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Sustainable diet and changes in food consumption in chosen European Union countries

Abstract. The most important challenges of food policy and public health in the 21st Century include fighting high levels of obesity and food waste. Both issues are linked to the necessity of reducing greenhouse gas emissions and inhibiting climate change. Diet modification towards a more sustainable and healthy model, based in greater extent on plant-derived (vegetal) food and not animal products is seen as a chance to improve this situation. Taking these aspects into consideration, an analysis of consumption trends (1991-2011) of 6 food groups, known as markers of sustainable diet, was carried out in 7 EU countries. The study was based on FAO Food Balance Sheet statistical data. The current consumption structures in the selected countries was compared to recommended, sustainable and healthy diets. It was shown that in general homogenization of food consumption, a decrease of pulses and increase of fruit consumption had taken place. In each country the share of cereals & potatoes, fruit & vegetables, milk & dairy products, and meat did not meet the recommendations. The consumption of the first two groups was too low, the remaining two – too high.

Key words: sustainability, food, consumption trends, sustainable diet, EU countries

Introduction

In 1972 the "The Limits to Growth" report commissioned by the Club of Rome think tank presented a model of world economic growth based on the demographic and resource depletion trends of that time[Meadows et al. 1973]. Its authors predicted that, due to environmental pollution and excess population growth, the global system could collapse by the mid or latter part of the 21st Century. This theory of limited growth, although much discussed and controversial, had a significant impact on the conception of environmental issues and lead to a search of alternative growth routes, especially as, at that time, the world faced a major energy crisis. The concept of sustainable development, including different goods consumption processes occurred, in the 1980s. Regardless, the continued world economic growth during the next decades caused natural environmental imbalance, resulting in climate changes due to excessive greenhouse gas (GHG) emission. Intensive development of the world agri-food system aimed at meeting increasing demand for food, especially diet westernization and higher animal products consumption in developing countries, significantly contributed to environmental pollution. The research undertaken in the frame of the European Commission Project EIPRO (2006) showed that food and drink consumption in general accounts for 20-30% of the ecological footprint of individuals in EU25, and in the case of eutrophication for even more than 50%. Meat and meat products (incl. meat, poultry, sausages etc.) have the greatest environmental impact, followed by

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milk and dairy products. The second global economic burden and challenge for public health and nutrition became obesity and other diet-related diseases. Their worldwide prevalence results from increasing consumption of animal products and highly processed foods containing excessive amount of fat, especially saturated fatty acids, added sugars, and sodium, and failure to meet minimum recommendations for fibre. In this scope, achieving sustainable agricultural production and food processing remains one of the main world development issues to lessen food-related GHG emissions. The role of consumers is to change their food consumption patterns towards a more healthy and sustainable diet.

Concept of sustainable diet and its rules

According to FAO definitions, sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable. They are nutritionally adequate, safe and healthy, while optimizing natural and human resources [FAO 2011]. Sustainable diets - in other terms - are healthy for both consumers and planet Earth as a whole and come down to five rules of consumer sustainable food choices and consumption [WWF-UK 2011]:

1. Eat less meat. Replace part of consumed meat amounts by protein-rich vegetal products such as whole grain, pulses, nuts and seeds.

2. Eat more plants. Enjoy more fruit and vegetables, as the WHO [2003] population dietary goal and recommendation is minimum 400g daily, but has not been reached in many countries, even among well developed and educated communities.

3. Waste less food. FAO [2011] estimates that global food losses and waste amounts to 1/3 of total world production and equals 1.3 billion tonnes of food. Guyomard et al. [2011] calculations showed that from 4600 kcal of vegetal agricultural raw materials which are globally daily produced, only 2000 kcal is consumed by people (1200 kcal is wasted, 1700 kcal is set apart for animal breeding and returns to the consumer as 500 kcal of animal foods). Poland, after joining the group of mature market economies, became the fifth EU27 Member State in terms of food wastage (9 million tonnes yearly excl. losses in agriculture) and constitutes 10% of total EU amount [European Commission DG ENV - Directorate C 2011]. According to British research [WRAP 2009] up to 30% of food brought home is wasted.

4. Eat less processed food. Such foods tend to be more resource-intensive to produce and often contain high levels of ingredients recognized as the main diet-related risk factors of obesity and other non-communicable diseases. So the advice is to choose more natural, fresh, seasonal and locally produced food.

5. Eat better food or buy food that meets a credible certified standard. Certification standards help consumers make conscious choices of the food produced with respect to the sustainable development goals: economic, social, and environmental. These include e.g. Fairtrade, Rainforest Alliance, Marine Stewardship Council certification. This rule regards also free range meat products and eggs, and regional and traditional products registered or not in EU good quality food certification schemes.

