dioxin residues have heightened the consumers need for security and control. Thus, an increasing portion of the consumers pays more attention to the criteria of freshness, origin and naturalness in terms of the least possible changes during food processing (AMA 1999, BMLF 1997, Nohel et al. 1999).

The Austrian food control system intends to protect the consumer from health hazards and deception. Food control institutions established by the head of the state government collect samples of foods, foodstuffs, food additives, cosmetics and commodities according to the annual auditing and sampling plan issued by the ministry. Auditing results of the manufacturers show that complaints about hygiene apply more often to service companies and

small producers directly selling their products in retail trade compared to the large producers.

In 1998, the amount of samples bearing health hazards was 5%, 10% of samples were wasted/spoiled.[4] For meat and meat products, fish and fish products, shellfish, eggs and particularly poultry and poultry products, higher proportions of complaints were found as compared to fruit and vegetables. Starting in1986, the number of salmonella poisonings increased significantly all over Europe although recently they have been going down slightly more. Table XY shows respective figures for Austria from 1990 to 1998, the estimated number of unreported cases is assumed to be much higher (Federal Ministry of Women's Affairs and Consumer Protection 1999). However, the risk of microbial contamination for the consumer could be minimised by accurate food preparation especially at the household level. Legislative measures will also include Salmonella-fighting-programs in Austria.

Tab. 8: Cases of illness and death due to infection with salmonella in Austria from 1990 to 1998 (Federal Ministry of Women's Affairs and Consumer Protection 1999)

Year	Illnesses	Deaths
1990	8515	11
1991	9030	6
1992	11109	8
1993	10014	4
1994	8706	4
1995	8705	5
1996	6976	8
1997	7488	2
1998	6971	0

As well as the consumers' concerns about food safety, their health awareness has also generally risen. After the lightness-boom of the 1980s slowly declined in its cycle as a trend, the 1990s brought in a second big wave of health awareness, which is now more strongly focused on the increased holistic feeling of wellness.

The acceptance of light-products in Austria in 1995 and 1998 confirms this downward trend. While five years ago nearly one third of adult men and women stated that they use calorie-reduced foods regularly (Unger et al. 1997), only 14% consumed light-products in 1998 (FESSEL+GfK 1998). This does not take into account the difference in the survey methods. The highest popularity among light-foods was found for dairy products; calorie-reduced ready-to-eat meals, beer and sweets have only gained slight acceptance on the market. The main reasons for switching to light-products are still maintaining body weight or health and for people over 35 there has been an increase in the number of those suffer-

[4] Basis for the calculations are only those samples which resulted in complaints, not all observed samples!

ing from a nutrition-related disease (Unger et al. 1997).

According to the predominant wellness feeling in Austria, the new matter is a growing demand for foods which supply an additional benefit for individual health. Nutritional fortification of basic foods can be an efficient measure for health prevention to rapidly and sufficiently improve the nutritional status of different population groups. There is an unsatisfactory level of knowledge about the intake of fortified foods and their contribution to nutrient supply. Additional and more detailed information is urgently required to estimate potential excessive intakes of nutrients with narrow safety margins. In Germany for example, already about one quarter of the consumers regularly consume vitamin fortified food products. Apart from iodised salt and fortified fruit juices – breakfast cereals, sweets, and enriched dairy products are the most frequently consumed products of this type in Austria. However, risks of these measures such as overdosing on the added nutrient due to extreme consumption habits must also be taken into consideration (Elmadfa et al. 1999). The market for so-called functional food also includes probiotic yoghurts and other products with additional health benefits. According to the different definitions, market shares for functional food of 5 to 10% were estimated for the following five years (Hüsing et al. 1999). Although the real outcome of this trend cannot be forecast exactly at the moment, most of the economic hopes in this emerging market should not be taken too seriously. In any case it seems to be leading towards a sort of medicine-pumping of the food supply.

3. The environmental impacts from food consumption

There is an ongoing running dispute about the importance and influence of private households and the areas in which they can make a significant contribution to sustainable consumption. Households, through their demand side influence on the economy, are potentially one of the major actors, yet often seem to remain a “sleeping giant.” This is why reliable and easily understandable information is of crucial importance if the already given environmental awareness of households is to become a relevant driving force in the market. A German study (Lorek and Spangenberg 1999) identifies *food and nutrition* as a priority field for action by households to reduce environmental impacts (beside *construction and housing, and transport)*. The results were basing on an input side methodology using energy, material and land-use aspects. Several other studies, mainly focussing on household energy consumption, led to a similar outcome about the importance of food.

Tab. 9 Resource use of different consumption clusters in % of the total national use (Lorek et al. 1999)

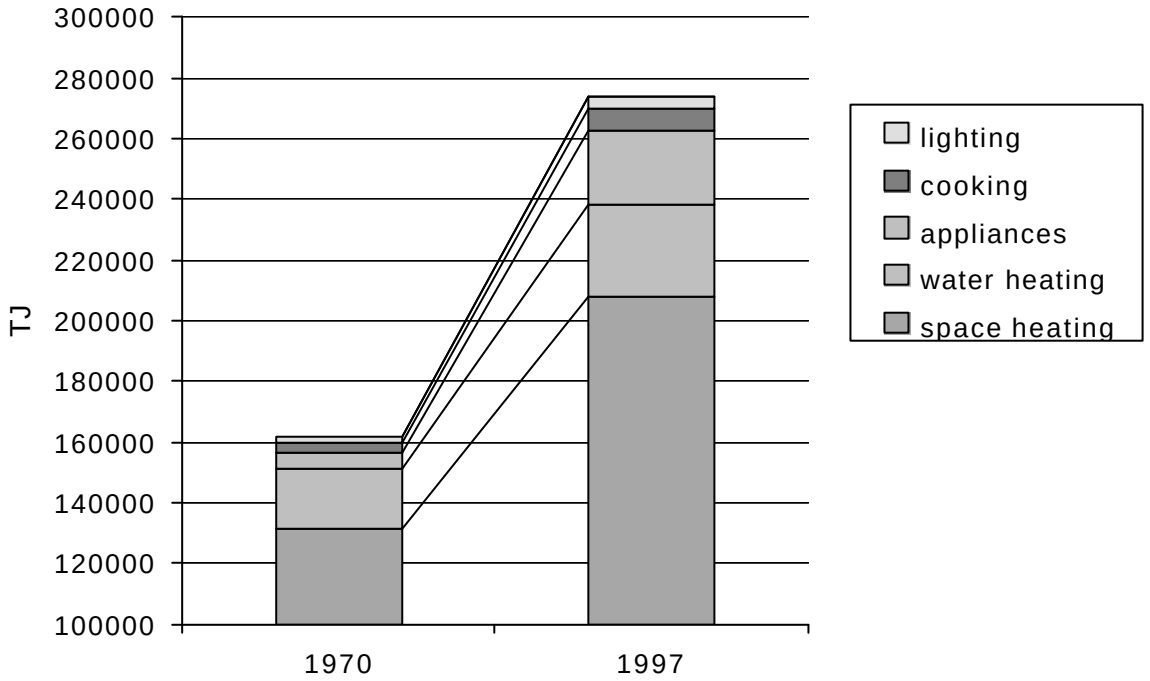
Consumption clusters	*Energy*	*Material*	*Land use*
Construction and housing	43,8%	29%	5,8%
Food/nutrition	**13,6%**	**19%**	**54,7%**
Mobility	24,2%	11%	4,6%

This section of the present study aims to describe the range of environmental impacts of the post-production stages, mainly consumption by households, whether it is done at home or out of home. There are manifold pressures upon the environment caused by the consumption stages. A series of different activities are connected with problematic environmental impacts: distribution, packaging, storage, shopping, cooking, dressing, cleansing, and waste disposal (for a detailed description see Jungbluth 2000). The broad variety of these impacts can be generally differentiated into pressures directly derived from the households, indirect effects caused by changes in the consumer demands on the structure of the food system (feedback loops), and thirdly, those impacts which effect the consumer on a mental level such as their attitudes towards environmental issues (environmental awareness, environmental justice). We focus our investigations on the first and the third category, the direct pressures and the level of attitudes (already discussed in the section above). The description of direct pressures includes the matters of energy, transport, area and waste. Indirect pressures like the so-called hidden impacts or “ecological backpacks“ accompanying most of the input flows into the consumption sector are kept out of investigations. The section is then supplemented by a separate food-related biomass balance, which is derived from the national material-flow accounting for Austria. It offers a brief summary of the methodological framework and highly aggregated picture of the biomass flow through the entire national food chain from the cradle to the grave.

3.1. Energy

Most of the studies dealing with sustainable food consumption focus on energy issues (e.g. Carlsson-Kanyama 1999, Carlsson-Kanyama and Faist 2000, Faist et al. 2000, Moll 2000), because energy is an essential input factor for shopping, storing, preparing, cooking and cleansing activities in the households. No cooking is possible without energy. In fact, the use of energy for all these nutrition-related activities plays a remarkable although not dominant part in the total energy use of the private households. For Austria it is estimated to about 19 PJ/a (1997), i.e. 7% of the total household energy consumption (excl. fuel for shopping trips). In comparison, the US case study estimates the energy use for cooking and washing dishes to be about 10% of all energy used in the home (Kaufmann and Chevrot 2000). A Swiss study (Ospelt 1996) shows that the cumulative primary energy consumption pertaining to food needs in private households accounts for 12% of the total.

Fig. 5 The use of energy consumption in Austrian households, 1970 –1997 (data from the Austrian Energy Agency)



Tab. 9 Energy consumption data on nutrition related activities of the average Austrian household with 2 adults and 2 children (data from the Austrian Ecology Institute)

Activities	Average energy consumption, in kWh/a per household
Cooking	330
Cooling	360
Freezing	230

Since the food related energy consumption of the households (excl. fuel for shopping trips) is clearly dominated by the use of appliances it seems to be worthwhile to have a closer look at their evolution over time. The aggregate energy intensity of food related technical household equipment (mainly electrical appliances) is determined by two factors: the growing efficiency of the tools vs. the growing amount of equipment through new and larger appliances. Although the average efficiency has increased and probably will continue to increase remarkably, the gains in efficiency were clearly outrun by the increases in volume and size. Thus the net effect turned into a clear boost of energy use in absolute terms as is shown in the figure above.

Tab. 10: Kitchen equipment quota 1970 to 1998, in percent of total number of households (Austrian Energy Agency 2000, own calculations)

	1970	1980	1990	1998
Refrigerators	66.5	97.5	96.0	97.0
Freezers	11.0	53.5	65.4	67.0
Dishwashers	0.5	11.5	30.0	44.0
Microwavers	0.0	0.0	23.0	45.0

The aggregate energy use of the retail chains (heating and cooling; without transport) is estimated to be about 5 PJ/a (own calculations based upon Belz 1994, AC Nielsen and BMLF 1997; under the assumption that similar to the total turnover about half of the total energy use is dedicated to food sales).

