

**Czech University of Life Sciences in Prague**

**Faculty of Economics and Management**

**Department of Economics**



**Bachelor Thesis**

**Comparison of Czech and French  
Organic Agri-Food Sector**

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Prague, 31<sup>st</sup> March 2011

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I would like to express my acknowledgement to my supervisor Ing. Petr Procházka, Msc., Ph.D., for having helped me with this Bachelor Thesis, from the very beginning until the final adjustments. I would also like to thank my family and close friends for having supported me throughout the process of the Thesis elaboration.

**Comparison of Czech and French Organic Agri-Food Sector**

**Srovnání českého a francouzského ekologického zemědělství a  
biopotravinářství**

## **Comparison of Czech and French Organic Agri-Food Sector**

### **Summary**

This Thesis deals with organic agriculture and its past as well as present situation in France and in the Czech Republic. General principles and history of organic farming are defined, followed by a more detailed history of organic agriculture implementation and current organic food market trends in each of the described countries, and an economic analysis on the development of organic agriculture in time. Differences and similarities between the two countries and major weak points of organic production in both are concluded from the results of the analyses.

### **Key words**

Organic agriculture, organic products, farming, organic market, Czech Republic, France

## **Srovnání českého a francouzského ekologického zemědělství a biopotravinářství**

### **Souhrn**

Tato práce pojednává o biozemědělství a jeho historické, jakož i současné, situaci ve Francii a České Republice. Jsou popsány obecné principy a historie biozemědělství, následovány detailnější historii zavedení biozemědělství a současných trendů na trhu biopotravin v každé z popisovaných zemí, a ekonomickou analýzou vývoje biozemědělství v čase. Rozdíly a obdobnosti těchto dvou zemí a hlavní slabé stránky bioprodukce v nich jsou vyvozeny z výsledků analýz.

### **Klíčová slova**

Biozemědělství, bioprodukty, zemědělství, biotrž, Česká Republika, Francie

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# **1. Introduction**

Agriculture and food production is one of the oldest and most important human activities. It is the basis for sustaining life on Earth and makes the development of human society possible.

Agricultural activity has been present in almost every society throughout history and has always kept within certain framework of rules and principles. However, due to undeniable changes that have occurred during the last two centuries, even agricultural production has been made adopt new techniques and viewpoints on producing food.

The most apparent change was brought about by the Industrial Revolution in the 18<sup>th</sup> century. It offered means for achieving the aim of producing enough for the increasing world population- improved technology and use of new chemical solutions that substituted a part of necessary human workforce in agriculture.

In parallel, another current began to form, one which refused the use of chemical solutions and preferred a more natural way of farming. Even if farming in harmony with nature had been practised in some areas since always and this was therefore not a new concept, the current was given a name only later on- organic agriculture.

It is a possible answer to world's problems related to overuse of chemicals and technology. It offers a solution to damaged nature and human health although it is contestable whether it can offer a solution for world hunger as well. Despite many attributes that are subject to discussion or criticism, organic agriculture took a steady path in most of the world's developed countries, and offers consumers an alternative to the conventional agricultural products that they can find in average shops.

Due to historical circumstances that shaped countries' profiles, economies and cultures, organic agriculture has been, is and will be accepted in different ways in different countries. For the purpose of this Bachelor Thesis, two countries with quite distinct economies and values in society have been chosen for comparison- France, as a representative of a Western European developed country, and the Czech Republic, situated in Central Europe and in many eyes playing a role of an outsider, sometimes associated with Eastern Europe and the Soviet Union until these days, not very well developed and certainly overlooked in economic aspects.

Organic agriculture has been introduced in different periods of time and has evolved in various directions in those countries. National economies are in a different stage of

development and have a dissimilar structure. Also the societies do not place value on the same things and have distinct level of knowledge and appraisal of organic agriculture and products. We can however point out a similarity- the development in both the countries was slow and modest at once. France accepted organic way of farming in the 70's, and became a leading European country in the 80's in the extent and volume of organic production. After this boom, however, organic production declined and the first place on the imaginary ladder has been overtaken by other Western European countries, like Germany and Great Britain. Czech Republic is in a position similar to France's in the 80's- presently it is living a boom of organic agriculture that is finding its way onto fields as well as into shops and people's plates.

Therefore, a comparison of those two countries is interesting and shows how two separate countries, even if located on the same continent, can be very different or very similar in certain aspects.

### **1.1 Objectives and goals**

The aim of this Bachelor Thesis is to compare the two countries from the historical as well as from the present point of view, to find a possible explanation to why the development has been different and what the biggest strengths and weaknesses of organic agriculture, organic agri-food production and organic food market in the two countries are. The explanation will be sought for from the economic point of view as well as with a descriptive analysis of organic markets in the two countries.

### **1.2 Methodology**

The basic question of this Bachelor Thesis is to answer what differences there are among the French and Czech organic agriculture production systems mainly from the economic point of view and whether any similarities in their development can be determined.

A current general opinion in the society would imply that Eastern European, Post-Soviet countries (such as the Czech Republic) have a less developed state economy than Western European countries, such as France. Therefore, also the sector of organic agriculture would be more expanded and better functioning in France than in the Czech Republic. The market of food would be more saturated and there would be a higher demand for organic products.

A usual explanation is historical circumstances that have influenced the economy and society as such. Even macroeconomic indicators suggest that this opinion is- at least in part- true. However, one of the aims of this Bachelor Thesis is to analyze the actual as well as historical situation in an economic way, not based on opinions prevailing in the society.

The main hypothesis of this Bachelor Thesis claims that contrarily to a widespread opinion of a favourable economic situation of a country being the direct cause for a well-developed organic agriculture (henceforward referred to as OA) system. Economic progress is not the only factor causing the OA to prosper and French OA is not better developed than the Czech one in spite of an apparent economic superiority.

The emergence of organic farming being related to positive economic development of a country is concluded from the theory of economic inequality by Simon Kuznets<sup>1</sup>. Applied in ecology as the EKC (Environmental Kuznets Curve), the theory suggests that by reaching a certain level of wealth, a country shifts towards a 'greener' production, that organic certainly is. The trend observed in time series on organic production in Czech Republic and France would confirm this principle in that this positive economic development has caused both GDP/capita computed by PPP and the share of land farmed organically to increase.

The quantitative analysis was based on economic and statistical theories. Statistical data provided by national statistical offices and organisations specialised in organic farming in respective countries was used. Annual data on total agricultural land farmed organically in respective countries were compared with time series of economic growth indicators. There has been found a relation between the overall level of economic evolution of a country and the volume of its organic production.

In addition, a qualitative analysis, represented by SWOT analyses of organic markets in both countries is contained in the Bachelor Thesis to complete the picture. This analysis is divided into four main parts. Strengths of the organic movement refer to its characteristics that would enable it to gain a strong position in the country's production system and on the market. Weaknesses are weak points of the movement, i.e. reasons for which organic production is inefficient or lags behind the optimal volume for the country. Opportunities are possibilities how to improve the position of OA on the market and positive circumstances that would help this improvement,

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<sup>1</sup> For the purpose of this Bachelor Thesis, the principle of more serious ecological impacts of industrial production of a country getting richer, that comes necessarily before the actual 'eco-friendliness' was omitted as it does not apply to organic agriculture.

whereas threats, on the other hand, are rather negative characteristics of the market, society and of the country, that would possibly prevent OA from expanding.

### **1.3 What is organic agriculture?**

Organic agriculture is a system of animal and plant production that places emphasis on the most natural ways of farming possible. The use of all chemical and synthetic inputs is banned, as well as chemical treatment for animals.

Organic is also a synonym for a certain lifestyle that prefers natural products, cultivated and produced in accordance with nature and its processes over conventional ones where the provenience is not clear and controlled.

The major advantage organic agriculture offers to consumers is the transparency of production process. Under this system, all production must conform to strictly set rules and follow organic principles of sustainability, healthiness and the minimisation of harmful effects on nature, humans and animals. The transparency is assured by those clearly defined rules that every producer must obey in order to be acknowledged and certified organic, which in turn is a device for him that he can present himself with.

Furthermore, consumers of organic products have a guarantee that the food they consume will be of a certain quality and containing nutritional richness, providing their organisms with vitamins, minerals and other necessary inputs. No artificial colorants, additives or preservatives are used in such production therefore residuals of chemicals cannot get into the human organism and cause illnesses or other harms.

Organic agriculture also contributes to the development of the countryside, providing more work opportunities for people in the production process that necessitates a lot of human workforce, and fighting against countryside displacement.

## **1.4 History of OA**

### **1.4.1 The first phase of the OA development**

In its basis, all agriculture has been organic since prehistoric times when our ancestors abandoned hunting and gathering plants and berries and began breeding and cultivating them. In that time, of course no synthetic inputs were available.

However, throughout the centuries two major factors coincided: population growth, and therefore, the need to provide food for more and more people, and the technological evolution which allowed this increase in agricultural production. These tendencies continued until the beginning of the 20<sup>th</sup> century which saw a boom in technology mainly in the period between the world wars as many of the technological innovations used in the war could be also employed in agriculture.

Conventional agriculture turned into a very efficient system, able to produce large quantities of food, but also dependent on technological aid, large-scale irrigation and chemical solutions<sup>2</sup>. This was perceived by many as a negative sign that agriculture was no more linked to nature, but had become in some way artificial. Moreover, as a lot of chemicals were used for various purposes- pesticides and herbicides against pests and weeds, fertilizers to increase plant yields, the provision of artificial colours and flavours to improve the taste, and preservatives to prolong the shelf life- they were blamed by many, especially scientists and doctors, for causing harm to human health. The general public were afraid of the hard to measure quantity of chemical residues that can get into their bodies from the consumption of agricultural products. Furthermore, negative impacts on the environment, such as soil degradation, erosion and depletion of natural resources, were perceived with resentment. Last but not least, animal breeding conditions became unsupportable in the eyes of certain people, as they did not provide basic needs for the animals and strongly limited their welfare.

In the 1940's, world saw another big movement. The "Green Revolution" was a period when yields from crop cultivation in many developing countries increased greatly. New varieties of crops were introduced, providing significantly higher yields, new methods of cultivation and new industrial substances used to support production. Mexico was the first country to experience this sudden growth under the management of Norman E. Borlaug, with new modifications of highly productive, disease resistant wheat. Later on, the Green Revolution continued in other countries, such as the Philippines, India and Pakistan. As a result, over 40% of Third World farmers were using those new varieties of wheat, rice, corn and others until the 1990's. Those hybrid seeds showed a highly effective transformation of input fertilisers and irrigation into yields. Anyhow,

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<sup>2</sup> Particularly two newly discovered substances for the purposes of war were found to be also efficient in agriculture- Ammonium nitrate and DDT (Dichlorodiphenyltrichloroethane). The first one, used in ammunition, served as a source of nitrogen for increasing soil productivity, the latter was originally used for fighting typhus and malaria-infected louses and mosquitoes that bothered the troops in the tropics and was later turned into an insecticide to control pest. (<http://www.pan-uk.org/pestnews/Actives/ddt.htm>)

after having reached the peak in production in the 1980's, many varieties began to decrease their performance<sup>3</sup>.