It is clear that in many countries governments and the "third" sector (NGOs) are aware of the need to transform the food chain into a more sustainable system in order for it to

cause less pressure on crucial resources (i.e. energy, water, and biodiversity), human health and animal welfare. At the same time the issue of sustainability is also more and more used as a tool by food producers and processing companies, which aim to provide value to customers by implementing a growing number of ethical standards and quality certificates.

Despite growing public interest in sustainability, scientific analysis shows that there is a gap between consumer attitude and behavioral intention [Vermeir and Verbeke 2006]. The challenge is therefore - on one hand - to further increase awareness of the issue, but also – on the other hand – to make sustainable food choices easier for consumers. The aim of sustainability may require, for example, that people in Western countries choose to eat smaller quantities of meat as well as types of meat that are produced in a more responsible way.

Aim and methodology of study

The aim of the presented study was to analyze changes in food consumption (kg per capita supply) of six selected food product groups – the so-called markers of sustainable diet. These were 3 plant-derived (vegetal) product categories: fruits, vegetables and pulses as well as 3 groups of animal products: meat, eggs, and milk and dairy products.

The methodology focused on analyzing FAOSTAT Food Balance Sheet data from 7 European countries: France, Germany, Poland, Czech Republic, Sweden, UK, and Italy during a 20-year period (1991-2011) and showing trends. Due to editing issues only odd years of the analyzed period are presented in this paper in the form of tables - however the calculations and results comprise all years. The current (2011) food consumption levels in the selected countries was compared to the UK-recommended diet structure which assigns a sustainable and healthy diet [WWF-UK 2011].

Study results

Consumption of vegetal products 1991-2011

The consumption of vegetal products fluctuates significantly depending on supply and prices, which are related to (among others) weather and trade conditions. In the analyzed period. Italy had the highest consumption of vegetables (max. 188 kg in 1992), followed by Poland and France. However disturbing falling trends can be noticed in all three countries (Table 1).

The lowest consumption of vegetables was in the Czech Republic (only about 74 kg/capita/year in 2011), but showing a 12% growth since 1992.

In most of the selected countries, excl. Germany and the Czech Republic, growing trends in fruit consumption were observed. Throughout the whole period the highest consumption of fruits was found in Italy (max. 163.6 kg/capita/year in 2009), the UK and Sweden. Poland and the Czech Republic had the lowest level of fruit consumption compared to all other described countries (Table 2). In five of the analyzed countries fruit consumption has a growing trend, but in the Czech Republic and in Sweden it is decreasing.

Table 1. Consumption of vegetables in selected EU countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	129.0	123.6	106.6	103.2	109	107.6	106.6	103.7	97.8	105.2	103.6
Germany	76.9	71.0	77.7	83.0	88.6	91.2	88.9	86.1	88.7	91.7	94.3
Poland	129.7	131.9	134.3	137.7	130.7	133.2	122.8	114.9	127.2	126.1	129.3
Czech Republic*	n.a.	70.5	74.0	75.3	82.0	75.2	71.0	79.0	75.5	72.0	74.1
Sweden	61.5	66.2	64.7	70.1	74.8	77.1	79.7	85.6	86.9	91.8	93.9
United Kingdom	88.9	89.3	76.9	84.4	92.3	90.9	92.3	95.9	91.6	88.7	94.1
Italy	181.1	161.2	177.9	178.1	184.8	160.4	174.3	183.4	157.7	174.8	144.5

*n.a. - data for Czech Republic are available since 1993
Source: [FAOSTAT 2014]

Table 2. Consumption of fruits in selected EU countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	78.2	84.3	94.0	83.5	89.1	96.6	95.8	112.1	116.2	115.8	110.1
Germany	102.9	88.5	80.2	88.1	83.5	88.6	90.2	84.7	81.0	79.1	80.4
Poland	38.8	46.0	41.7	44.7	50.5	54.0	48.8	51.2	45.3	54.7	54.3
Czech Republic	n.a.	66.5	78.3	74.3	73.7	63.3	66.6	69.7	70.2	75.9	68.7
Sweden	88.3	87.2	82.0	92.5	98.6	101.3	115.1	109.8	117.5	117.8	117.0
United Kingdom	75.0	79.1	78.8	79.6	86.4	92.0	115.6	127	126.9	125.1	125.7
Italy	125.1	137.6	119.8	118.7	137.9	134.2	134.2	152.8	151.5	163.6	140.8

Source: [FAOSTAT 2014]

Exactly the opposite trends can be observed in the case of the third vegetal aggregated product category: pulses. The yearly consumption of these products, which include beans and peas in 2011 oscillated between 1kg/capita in Germany and 4.8 kg/capita in Italy. It shows growth trends only in the case of the Czech Republic and Sweden (Table 3).

