



## New challenges to improve organic bread wheat production in Europe

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### Abstract

*The total organic area in the EU-27 had an annual average growth rate of nearly 15% from 1998 to 2006 with winter wheat being the most important cereal crop. Wheat yield in organic farming is around 30% to 70% of yield of conventional farming but higher premia for organic wheat may to some extent compensate for this. Bread wheat is grown in a variety of crop rotations and farming systems and four basic organic crop production systems have been defined. Nitrogen deficiency and weed infestation are considered to be the most serious threat in organic wheat production. Organic wheat producers will have to fulfil the technological needs of bakers although the requirements differ widely from small artisan bakers to large enterprises handling the organic bread processing. To maintain and expand organic wheat production, there is a need to control weed population, manage nitrogen nutrition and maintain crop diversity in the cropping system. In order to obtain a share in the premium price of organic wheat products, farmers may involve in further processing and marketing.*

**Key words:** organic wheat, food-chain, baking quality, yield, farming system

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## **Introduction**

Across Europe, the organic market is currently one of the most expanding sectors of the food industry but considerable differences exist across the EU-27. Although organic grain production has rapidly progressed since the mid 90s, the growth has not matched the increasing demand in human nutrition and animal feed. The large demand of organic bread wheat for human nutrition has resulted in record-level prices and significantly increased imports. This sector should be secured from domestic sources when imports from outside EU may introduce additional levels of economic risk associated with transportation and quality.

The purpose of this communication is to underline main challenges of the organic bread wheat to improve production and quality in Europe and guarantee economic and environmental sustainability.

## **Materials and methods**

The paper consists of results from a survey realised in 5 EU countries (Austria, Denmark, France, Italy, Switzerland) which are quite representative for the diversity encountered in Europe. This survey is complemented with statistical data and literature reviews. Statistical data were collected from European database (Eurostat, IFOAM) and the national statistics of the selected countries. In these dataset, the area, share and growth of organic production, arable land and wheat production have been analysed. The main characteristics of the farming systems (crop rotation, type and size of animal husbandry, machinery used, list of technical problems, crop management of organic wheat, ...) has been described both thanks to 26 interviews of farmers and/or key informants and national literature review.

## **Results and Discussion**

### *Important growth of organic wheat in the EU*

Wheat is the most important organic cereal in EU-27 with ca 400.000 ha in production. Durum wheat (117,686 ha) is particularly grown in Italy while large areas dedicated to the soft wheat production are found in Germany (45,000 ha), France (35,008 ha) and the United Kingdom (21,767 ha) (Eurostat, 2009). France and Austria recorded positive growth of more than 25% between the years 2000 and 2008. Denmark follows with a growth of 12%. The development of organic soft wheat in Italy and Switzerland is low or null while the organic share has largely increased for others products. Concerning the supply of organic products in Europe, Italy accounted for nearly 18% of all organic crops in the EU-27 while the others countries account far less like 9% for France, 6% for Austria and around 2% for Denmark.

### *Crop production systems in organic farming*

Traditionally, organic farms included both crops and livestock production. From the beginning of the 1990s, organic agriculture has become much more specialized by the conversion of highly specialized conventional systems, and crop rotations have been simplified in arable farming systems. Current organic cropping systems presented a large and continuous spectrum of diversification and intensification. These are characterised by different levels of inputs, crop diversity and crop management practices. Four basic types of cropping systems comprising soft wheat production were highlighted in the survey in five UE countries (Table 1). These four farming systems were i) mixed farming systems in temperate and Atlantic climate, ii) organic arable systems in western and central temperate regions, iii) irrigated grain systems in Mediterranean region and iv) extensive grain systems in Southern and Central Europe.

**Table 1.** Examples of organic wheat in the crop rotation

Farming Systems	Crop rotation	Duration of rotation	Proportion of wheat in the crop rotation	Fertilization type for wheat
Mixed farming systems	GC (2-4yr)- WW – SC – WC - ....	8-11 yr	20-30%	Slurry, compost
Highly specialised Arable systems	GL – WW – SC – RC – WW	6-8 yr	20-40%	Organic fertilisers
Irrigated grain systems	GL – WW – SC – GL - WC	4-6 yr	20-33%	Organic fertilisers
Extensive grain systems	GC (2) – WW – SC - WC	4-6 yr	0-33%	None or limited compost

WW winter wheat / GC Grass crops = Luzerne, Clover grass / SC Spring crops = Maize , Spring Barley, / RC Root crops = Sugar beet, Potatoes / GL Grain legumes= Pea, Soya

In general, organic grain systems with winter wheat are characterized by higher crop diversity and wider crop rotations compared to comparable conventional systems. Within a crop group, diversity is often higher, e.g. cereal patterns are less dominated by winter wheat and winter barley, than in conventional farming. Currently, weeds are considered to be the most serious threat in organic wheat production while diseases and pests are of relatively minor concern. Fear of ineffective weed control is also perceived by the farmers as one of the major obstacles for conversion from conventional to organic production. The productivity of organic wheat is also restricted by the limited supply of N. By choosing cultivars with good disease resistance, the organic farmer should be able to keep disease problems within acceptable limits. However, the choice of suitable cultivars for organic wheat is still limited, as plant breeding has been largely directed at providing cultivars adapted to conventional farming. Moreover, for the organic grower, disease resistance is only one aspect to be considered and choice of cultivars may be strongly influenced by other factors such as grain quality, ability to compete with weeds, N use efficiency and availability of organically produced seed.

