



# Processing of Wheat to Bread

## Control of Quality and Safety in Organic Production Chains

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This leaflet provides a practical overview for millers, bakers and others involved in production of flour and bread, on what can be done at these steps to improve the quality and safety of organically produced bread, in addition to certification and general food safety requirements. A separate leaflet covers the wheat production and grain storage steps, and other leaflets cover other commodities or aim at consumers and retailers.



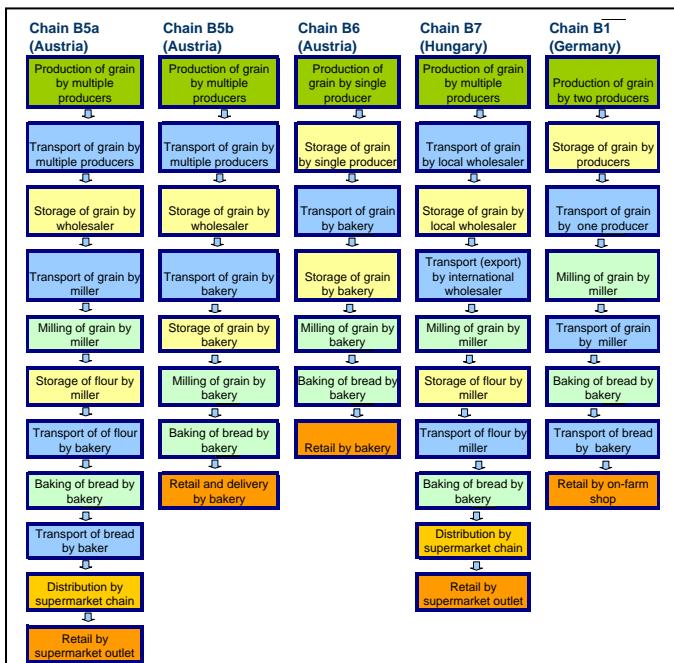
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## The Organic HACCP Project leaflets

This is no. 10 of a series of 14 leaflets comprising information on how control of quality and safety can be further improved in organic supply chains across Europe. The Organic HACCP project has reviewed studies of consumer concerns and preferences in relation to organic production systems and collected information about typical production chains for 7 commodities in regions across Europe. For each of the criteria listed below, the information was analysed to identify Critical Control Points (CCPs), defined as the steps in supply chains where the qualities of the final product can be controlled most efficiently. CCPs were identified using methods developed for Hazard Analysis by Critical Control Points (HACCP), a standard procedure to prevent food safety risks. The new aspect is thus to improve how consumer concerns are addressed, through the use of the CCP concept for a wide range of criteria, not only safety:

1. Microbial toxins and abiotic contaminants; 2. Potential pathogens; 3. Natural plant toxicants; 4. Freshness and taste; 5. Nutrient content and food additives; 6. Fraud; 7. Social and ethical aspects.

## Overview of the examined wheat and bread chains



The diagram shows the analysed organic supply chains for wheat and bread throughout Europe. On the project's homepage ([www.organichaccp.org](http://www.organichaccp.org)) they are shown in more detail and each of the CCPs are shown and described.

## Milling

### Important issues to control at this step

Wheat grain contains the nutrients B vitamins in the bran and vitamin E and polyunsaturated fatty acids (PUFAs) in the germ. During milling the protective cell layers are destroyed and the vitamins and PUFAs become exposed to oxidation. If the flour is stored, this can lead to loss of nutritional value, a rancid taste and yellowing of the flour. So the germ is often removed, to provide white flour or flour that can be stored for a long time. In white flour also the bran is removed, this profoundly changes the baking properties and the taste. Whole meal products appear to protect against heart disease.

### Specific problems for organic production

Many consumers buying organic food prefer food processed using gentle traditional methods; for wheat this means stone grinding rather than roller milling, however, organically certified milling facilities may not be available in the local area. Some large-scale milling facilities are parallel operations, certified to handle both organic and conventional products. This gives more options for the farmers and bakers, but introduces a risk of mixing with conventional wheat or accidental use of non-allowed agents. The agents to control storage pests in organic production are limited, making prevention and early detection of pests very important.

Many consumers of organic products want to know who produced them, since they see this information as a sign that he/she is willing to take responsibility for the product.

### Recommendations

- If you know that the flour will be used quickly (less than a few weeks), let the wheat germ be included in the flour. However, enquire in advance that your customers agree to this procedure, or offer them a choice (if you use roller milling, with stone grinding the germ can't be removed).
- If possible, choose each batch of grain according to the optimal properties for the type of flour that is to be made, and adjust the milling conditions to the properties of the batch of grain. Define the milling method on the invoices.
- In parallel operations, use dedicated trucks and other equipment for organic material, and mark them clearly, e.g. by painting them in different colours.
- If handling material from more than one farm, as far as possible keep material from each farm or at least each region and variety as separate batches and include information about origin and variety on the invoices when it is sold. Only mix batches if it is necessary in order to obtain the quality and quantity requested by the consumer.

## Dough preparation, rising and baking

### Important issues to control at this step

The wheat composition influences the properties of the dough, which again influence the quality of the bread.