This system was believed to be the solution for world hunger. Adopting it brought about higher yields, therefore also higher profits for farmers and an increased food supply for a large number of people. However, opponents of this agricultural-industrial approach argued that "the Green Revolution depended on fertilizers, irrigation, and other factors that poor farmers could not afford and that may be ecologically harmful; and that it promoted monocultures and loss of genetic diversity"<sup>4</sup>.

On one hand, the overall attitude was in favour of industrialising agriculture, so as to increase yields and farmers' profits in the view of reducing food insecurity and poverty all over the world, and on the other there was a counter-stream, questioning the benefits of those practices and putting them into comparison with their costs.

However, a purely organic agriculture was conducted mainly only in domestic production, on household gardens and small-scale fields. The first public "loud-talk", opposing the generally adopted technological and chemical methods in agriculture, was heard in England in the 1920's.

In France, after a series of discussions, there was a scientific panel consisting of scientists and medics, affirming that the utilization of such a quantity of chemical inputs in agriculture had a proven and obvious negative impact on the health of people.

#### **1.4.2 OA development since the 70's**

It can be said that in the 60's and 70's the distinction between organic and conventional farming became clearer and more deeply rooted in a larger share of the minds of the wider population. A big contribution to the widening of organic knowledge were various publications of thinkers, writers and scientists mentioned above that introduced the organic way of thinking to people.

With the expansion of organic thinking, changes began to be promoted and made concerning agricultural production, leading to chemicals and extensive water usage regulation. Organically grown food became popular and demand for it grew. This meant that an established system of regulations and certification was called for.

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<sup>3</sup> The Green Revolution movement was funded by various governments, as well as by private subjects. Many of them did so from the pure belief that a solution for world hunger has, at last, been discovered, e.g. the Rockefeller and Ford Foundations. (Rosset, P.- Lessons from the Green Revolution, <http://www.foodfirst.org/media/opeds/2000/4-greenrev.html>)

<sup>4</sup> From Columbia Encyclopedia, Sixth Edition, 2008, [http://www.encyclopedia.com/topic/Green\\_Revolution.aspx](http://www.encyclopedia.com/topic/Green_Revolution.aspx)

A first such standards system, however voluntary, was published in 1972 by Rodale Press, a group around a scientist J. Rodale. They were also involved in the creation of first two farmer's associations in the 1970's, the California Certified Organic Farmers and Oregon-Washington Tilth Organic Producers Association<sup>5</sup>.

Other organic associations formed, including Demeter International in Germany, and Soil Association in the UK. Those associations joined together in 1972 to form IFOAM (International Federation of Organic Agriculture Movements), which has a major influence and importance until these days. The Federation was created in France and its major role was putting together and sharing information from different countries and associations for the benefit of all.

In various countries, several movements towards sustainability and environment came along. One of them was Know Your Farmer, Know Your Food movement, a campaign released in the USA in 1970 promoting consumption of locally grown food rather than imported.

During the 80's and 90's, first countries began to formulate laws concerning agriculture and with the distinction of OA. This led to promotion of and pressure to adhere to organic standards. Organic food market also grew responding to the growing demand in the pace of around 20% annually.

First two farms that converted to organic because of economic reasons did so in fact by mistake. Located in the USA, after a 1980's farming crisis they were in financial difficulties, however still able to produce. With no money available for purchasing fertilisers, they produced organically not on purpose. However their products, despite of their higher prices, were demanded and led to the decision to convert officially organic. Other farmers experiencing financial difficulties followed and converted for strictly economic reasons. More organic farmers made the organic products sector more competitive with the conventional one<sup>6</sup> and the movement continued to grow.

## **1.5 Principles of OA**

The principal distinction between organic and conventional agriculture is a non-utilisation of the most of chemical inputs. Following is a description of particular banned or prescribed methods of production and inputs.

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<sup>5</sup> Source: <http://www.sarep.ucdavis.edu/Organic/complianceguide/intro2.pdf>

<sup>6</sup> Source: <http://www.sarep.ucdavis.edu/Organic/complianceguide/intro2.pdf>



### **1.5.1 Farm**

Organic production must comply with rules described in the EU Regulation No. 2092/91. The conversion to organic can take several steps within each of which a part of the farm is converted. The farmer has to ensure that conventional and organic units will not mix. The first two years of conversion are a monitored transition period where products cannot be certified organic yet. During this period, the most suitable cover of arable soil is clover or other legumes that will provide soil with nitrogen.

All methods aim towards the most efficient nutrient maintenance, i.e. to minimise nutrient losses. A preferred way of maintaining soil fertility is the application of crop rotation. It means that the farmer has to vary fertilizer-exploitative crops (crops intended for production and sale) with fertilizer-providing crops.

Probably the most successful systems are mixed- plant and animal production together, just as R. Steiner described (see in Supplements chapter, Picture 1).

### **1.5.2 Plant production**

Forbidden are all synthetic fertilizers, as well as soluble mineral fertilizers. Organic manure can be used as fertiliser, but not coming from large-scale animal production units. The manure is preferable composted. Other allowed fertilisers are lime rock phosphate, potash, seaweed and some natural biocides<sup>7</sup>.

A basic nutrient needed is nitrogen (N). No synthetic mixtures containing N can be used, therefore farmers try to fix atmospheric N maximally with the help of legumes.

The base of weed control is an improved competitiveness of crops in order to reduce the amount of weeding needed. Varieties of crops with rapid ground covering ability are chosen and sown with minimal spaces and rows between individual plants in an east-to-west orientation to capture the majority of sunlight and not to let it reach the ground level. Sometimes, cereals are undersown and potatoes are left to chit.

Instead of herbicides, hand techniques and some machinery are utilised, such as harrows, inter-row and rolling cultivators, brush weeders. Sunlight is used, as well as flames, to fight weeds.

According to predispositions or resistance of crop varieties to certain diseases, as well as according to their congruity with local soil and weather conditions, many diseases

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<sup>7</sup> A biocide is a solution for eliminating undesirable organisms; they include herbicides, pesticides and antimicrobials. In agriculture, biocides are used to fight fungi, germs and insects.

can be avoided. There are certain natural biocides allowed for prevention of diseases, e.g. sulphur (S) or copper (C) up to a certain level.

Pests are removed by natural pest predators that are encouraged to live in fields where suitable conditions are drawn up for them (e.g. certain type of vegetation seeded around the field). Sulphur and plant derived insecticides pyrethrum and derris are allowed.<sup>8</sup>

### **1.5.3 Animal production**

Many problems and prospective violation of organic laws can be avoided with the selection of appropriate species, naturally occurring in given climatic conditions. Proper treatment since birth, good nutrition and care, access to grazing lands and everyday exercise can prevent illnesses up to a certain level.

Naturally, animals should be fed exclusively with organic fodder. No conventional fodder is allowed, no fodder based on fishmeal, urea or solvent-extracted as well as genetically modified one and no chemical additives or hormones. 60% of forage should be on a dry matter basis. Out of this dry matter, 60% should come directly from the farm itself. Organically bred animals cannot graze on non-organic pastures and grasslands. Otherwise, non-organic livestock can graze on organic land only for a limited period of time.

Sicknesses should be prevented, rather than treated. However, no preventive medicine administration is allowed. In case a sickness is treated with veterinary drugs, there is a certain recovery period during which the animal is not considered organic, or this status is lost completely.

Rules apply also to the housing, where the stable has to be provided with enough bedding and ventilation. Only half of the stable maximally can be slatted and the facilities should have a sufficient hygienic conditions level. Attention is paid to a correct number of animals kept together. Generally animals should be treated with maximal attention and any maltreatment or stress should be avoided. Intensive methods of animal production are forbidden, such as battery cages and sow stalls.

### **1.5.4 Organic processed food**

Every processor and producer of organically grown food has got to establish a production system, individual steps of which will comply entirely with organic principles. This includes processing, packaging and labelling.

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<sup>8</sup> Source: <http://www.sopa.org.uk/methods.php>

Production coming from an organic farm must not be mixed with any conventionally farmed production or materials in order to prevent contamination. No conventional product can be labelled organic to mislead the consumer.

The only non-organic component can be water and kitchen salt, that are not available in an organic version. Therefore, those two are not considered when qualifying the product organic. Other additives, flavourings, vitamins and other micronutrients can be used only upon the approval of a responsible certifying authority. The full list of additives permitted for utilisation is included in the Supplements chapter.

## **1.6 Major advantages of OA**

### **1.6.1 For consumers**

One of underlying elements of discontent with the conventional agriculture is the high possibility of chemical residuals found in food. Since chemicals are used abundantly on a daily basis in conventional agriculture, they rest in the food people consume. They can be then identified as one of major reasons for sicknesses and degrading effects on human organism.

Organic food does not cause those harmful effects as, from its base, there are no chemicals used in the production. It is, once again, the concept of quality versus quantity, as conventional agriculture is aimed mainly on maximising yields and profits, producing as much as possible.

People who care about their health therefore have a tendency to opt for food that will not contaminate their organisms with unnatural, synthetic substances. Especially women with small children prefer organic food whenever it is possible. Babyfood is also one of the basic organic products offered on the market.

As a result of cultivation aimed at benefiting as much as possible from sun, water, soil and natural fertilizers, organic food is believed to be richer in vitamins and other nutrients.

Moreover, a lot of people deem organic food tastier. Tastefulness, however, cannot be analysed and defined, as well as quality and it is left to a subjective consideration.

As OA emphasises a good selection of varieties and species to cultivate and breed, a lot of crop varieties used cannot be found anymore in conventional agriculture. A typical example is spelt that is very valuable in cuisine but its cultivation has been overridden by more fertilizer-responding and higher yields showing wheat.

### **1.6.2 For producers**

Not only consumer demand drives the organic production. Also a lot of producers prefer a way of farming in accordance with the natural cycles and climatic conditions. OA allows for a feeling of harmony with nature.

Moreover, food production does not have to be the unique way of making their living for farmers. Especially in those times when OA is still quite recent and not very well expanded yet, farms can offer adjacent activities for creating profit, e.g. eco-agrotourism<sup>9</sup>.

Generally lower yields on organically managed fields are compensated for by a higher selling price of the production. Therefore even with lower output the profit for the farmer can be comparable, if not higher than for a conventional one.

Lower spending on inputs is a matter of evidence for organic farms as the majority of inputs (crop fertilizers and animal fodder) should and does come from the farm itself and no industrial agrochemicals, animal feeding supplements and medicaments are purchased.

### **1.6.3 For soil and water systems**

A major problem linked to conventional agriculture is too intensive soil exploitation. According to United Nation's 1992 global survey<sup>10</sup> conventional way of farming contributes to soil degradation by 20% and mainly by erosion. Soil is being driven off by water and with its decreased natural nutritious ability synthetic fertilizers are needed to be put in to sustain a certain level of yield (not speaking about increasing it). This makes the problem cycled- the more crops cultivated and the more soil is being exploited, the more degraded it is and the more chemicals have to be used to cultivate more crops.