### *Profitability of organic wheat in Europe*

The economic viability of wheat production in Europe is clearly affected by the support payments policies, the technical performance but also by the existence of an adequate marketing structure.

Even the climatic conditions are diverse in Europe, yield performance is largely explained by input and labour intensity (fertilization quantity, weed and soil management). Conversely, baking quality is linked with cultivar characteristics and climatic conditions. Table 2 illustrates yield variability in the countries participating in the survey where conventional wheat yields varied from 6 to 8.2 t ha<sup>-1</sup> (source Eurostat).

**Table 2.** Organic wheat yields (t.ha-1) in the countries participating in the survey.

	France	Denmark	Austria	Italy	Switzerland
Grain yield Min value	2.5	1.0	3.0	3.5	3.0
Grain yield Max value	5.0	4.0	5.5	6.0	6.5

The direct support given to organic farmers via area payments or others subsidies is anticipated to have a substantial impact on the economic viability of organic production also in the future. The implementation of direct support for organic farming greatly varies amongst the different member countries and regions of the EU, both in terms of the levels of payments and eligibility for the programmes.

Over the last five years, these premiums have fluctuated considerably over time in coherence with the large variation observed on the world cereal market. In the European Union, farmers are receiving premiums for organic wheat from 30% up to 200% depending on countries and sales channels. Prices for organic cereal used for human nutrition can reach 100% above conventional prices, whereas the price increase for animal feed is maximum 30%. The premiums of organic wheat reported from Austria and France are above 150%, about 50% in Switzerland, where the price level for conventional wheat is high, and 30-40% in Denmark. The premium is around 80% in Italy where the domestic market for organic food is not consolidated. For the consumer, the premium of organic cereals is approximately 60% ranging from 40% for whole wheat to 75% for flour. The large gap between farm-gate and consumer price for organic products strongly limits the development and expansion of the organic cereal sector. The key question is whether the relative profitability of organic wheat will still be maintained if the premium paid by consumers is reduced. First, it depends on the combined growth in consumer demand and production level, which should result in upward price pressure on organic foods in comparison to the likely decline in production costs. Secondly, it is also determined by direct policy support compensating yield gap. Finally, the profitability of organic grains should be also guaranteed by the improvement of yield performance compensating the decline of the price premium.

Organic products have been frequently associated with attributes such as local origin and supply, small-scale units of production and direct selling from producer to consumer. Nevertheless, nowadays organic markets are mainly based on highly industrialised and concentrated units of production, distributed through mainstream retail channels. The organic wheat and flour market has been diversified over time.

Traditionally, direct sales from producer to consumer and specialised shops provided organic products for target consumers interested in non-conventional products (whole food or healthy food). The amount of organic wheat-based products sold through these channels was often small, with only small segments of consumers being reached. In the beginning of the 2000s, the development was strongly supported by the wholesalers entering the organic market. Supermarkets were important actors in developing sales through new (occasional or regular) consumers.

## **Conclusions**

Wheat yield in organic farming is around 30% to 70% of yield of conventional cropping but higher premium for organic wheat may to some extent compensate for this. To maintain and expand organic wheat production, the crop management needs to be optimized and the grain yield should be improved to become economically more attractive to the farmers. First, there is a crucial need to maintain diversity within cropping system, to support ecological health, control weeds and improve N management by N fixing crops, while organic farmers are increasingly being pressured by forces of the market to re-adopt the factory principles of specialization and control.

Bread wheat is grown in a variety of crop rotations and farming systems. It is essential to manage nutrient supply and control annual and perennial harmful weeds. Premium price for special quality can be obtained by optimized choice of genotype, crop rotations and adjusted organic fertilizer inputs. In order to participate in the premium price of organic wheat products, farmers may get involved in further processing and marketing.

Organic wheat producers will have to fulfil the technological needs of bakers; even the requirements are diverse from small artisan bakers to large enterprises. Then, there is a need to investigate the effect of different growing regimes and technological processes on baking quality and performance. Additional knowledge and references will be provided by the European AGTEC-Org project ([www.agtec.coreportal.org](http://www.agtec.coreportal.org)).

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