Wheat with a strong protein component results in a very elastic dough, which can rise to a large size and keep its shape after baking. In contrast a different type of protein or a smaller percentage results in a brittle dough, which would collapse if one tried to make bread from it, but is superior for making crisp and crunchy biscuits. The amount and type of other components of the dough, such as water content, lipids and other additives, as well as the details of how the processes of mixing, kneading and rising are carried out (temperature, intensity, duration etc.) modulate the dough properties. Due to this it is possible to adjust to some variation in wheat quality and still produce a consistent good quality. But it requires either extensive experience or good tables listing optimal combinations of properties and recipes.

Wheat bread tastes best when it is freshly baked, and procedures where the dough is stored, distributed or even sold as a partially finished frozen or refrigerated 'par-baked' product, allow it to be baked shortly before purchase or consumption, but may not produce the best flavoured bread.

*Bacillus subtilis* produces spores that can survive the baking process and make the bread 'ropy'; this spoils quality but is harmless from a food safety point of view. Long fermentation with sourdoughs (lactic acid bacteria) can control rope forming bacteria and improve the bioavailability of nutrients.

#### Specific problems for organic production

Plant residues and other organic fertilisers release the nutrients slowly during the growing season, so organic wheat tends to have relatively low protein content. However, other factors than protein content are also important for baking quality, and organic wheat tends to have stronger rising ability than conventional wheat with the same protein content. Due to this, the behaviour of the dough during the mixing, kneading and rising processes often deviates from standard tables based on conventional flour. This can make it difficult to optimally utilise organic flour in enterprises that primarily produce conventional bread.

A small number of additives is permitted in organic production, in particular ascorbic acid, to adjust the dough properties. This is particularly important when wheat of high quality is not available. However, many consumers find it important that the bread is made without any additives other than salt and yeast. In some cases organic additives such as acerola can be used instead of ascorbic acid.

Consumers buying organic bread tend to expect a very good taste and texture of the bread. To obtain this, it is necessary to use more flour per loaf and longer rising times than for conventional bread. This increases the costs and thus the premium that is required for a viable production.

#### Recommendations

- Record carefully how the dough develops when using flour with slightly different properties, so you establish your own procedures for optimising recipes to the flour.

- Test if the use of sourdough and other traditional methods are suitable for use in your production system, (if not already in use), to improve taste and other quality aspects.
- If it is your experience that you can produce good quality bread without additives, then make sure you inform your customers that you don't use additives. On the other hand, if you do use allowed additives, organic or not, it is also very important that you declare this clearly.
- Provide information to the consumers on how your bread is produced, in particular if you use any non-standard procedures to promote the taste or nutritional quality of the bread, or if you use any technology that interrupts the baking process, e.g. frozen dough or 'par-baked' bread.

#### General Recommendations

Exchange information about your quality control and their quality measurements with the companies and persons in charge of the other parts of the chain. Formal or informal collaboration agreements can ensure that quality and safety is controlled at every step of the supply chain, and that the costs of this are shared fairly among the participants. While it is not common to provide any precise reference to the origin of the grain that is used for production of bread, a substantial percentage of the more dedicated organic consumers would prefer bread with such information, as well as some of the quality-conscious or locally supportive consumers. This would require awareness of this topic at all levels in the supply chain. On the other hand, costs would not necessarily be particularly high, since the wheat that is best suited for bread making tends to originate from relatively specialised enterprises, which can provide quite large batches of uniform quality from one farm or regional group of collaborating farms.

#### Continuation in the QLIF project

The work of Organic HACCP identified several areas where more research is needed to improve the control of quality and safety of organic products. In 2004 the project QualityLowInputFood (QLIF, [www.qlif.org](http://www.qlif.org)) was started to broaden the understanding of quality of organic food. QLIF is an Integrated Project in the European Commission's 6<sup>th</sup> Framework Programme with 31 participants in 15 countries. QLIF is a 5-year project aiming to provide research and development on quality, safety and efficiency of organic and other low-input farming methods in Europe. The following topics relevant for quality and safety of wheat for bread making will be investigated in QLIF:

- Studies of relations between different aspects of food quality, consumer perceptions and buying behaviour (Consumer expectations and attitudes, 2004-2007).
- Studies of effects of growing factors and variety on baking quality (Effects of production methods, 2004-2008). Development of HACCP procedures for control of quality and safety in organic supply chains and training courses for advisors (Transport, trading and retailing, 2006-2008).



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## Bibliographical Information

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A PDF version can be downloaded free of charge from the project internet site at [www.organichaccp.org](http://www.organichaccp.org) or from [www.orgprints.org/view/projects/eu-organic-haccp.html](http://www.orgprints.org/view/projects/eu-organic-haccp.html).

Printed versions can be ordered from the FiBL Shop at [www.shop.fbl.org](http://www.shop.fbl.org).

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## About Organic HACCP

The main objectives of this Concerted Action are to assess current procedures for production management and control in organic production chains, with particular reference to the characteristics valued by consumers, and from this to formulate and disseminate recommendations for improvements.

The 2-year project started in February 2003. The results of the project, including a database of Critical Control Points in the analysed chains, are available on the project website [www.organichaccp.org](http://www.organichaccp.org).

## The Project Partners

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