As a nutrient- rich soil is crucial for organic farming, the soil management is being paid a lot of attention to. A basic method for assuring that no synthetic fertilisers are added as the soil itself provides them is the crop rotation. The content of organic matter is generally significantly higher in organically than in conventionally managed soil.

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<sup>9</sup> Agrotourism is an activity where visits, stays and excursions on the organic farm are offered to general public as a leisure. Sometimes they are combined with experiencing typical farmers' activities as feeding, milking the animals, weeding, harvesting etc. and farm's products selling. Eco-agrotourism is the author's designation of agrotourism held on organic farms (other official denominations can be agroecotourism, ecological agrotourism etc.).

<sup>10</sup> Stroh M., Raloff J.- New UN soil survey: the dirt on erosion - United Nations report, 1992, Science News

Water usage in agriculture accounts for two thirds of the total human consumption of water, therefore it is obvious that a good water management system has to be established. Excessive watering and water polluting by pesticides employed are two major problems of conventional agriculture. Some water sources are being depleted faster than is the natural ability of the source to renew which contributes to the overall problem of global water scarcity and its quality.

Those issues are eliminated by organic methods of farming as a part of it is the good and responsible water management. Moreover, there is no danger of water contamination by agrochemicals. No chemical leakage into soil and air also results.

#### **1.5.4 For the countryside**

From the producers' point of view OA inhibits the recent global tendency of countryside depopulation, linked to the general socio-cultural trends. Significantly human labour-demanding methods require more human workforce employed than conventional agriculture where a lot of work is done by machinery and agrochemicals.

Therefore, new work opportunities are created on the farms that contribute to sustaining a steady population and employment at the countryside.

#### **1.4.5 For the atmosphere**

A topic of concern nowadays is global warming. Agriculture is accused to be one of major contributors for the greenhouse effect as conventional methods of production include heavy machinery utilisation that accounts for a high level of emissions in the atmosphere, especially carbon dioxide (CO<sub>2</sub>), nitrogen monoxide (NO) and methane (CH<sub>4</sub>).

It is proven that emissions of CO<sub>2</sub> per hectare are lower in OA than in conventional one, however when comparing emissions per unit of production both of the two ways of agriculture would be generally the same. OA can have sometimes even higher emissions of CO<sub>2</sub> per unit of production.

## **2. OA in the Czech Republic**

### **2.1 History of OA movement in the Czech Republic**

#### **2.1.1 Introduction of OA**

Organic movement was introduced in the Czech Republic as late as in 1989. By that time, the country was still a part of Czechoslovakia and it had just liberated from under the dominion of the Soviet Union and regained sovereignty. Up to that date, the economic and political conditions were not favourable of alternative methods of farming and the agricultural production was centrally planned. Unified Agricultural Cooperatives (JZD, Jednotne Zemedelske Drutstvo) is a specific feature of Czech countryside before 1989 that integrated individual farmers into large-scale production units that had to fit in the central production plan fixed by the government. In those cooperatives that had a sole purpose of supplying the biggest possible amount of food, nature or environment were no points of concern.

The Czech society had access to little information regarding organic movement or evolution of it abroad- mostly translated foreign scientific papers- however it was perceived rather negatively in the society. Moreover, there was no reliable information about healthiness and the impact of chemical residuals in conventionally farmed products as the official statement of the socialist government made people believe that the population was healthy and prosperous. Therefore, organic farming was not organised and recognised, even if in a small scale it was practiced on individual gardens.

Awareness of health issues and correct dietary requirements was not on a high level in the Czech society. There were a few consumer groups promoting alternative way of eating and even publishing magazines that brought instructions about cultivating one's own, "non-chemicalised" food<sup>11</sup>.

The real OA began in the Czech Republic with only three farms farming organically in 1989. Until 1993 OA was rather a matter of individuals and small solitary associations that grouped several producers and created their own rules.

As the former Communist regime did not allow any information about OA to spread in Czechoslovakia, training and education were needed for future farmers, lawmakers

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<sup>11</sup> Sarapatka B., Urban J.- Ekologicke zemedelstvi: Ucebnice pro skoly i praxi, 2003, Ministry of Agriculture of the Czech Republic

and the general public. The first conference about OA was organised as soon as in 1987 at the University of Agriculture in Ceske Budejovice, a town in Southern Bohemia, whose university was the sole higher education centre in Czechoslovakia that acknowledged OA as a sound form of agricultural production.

First international conference, even supported by IFOAM, was held in 1990 since it had already been prepared long ago and awaiting the regime change. Participants were members of Czechoslovak Scientific Community and several hundred farmers.

In 1990, a system of subsidies to organic farmers was established thanks to the Vice-Minister of Agriculture Richard Bartak. However, these were stopped three years later after a series of scandals concerning their abuse. They were re-installed in 1998 and constituted one of the major motivations for conventional farmers to convert to organic.

In 1992, a Pro-Bio organisation was created- the first business organisation of organic farmers. Other organisations (Naturvita, Altermil, Libera, Biowa) were founded consequently, some of which later merged with Pro-Bio that enlarged its field of activity and grew in importance and influence.

In 1993, the Ministry of Agriculture and currently existing farmer associations joined to establish first Czech direction dealing with OA. Along with this Methodical Direction for Ecological Farming, Certification Committee and Technical Commission were created. First organic rules and principles were drawn up in a system of controls and labelling and KEZ (Organic Agriculture Control), an independent company, was appointed for controlling agricultural producers. It remained the only Czech control and certification body until 2005.

This was also the year when organic food appeared on the market, as the two-year transition period for the first organic farmers had ended. Some of the products were even exported and Czech producers participated on a famous Bio-Fach fair held annually in Germany. However, it was not introduced into supermarket shelves until as late as in 2001.

In 1995, the IFOAM accredited the Czech Republic for control and labelling of organic products, which served as a good promotion for Czech organic products abroad and helped their export to be established.

Since 2001, OA is rooted in Czech legislation thanks to the Act on Organic Farming 242/2000 that replaced the Methodical Direction from 1992. This law is equivalent to European Regulations on OA and specifies the same aspects of organic production and processing, standards and conditions for organic farms and certification process for

inspection organs. Thanks to this Act Czech Republic was placed among the List of Third Countries of the European Union (that is, before the Czech Republic joined the European Union in 2004) that are entrusted with confidence and can export to European countries. First, the plant production was listed there, and in 2001, also animal production.

### **2.1.2 Recent development of OA**

Czech government has been helping various branches of agriculture, industry, education etc. to expand in the Czech Republic by means of its Action Plans. One of them has also been devoted to promoting the OA since 1998, when the OA became a valid point of concern of the Czech government with the re-establishment of subsidies. It is the Action Plan for Developing Organic Agriculture from the year 2004 that specified the required development of OA until the year 2010.

Another governmental plan counting with OA as a form of agriculture eligible for subsidies is the Rural Development Programme, on schedule from 2007 until 2013. Subsidies system in this programme was taken from the previous plan. Around 80% of the money is funded by the European Union, the rest comes from the Czech state budget.

A big and important achievement was foundation of the first Czech technologic platform for OA on September 9<sup>th</sup>, 2009. Founding members of this platform were universities and high school workers, research institutes, organic producers as well as processors. The aim of this platform is to help expand organic movement in the Czech Republic by interlining theory and practice, enhancing research and communicating its results to the wide public, supporting competitiveness of OA and creation and establishment of supportive documentation needed. The platform's origin was in Initiative of the European Commission from 2004 that encouraged platform creation in other countries as well.

Due to the ruling economical crisis, the amount of consumers buying organic food decreased in 2009, as the trend goes also in other European countries. The decrease was not significant- 2% less consumers than in 2008 (28% of organic upon all consumers) and was most likely caused by the price premium on organic products compared to conventional. On average this price premium was 140% that makes a significant difference especially at the time of making more careful and considerate consumer choices. The volume of organic market still increased even in the period of crisis- the increase, however, slowed down from 70% in 2007 to 40% in 2008.

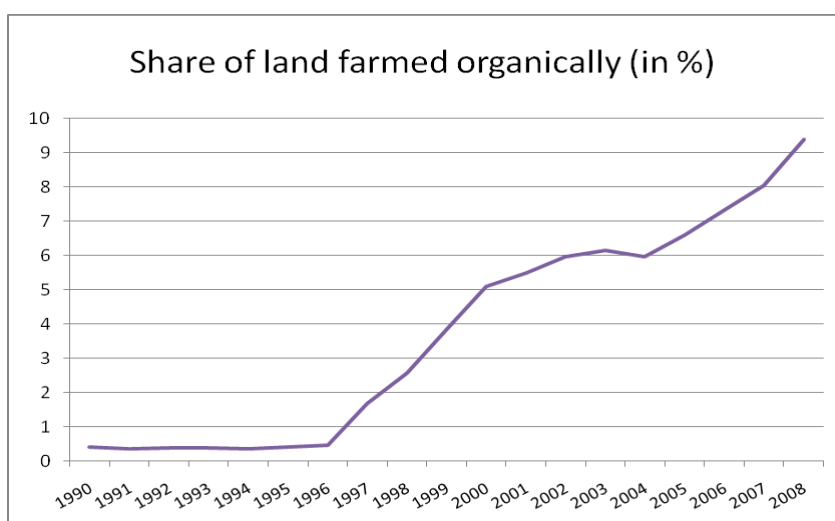


Nevertheless, The Czech Ministry of Agriculture counts with an increase in the share of organic over the total consumption, which is currently over 10%, by 5% until 2015. In order to support OA in the Czech Republic, the Ministry plans on continuing the Rural Development Programme and financial support for organic producers, and especially the Action Plan for OA that will run between 2011 and 2015<sup>12</sup>. This should also contribute to decreasing the share of imported organic product on Czech market that is actually over 60%.