The overall impact on greenhouse gases (GHG) caused by the energy consumption of households and retailers requires a calculated non-comprehensive extension of data investigations (detailed information about the mix of energy careers is necessary). According to the German Enquete-Kommission distribution and consumption together cover 42% of the whole CO2 emissions which are connected with the food system.

Tab. 11: The contribution of the food system to the greenhouse effect, in million tons of CO2-equivalents per year (Enquete-Kommission 1994)

	mio tons of CO2-equivalents	percentage
agriculture	135	52
processing	15	6
distribution	35	13
consumption	75	29
total	260	100

3.2. Transport

When people go food shopping or out to have a meal, they usually walk or, increasingly, drive their car. First, it might be worth mentioning that shopping for food is actually the only considerable pedestrian traffic relevant mainly within short distances from the home. However, no statistics are available on the real extent of pedestrian traffic referring to the total modal split. The traffic experts, however, at least all agree that it is slowly losing its importance. The reasons are manifold, reaching from transitions in family structures, increasing convenience up to the sustained loss of local stores. Primarily, it is the large variety of locally situated groceries that has decreased remarkably, so that today already more than 300 municipalities in Austria are without any local food supply.

Obviously the food-related transport activities directly related to households are mainly centred around individual car traffic. Official data about the specific amount of food miles does not exist, but it is estimated that about 15% of total individual car traffic is dedicated to shopping trips, which are undoubtedly quite frequently made based on food demand. Under the assumption that food shopping comprises about two thirds or more, it would be up to approximately 10% of the total transport demand of the households (Herry and Sammer 1998). However, quantitative estimates are extremely uncertain because of the frequent lack of clarity regarding the functional relationship of the shopping trips. For instance, working people very often manage their food shopping on the way to and from their working place, which makes it rather impossible to generate indicative figures for food miles.

The data situation is clearly better with regard to commercial freight traffic, because the official freight traffic statistics also include the possibility of a functional differentiation of transport performances, which means that one can draw a rather clear relationship to transport performances directly caused by the food system. Furthermore, it is possible to differentiate into long-distance freight traffic, short-distance/local freight traffic and freight traffic from abroad. With regard to the transport performance (measured by tons/km.a) the share of food freight is about 10.4% (1993: 26.9 mio tkm) of the total annual freight volume. In comparison with the total volume growth, no noticeably greater increase was observed. Since the mid-1980s, food freight volume has increased by about 10%, which is rather similar to the total freight volume growth (Payer et al. 1996). However, the further growth after the entry into the EU is estimated remarkably higher because of market liberalisation. A German study estimated a rise of about 70% of the average food miles per capita since the 1970s, whereas the quantitative per-capita-consumption has changed in no way (Mildner and Böge 1996).

The modal split of food freights shows a clear dominance of road traffic constituting three quarters of the total food transport performance. With regard to the average transport distances, the long distances clearly prevail against the short distances. The domestic long-distance freight traffic together with the transit traffic cover up to about 70% of the total food related transport performances, whereas the short distances cover merely 20%. The average distance within the short-distance traffic is about 50 kilometres, whereas the average

distance of long-distance drives is about 230 kilometres. Compared to others the domestic long-distance freight traffic shows the highest rates of growth. Furthermore, the share of food miles by air transportation seems to be rather low in Austria. Although the official freight traffic statistics do not offer any data about transport performances by air, the food miles by air can be assumed to still play a marginal role in the traffic situation.[5]

Tab. 12: Food miles in Austria, 1984 to 1995 – annual freight traffic in mio tons/km (own calculations based upon ÖSTAT Güterverkehrsstatistik, Payer et al. 1996, Rosinak & Partner 2000)

	1984	1988	1993
traffic medium (modal split):			
road	1,984.3	2,006.0	2,039.3
rail	532.5	697.5	571.7
waterway	25.4	52.2	158.6
total	2,542.3	2,755.6	2,769.6
transport distances:			
domestic long-distance freight traffic	796.1	929.6	893.7
domestic short-distance freight traffic	542.1	527.1	576.8
import	240.7	248.8	252.7
export	136.2	200.1	172.2
transit	827.3	850.1	874.2
total	2,542.3	2,755.6	2,769.6

All in all, the growing amount of transportation can be regarded without a doubt as one of the most serious environmental pressures resulting from the food system. The rapid growth of distances has been caused by several factors. The evolution is closely connected to the general centralisation of production sites, the reduction of small stores in favour of big supermarkets, hypermarkets and shopping centres, and the rising internationalisation of nutrition habits (see also chapter 2.2.6). Also to be considered is that the growing transport intensity is the one dimension of this development accompanied by a great number of further pressures. Transport related air emissions, changed challenges to the preservation frames (a close cooling chain), changed challenges to the packaging systems, and an increasing demand for large storage plants.

[5] In terms of absolute tonnage the freight transportation by air shares merely 0.0002 % of the total freight traffic. Since the mid-1990s freight export via the airport of Vienna, by far the biggest air freight destination in Austria, has remained constant with no increases (ÖSTAT).

3.3. Waste

In terms of waste management, the delivery, preparation, use and disposal of food gain a tremendous importance. Food waste covers a huge part of the total waste caused at the consumption level. It covers food losses by overstocking, over preparation, cooking losses, plate waste, leftover portions, misunderstanding of quality defects etc. in all kind of kitchens (households, restaurants, caterers, bars, fast food chains, hospitals etc.), diverse packaging materials and finally human excreta. Because of the mixing with other waste fluctuates the availability of consistent data on the food related waste volume is quite limited. A Swiss study (Belz 1994) estimated that at least one quarter of total municipal waste is caused by food consumption. Probably it is the second largest component of discarded waste second only to the waste volume caused by construction activities.

According to the Federal Waste Management Plan, approximately 2.8 million tons of non-hazardous waste from domestic households and similar establishments (agriculture, commercial/industrial/public administration offices, kindergartens, schools, hospitals etc.) accumulated in 1996. About 54% were disposed of as so-called residual and bulky waste by the public garbage collection service. About 46% of the entire accumulation of community and domestic waste could be gathered by separate collection and subsequently delivered to sorting, recycling, thermal recovery, other treatment and landfill. During the late 1990s the total accumulation of waste from households and similar establishments increased remarkably. The annual growth rate of household waste is currently estimated at about 5% (Hochreiter 2000), which is definitely more than the annual GDP rate. The most significant reasons for that rise are the sustained population growth, the growing trend towards single households, the growing supply of one-way-products, and the obvious change in food consumption patterns (increasing demand of convenience food and smaller packaged units). The most food relevant parts of the waste from households and similar establishments concern the packaging waste, the biogenic waste and the low weight but hazardous waste in the forms of refrigerating agents, propellants or solvents containing hydrofluorcarbons (FMEYFA 1998).

The annual packaging waste volume is caused to a great extent by food products and beverages, whereby beverage packaging constitutes nearly half of the total household packaging waste. Although the recycle quotas in the sectors of beer, drinking-waters, wine, non-alcoholic refreshments and milk are quite high in comparison to other countries, the actual share of recyclable beverage packaging has continuously decreased from about 80% in 1985 to about 50% in 2000 (Austrian Ecology Institute). Recyclable beverage bottles cause less energy intensity, less residual waste, and help to support regional production. But the competition-driven economic pressure in favour of one-way-systems currently seems to be very high.

In the case of biogenic waste (mainly food and garden waste formerly self-composted), the quantities collected separately in biodegradable waste disposal containers nearly doubled, rising from about 180,000 tons to 360,000 tons (self-composting not included). In 1996, the

per capita amount collected was about 46 kg on a national average. It is estimated that additional potentials of nearly 20% of residual waste can still be separately collected and earmarked for bio-technical treatment (FMEYFA 1998). A study on the waste management in the Viennese gastronomy estimates the potential of residual waste reduction at more than one third of the recent volume. Separate waste collection is regarded as the most effective measure. For example, a remarkable part of the biogenic waste could be re-used in pork production (Graggaber et al. 2000).

Tab. 13: Average food losses at the household level, in percent of product net weights (Erard 1986, ÖSTAT 1995)

poultry	55%
veal	50%
beef	48%
oils	46%
butter	45%
pork	45%
fruits	42%
cheese	18%

3.4. Environmental awareness in food consumption

The sustained need for healthier life-styles must be looked at in close connection with a general rise in interest in environmental issues. Consumers in Austria are often regarded as more environmentally focussed than in other countries. At the level of food consumption in Austria that means at least a growing willingness to purchase products from organic farms, products without GMO-related ingredients, products from true-to-species animal keeping, meals without hormone-treatment, products without irradiation-treatment, products with less transport inputs or products which guarantee landscape conservation. Thus, in Austria about half of the consumers are willing to pay up to 20% more to environmentally protect food products. About 5% of those interviewed are even willing to pay an even higher price. The higher the educational status the greater is the willingness to pay more for environmentally friendly foods (ÖSTAT 2000).

In fact, the Austrian boom of organic farming during the first half of the 1990s was heavily based on the growing demand for those products. Today, more than one half of all consumers at least occasionally uses organic products (Nohel et al. 1999). However, there are a few further success factors to the Austrian bio-boom. These range from the entrance of the big chain stores into the organic food business, the highly clever restructuring of the umbrella organisations of the organic farmers and the remarkable boost of public subsidies after the entrance into the EU.

Eighty-nine percent of all Austrian consumers - more than the EU average - wish to be informed in detail about the origin of the products they buy. Far more than 80% also want information about use of GMO, treatment with irradiation, way of animal keeping, organic production of foods and environment-saving measures. For other EU citizens those criteria are less important.