Table 3. Consumption of pulses in selected EU countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	2.1	2.1	2.2	2.1	2.3	2.0	2.1	2.0	1.9	1.7	2.0
Germany	0.9	0.9	1.1	1.7	1.3	0.9	0.9	0.6	0.7	0.6	1.0
Poland	2.6	1.8	2.3	2.2	2.5	2.0	1.6	1.6	2.2	1.8	2.1
Czech Republic	n.a.	1.8	1.8	1.8	2.0	1.9	2.1	3.0	2.7	2.9	2.6
Sweden	0.8	1.1	1.3	2.3	1.6	1.5	1.7	1.8	1.9	1.8	1.9
United Kingdom	4.7	6.1	5.1	6.5	6.7	6.6	4.4	3.0	3.0	2.9	2.4
Italy	5.7	5.4	5.3	5.6	5.6	5.5	5.6	5.5	5.4	5.3	4.8

Source: [FAOSTAT 2014]

Consumption of animal products 1991-2011

The consumption of meat and its products at the beginning of the analyzed period was highest in France (100.9 kg/year) and lowest in Sweden (59.1 kg) (Table 4, Figure 1). In the next 20 years the consumption decreased only in two of the studied countries – France and Czech Republic. In the remaining countries meat consumption increased and in 2011 its level varied between 75.6 kg (Poland) and 88.7 kg (France).

Table 4. Consumption of meat and its products in selected EU countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	100.9	94.1	97.8	99.8	98.8	101.6	96.2	88.3	83.7	90.4	88.7
Germany	87.7	84.1	81.4	81.6	82.9	81.3	83.1	82.0	86.1	86.0	87.9
Poland	78.0	73.4	69.2	65.8	72.3	70.8	75.1	72.9	76.8	74.6	75.6
Czech Republic	n.a.	94.6	84.0	80.1	80.6	76.6	80.1	87.5	85.5	83.6	80.4
Sweden	59.1	61.9	64.8	67.6	72.5	70.2	76.5	77.5	78.9	78.8	81.9
United Kingdom	72.5	72.2	73.5	73.3	76.0	78.5	82.9	83.5	85.1	80.8	82.5
Italy	86.4	87.8	84.0	85.6	88.5	90.1	86.3	84.5	87.7	87.6	86.7

Source: [FAOSTAT 2014].

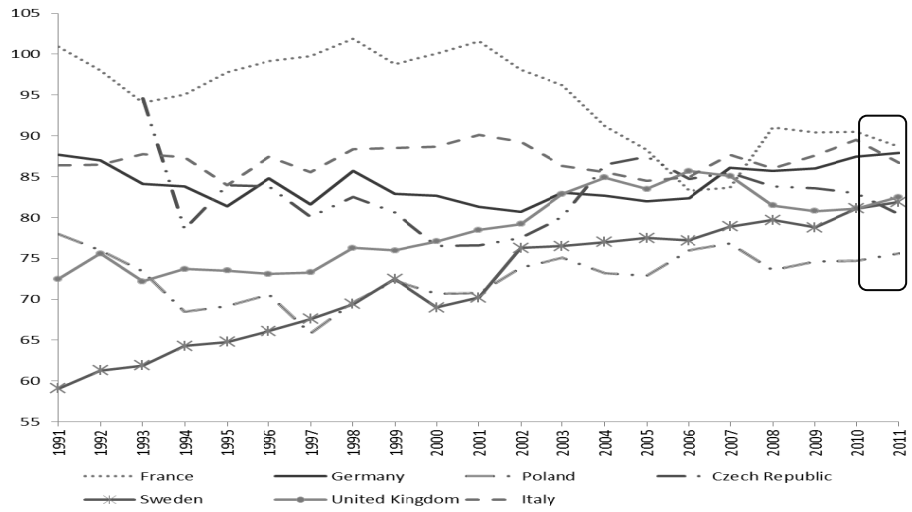


Figure 1. Changes in consumption of meat and its products in selected EU countries (1991-2011) [kg/capita/year]
Source: [FAOSTAT 2014].

Milk and dairy product consumption in the analyzed two decades showed both growth as well as falling trends (Table 5). In Sweden the level of milk consumption remained highest, surpassing 340 kg/capita/year. In the Czech Republic and France it decreased and in Italy, UK and Germany it increased slightly. In Poland consumption is relatively low but has increased in the last years, reaching almost 198 kg/capita in 2011.