Year	1995	1996	1997	1998	1999	2000	2001
Share of land farmed organically	0.35	0.4	0.47	1.67	2.58	3.86	5.09

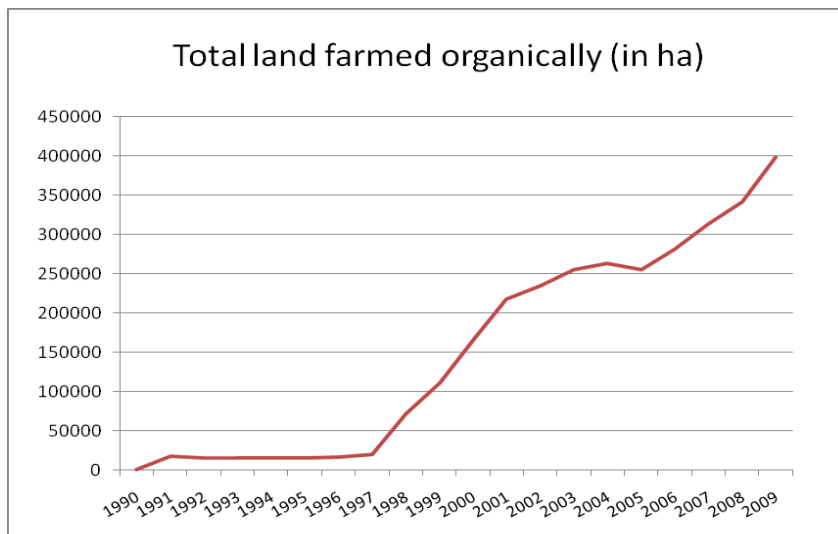
Table 1 Share of land farmed organically over total agricultural land in the Czech Republic, source of data: Bio-info.cz

Year (cont.)	2002	2003	2004	2005	2006	2007	2008	2009
Share of land farmed organically	5.5	5.97	6.16	5.98	6.61	7.35	8.04	9.38



Graph 1: Development of share of land farmed organically over total agricultural land, own illustration; source of data: Bio-info.cz

<sup>12</sup> According to the words of Jiri Urban, deputy of Minister of Agriculture. Source: <http://www.e15.cz/byznys/prumysl-a-energetika/ministerstvo-zemedelstvi-i-agrarni-komora-cr-chteji-zvysit-produkci-biopotravin>



Graph 2: Development of land farmed organically; own illustration; source of data: Pro-bio

## 2.2 Specific features of Czech OA

✚ Organic production in the Czech Republic did not start by being enhanced by the state. On the contrary, the state rather opposed and refused to acknowledge this way of farming. Organic was barely known in the country during many years of its already established existence abroad.

In the beginning organic way of cultivating was being conducted rather in individual gardens and the first three farmers that converted to organic in 1989 were in a sense outcasts. Only several years afterwards the new, democratic Czech government acknowledged organic as a fully-valued way of farming, however it lacked a proper legislation and support for a long time.

Despite a rather unfavourable beginning, OA gained its place in Czech agriculture and around 2003 Czech Republic was already one of the most progressive European countries in this field where OA is developing and share of total agricultural land farmed organically is increasing steadily.

✚ One of the major reasons for a possible failure of establishment of OA in the Czech society is that Czech people have, in general, never been very environmentally aware. In this case the low awareness is rather of the relation between food and environment, compared to some of other European countries, such as Germany, Austria and Great Britain. Once again the history could be blamed for this, due to a fact that Czech nation had a quite hard time under the Communist control until 1989, a period in which food was not easily accessible and there was no wide range of choice.

Therefore people would consider more the harms and benefits of food and its accessibility to themselves than to the nature.

People's diet was rather unified and designed without a specific interest to healthiness or ecology. Certain types of food were even unable to find in shops. This is a case of e.g. tropical fruit whose inaccessibility became one of symbols of the Communist era, having found its way to Czech shops as late as in the 1990's.

Moreover, as not enough pertinent and quality information about dietary requirements suitable for different age and sex groups was available, people had to rely on common sense and officially formulated advices given by called-on state functionaries. Their choices were, therefore, led rather by a will to spend the least money possible on food than to focus on the quality of consumed food or its environmental impact. Briefly, Czech society developed certain consumption patterns that place emphasis on quantity rather than quality<sup>13</sup>.

A few alternative viewpoints were introduced (vegetarianism, veganism, macrobiotics) until 1990's. The idea of organic farming, however, was hardly imaginable for the majority of population.

Until these days, there is a large share of Czech people who still have in their minds hard times from their childhood or youth under the Communist era where families sometimes had to struggle to get hardly anything to eat. For those people the most important is to save money, buying the cheapest alternative in food and saving money for satisfaction of other needs. Such people do not see any point in buying organic food that is more expensive than conventional one when the difference of impact on their bodies is not clearly visible. Psychological and ethical function of organic is not close to their thinking and they prefer cheap, conventionally farmed food over organic.

Czech food producers and distributors have accommodated their offer to the nation's tastes- or rather they did not have to change it significantly from the era before 1989, assuming that the nation's consumption patterns did not change very much.

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<sup>13</sup> Typical Czech cuisine is based on consuming a lot of meat, potatoes and seasonal types of vegetables and fruits. Animal fats are used a lot together with flour- and egg- based dough and preparations. As in history the nation had come through poverty and famine periods related to wars and seasonal variation (long, cold winters or summer droughts), the primary function of food was to secure basic energy requirements. In other words, people would eat just because there was something to eat, not caring too much about its suitability for their bodies. This viewpoint of nutrition persisted until the 1990's and was even reinforced by the fact that quality of food was understood as a quite luxurious concern while satisfaction of much more urgent needs- having where to live, keeping one's job and feeling of freedom- was actual.

However, despite all the historical predominance of quantity over quality approach certain groups of people care about their and their children's health, the environment and the impact our consumption has on it. These are mainly people from young generation, mothers with children and educated, environmentally aware and ecology-oriented people.

✚ In response to a growing interest in organic food also the supply had to expand. It adjusted rather slowly and up to now (year 2011) the imaginary scissors of demand and supply curves are not closed. Nevertheless the supply in Czech Republic is growing in scope and volume and gradually reaching the benchmark set by other European countries.

Still the nation has not fully changed its consumption patterns, which would, though, even not be possible and desirable. The base of consumption choices is in the price for the majority even if interest in organic food is expanding and Czech market is not saturated yet.

✚ Major motivations for buying organic food are health awareness and ecological impact of one's consumption, as appears in a survey by Matejovsky and Vonsovska, 2007<sup>14</sup>.

A rather subjective and hardly measurable reason for consuming organic products is their better taste. Also the effort of living a healthy life style and promoting it also in one's family was cited among the major motivations.

A large portion of customers is also motivated by the will to support local or national producers. Therefore they would prefer Czech organic products over foreign. These people are, however, in some cases disappointed by a low choice of local products in shops that tend to place foreign marks into their shelves due to an insufficient offer from Czech organic suppliers. In some cases they take advantage of the sale of products from farmers on farmer markets or directly on farms.

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<sup>14</sup> Matejovsky, L., Vonsovska, I.,- Ekologické zemědělství v ČR, Greenmarketing- popis ekologických zemědělců propagující své produkty v ČR, 2007, Czech University of Life Sciences in Prague, Technical Faculty

## **3. OA in France**

### **3.1 History of OA in France**

#### **3.1.1 Introduction of OA in France**

Translation of organic agriculture into French is 'Agriculture Biologique', and this same sign bears also the official organic logo introduced in 1988, which is owned by the state.

France was one of the countries where OA movement actually started and developed as early as in 1950's, influenced by the trend in neighbouring countries (Germany, United Kingdom). A fundamental personage for the French OA was Claude Aubert whose book 'L'agriculture biologique' published in 1970 became a basic early source of knowledge. The first farming method we could call 'organic' was using calcified algae as soil fertilizer, a method that came to be known as 'Lemaire-Boucher'<sup>15</sup>. This method represented one of the two main approaches emerging in France- a technical one, aimed at commercial companies supplying farms with preparations. On the other hand, the association Nature et Progres, independent of the commercial sector, established in 1964, contributed to development of all currents of thinking and methods used in OA and to the foundation of IFOAM (International Federation of Organic Movements) in Versailles in 1972.

This was also the year when first organic standards ('cahier des charges') were established by Nature et Progres, and the French government recognised organic way of farming since as early as in 1981, when OA was even not introduced in many other European countries. This high state recognition and support was probably one of the main reasons why OA developed so fast and so early in France. During the 1980's, France became Europe's leader in the volume of organic production and number of organic farms, accounted for 40% of all Europe's land farmed organically and was the main supplier of organic products of a high quality level to European markets.

At the end of 1980's, however, the country lost some of its potential and repute, as the governmental support relaxed and the European Council Regulation EEC 2092/91,

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<sup>15</sup> Seaweed is used as a soil fertilizer in many countries worldwide, especially in those with access to sea. Some of the taste, colour, shape and size characteristics of vegetables are even accounted to utilization of algae as a soil conditioner. In maritime areas, seaweed is used not only in the industrial, but also in private individual farming.

the basic regulation on OA, was poorly implemented<sup>16</sup>. Compared to other European countries where the 1990's were marked by a rapid growth in organic volumes, France stagnated and lost its leading position. At the end of this decade, it ranked fifth after Italy, Germany, Austria and Spain.

This trend was reversed in 1996 when it caught its former pace and direction towards increasing the volume up to having doubled in two years (1997 to 1999) and accounted for 1,1% of total agricultural land in 1999.

Demand grew along by a speed of 20% annually and governmental action plans (e.g. Plan Pluriannuel de Développement et la Promotion de l'Agriculture Biologique- A Perennial Plan of Development and Promotion of OA- in 1997) and subsidies were re-introduced in order to support the progression of the supply capacities.

### **3.1.2 Recent development of French OA**

The fastest increase in volume of organic production, in the share of organic products over the total agricultural production, and in the number of farms managed organically, was experienced between years 1996 and 2003, with annual increases of 5 to 10% (Agence Bio, 2009<sup>17</sup>).

The growth has slowed down then; particularly in the years 2008 and 2009 France experienced a period of stagnation of organic production volume growth. This was due to two main reasons:

- The first, a more self-evident one, is the economic crisis that hit France as it did hit other countries and caused people to try to save money even while satisfying their basic needs, food included. This shifted some customers from consuming organic food to the conventional one.
- The second, a lot more important and striking, however existent since a longer time even if in a sort hidden problem is the unsustainable boom in certain sectors of organic as well as conventional agricultural production. This concerns particularly the sector of milk and dairy production, where supply of conventionally produced milk by far outreached demand for it.

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<sup>16</sup> According to Reynaud, M., Schmidt, W.- Organic Agriculture in France, SOL, Bad Durkheim, Germany, 2000

<sup>17</sup> Source: Agence Bio, Les productions biologiques en France et par région booklet, 2009, [http://www.agencebio.fr/upload/pagesEdito/fichiers/BioFr\\_ChiffresCles2010.pdf](http://www.agencebio.fr/upload/pagesEdito/fichiers/BioFr_ChiffresCles2010.pdf)

According to economists, the boom in the industry could not have equalized the demand for milk and dairy products. Yet another theory suggests that demand for French milk was decreased due to cheaper alternatives imported from China and used by processors in dairy products<sup>18</sup>.

Several factors combined led to excess raw milk production for which there was no usage. France saw national farmers' strike in December 2009 that influenced the whole country's functioning. The aim of the strikers was to force milk processors to use French milk produced by them and to guarantee fair redemption prices.

Farmers perceived converting to organic as a way to get out of problems. The main reason for this is that an organic farm is less dependent on external fodder and food mixtures, forage and health chemicals, therefore it can cut costs by producing the majority of those inputs needed itself. Under organic management, a farm produces less so there is no excess production, and on the other hand it can compensate for the lower production by higher redemption price of products.