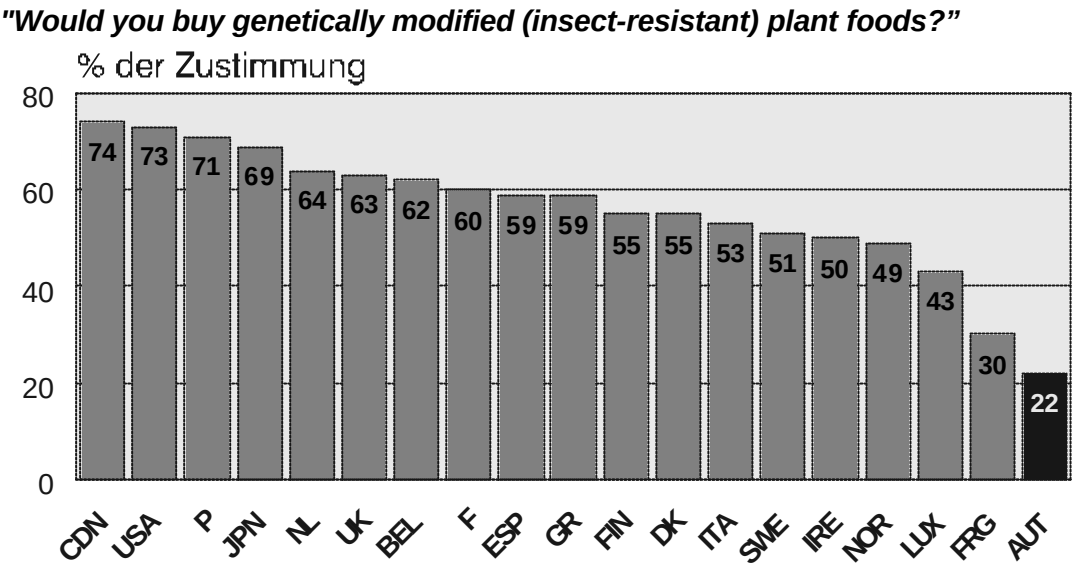
Tab. 14: Environmental-related shopping criteria and food specific information need in Austria compared to EU average, answers in % (taken from Fraselle and Lacoste 1998)

"If you buy a food product, do you wish to be informed in full particulars about:"		
Answer:	YES - Austria (%)	YES - EU (%)
product origin	89	80
use of GMO	87	75
treatment with irradiation	86	77
way of animal keeping	86	69
organic production	85	75
environmental impacts	84	77
production method (cultivation, breeding etc.)	79	67

As mentioned above (see chapter 2.2.7) demand for information about the food consumed such as food labelling is also widespread. Ninety-three percent of the Austrian population claimed to read food labels regularly. Ninety-six percent would like to find a declaration of origin on the food label, and about 90% want a statement on used food additives and new preservation methods such as food irradiation or the application of genetically modified organisms (GMOs) (*Fraselle* and *Lacoste* 1998).

Compared to citizens of other EU and even international states, the Austrians' scepticism towards genetic engineering is highest. In April 1997 a referendum certified that 78% of Austrian consumers refuse to ever buy genetically modified plant foods – the highest proportion of all population groups surveyed. Whereas genetic technology is rather accepted in the fields of medicine and pharmaceuticals (about 40% approval), the acceptance is extremely low concerning plant and animal food production with 95% disapproval. In this context, luxury foods such as sweets or alcoholic beverages still have a better chance of being accepted than basic foods (Elmadfa and Weiss 1997).

Fig. 6: Willingness to buy genetically modified plant foods in Austria – international comparison (Hoban 1997)

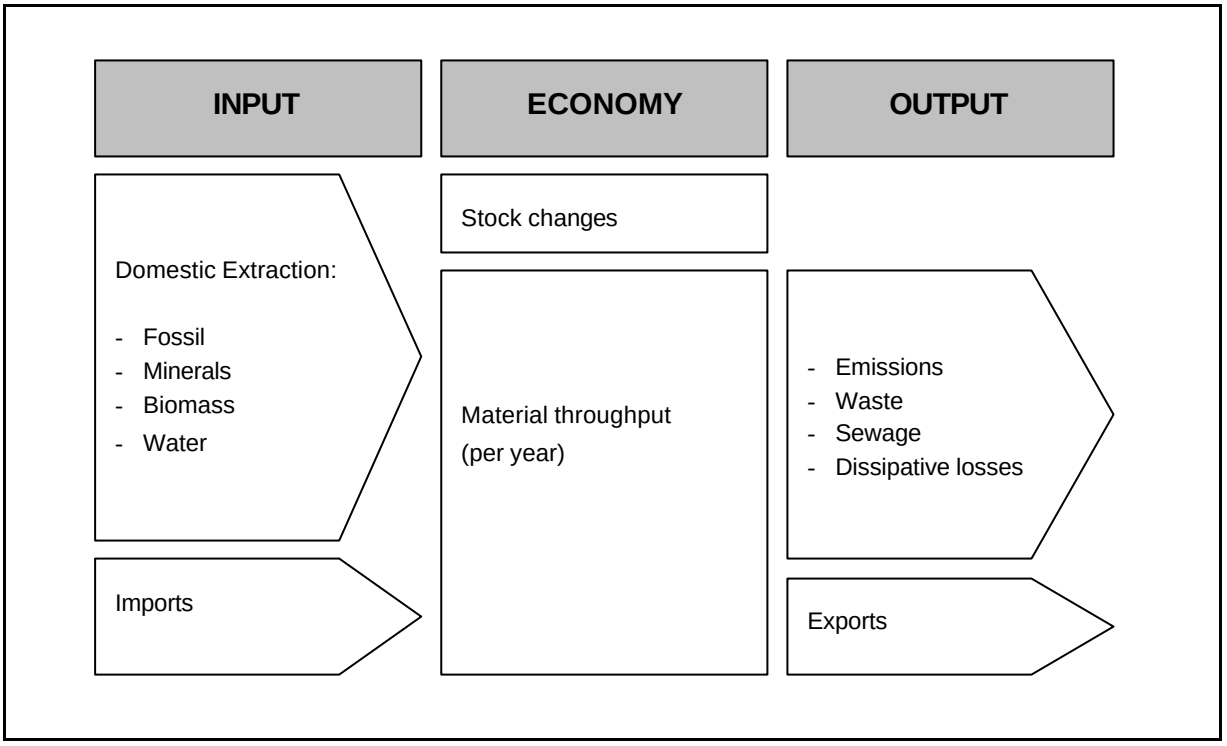


3.5. Excursion: Food-related biomass flows - empirical results from national material flow accounting:

The ecological dimension of the sustainability debate amongst other things challenges a general reduction in the human use of non-renewable resources and the reduction in the use of renewable resources as far as it goes beyond their rate of regeneration. Since then, the dominance of the paradigm of toxicity has lost its monopoly position in environmental policy. For the first time particular attention is being paid to the mere physical dimensions of the relationship between society and nature, which in comparison to every living organism can also be described in terms of physical metabolism.

All kinds of social systems can be constructed as physical input-output models in order to constitute the material metabolism with their environment. The following figure shows the functional relationship of the relevant material flows.

Fig. 7: Input-out-model of the metabolism of social systems



Since the 1990s, at the national level so-called material flow accounting has been done in several industrialised countries. These national material flow accounts are an essential part of the SEEA (System of Ecological and Economic Accounting), which are calculated as satellite balance accounts to the SNA (System of National Accounting). The systemic boundaries of the material flow accounting are the same as for the SNA. Thus, the results of material flow accounting can be related to data coming from the SNA. National material flow accounting provides a highly aggregated picture of the physical exchanges between society and nature, and between different national economies respectively. It allows us to describe the entire material base of the annual monetary domestic product of the national economy.

At the national level, the input side of the model consists of all primary extractions within domestic territory and all material imports from abroad, which adds up to the total direct material input into the economy. The imports consist of the mass of raw materials, semi-finished, and finished products. The weight of the raw materials and products is calculated as they are passing the territorial borderlines of Austria. But all the hidden indirect material inputs, which are necessary for the extraction and processing from abroad ("ecological backpack"), remain uncalculated. Then, the materials imported into the domestic socio-economic system are processed either to the extension of stocks (e.g. buildings, stock of wines) or to be consumed and then put out of the system into nature. Thus the output side of the equation includes emissions into the air, emissions into the water, wastes in different forms, dissipate losses, purposive outputs like pesticides or fertilisers, and the export of

commodities abroad. All the flows are measured in tons. Due to the thermodynamic laws the sum of the inputs is always equal to the sum of the outputs plus stock changes. The balancing period is the calendar year. The total material balance sheet consists of several partial accountings referring to the annual throughput of biomass, minerals, fossils and water. All partial balance sheets follow the same pattern, namely imports, primary extraction, processing, final consumption, output to nature and exports.

Apart from the distinction into partial accounting by different mass categories it is also possible to distinguish criteria for the sector, function and region. For instance – material accounting referring to the whole food chain within the national economy. However, the necessity of new system boundaries has to be taken into consideration, and the fact that data availability is mostly limited in comparison to national statistics. Therefore the following elaboration of a consistent material flow accounting for the whole food chain is confined to the close accounting of all food-related biomass flows at the national level.

The empirical results are presented in the figures below. Accordingly, the national food-related demand of biomass is 30.8 mio tons (excl. irrigation). This is about 16% of total direct material input (excl. water input) of Austria's economy. Of that, 83% is covered by domestic extraction, and 17% is imported from abroad. The domestic extraction mainly consists of plant production. But there is only a marginal share of direct animal extraction in the form of fish, game and honey. Namely 49%, by far the biggest part of food-related demand of biomass, is dedicated to fodder. The national fodder input stems from domestic extraction up to about 96%, merely 4% is imported.

The entire demand of biomass for nutritional purposes is about 3.9 tons per capita. Of that, merely one third is dedicated to private consumption, that is an average per capita use of 1.2 tons per year. If one also subtracted all losses within private households, the final net consumption is about 0.9 tons per capita. Thus, only one quarter of total input finally goes down the red lane.

Tab. 15: Food-related Biomass Flow Accounting Austria 1997, in mio tons (sources: Gerhold and Petrovic (2000), Schandl et al. (2000), Wolf et al. (1998), own calculations)

INPUT		**OUTPUT**	
IMPORT			
		food (vegetable)	4,5
		food (animal)	0,03
		fodder	0,6
total			**5,13**
PLANT PRODUCTION			
Irrigation	*53,0*		
harvest	25,1	harvest to food supply	8,0
		own consumption	0,3
		harvest of fodder (incl. green fodder)	14,6

		aftermath losses (shrinkage, dwindling)	2,2
total	**25,1**		**25,1**

ANIMAL PRODUCTION			
fodder demand, in total	16,1	own consumption, direct marketing	0,2
thereof: fodder ref. harvest statistics		private consumption	1,6
thereof: fodder from fodder processing		hunting	0,0
thereof: green fodder		eggs	0,0
thereof: milk		fodder (raw milk, dairies, fat)	0,4
		processing (fat)	0,0
		processing (raw milk, dairies)	2,5
		losses (raw milk)	0,0
		losses (meat, game)	0,2
		superimposed fodder, silage losses	0,5
		animal manure	28,6
		C-emission (in methane)	0,2
		C-emission (in CO2)	4,0
demand of oxygen (respiration)	11,7	oxygen (in CO2)	11,7
demand of water	37,4	evaporation	15,1
total	**65,2**		**65,2**

2nd PROCESSING STAGE			
meat, milk, eggs	4,1	food products	9,4
vegetable products	8,2	fodder	1,2
water for beverage processing	2,2	exports	7,6
imports (coefficient)	4,9	losses	1,2
total	**19,4**		**19,4**

PRIVATE CONSUMPTION			
Food products	9,4	kitchen-refuse	1,8
own consumption, direct marketing	0,5	faeces	0,3
		urine	4,4
		evaporation	1,1
		C-emission (human respiration)	1,7
		balance carried forward	0,6
total	**9,9**		**9,9**