Table 5. Consumption of milk and its products in selected EU countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	287.2	272.9	272.3	255.9	266.4	272.3	272.7	257.3	261.6	247.2	250.0
Germany	234.1	222.3	234.0	231.5	230.3	234.0	250.7	249.0	259.2	265.4	255.4
Poland	226.9	207.8	194.8	192.1	199.4	192.7	196.9	172.3	168.0	168.1	197.9
Czech Republic	n.a.	220.4	200.5	184.8	204.7	200.4	200.5	215.7	203.1	177.4	178.3
Sweden	345.3	369.3	346.8	340.8	346.6	362.2	380.3	369.9	355.7	357.5	342.3
United Kingdom	227.1	217.6	216.0	237.2	230.7	226.9	241.7	248.0	240.2	236.3	240.9
Italy	252.8	242.0	233.5	249.9	271.8	270.6	262.1	271.0	258.1	258.0	260.4

Source: [FAOSTAT 2014].

Table 6. Consumption of eggs in selected countries (1991-2011) [kg/capita/year]

Country/year	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011
France	14.7	14.6	15.8	15.7	16.0	15.8	15.3	14.3	14.4	14.1	12.5
Germany	14.4	11.8	12.1	12.7	12.2	12.4	11.9	11.6	11.9	12.2	12.8
Poland	9.8	8.8	8.6	10.6	10.4	11.1	11.7	11.8	11.5	11.4	9.5
Czech Republic	n.a.	12.7	13.1	14.3	17.4	16.7	14.6	14.0	15.0	15.2	13.0
Sweden	12.4	12.3	11.3	11.6	11.6	11.0	10.4	11.1	11.1	12.0	12.4
United Kingdom	10.4	10.0	9.9	9.8	9.3	10.0	9.9	10.2	10.3	10.3	10.5
Italy	12.7	12.2	12.0	12.8	12.3	12.0	11.6	11.6	11.6	12.7	11.7

Source: [FAOSTAT 2014].

Egg consumption in most of the studied countries was characterized by decreasing trends, with the exception of Poland and the UK. However in these countries the level is still lowest (Table 6). As in the case of total meat and meat products the consumption of eggs became less varied, ranging from 9.5 to 12.8 kg/year in 2011 compared to 8.8-14.6 kg in 1993.

Towards a sustainable and healthier diet

The volume of food consumption calculated per capita on the food balance level in the investigated European countries in 2011 varied from 860 kg in Czech Republic to over 1 ton in Italy (Table 7). Poland with the food consumption volume of 941 kg/capita occupies the sixth position, between France and the Czech Republic.

The highest consumption of cereals and starchy roots (incl. potatoes) and lowest of meat was noticed in Poland. The highest consumption of meat was found in France, Germany and Italy. Italy had also the highest consumption of fruits and vegetables, surpassing 280 kg/capita, which is about two times more than in the Czech Republic. In the case of milk & dairy product consumption, its level varied from 178 kg in the Czech Republic to 342 kg in Sweden. Germany and United Kingdom did not show extreme (maximum/minimum among countries) volumes in any of the analyzed product groups.

Table 7. Volume of food consumption in selected EU countries (2011) [kg/capita/year]

Country	Total consumptio	Cereals & starchy roots	Fruit & vegetables	Milk & dairy products	Meat (without offals)
France	965.4	180.0	213.7	250.0	88.7
Germany	966.4	182.2	174.7	255.4	87.9
Poland	941.0	265.7[1)]	183.6	197.9	75.6
Czech Republic	861.0[2)]	185.3	142.8	178.2	80.4
Sweden	1 015.6	156.6	210.9	342.3	81.9
United Kingdom	973.5	214.8	219.8	240.9	82.5
Italy	1 019.2	194.4	285.3	260.4	86.7

[1)] highest consumption level [2)] lowest consumption level

Source: [FAOSTAT 2014].

Consequently, significant differences were noticed in the total energy intake as well as in the level of energy originated from animal and vegetal products (Table 8). The highest energy value of an average diet was observed in Italy and Germany, whereas the lowest in Sweden. Italy, the Czech Republic and Poland (73-74%) had the highest share of vegetal energy in total energy intake, while France and Sweden had the lowest (66%).