Another important reason for converting is the governmental support provided which is sought for especially in the times of crisis. In total, almost 40 million Euros were spent by the government on organic farming research between 2000 and 2006<sup>19</sup>, carried out mainly at state research institutions, less on private ones.

In total, the share of land farmed organically over the total agricultural land in 2009 was 3,14% according to the booklet on French organic agricultural production issued by Agence Bio in 2009. This is a public interest group composed of French Ministry of Agriculture, Food, Fishery and Rural Affairs, Ministry of Ecology and Sustainable Development, Agricultural Chambers Permanent Assembly (APCA, Assemblée Permanente des Chambres d'Agriculture), National Federation of Organic Agriculture in French Regions (FNAB, Federation Nationale d'Agriculture biologique des Regions de France) and the Organic Products Processors and Distributors Syndicate (SETRABIO/BIOCONVERGENCE, le Syndicat des Transformateurs et Distributeurs de Produits de l'Agriculture Biologique)<sup>20</sup>. Even if the annual increase was 16 percent and currently France has the fifth largest amount of organic production of European countries, over

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<sup>18</sup> Somerfield, M.: Organic Farming in France- French Farmers turn to organic agriculture, 2010, source: <http://www.suite101.com>

<sup>19</sup> Source: World of organic agriculture- Statistics and emerging trends 2008, IFOAM, Bonn, Germany and Frick, Switzerland, 2008

<sup>20</sup> Source: Les chiffres de la Bio 2001 booklet, Agence Francaise pour le Developpement et la Promotion de l'Agriculture Biologique, Paris, France, 2001

three percent of organic agriculture share is not a very high number compared to other European states.

There were 16 446 organic producers, a number that represents an increase of 23,7 % in a year. In 2009, there was even an 89% increase in the number of land in conversion.<sup>21</sup> The dynamism of growth continued in 2010, the year for which, however, there were no official exact data at the time of writing this Thesis.

Currently, the French government introduced an OA Development Plan that sets two principal objectives for OA until 2012- 6% of total agricultural land farmed organically and utilization of organic food in private and public catering spaces, such as school canteens and restaurants. Improving distribution and supply channels, education of catering staff and promotion of organic products to them as well as to the catering customers are the main axes of action.

In 14 regions, the objective of 6% share of organically farmed land has already been achieved- especially regions of Languedoc-Rousillon and Provence-Alpes-Cote d'Azur.

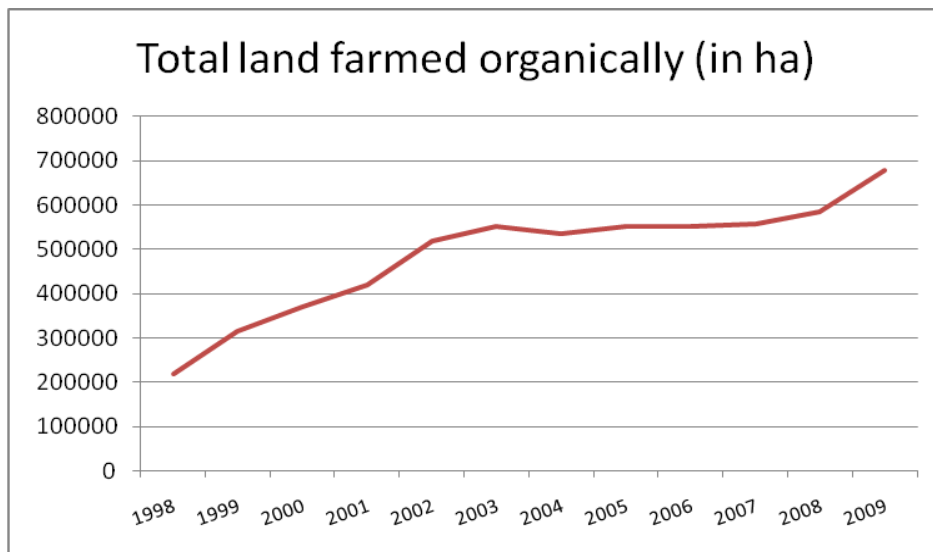
Year	1995	1996	1997	1998	1999	2000	2001
Share of land farmed organically (in %)	0.42	0.5	0.65	0.7	1.1	1.3	1.5

Year (cont.)	2002	2003	2004	2005	2006	2007	2008	2009
Share of land farmed organically (in %)	1.75	1.87	1.93	1.99	2	2.02	2.12	2.46

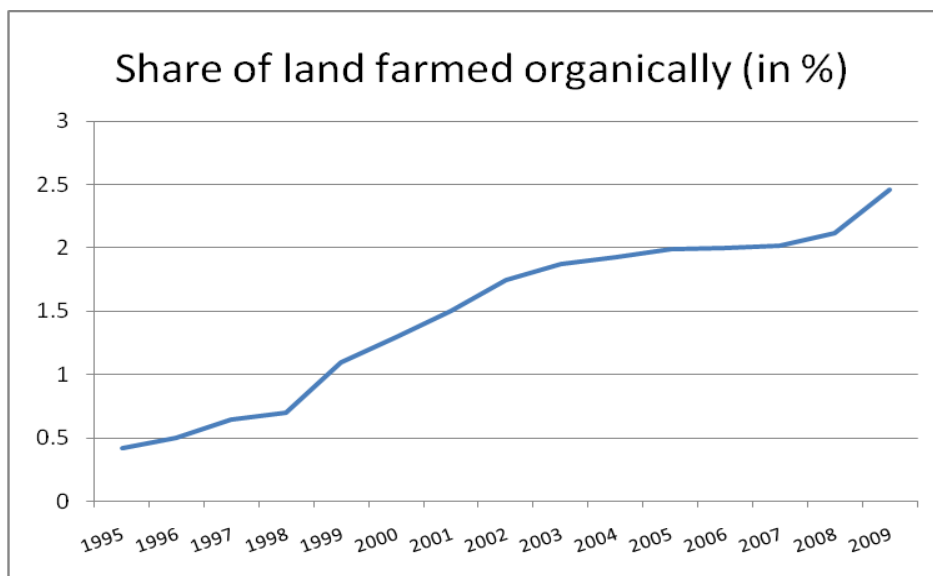
*Table 2: Share of share of land farmed organically in France, source: Agence Bio*

<sup>21</sup> Source: Actu-environnement, 2010, <http://www.actu-environnement.com/ae/news/marche-produits-bios-2009-agence-bio-10273.php4>





Graph 3: Development of area farmed organically, own illustration; source of data: Agence Bio



Graph 4: Development of share of land farmed organically, own illustration; source of data: Agence Bio

### 3.2 Specific features of French OA

✚ Contrarily to the Czech Republic, France is a country with a strong tradition in organic production. Although the majority of people might not know the history and the importance of France in it, they are already used to finding organic products in their shops and meeting organic producers on markets that are also a lot more usual way of distribution than in the Czech Republic.

Farmer markets are very popular among French people. According to guides on France, there are over 35 000 traditional markets all over the country and people are used to shopping there for fresh and local products<sup>22</sup>. People have also a reputation of being very proud of their nation and they like buying French products and supporting local producers.

✚ This is also connected to the fact discovered by Agence Bio in its booklet on national organic production in 2009 that the majority (53%) of organic farmers practised direct sale of their products. 76% specifically sell their production directly on the farm, and 54% at the markets and fairs.

Direct sale on farms decreased in the last twenty years with massive introduction of organic food into supermarket and hypermarket chains.

Compared to the Czech Republic, where the number of distributors of “farmer-boxes” can be counted in decimals, 21% of French organic farmers used this distribution channel in 2009.

✚ As has already been said in the earlier chapter, OA enjoys a great support from the state mainly as regards subsidies. Subsidies to French agriculture have long time been a rather controversial topic. The government was accused of hypocrisy, declaring it was supporting “small, family farms with a quality production” when in fact the money would go to big, excessively polluting cereal-production farms<sup>23</sup>. This policy provoked a lot of criticism from the side of other European countries and the European Union.

In 2009, the French government announced it would divide the amount of subsidies for agriculture in a different way henceforth. Organic farms, along with farmers running their farms in disadvantaged mountainous areas and those breeding sheep, goats and cattle are exactly those that need an effective support with their struggle for profit-making. With this step, the government would like to support traditional ways of agriculture and to promote organic.

✚ France is a country with important wine production. French wines are world known by their quality and abundance of varieties. France is also one of the few countries where wine is produced organically and this production has been increasing rapidly for last few years- the country saw a 20% increase of organic wine production between 2006 and 2007, 25% in the next year and even 39% between 2008 and 2009.

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<sup>22</sup> Source: <http://www.francethisway.com/tourism/france-markets.php>

<sup>23</sup> According to Litchfield, J: French Finally Reduce Subsidies to Large Farms & Increase Support for Organics and Small Farms

In total, 4,6% of overall wine production was organic in 2009<sup>24</sup> and the number of organic wine producers was 3024. Out of this number, over one half of plants were under conversion lasting for three years. Therefore, organic wine production is predicted to increase furthermore after the conversion period ends.

✚ France is the European leader in supply of organic chicken. In 2009 there were 6 013 898 heads of poultry bred for meat, which accounts for just under 1% of total production. In addition, 4,5% of eggs were organic. These numbers are high, but compared to other European countries such as Austria or Denmark, the proportion of organic in the overall chicken production is not that significant<sup>25</sup>.

✚ There is an initiative of the government and some non-governmental organizations as a part of a new law “Grenelle 1”, aiming at a twenty-percent introduction of organic ingredients into the menus of public and private catering spaces. The introduction saw its biggest boom in 2006 and the aim is to increase the number of catering spaces offering organic food up to 80% in 2012.

A research conducted by Agence Bio in 2009 showed that around 40% of catering spaces (i.e. 29000 of them) offered organic food at least “from time to time”. Public catering (school and university canteens, office restaurants and canteens) offered organic food more often- in 48% of cases, compared to only 28% in the private sector (restaurants, bistros, etc).

Otherwise, the research showed that more than 40% French children had already tasted an organic ingredient in their school canteen, and out of those who have not, 75% of their parents claimed they would have liked them to have<sup>26</sup>.

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<sup>24</sup> All percentages taken from Agence Bio, Les productions biologiques en France et par région booklet, 2009, [http://www.agencebio.fr/upload/pagesEdito/fichiers/BioFr\\_ChiffresCles2010.pdf](http://www.agencebio.fr/upload/pagesEdito/fichiers/BioFr_ChiffresCles2010.pdf)

<sup>25</sup> Source: Further Growth Expected for EU Organic Poultry Sector Despite New Feeding Rules, <http://www.thefreelibrary.com>

<sup>26</sup> Source: Research report CSA/Agence Bio 2009; [http://www.agencebio.fr/upload/pagesEdito/fichiers/observatoire\\_restaurationsbio2010.pdf](http://www.agencebio.fr/upload/pagesEdito/fichiers/observatoire_restaurationsbio2010.pdf)

## 4. Analysis

### 4.1 Regression analysis

The initial statement of a better developed OA in France than in the Czech Republic was examined from an economic point of view, in order to prove whether a country's economic position really has a major influence on the OA development. Regression analysis was used as a tool for this examination.