EXPORT	
food	3,0
fodder	0,2
total	**3,2**

4. Policy implications

4.1. The importance of environmental issues for national nutrition policies

In Austria, national goals and strategies related to nutritional issues are generally far removed from the political agenda. The reasons for this lack of focus are manifold. This is not the right place to enter into a deeper political analysis of the state of national nutrition policies. At the moment, however, they can be illustrated through the broad distribution of nutritional issues to different ministries, and the obvious difficulties of intergovernmental cooperation. It seems worthwhile to mention that it took nearly two decades of negotiations between experts and officials to elaborate an initial national nutrition report, whereas other developed countries have already entered into comprehensive public debates on the effectiveness of these monitoring instruments. Due to this condition of slack patchwork activities, for a very long period of time, the national nutrition policy was mainly driven by the purely quantitative post-war security paradigm, which actually lost its relevance for the vast majority of Austrians, living in one of the wealthiest nations in the world. Changes took place after Austria's entry into the common European market, when the old supply-side market regulation system failed and demand-side issues of malnutrition and quality began to become more attractive. However, in comparison to other countries, there are still no definite national goals and strategies. Apart from the production-related regulations on food safety and risk assessment, today's nutrition policy in Austria is based mainly on three lanes of activities:

- dietary allowances[6],
- nutrition reporting[7], and
- nutrition related health promotion

As in many other countries, in Austria the dietary guidelines have also turned from the old nutrient focus to a more food-based approach. Currently there is widespread insight that the nutrient-based recommendations require a level of expertise that cannot be expected from the average consumer. Thus, recently the practice of dietary counselling increasingly tends to use guidelines that translate from the level of nutrients to the common level of

[6] In Austria the recommended dietary allowances (RDA) are published by the Austrian Association of Nutrition. The Austrian RDA in fact are completely adopted from the German Association of Nutrition because of the general assumption of a rather similar nutritional situation in both countries.

[7] In 1994 the first nutrition report (Elmadfa et al.1994) was worked out for the federal state of Vienna. In 1997 the Federal Ministry of Forestry and Agricultural Affairs published the first national food report (BMLF 1997), which actually goes far beyond the strongly medical minded focus of traditional nutrition reports by monitoring the structural changes along the whole food chain after entry in the EU. In 1999 the first national nutrition report (IfEW 1998) was published by the Federal Ministry of Women's Affairs and Consumer Protection, and the Federal Ministry of Labour, Health and Social Affairs.

product groups in order to promote the consumer's nutritional knowledge in a more effective manner. The most well known concepts could be the food guide pyramid and the "nutritional cycle." Both concepts offer suggestions for dishes and daily servings for single product groups, not for specific products. Consumers should be supported in making their own choice without being offended by technocratic orders. The recommendations should be clear and motivating such as: "less fat" and "less products rich in fat " or "more fruits and vegetables." The food based guideline approach also undoubtedly seems to be a promising starting point for more environmentally sound patterns. For example, "less packaged products" or "protecting biodiversity." The key question might be, how could we manage to provide the consumers with more information about the ecological impact of their food consumption patterns?

However, these activities still pay no particular attention to the ecological dimension of food consumption. The focus within Austria's national nutrition policy obviously offers hardly any recognisable linkages to the running debates on sustainable development. Nevertheless it is worth mentioning that the national food report includes a complete chapter on the dynamics of the domestic market of organically produced food, and that the national nutrition report includes some detailed statements on the quality of organically produced food products, the contamination of drinking water, and the consumers' concern about genetically modified food products.

Obviously the nutrition agenda is mainly dominated by the criteria of wellness and lifestyle issues, whereas environmental issues seem to be secondary. This is also clearly underlined by the thematic priorities within the broad variety of health promotion projects and initiatives in Austria. The project data bank of the Forum Gesundes Österreich (FGÖ), the largest government fund for public-private health promotion activities from the local to the national level, contains a list of about 300 funded activities which have been running since 1996. The most frequent topics of these activities are exercise and nutrition, followed by psychological health and medical welfare. In total about 200 projects are dedicated to nutrition issues. Nearly thirty different projects of those were established in the context of both nutrition and environment.

A closer connection to the question of how to promote sustainable patterns of food consumption might be offered by the National Environmental Health Action Plan (NEHAP). In 1994 at the Second European Conference on "Environment and Health" in Helsinki, the European ministers of environmental and health affairs initiated a declaration to elaborate national environmental health action plans. The sum of these national plans should make up the Environmental Health Action Plan for Europe (EHAPE) which in turn would regularly report to the UN/ECE. There was a basic agreement that sustainable development definitely requires shifts in consumers' behaviour (as well as others'). In Austria, the Federal Ministry of Environment, Youth and Family Affairs, the Federal Ministry of Labour, Health and Social Affairs, and the Federal Ministry of Women's Affairs and Consumer Protection published the Austrian NEHAP in 1999 as a common strategy paper that aims to integrate the crossovers from the overlapping policy fields: environment and health. The Austrian

NEHAP identifies eleven priority thematic fields including targets, problems, pressures, trends and measures. At least the fields of food, water, traffic and settlement offer some relevance with regard to sustainable food consumption. In the field of food quality and safety problems there is a lack of adequate information about dietary habits, product information and irradiation of foodstuff. The proposed measures focus on the availability of nutritional status reports, the further extension of product declaration, and the maintenance of positive irradiation lists. Apart from food quality and safety the action plan does not offer further food-related policy activities.

Tab. 16: The National Environmental Health Action Plan of Austria – Overview of the measures proposed in the field of "Food Quality and Safety"

Problems	Area of application	Measures	Actors involved	Time horizon
Information on the dietary habits and mistakes of the population	national	Preparation of nutritional status reports	Federal Chancellery – Federal Minister for Women's Affairs and Consumer Protection, Federal Ministry of Labour, Health and Social Affairs, Federal Ministry of Economic Affairs	short-term
Product information	national, international	Further extension of product declaration, including: a) Identification of the ingredients' quantitative share, b) Indication of ingredients also for alcoholic beverages, c) Regulations regarding the product declaration's form to improve its clearness and legibility	Federal Chancellery – Federal Minister for Women's Affairs and Consumer Protection, Federal Ministry of Labour, Health and Social Affairs, Federal Ministry of Economic Affairs, Federal Ministry of Agriculture and Forestry, EU	short-term to medium-term
Irradiation of foodstuff	national, international	Maintenance of the positive list (only approved products may be put on the market) and restrictive approach in issuing permits, Providing for inspections directly in the production and processing facilities Efficient food monitoring	Federal Chancellery – Federal Minister for Women´s Affairs and Consumer Protection, EU, Federal Chancellery – Federal Minister for Women's Affairs and Consumer Protection, Federal Chancellery – Federal Minister for Women's Affairs and Consumer Protection,	short-term short-term to medium-term continuous

Sources: ANEHAP1999

4.2. Instruments supporting sustainable food consumption patterns

Beyond the general policies on nutritional issues, there are state-level and private activities which might work as quite an effective support to change consumption patterns towards

developing more sustainable habits: information instruments such as labelling or information campaigns, regulations, and market instruments. In general the application of information instruments is definitely more widespread than other instruments. Since Austria entered the common market of the EU, the old system of food market regulation was rapidly replaced by the new paradigm based upon the assumption of a rational choice consumer. With regard to the environmental issues of food consumption, the market transition caused by the EU-access has provided the demand side with a few information instruments but definitely no regulations directly addressed to the consumers. The market competition between more and less environmentally friendly food products and services is predominantly carried out through information instruments. Market instruments focus on subsidies but there are no eco-taxes or fee solutions aiming to reduce the environmental pressures caused by food consumption.

Information instruments

Environmentally friendly products are mostly positioned as premium goods, which consumers associate with ecology and health. To ensure the credibility of those products, different labels have been developed. In Austria, there is a remarkable variety of private labels of commercial- and certification-organisations. With regard to ecological criteria the most well known are the different labels for the organic products, which mainly aim to guarantee the compliance with the organic farming and processing principles. With regard to the organic labels, however, it seems to be a great challenge to the consumers to maintain an overview of the whole range of different labels, which also includes products that do not fulfil the strict criteria of the EU regulation no.2092/91. The best-known labels for organic products are the labels of the biggest organic farmers' association, the additional state label, and the private commercial label of the main domestic retailer. The domestic retailer heavily promotes their label, which no doubt is one of the key factors for the boost in the organic market in the 1990s. Labels for non-GMO products and fair trade products are quite seldom and still not well known.

In comparison, the regional labels have gained remarkably more importance in the late 1990s, as mentioned previously (see chapter 2.2.6). Although this kind of labelling usually does not provide any information about the environmental performance of its products, at least it might create a certain awareness for the regional origin of the products and helps to support small-scaled modes of production. The national food report (BMLF 1997) includes a first nation-wide list of about 140 different regional labels. The majority of the labelled products were dairies and meats. About 40% of the regional labels exclusively covered products from organic farming. The modes of distribution showed a clear dominance in favour of direct marketing to the consumers, followed by restaurants and caterers. It is possible to assume that the reported number of regional labels has increased remarkably. Today, the regional labels are already quite well presented in the World Wide Web. Internet portals working as virtual country markets not only provide alternative shopping opportunities but also comprehensive information about the products themselves, their modes of production and the regions of origin.

Eco-labels for food products based upon more comprehensive eco-balances, however, might be experiencing a slight growth in awareness. In summer 2000, the Austrian Ecology Institute with the support of the Federal Ministry of Agriculture, Forestry, Environment and Water Management published a consumers guide which includes an eco-ranking for more than 160 selected typical product examples of all important food product groups (Gupfinger et al. 2000). On the basis of several international eco-balances and similar studies, the eco-ranking covers the categories of transport, agriculture (plant and animal production), packaging, processing and preservation. The ranking is supplemented by further rankings with regard to health and social tolerance, background information on the different product groups, and shopping hints.

Apart from labelling, there are also consumer information campaigns that seem to form a valuable contribution to the consumers' information level with regard to environmental issues. These information campaigns are mainly undertaken by environmental and consumer protection organisations but are often supported by public funds. One of the more successful examples is the "Earth & Hearth Tales" interactive exhibition aiming at deepening and revising the visitor's knowledge of ecological agriculture and healthy food. Since June 1996, the exhibition has been on tour through Austria. It is shown mainly in schools, supplemented by exercise books for pupils, action folders for teachers guided tours, workshops and vocational training seminars for teachers and farmers. Up to now, about 100,000 visitors have seen the exhibition. The exhibition was conceived by "die umweltberatung", "ARGE Biolandbau" and "Koordinierungsstelle für Umweltschutz." Due to its great success, it was not possible to meet the requests of all communities and schools that wanted to install the "Earth & Hearth Tales" exhibition. They came up with the "Earth & Hearth Tales"- Box, which contains a wealth of games, information materials and suggestions pertaining to ecological agriculture and nutrition, and is especially well suited for teaching and classroom use.