Table 8. Total and vegetal dietary energy supply in European countries (2011) [kcal/capita/year]

Country	Total energy kcal/capita/year	Vegetal energy	
		intake, kcal	% of total
France	3524	2343	66.5
Germany	3539	2447	69.1
Poland	3485	2543	73.0
Czech Republic	3292	2435	74.0
Sweden	3160	2089	66.1
United Kingdom	3414	2425	71.0
Italy	3539	2624	74.1

Source: [FAOSTAT 2014]

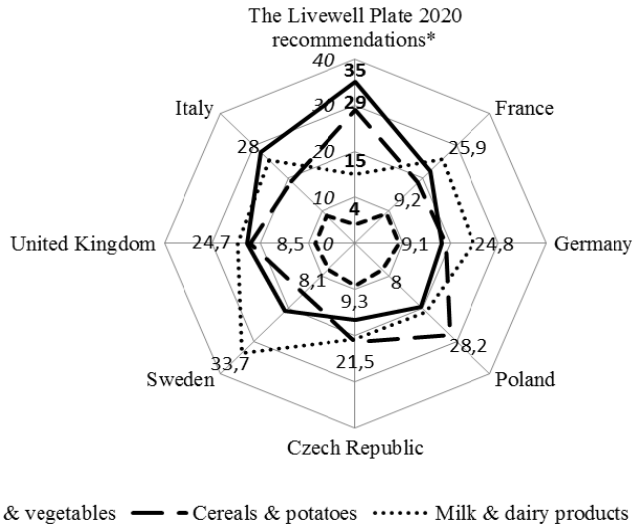
It is worth noticing that during the period 1991-2011, dietary energy supply increased in greatest extent in Sweden, United Kingdom, Germany, and Poland (by 6-7.4%). Only in Italy the energy value of an average diet fell by almost 3%. In the case of France the reduction was very small and reached 0.5%.

Having in mind that an average adult needs respectively 2500/2000 calories/day the data presented above prove that we tend to overeat food that has a highly detrimental impact on our health and on the environment [WWF-UK, 2011].

To help to change food habits in many countries, governmental (for example USDA in the US) and nongovernmental organizations prepare nutritional recommendations. In the United Kingdom the Food Standard Agency elaborated "The Eatwell Plate" which illustrates the proportion of major food groups that should be included in a healthy diet. Further - this concept was extended by the aspects of sustainable diet (UK's 2020 target for

reduction in greenhouse gas emission and recommendations for a healthy diet) and is popularized as *The Livewell Plate 2020*. The structure of the volume of different food groups which should be consumed to achieve a sustainable and healthy diet are as follows – in % of total daily food consumption: fruit and vegetables – 35%; bread, rice, potato, pasta and other starchy food – 29%; milk and dairy products – 15%; food and drinks high in fat and/or sugar – 9%; meat (without offal) – 4%; fish – 3%; eggs – 1%; beans and pulses – 4%; nuts and seeds – 0,3% [WWF-UK, 2011].

The existing food consumption patterns in the investigated European countries differ very much in comparison to these guidelines (Figure 2).



*WWF - UK Livewell: Heathy people, Healthy planet 2011

Figure 2. Share % of main groups of product in total food consumption in selected EU countries (2011) regarding the Livewell plate 2020 recommendations

Source: own calculations based on FAOSTAT Food Balance Sheet data 2014

Major changes are needed in the case of fruit and vegetable consumption. Special effort to increase the share of this group of products in total consumption should be made in the first priority in the Czech Republic, Germany and Poland. Increasing the share of cereals and starchy roots are needed firstly in Sweden, France and Germany.

The opposite tendency, that is, lowering its share in daily total energy consumption, should apply to meat as well as milk and dairy products. In the case of the first group of products this should take place especially in the Czech Republic, France, and Germany. In Sweden, Germany and France energy from dairy product consumption should be limited.

It is important to underline that the proportion of the main food groups in the model of a sustainable and healthy diet in Poland is closest to recommendations only in the group of cereals and starchy roots (potatoes). The presented data demonstrates that consumers do not need to eliminate any food groups to follow a health, sustainable diet.

Final remarks and conclusions

Based on the compared FAO data it can be concluded that in the last two decades in the selected countries a process of homogenization of food consumption patterns has slowly taking place, especially in the case of meat, eggs and vegetables. In each country the share of cereals & potatoes, fruit & vegetables, milk & dairy products, and meat did not meet sustainable diet recommendations. The consumption of the vegetal products is too low, while in the case of animal products – too high. In 2011 Italy, Czech Republic, Poland and UK had the highest share of vegetal energy in total energy intake, while Sweden, France and Germany had the lowest.

Further dissemination of the necessity for sustainable diet changes and research on the reasons of development is needed. It will have a positive impact on both environment and health. Moreover further cooperation between governments, civil society and the private sector (for example in the form of private-public partnerships) should be encouraged to promote sustainable diets in order to achieve sustainable food production, processing and consumption, and to minimize environmental degradation and loss of biodiversity.

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