Share of agricultural land farmed organically over the total agricultural land in a country was taken as the dependent variable, as it is considered to be a representative indicator of OA development. The simple absolute number of organic farms would not be as representative, as two countries of different size and volume of agricultural production were compared. The economic position of a country, or the independent variable, was represented by level of GDP/capita (Gross Domestic Product/capita) computed by PPS<sup>27</sup> (Purchasing Power Standards), data taken from Eurostat database.

All these variables were found for Czech Republic as well as for France and compared only within the respective country, no cross-country comparison was held. The range of the analysis were years 1995 to 2009.

A regression analysis was composed for each country. It was assumed that:

$$y = a_0 + a_1 * x_1 + \varepsilon, \text{ where:}$$

$y$ ... dependent variable (share of land farmed organically over the total agricultural land)

$x$ ... independent, explanatory variable (GDP/capita in Purchasing Power Standards)

$a_0$ ... is an unknown value, the rest of the dependent variable not explained by the previous component

$a_1$ ... parameter explaining the impact of independent variable on the dependent one

$\varepsilon$ ... standard error term

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<sup>27</sup> Purchasing power parities (PPPs) are indicators of price level differences across countries. PPPs tell us how many currency units a given quantity of goods and services costs in different countries. PPPs can thus be used as currency conversion rates to convert expenditures expressed in national currencies into an artificial common currency (the Purchasing Power Standard, PPS), eliminating the effect of price level differences across countries. The main use of PPPs is to convert national accounts aggregates, like the Gross Domestic Product (GDP) of different countries, into comparable volume aggregates. (Source: Eurostat, 2011)

The interpretation of this equation is that economic growth of a country influences the growth of organic production; more precisely, that the higher the GDP is (meaning a positive economic development of a country), the higher the ratio of organically farmed land over the total land.

Following are Statistica results of the analysis for the Czech Republic:

	Value
Multiple R	0.898198311
Multiple R <sup>2</sup>	0.806760206
Adjusted R <sup>2</sup>	0.791895607
F(1,13)	54.27392818
p	5.44715 <sup>-06</sup>
Standard error of estimate	1.33284605

Table 3: Regression analysis results summary ; own computation in Statistica

Explanation of the coefficients:

The *Multiple R indicator (coefficient of correlation)* in the table of correlation characteristics close to 1 tells us that there is a strong positive dependency between variables. *Multiple R<sup>2</sup> coefficient (coefficient of determination)* shows the percentage of descriptive value of the regression. The *adjusted R<sup>2</sup>* is a coefficient of determination computed using degrees of freedom instead of frequency.

The p-value is said to be statistically significant only if distinctively lower than the set level of significance *alfa*. As the *alfa* was set to 0,05 and the *p* significance level is lower than this value, we can conclude that this is a statistically significant coefficient of correlation.

From the table of parameter estimates for the regression line equation, the *t* coefficient shows the value of the parameters' statistical significance; for the sake of an easy interpretation this value was converted into the form of computed significance level.

	b*	Standard error (from b*)	b	Standard error (from b)	t(13)	p-value
Absolute member			-28.3590	4.490729	-6.31500	0.000027
Independent variable	0.898198	0.121920	2.0199	0.274175	7.36708	0.000005

Table 4: Regression analysis results summary; own computation in Statistica

Afterwards, a Durbin-Watson test was conducted to determine the presence of autocorrelation of residuals for the dependent variable values. The outcome of the test follows:

	Durbin- (Watson.d)	Serial (correlation)
Estimate	0.544160	0.653974

Table 5: Result of DW test; own computation in Statistica

The  $d$  value of a DW test less than 2.0 indicates the presence of a positive correlation. In this case, therefore, residuals are correlated ( $d = 0.544$ ).

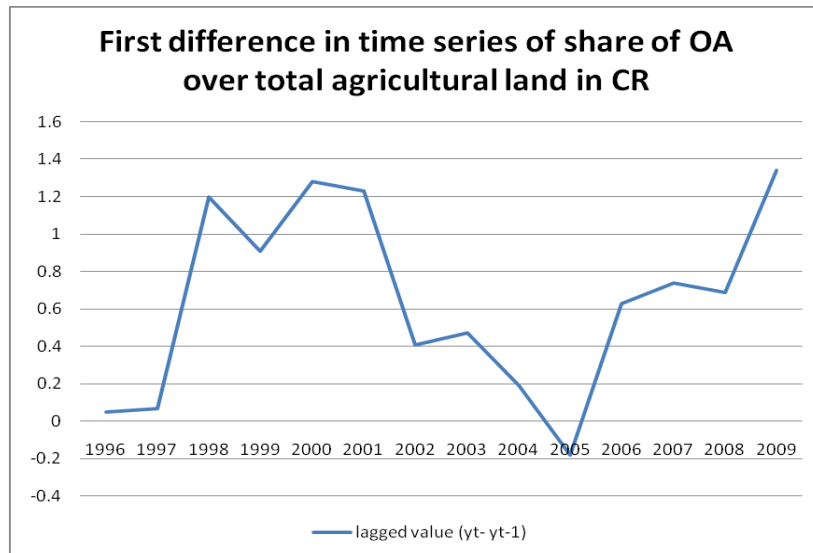
In order to determine whether there is a real influence of GDP and PPP on the level of OA in a country, it is furthermore necessary to avoid the possible misinterpretation of a high  $R^2$  (0.8, as resulting from the regression analysis). This high level could have been caused by a trend present in the time series. Therefore, the time series was tested for presence of a **unit-root** to determine whether the  $y$  time series is stationary or whether there is a trend that would disallow the regression to be accurate.

To define whether a unit root is present in the time series, several assumptions are useful:

- The trend in the time series is visible; level of the share of land farmed organically has increased every year out of the range surveyed (with the exception of years 2004 to 2005) and the time series is non-stationary (see Picture 2 in Chapter 2.1.2)
- There is no trend in the first-difference time series (see Table 4 and Picture 6 below); the first difference series is stationary

year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
value ( $y_t$ , %)	0.35	0.4	0.47	1.67	2.58	3.86	5.09	5.5	5.97	6.16	5.98	6.61	7.35	8.04	9.38
lagged value ( $y_t - y_{t-1}$ , %)	N/A	0.05	0.07	1.2	0.91	1.28	1.23	0.41	0.47	0.19	-0.18	0.63	0.74	0.69	1.34

Table 6: Share of land farmed organically over the total agricultural land; source of data: Czech Ministry of Agriculture



Graph 5: Graph of first differences in time series of share of land farmed organically; own illustration, data taken from Table 4

- Generally, most macroeconomic and financial indicator time series are non-stationary, whereas their first difference is stationary

The time series is a non-stationary one and the variables are cointegrated.

It was concluded that the regression analysis with only two explanatory variables is not accurate. This relation is a spurious one, meaning that variables  $y$  and  $x_1$  are independent on each one and their synchronous positive development has been caused by another, not observed variable. This variable is unknown and was neither measured nor named for the purpose of running the computations. It can be assumed that a general positive development of economic situation in the country would cause both GDP computed by PPP level and organic production volumes increase.

The same series of computations was held for France, again with an assumption:

$$y = a \cdot x_1 + c,$$

See results of the regression analysis below:

	Value
Multiple R	0.360819628
Multiple R <sup>2</sup>	0.130190804
Adjusted R <sup>2</sup>	0.063282404

F(1,13)	1.945806576
p	0.186416298
Standard error of estimate	0.64289409

Table 7: Regression analysis results summary; own computation in Statistica

	b*	Standard error (from b*)	b	Standard error (from b)	t(13)	p-value
Absolute member			8.97432	5.369882	1.67123	0.118560
Independent variable	-0.360820	0.258667	-6.69490	4.799482	-1.39492	0.186416

Table 8: Regression analysis results summary; own computation in Statistica

A Durbin- Watson test of residuals autocorrelation was conducted as well:

	Durbin- (Watson.d)	Serial (correlation)
Estimate	0.139110	1.067634

Table 9: Result of DW test; own computation in Statistica

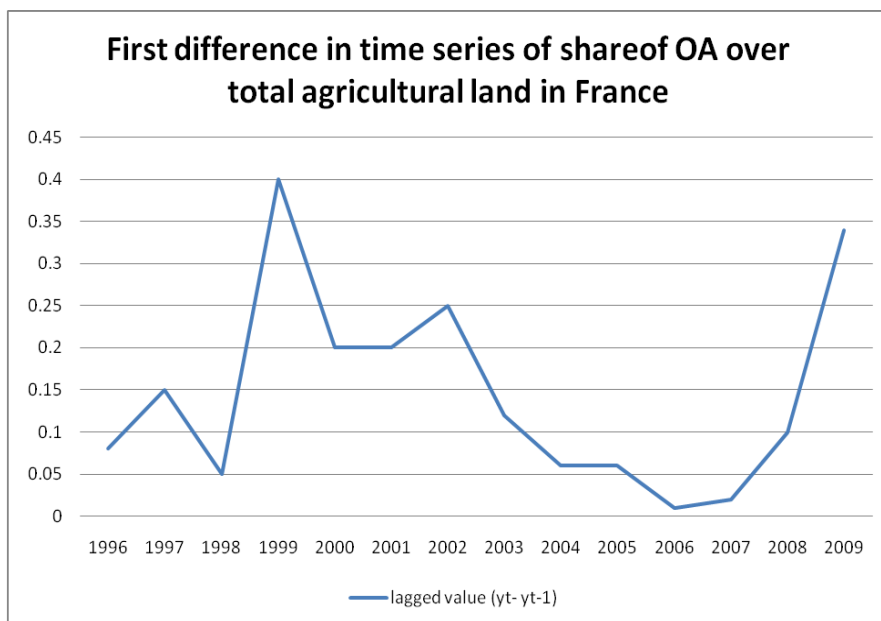
Since  $d$  suggests correlated residuals this time as well and a time series of the same indicators as previously is concerned, the same theory applies here and the same conclusion holds: the GDP/capita adjusted for PPP is not a sufficient explanatory variable for a positive growth of share of land farmed organically over the total agricultural land. On the contrary, both two were caused by another, unknown factor, supposedly a general positive development of economic situation in France.

See table of  $y$  time series and one-year lagged  $y$  for France, as well as a graph of the lagged values of  $y$ :

year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
value ( $y_t$ , %)	0.42	0.5	0.65	0.7	1.1	1.3	1.5	1.75	1.87	1.93	1.99	2	2.02	2.12	2.46
lagged value ( $y_t - y_{t-1}$ , %)	N/A	0.08	0.15	0.05	0.4	0.2	0.2	0.25	0.12	0.06	0.06	0.01	0.02	0.1	0.34

Table 10: Share of land farmed organically over the total agricultural land; data source: Agence Bio





Graph 6: Graph of first differences in time series of share of land farmed organically; own illustration, data taken from Table 8

### 4.3 Descriptive analysis of Czech OA market

Czech market of organic products is still quite young and not fully developed, so it is possible for new producers and processors to enter into it with new products and ideas. Also, the “Czech organic consumer” concept is young and the majority of Czech population do not have any firm consumption patterns yet. They tend to prefer organic food with an added value- historical, social, related to an image of a fair domestic producer and support of the Czech OA development.