Market instruments

Although the European environmental policy aims to foster the importance of market instruments, there are only a few market-based instruments like taxes, fees or subsidies offering economic incentives for environmentally friendly food consumption behaviour. In comparison to other EU members, in Austria the eco-taxes are obviously less applied instruments. The annual revenue of eco-taxes in general is about 5.5% of the total tax revenue in comparison to 6.7% of total EU average. In comparison to the currently predominant energy, transport or resource taxes, the so-called pollution taxes (user pays-principle) by about 1% of total tax revenue are of less importance than the international average shows (Gerhold 2000). The former fertiliser tax was abolished in 1996. However, in many other countries the pollution taxes currently seem to gain more attention because of their relatively easy administrative handling in comparison to the polluter pays-principle. The consumption of environmentally problematic food products (e.g. high-energy intensity, high transport intensity, high intensity of pesticides) might offer some interesting linkages in fa-

vour of environmental taxes.

The various deposit systems of the beverage industry (milk, mineral water, soft drinks and beer bottles) in favour of multipath bottles is also looked upon as an effective strategy to reduce the packaging waste from food consumption. However, due to cost reasons, one way bottles, mostly plastic, continuously substitute the multipath systems.

Besides deposit fees there are a broader range of different supply-side subsidies fostering environmentally friendly production and distribution systems, which sometimes indirectly effect consumer prices. As these subsidies are not completely absorbed by the producers themselves, it results in relatively lower prices for environmentally friendly products. The price difference to the common, less environmentally friendly products decreases and the market incentives create higher demand for green products. For example, the EU regulation no. 2092/91 has provided the legal basis for premiums that favour organic farming, which enables both increase on the supply side and relative decrease in the high-price of organic products according to the type of food, market share and marketing channel.

5. Conclusions

The domestic sector is an important area of the economy but is often unjustly overlooked as a source of pressure on the environment. The choices made by individuals concerning the purchase of consumer items can significantly influence environmental impacts from the domestic and other sectors. This is especially evident for daily food consumption decisions. The influence of households on the environmental impacts of food production and consumption goes far beyond cooking and cooling patterns. The importance of the household sector lies in its demand for food resources and products, the food waste generated by consumption of those ingredients and its capacity to influence agricultural, industrial and commercial activities through its spending power. This influence can be shown through the exercise of consumer choice, either in increased demand for perceived environmentally friendly products or in the avoidance of less friendly products or manufacturers. By expressing their preferences at the shopping points, households have a significant influence on the kind of food supplied, the modes of production, distribution, preparation and storage. At the same time, households themselves are influenced by a variety of demographic, social and economic factors, including household income, working and leisure time structures, availability of goods, availability and quality of substitutes, nutritional knowledge, environmental awareness, and peer groups.

Starting from a comprehensive description of the changing food consumption patterns in Austria, the case study demonstrates the close links between the day-to-day consumption decisions about food and environmental impacts.

The age structure of the population will change in favour of a growing portion of older people. The share of people over 60 is forecast to increase to 25% by 2015 whereas the share of children under 15 will go down to 14%. This means a more or less constant need of energy and/or food products during the near future but a long-term decline of the physiologically necessary demand, mainly caused by the lower energy needs of older people. Thus, no significant increases in nutrient and consequently food demand need to be expected for the coming two decades.

The number of households will continue to increase whereas the average size of the household will simultaneously decrease. The ongoing development in favour of single-households and the general trend to individualisation promotes the demand for convenience products, for smaller packing units, for rationalised cooking behaviour and for a stronger home meal replacement (domestic outsourcing). The number of working women with higher education is still increasing whereas the number of women acting only as housewives is definitely going down. Together with the fact that the majority of men still only minimally participate in the housekeeping agenda, these factors will contribute to the growing demand for frozen foods, chilled ready meals, single serving packages, instant meals, sophisticated kitchen equipment, mobile delivery services and home meal replacement.

The relative share of food expenditure in terms of total private consumption has continuously decreased, reaching about 15%, which means a growing unused available portion of income. This effect of increased available income together with the enormously growing variety of the food supply has promoted a more situated and event-driven consumer behaviour (hybrid consumer, chameleon consumer), which gradually seems to be losing its former strong determination by social factors such as income, education and profession.

The most important source of supply for nearly all food categories are supermarkets and discount markets. Only meats and baked goods are purchased more frequently from the specialised trade. But new forms of food shopping opportunities have begun to gain more importance during the last few years, for example petrol stations or mobile delivery services. The rate of online-shopping has increased remarkably, but because of confidence issues the growth rates are not so rapid as in other fields.

There is a wide-spread feeling of insecurity, which is mainly based upon the general decreasing confidence in the arguments of experts, the inferior information policy of producers, the growing alienation from highly processed products, and the frequent food scandals like BSE or dioxin residues. Not surprisingly, an increasing number of consumers pay more attention to the criteria of freshness, origin and naturalness in terms of the least possible changes during food processing.

Since the mid-1980s, consumption patterns with regard to different food categories have changed with remarkable increases in fruit juices, refreshment beverages, fresh fruits, vegetables, cereals, rice, cheese and legumes, fish, poultry and plant oils, but significant decreases in veal, beef, pork, milk and rye. Simple consumption data, however, is not an appropriate assessment of environmental impacts. It reflects neither positive nor negative changes in the pressures upon the environment. To reflect these changes would require comprehensive analysis of the different modes of production and distribution. Nevertheless, the focus of the study urges reconsideration of the usual dietary allowances with regard to their ecological suitability. Crude recommendations, for example, in favour of more fish and poultry do not reflect the often very problematic methods of fishing or animal keeping.

Thus, more transparency about the environmental impacts of food products definitely requires adequate information tools. The study confirms the Austrian consumers' relatively high attention to environmental issues. In Austria, labelling in favour of organic products offers important support for environmentally friendly food products. It can be regarded as one of the key factors in the market boost of organic farming products. Future attention ought to be drawn to a better understanding of the underlying environmental principles, and the more effective avoidance of misleading labelling. Furthermore, information policy support in favour of other environmentally relevant features such as the origin, the use of GMO, the treatment with irradiation, or the method of keeping animals might be desirable for quite a large target group. But a general eco-labelling for food products, such as for

other products, still does not exist. First pilot activities investigating selected eco-ratings are under development, but ought to be supported by further studies.

In terms of direct environmental impacts, the study provides a rough overview of the three main dimensions, namely energy, transport and waste. The food related direct use of energy (fuels for shopping tours excluded) is estimated to about 7% of the total household energy consumption. The ratio of food miles is estimated to be at least 10% of total individual car traffic. It could be shown that most of the recent studies relevant to the subject focus on the energy implications of food consumption, but often overlook the high relevance of transport and waste volumes. It is assumed that this strong energy focus is mostly caused by the remarkably improved availability of appropriate energy data in comparison to the data upon the food consumers related waste flows and transport kilometres. Thus, more data on food losses and food miles at the domestic level would be highly welcome for further studies.

In general, the focus of Austria's nutrition policy hardly offers operational linkages to the running debate of sustainable development. The nutrition agenda is mainly dominated by the criteria of wellness and health issues, whereas environmental issues seem to be secondary. A closer connection to the question of how to promote sustainable patterns of food consumption might be offered by the National Environmental Health Action Plan (NEHAP). In the field of food quality and safety, the Action Plan states a lack of adequate information about dietary habits, irradiation of foodstuff and product information. The proposed measures focus on the availability of nutritional status reports, the further extension of product declaration, and the maintenance of positive irradiation lists. Beyond these policy recommendations on nutritional issues, there are some further state-level and private activities that work as quite an effective support to change consumption patterns to become more sustainable. These activities are mainly based on information instruments such as environmentally related product labels, regional marketing or consumer information campaigns. But there are only a few market-based instruments such as fees or subsidies offering economic incentives for environmentally friendly food consumption behaviour.

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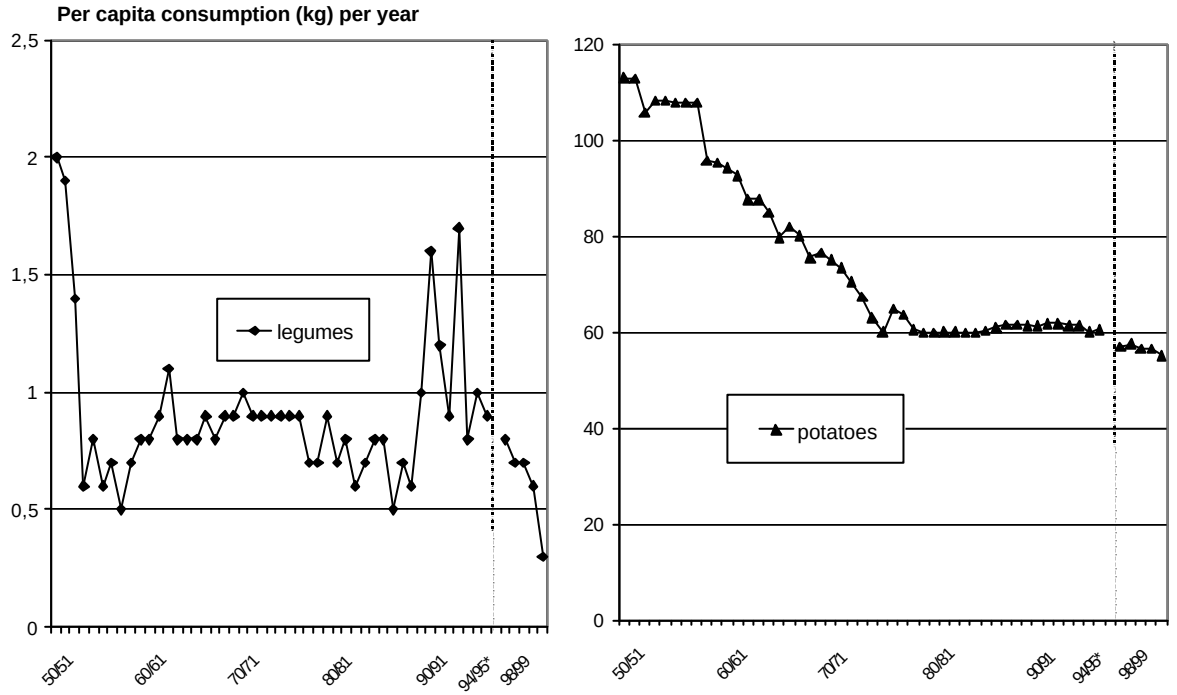
Appendix

Fig. 8 Consumption of legumes and potatoes 1947/48-19998/99



*Due to Austria's access to the EU and adaptation to survey, mode figures from 1994/95 onwards are not completely comparable.

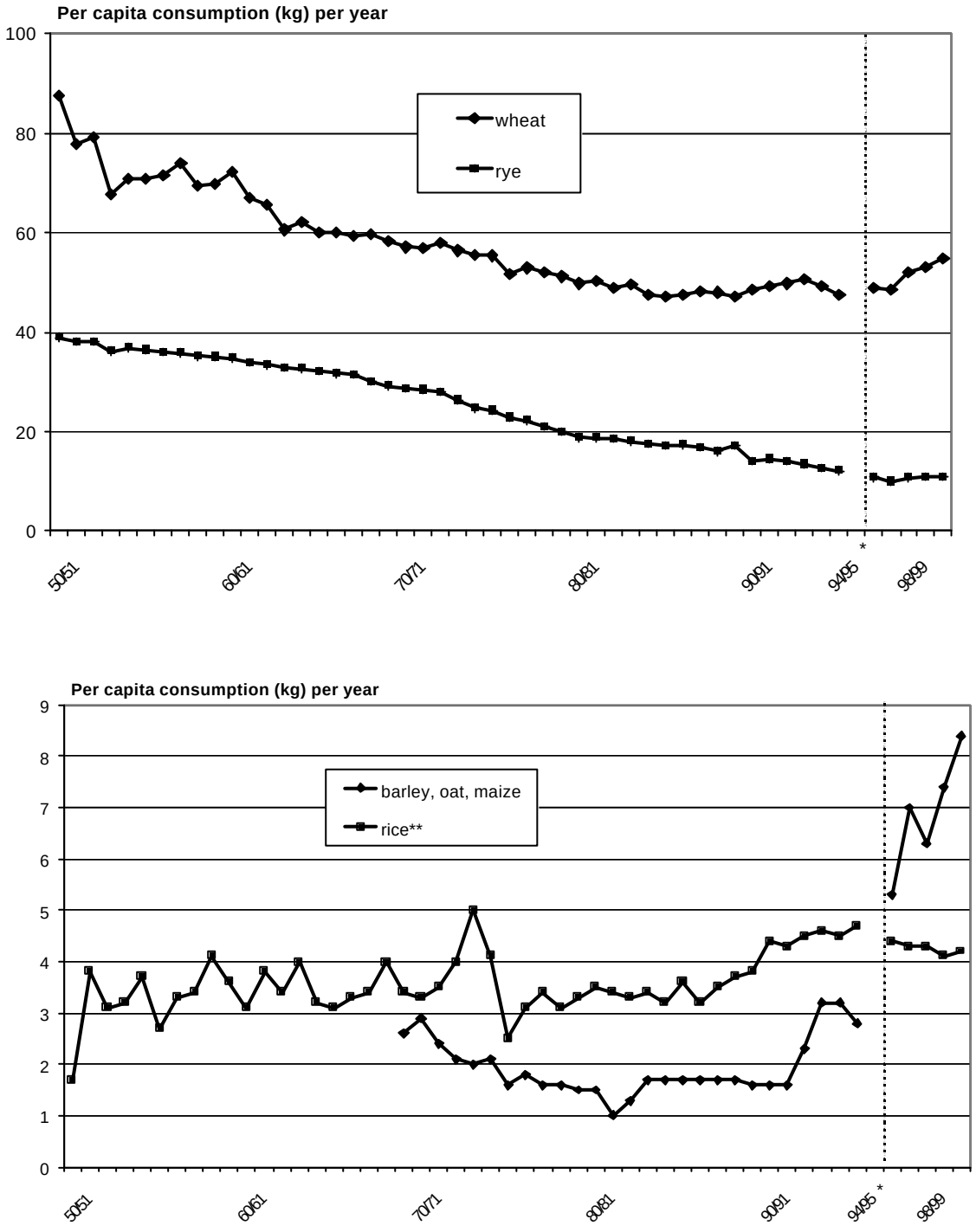


Fig. 9 Consumption of cereals and rice 1947/48-1998/99

*Due to Austria's access to the EU and adaptation to survey, mode figures from 1994/95 onwards are not completely comparable.

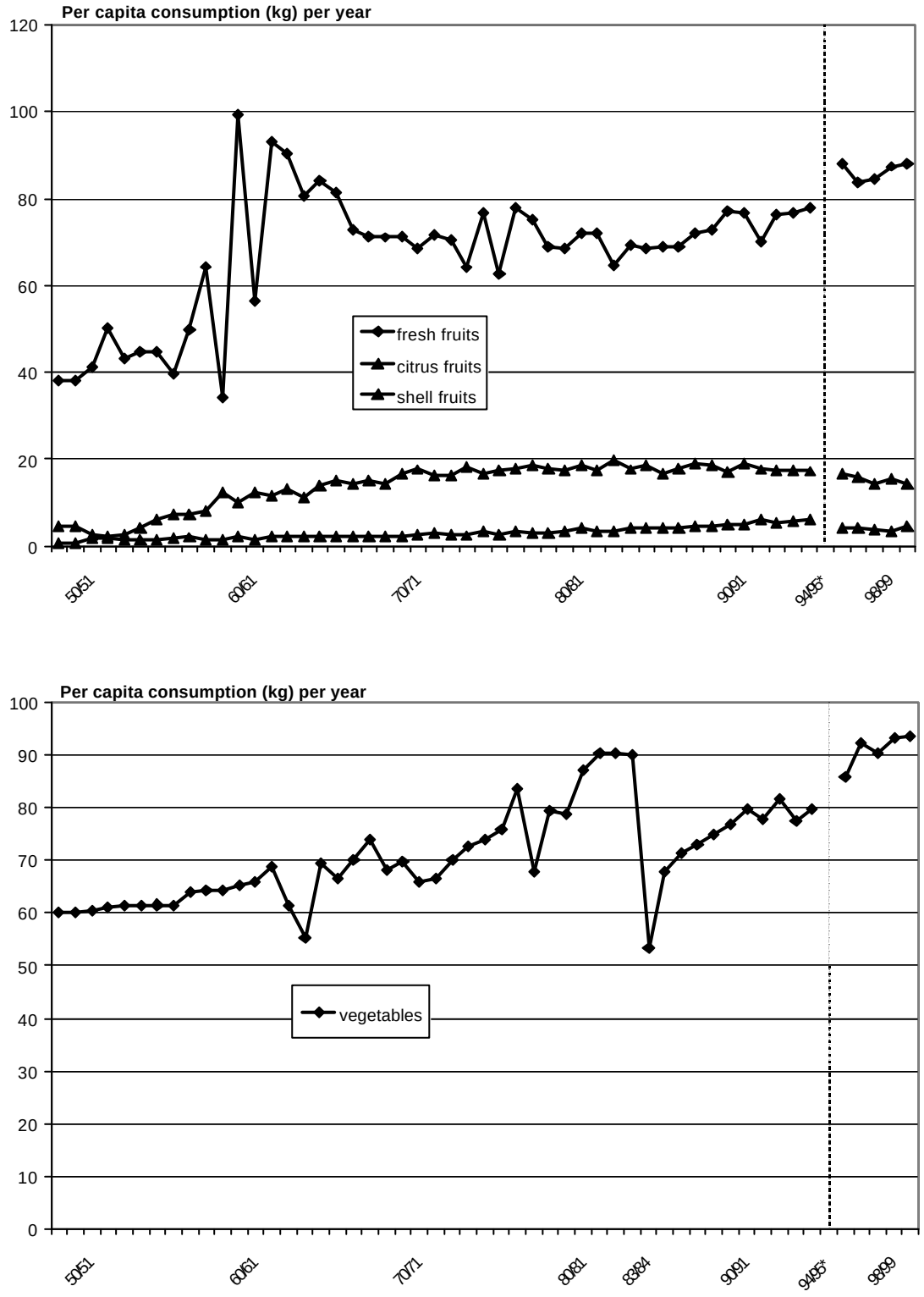
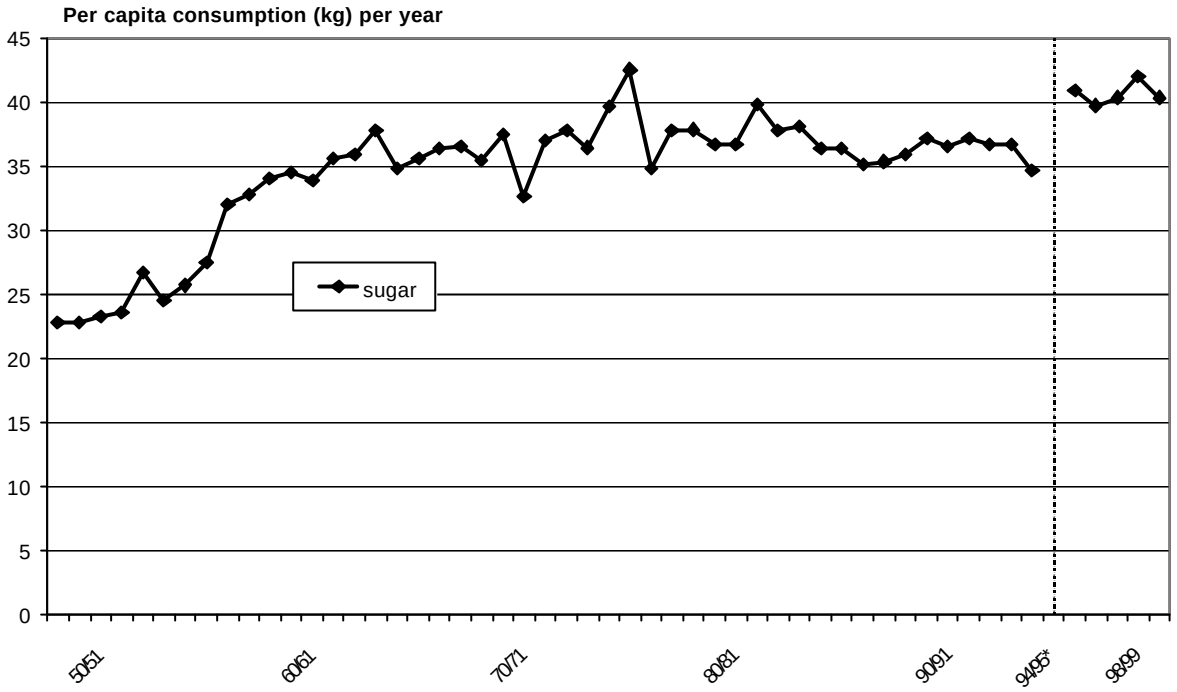


Fig.10 Consumption of fruit and vegetables 1947/48-1998/99

*Due to Austria's access to the EU and adaptation to survey, mode figures from 1994/95 onwards are not completely comparable.