Therefore, a considerable number of Czech consumers opt for buying organic food directly at the farms, at the farmer markets and from the fair-trade chain.

According to the Green marketing survey ran in Czech shops offering organic food<sup>28</sup>, the widest range of organic products is offered by a drugstore chain DM even if on considerably lesser surfaces than supermarkets. Generally all retail supermarkets, hypermarkets and drug stores enlarged their offer and sold around 80% of all the organic products on the Czech market. The overall volume of organic products sold by retail sellers increased by 47% since last year.

<sup>28</sup> Source: Green Marketing survey, April 21st 2009  
<http://www.agronavigator.cz/ekozem/default.asp?ch=28&typ=1&val=100185&ids=0&cmo=12&cye=2010>

According to this survey, a practice applied by supermarket chains for the current situation where there is quite a limited range of domestic organic products is to change packaging- to sell products under the supermarket's own mark. This strategy aims at making the customer believe he is buying something unique while in fact he is buying only what he would have bought somewhere else under another name. This might imply cheating on the consumer and lower his or her trust in organic concept.

The majority of organic products are offered in the category of baby meal and child meal, followed by pastries and bakery products. Milk and dairy products account for the third place, soft drinks for the fourth and meat and meat products for the fifth.

However, these are rather steady actors on the Czech market. The biggest increase in production was observed in the category of Frozen food and deli and Coffee and alternative cereal coffee-like drinks.

#### 4.3.1 SWOT analysis of Czech organic market

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>✚ Well-defined system of rules, certification and labelling that derives from the European Regulation</li> <li>✚ Small-size country, small number of control organs, easy to inspect and manage</li> <li>✚ High percentage of organically farmed land over total agricultural land</li> <li>✚ Strong demand for organic products</li> <li>✚ Governmental support, subsidies</li> </ul>	<ul style="list-style-type: none"> <li>✚ Insufficient supply, processing structures and distribution chains</li> <li>✚ Lack of organic „tradition“ and of affinity in people's minds</li> <li>✚ Nation not willing to pay price premiums</li> <li>✚ Poor informedness of people</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>✚ Gaps on the market</li> <li>✚ Increasing demand and insufficient supply, especially local products demanded</li> </ul>	<ul style="list-style-type: none"> <li>✚ Poor marketing and promotion</li> <li>✚ Competition from European Union and other countries with establishment of bilateral treaties</li> </ul>



 Possibility to export to other countries due to compatibility of organic standards	 Relatively small market, easy to saturate
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Table 11: SWOT analysis of Czech organic market, own illustration

### 4.3.2 Major insufficiencies on the market

#### 4.3.2.1 Poor promotion and communication

It seems that not all Czech organic producers and processors have learnt yet how to communicate efficiently with the general public and how to promote their products so as to increase their customer base. Communication techniques are improving, however insufficiently given the large number of potential customers that they should aim at.

There are many organisations and associations shielding organic producers and providing informative services. They run Internet pages, organise meetings, conferences and seminars. Shops selling organic products (especially retail sellers) give large-scope and detailed information to customers, provide them with leaflets and information brochures, organise campaigns, sales and in-store tasting.

Also organic farmers and producers try to get in touch with their prospective customers through a customer-friendly approach, including running Internet pages of their farms, offering e-shops and delivery services and, in certain cases, also excursions and holiday stays on their farms. This all contributes to expanding the awareness of organic movement among the nation, however still a large portion of it remains intact.

#### 4.3.2.2 Small scope of goods and services offered

Increasing demand for organic products means that also the range of goods and services demanded broadens.

According to the words of Mr. Bartak (former Minister of Agriculture that helped promote OA by means of subsidies in the 1990's), in the beginning when organic products were introduced to Czech market, first products offered were, in the majority, dry and durable goods and dry mixtures. Those products do not constitute an equilibrated or usual diet for people. There was a lack of organic meat until recently, and of dairy products.

The offer developed in time, expanded and changed its structure. According to Matejovsky and Vonsovska's research, in 2005 the biggest portion of organic products available on the market was occupied by processed food (pasta, vegetable and fruit

mixtures, food preparates). Milk and dairy products were on the second place and meat and meat products on the third one together with beverages. These products were followed by bakery products, cereals and fruit and vegetables.

Almost lacking were ready-made foods (oven-heated) and a big insufficiency is in the offer of organic eggs.

#### *4.3.2.3 Selling and distribution*

As it was already commented on, the majority of organic food is sold in supermarket, hypermarket and drugstore chains. Other points of sale are specialised retail sellers, farmer markets, online shopping and direct sale on farms.

However, people's tastes would imply a slightly different distribution system. The focus here is mainly on "farmer-boxes", a way of delivery of organic products that combines the particular farmer's participation and the comfort of having products delivered home.

This system is already well-established in some of Western European countries, France included. Prospective consumers make an early offer with a farmer. After having harvested his fruits and vegetables, this farmer arranges the ordered quantity into a box that he hands out to the customer, sometimes he can deliver it until the customer's house. Payment for the delivery is included in the price of the food and can be made in advance or at the time of delivery. Along with fruit and vegetables, the box can contain other food items, such as beverages, eggs, or even seeds and flowers.

So far, there are only few cities, mainly bigger, that the farmer-box trade is established in. The number of farmer-box providers is increasing every year, however insufficiently given the consumers' interest. According to the server *bio-info.cz*, in November 2010 there were 50 farmer-box cooperatives over the Czech Republic. Individual and collective suppliers are combined in this number, home delivery and personal takeover as well.

#### *4.3.2.4 Education*

As holds for lifestyle generally, the base of establishing a valid lifestyle patterns is the youngest generation. Initiatives from different organic associations are starting projects in schools that would promote organic lifestyle there, introduce it to children, and even supply organic food into school canteens to get children used to it. Adjoint are courses and workshops for their parents. The latest case is Country Life company that was commissioned by the government to run a similar project in twenty Czech schools.

According to the author's opinion, at least some of the knowledge about organic farming should be included in basic school syllabus, as a part of Natural Sciences subject.

#### *4.3.2.5 Insufficient processing capacities*

A current problem, even if not very dispersed, is processing organically farmed production as conventional, due to poor capacities of organic processing units and sometimes also too big distance of the producer to the processor. Especially milk has often to be sold and processed as conventional even if gathered from organically bred cows. Many producers complain about losing money that they would otherwise gain as the organic price premium, along with the loss of organic status of their production. Low redemption prices, low processing capacities and incapability of reaching the organic processor within durability period tend to inhibit Czech organic milk production.

### **4.4 Descriptive analysis of French organic market**

France is currently the second biggest European organic market (after Germany), with a volume of 2.6 billion Euro of sales in 2008 that represent 1.7% of total food market of the country. Last ten years saw a rapid expansion with yearly increments of around 10%<sup>29</sup>.

According to a survey published by Agence Bio in 2009, 46% of French citizens consumed organic products at least once a month and 39% had bought at least one organic product in the last four weeks before the survey was conducted. Among those that did not consume or buy organic food, the main reason was the higher price of such products and lack of reflection about doing so. On the other hand, contrarily to the Czech Republic where a large number of people do not trust organic standards, 97% of interviewed French claimed they believed organic production did not use any chemical agents. There was a general belief of their good impacts on human health and the environment and a better taste. The major source of information for the population would be television, followed by news and magazines and in-store publicity.

The most consumed products are fruits and vegetables, dairy products, particularly cheese, eggs and organic chicken. An increase in organic wine consumption goes hand-in-hand with the promotion and expansion of organic wine production.

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<sup>29</sup> According to USDA Foreign Agriculture Service GAIN Report- Journo, L.J.- French Organic Market, Paris, 2009

The primary purchase place for organic products are supermarkets and hypermarkets that are generally very well supplied. Almost 40% of all organic purchases have been realised there. This is due to the assortment of organic food offered in their shelves, corresponding to people's tastes- biscuits and breakfast products, dairy and dry products.

Even if farmer markets have a long tradition in France, only 42% of products are purchased there. However, it is still markets where the majority of cheese, fruits and vegetables are sold. Shopping on a farm is also popular in France and the majority of eggs and meat are sold by this means.

Only one third of organic buyers (31%) would shop in specialised stores, mainly for soya products and condiments. Among retailers, probably the most famous one is Biocoop, with its chain of 322 shops (in September 2010, according to Biocoop's official website). The shops sell organic food as well as cosmetics.

#### 4.4.1 SWOT analysis of French organic market

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>✚ Well established organic production</li> <li>✚ Tradition recognised by people</li> <li>✚ Strong national feeling, support of national and traditional producers</li> <li>✚ Governmental support and subsidies</li> </ul>	<ul style="list-style-type: none"> <li>✚ System of subsidies not transparent, criticised</li> <li>✚ Supply insufficient for satisfaction of increasing demand</li> <li>✚ Lack of processing units for some products</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>✚ Tight links with countries worldwide, possible exports (wine)</li> <li>✚ Strong position in the European</li> </ul>	<ul style="list-style-type: none"> <li>✚ Imports and re-exports- supported by the establishment of international treaties</li> <li>✚ Saturation of market</li> <li>✚ Competition from other European</li> </ul>


Union	countries
 Establishment of organic feeling within the young generation	

Table 12: SWOT analysis of French organic market, own illustration

#### 4.4.2 Major insufficiencies on the market

##### 4.4.2.1 Supply incapable to cover demand

A characteristic common in many European countries where organic farming is already established, including France, is that the volume of production cannot cover the demand for those products. The demand increases by around 10%, every year, whereas increments in overall organic production in the country are only between 5 and 10%. This tendency creates an opening gap.

Consuming organic products has shifted from representing a lifestyle of a minor group of the population into a trend, capturing more and more people. They become aware of some negative impacts that consumption of conventional products might have - news and information about which there is an increasing supply of in media- and reconsider their consumption preferences. With the contemporary social pressure on people so as to remain healthy and good-looking, and with the typical affection of French people to domestic and traditional production, France is a very suitable country for establishing a strong organic consumer base.

Demand for organic products also increases in a faster pace when those products shift to being offered in supermarkets and hypermarkets, such as what happened in France around 1990. Until then, it was mainly through retailers that the largest part of organic food was sold. As more organic products get introduced to a larger number of consumers, supermarket and hypermarket chains influence the organic market, especially as regards products range offered and their volume.

##### 4.4.2.2 Price perceived too high

One of the conclusions resulting from a market research run by Agence Bio in 2009 suggests that the major reason for the French not to buy organic products is their higher price compared to conventional products. More than 90% of French, a considerably high percentage, claimed in that research that they would be willing to increase their organic purchases if the price decreased.