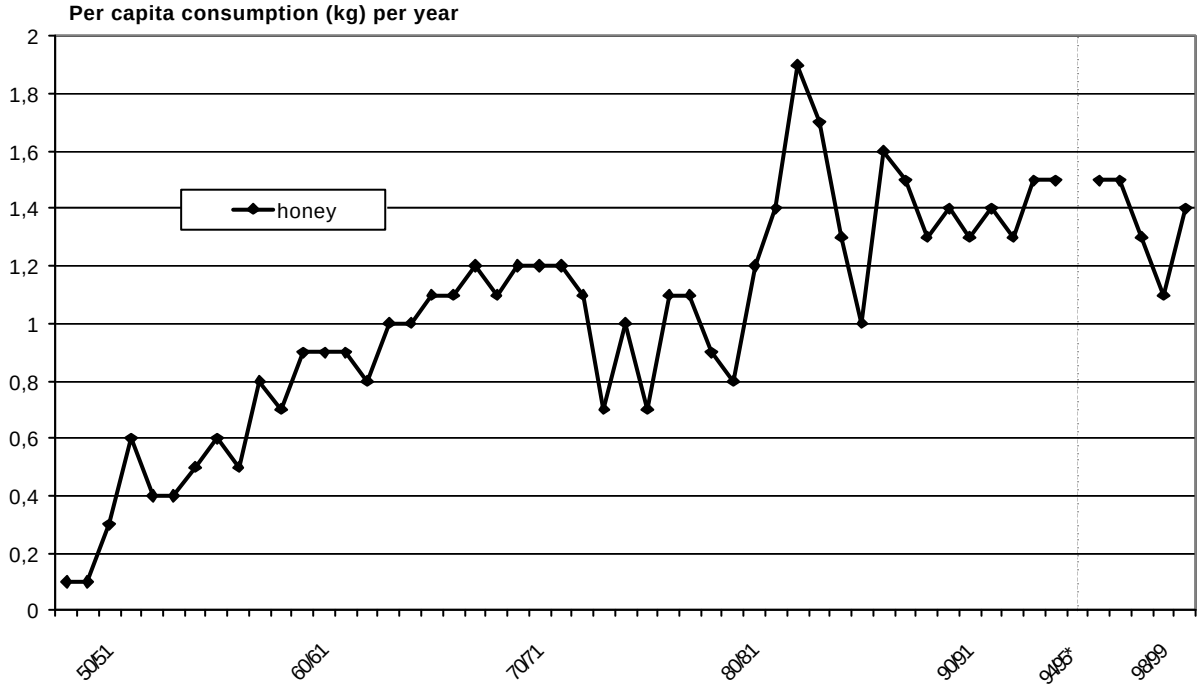


Fig.11 Consumption of sugar and honey 1947/48-1998/99

*Due to Austria's access to the EU and adaptation to survey mode, figures from 1994/95 onwards are not completely comparable.

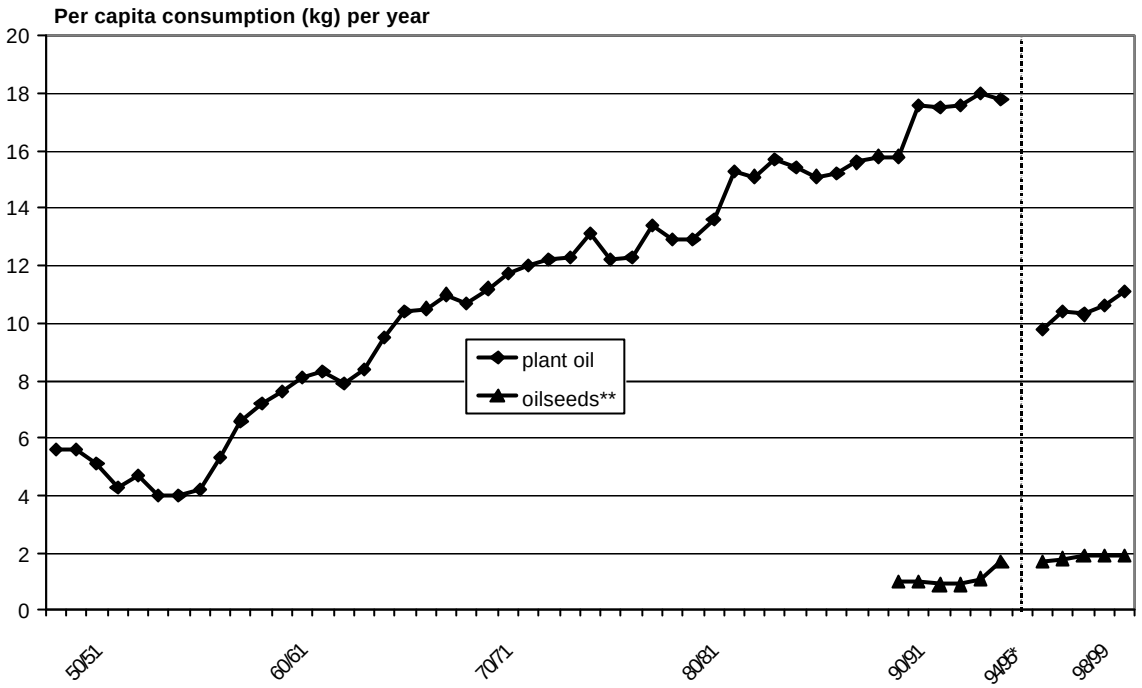


Fig.12 Consumption of plant oil and oilseeds 1947/48-1998/99
*Due to Austria's access to the EU and adaptation to survey mode, figures from 1994/95 onwards are not completely comparable. **oilseeds have been recorded only since 1989/90.

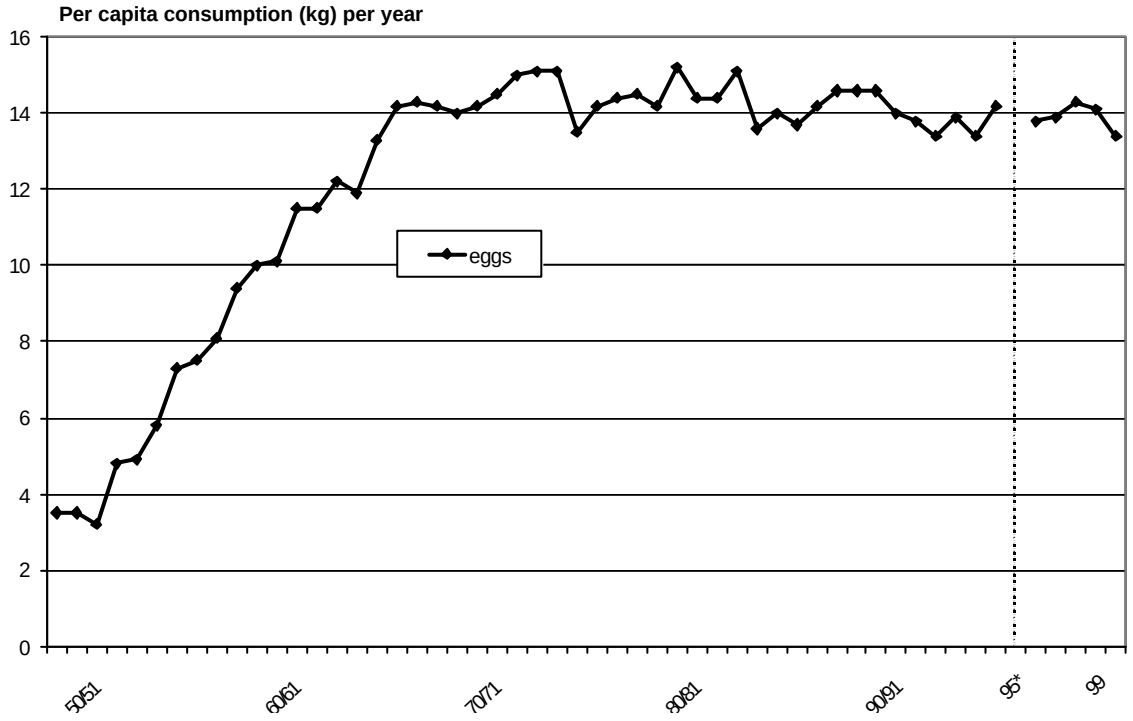
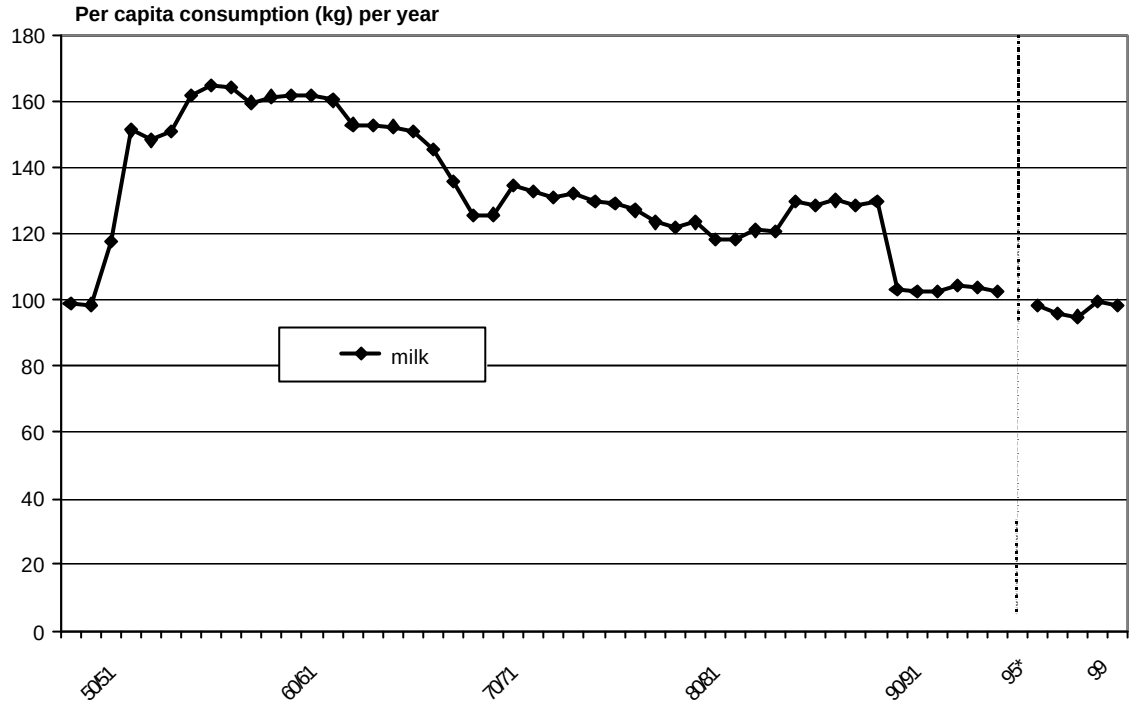


Fig.13 Consumption of eggs 1947/48-1999
*Due to Austria's access to the EU and adaptation to survey mode, figures from 1995 onwards are not completely comparable.