On the other hand, one third of consumers admitted that the price premium was reasonable given higher quality and standards and other rules to follow when farming.

They were willing to pay in average up to 11% more for organic product, which does, however, not correspond to the real market price premiums.

#### *4.4.2.3 Difficult accessibility and insufficient offer in shops*

Another of the major reasons for not purchasing organic products in shops cited by French consumers was an insufficient accessibility and availability of products in shops, as well as complete lack of certain goods such as fresh and dried fruits, especially exotic, vegetables and nuts.

This represents an opportunity for importing as the demand for these products can possibly not be satisfied by domestic production. The main countries those goods are imported from are the “third countries” listed by the European Commission (see Chapter 1.5.2). Among other importers, mainly of temperate fruit, are Mediterranean states, such as Italy and Spain that accounted for 87% of total French fruit imports from European Union in 1999<sup>30</sup>.

Not only imports compensate for the insufficient domestic supply. Re-exporting, i.e. importing a good and then exporting it into a neighbour country takes place between all members of the European Union and it is a very popular way of ensuring supplies of organic goods as the common European regulation guarantees the acceptance of the product from one country to another. France is one of the major European re-exporters, along with Belgium and the Netherlands, and also the importer of fruits and vegetables from the two countries, as well as from Spain and Italy. Re-exporting, however, makes it difficult to establish true volumes of imports from tropical countries to France.

#### *4.4.2.4 Low processing capacities*

As concluded in one of the previous paragraphs, France is a suitable country for the development of OA. There is a large consumer base keen on buying organic food, and on the other hand with the governmental financial and administrative support many producers shift to OA for reason of rationality. Every year there is an increasing number of producers that sometimes, however, do not have an opportunity to sell their raw products to a processing unit.

A problem similar to many countries with organic production- including the Czech Republic- occurs in France also. It is the occasional need to sell organic production as conventional that seems as a strong discrepancy in a country with such an availability of funds and structures to support agriculture. A test case to illustrate was organic milk

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<sup>30</sup> Source: Hube, Amelia F., Balmer, B.- USAID/GEO Guyana Economic Opportunities, Export Market Series Bulletin no.14, United States Agency for International Development in Georgetown, Guyana, 2004



and farmers' protests in 2009 (see Chapter 3.1.2) where, due to the economic crisis that left processing units short of funds to cover redemption prices of organic milk and due to the supply of cheaper imported conventional milk, French organic dairy farmers were left with their production for which there was no use.

#### *4.4.2.5 Wrongly aimed policies*

Many experts believe that the situation in France might not be well-balanced in a sense that although demand for organic products keeps on increasing and so does the organic market volume, wrong governmental policies and poor logistics and organisation structure have caused a lack in domestic production capable to cover the demand. It is true that the government runs many agricultural programs and aids, the organic branch among them, in order to achieve the planned 6% share of organic among the total agricultural land in 2012. However, as the supply does not grow fast enough and the market is open to the international, French products are not competitive enough to contest with imports from other countries. Imported products have the advantage to be perceived exotic and in many cases they are also cheaper, although the fact of them being imported violates one of the basic rules of organic way of living- the eco-friendliness.

Moreover, even if in recent years there has been an increase in the number of producers converting to organic, it takes over two or three years (due to the conversion period) before their production actually appears on the French market. Until then, consumers willing to purchase organic products will opt for imported goods.

## **5. Conclusions**

Each of the two compared countries, France and the Czech Republic, has its strong point in a different aspect. On one hand, France has once lived a true boom of organic production, being among the very first ones to acknowledge organic way of farming and to supply organically produced food into other European countries. Organic agriculture had a strong position there and was deeply rooted in the national consciousness. France however lost this leading position around twenty years ago and has not redeemed the position yet. It is currently the third biggest market with organic products in Europe, very well-known for specific organic products such as chicken, eggs and wine. Otherwise, it can be said that people are more environmentally aware than the Czech and honour traditions and nationalism, so they like to support domestic organic agricultural production. It is hard to predict whether France will regain its leading position in volume of organic production in Europe since the current growth rate is not a very fast one.

In the Czech Republic, the origin of organic production was not easy and straightforward. Organic agriculture found its way into the production chain slowly at first and since recent years it has expanded in a fast pace. Although the market is not a very big one given the size of the country, there are still a lot of opportunities for new producers and distributors to establish their businesses there. If the growth of organic production continues with the same speed as in recent years, Czech Republic can soon compete with bigger European states. However, current insufficiency of processing capacities is inhibiting a fast growth. Limited size of Czech market is not a problem as there will always be enough customers all over Europe, thanks to the international treaties on standards acknowledgement across borders within the European Union.

Organic agriculture is an important part of agricultural production in many countries worldwide. It is hard to ignore its development and presence in the country's food market. Indeed, from the available data collected in this Bachelor Thesis it would seem that the sector is expanding and there is still a lot of space and opportunities for innovation and delivery of new products and services.

Results of the analysis suggest that the economic position of a country and development of its organic agricultural production are related, even if not directly dependent on each other. It goes, however, beyond the scale of this Bachelor Thesis to examine the problem in further details and to fully describe the relation. The research done in this Thesis might be useful for analysing short-time dynamics of the organic

agriculture development. A further research would be suitable to clarify the long-term factors contributing to the OA expansion; this research should focus primarily on investigating structural changes in policies administering OA on the national, as well as supranational, level, on the influence of financial and non-financial support of OA and on additional indicators of a country's economic growth.

Although opponents to OA argue that the concept of eating food claimed to be healthier than conventional might be only a momentary trend that will leave off in some time, when people realize they were only paying an unreasonably high price for almost the same food they might be eating elsewhere and switch back to consuming conventional products, there is a strong belief in the concept of farming organically. It is, without any doubts, a way to sustain nature and its richness as well as to care for one's health and a responsible consumption.

It is predictable that the growth will continue at least in the near future, unless a significant change is made in policies on national or supra-national level, or unless an important event changes opinions of people and trust towards organic agriculture. Analysis of current trends suggests, however, that this is not likely to happen and that it will be rather the supporters of organic agriculture than its opponents that will rejoice from the further development of the organic trend.

## 6. Supplements

### 6.1 Components of a non-agricultural origin permitted for utilisation in organic food production

#### 6.1.1 Additive substances

E 153	Medicinal carbon	E 170	Calcium carbonate – all operations excluding colouring permitted
E 220	Sulphur dioxide (only for wine production)	E 270	Lactic acid
E 290	Carbon dioxide	E 296	Malic acid
E 300	Ascorbic acid	E 306	Natural extract with a high content of tocopherols-antioxidant into fats and oils
E 322	Lecithins	E 330	Citric acid – for oil production and starch hydrolysis
E 333	Calcium citrate	E 334	Tartaric acid
E 335	Sodium tartrate	E 336	Potassium tartrate
E 341	Calcium dihydrogen phosphate – conditioners used for self-conditioning flours	E 400	Alginic acid
E 401	Sodium alginate	E 402	Potassium alginate
E 405	Propane-1,2 diol – for dugar production in the stage of crystallization	E 406	Agar
E 407	Caraghenane	E 410	Carubine (carob flour)
E 412	Guar gum	E 413	Tragant

E 414	Arabic/ Acacia gum	E 415	Xanthane
E 416	Karaya Gum	E 422	Glycerol – herbal extracts
E 440	Pectines	E 500	Sodium bicarbonate – for sugar production
E 501	Potassium carbonate – for grapes drying	E 503	Ammonium carbonate
E 511	Magnesium chloride – coagulation agent	E 513	Sulphur acid – for sugar production
E 516	Calcium sulphate - coagulation agent	E 524	Sodium hydroxide – for treatment of surface of lye-treated pastry, sugar and rapeseed oil production
E 526	Calcium hydroxide	E 551	Silicum oxide- gel or colloid solution
E 553	Talcum (amianth-free)	E 558	Bentonite
E 559	Aluminium sillicate	E 901	Bee wax
E 903	Carnauba wax	E 938	Argon
E 941	Nitrogen	E 948	Oxygen

**Table 13: List of permitted additive substances**

Ethanol – dissolvent; Tannic acid – for filtration; Albumin from egg-white; Casein; Gelatine; Herbal oils – as lubricants, agents for components separating and for prevention of foam; Diatomaceous earth; Pearlite; Rice powder

### **6.1.2 Food aromas**

Solutions issued from physical processes, e.g. distillation and dissolution extraction, enzymatic or microbial procedures from raw materials of herbal or animal origin as such or modified for human consumption by processes designated for food preparation (natural aromatic solutions).

### 6.1.3 Drinking water

### 6.1.4 Salts

Salts with sodium chloride or potassium chloride as a main component, frequently used when food processing

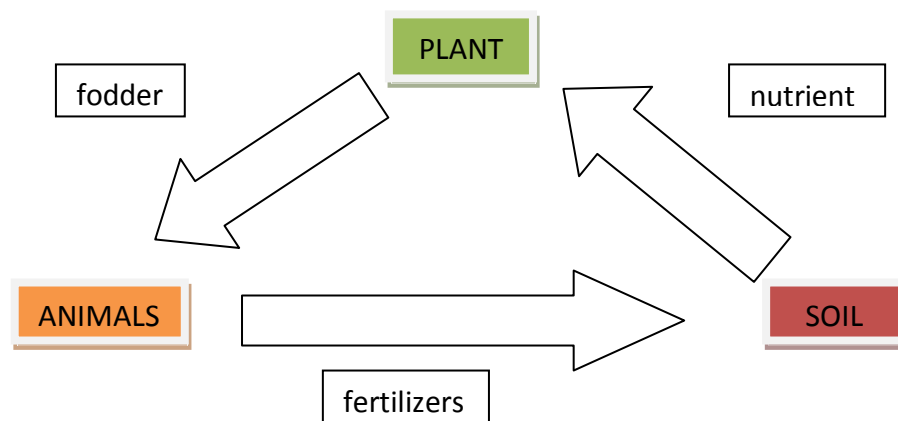
### 6.1.5 Micro-organisms and enzymes

Micro-organism and enzyme cultures commonly used in food production, with the exception of genetically modified organisms (e.g. yeast, dairy products, rennets)

## 6.2 Rudolf Steiner's Biodynamic Agriculture System

The first coherent farming system, called Biodynamic Agriculture, was introduced by Rudolf Steiner (Austria, \*1861) that applied it on his farm in nowadays Poland. This system relied on the basics of OA, joining nutrient-rich soil with healthy plants and animals and their interaction.

Following illustration depicts the Biodynamic Agriculture system:



Picture 1: Biodynamic Agriculture. Own illustration

The soil provides plants with nutrients necessary for their growth and healthy plants are used as a fodder for farm animals. They, in turn, produce manure that can be used as a nutrient for the soil, which closes the circle of bilateral co-operation. Therefore, a farm with plant and animal production can be self-reliable.

## 7. Resources

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