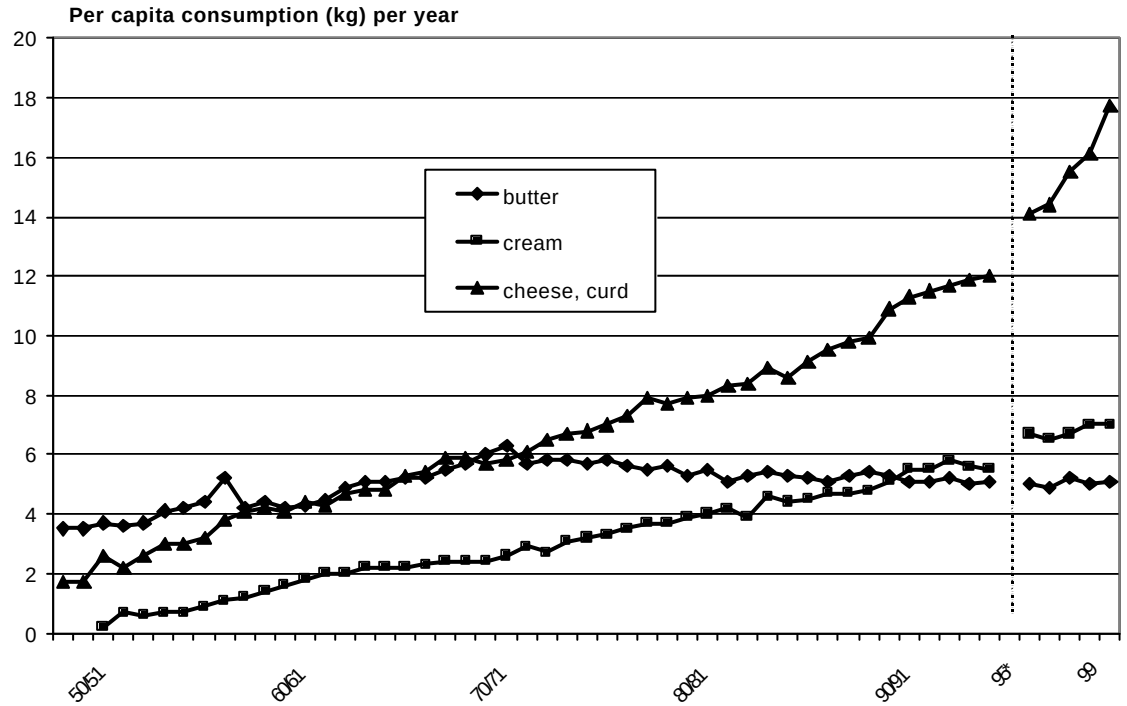
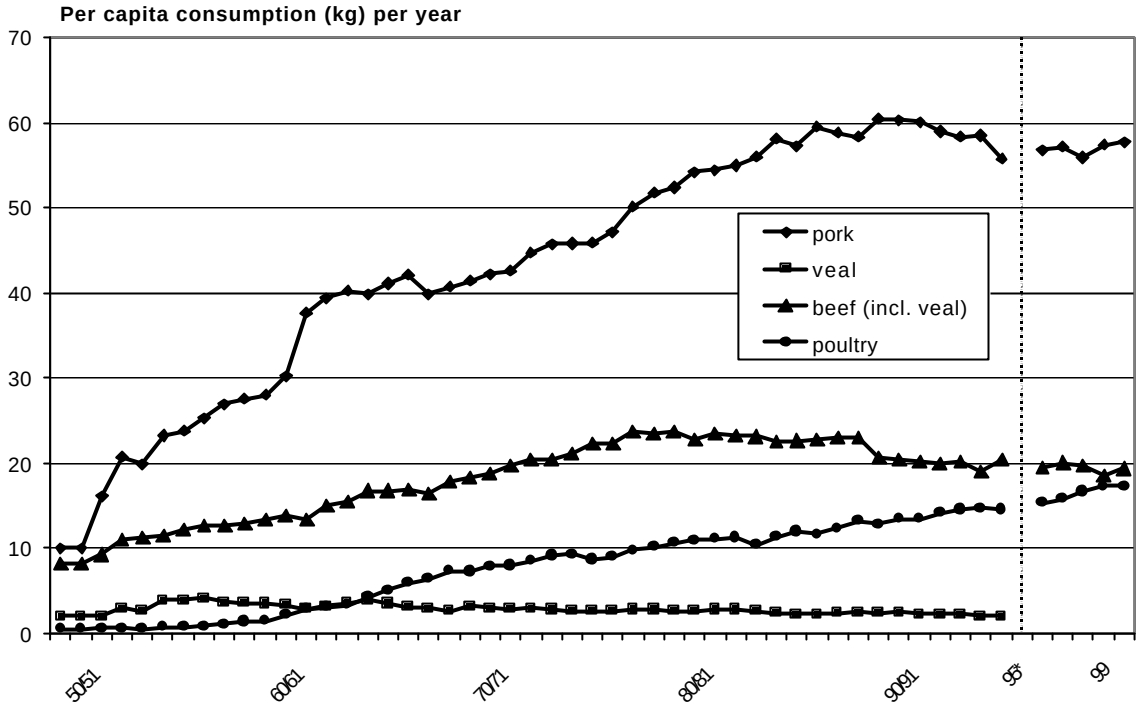


Fig.14 Consumption of milk and dairy products 1947/48-1999

*Due to Austria's access to the EU and adaptation to survey, mode figures from 1995 onwards are not completely comparable.



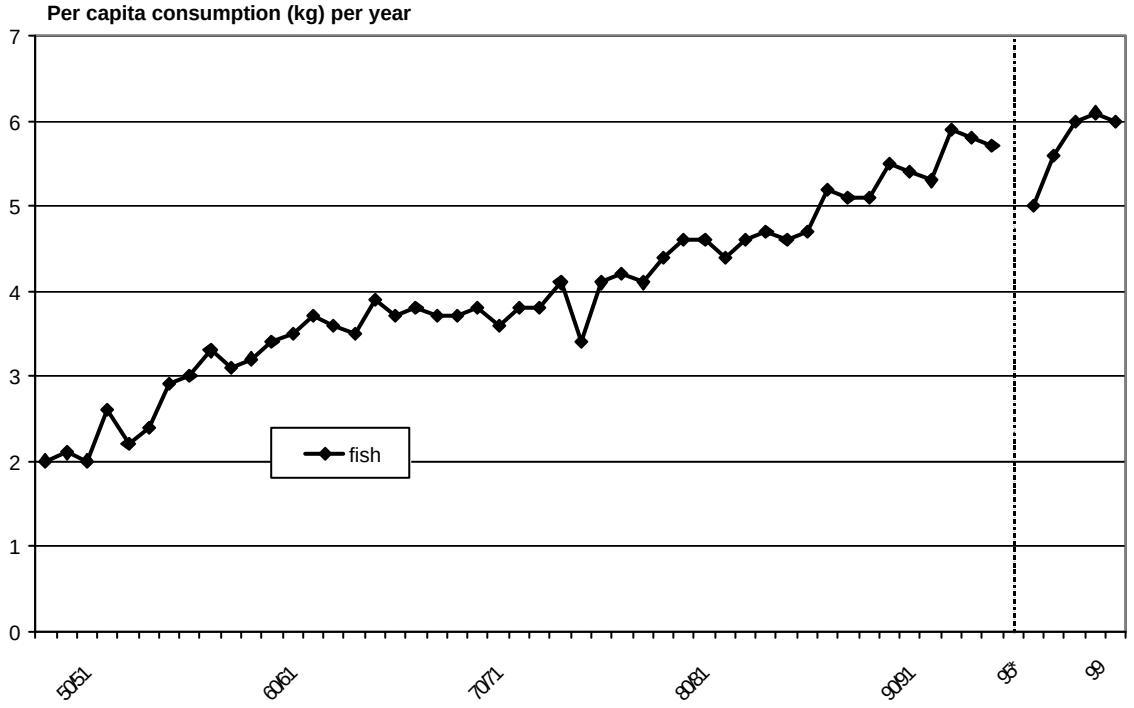


Fig. 15 Consumption of meat and fish 1947/48-1999

*Due to Austria's access to the EU and adaptation to survey, mode figures from 1995 onwards are not completely comparable.

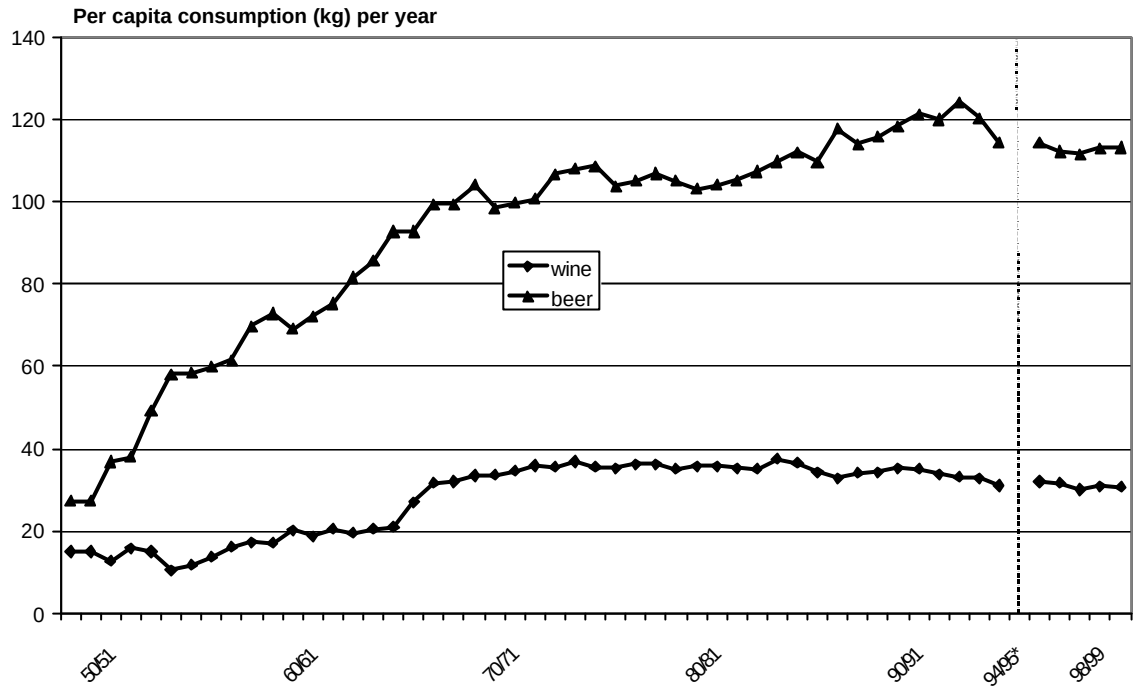


Fig. 16 Consumption of wine and beer 1947/48-1998/99

*Due to Austria's access to the EU and adaptation to survey, mode figures from 1995 onwards are not completely comparable.