



# **Assessing the risk from mycotoxins for the organic food chain: Results from Organic HACCP (5th EU-framework) and other research**

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TOMATOES CABBAGE EGGS BREAD MILK APPLES WINE

ORGANIC HACCP

QUALITY MONITORING AND TRACEABILITY THROUGHOUT THE CHAIN

## Outline

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- **Introduction**
  - **Danger of mycotoxins**
  - **Critical factors in the production and storage of feedstuff**
- **Results of Organic HACCP**
- **General Findings in the Literature**



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# Mycotoxins in Organic Animal Feed

**Susceptibility of domestic animals towards mycotoxicoses (Dänicke, 1999)**



	Cattle	Swine	Swine	Poultry
Mycotoxin		Breeding	Consumption	
Zearalenon	-	+++	++	+
Desoxynivalenol	-	++	+++	+
Ochratoxin	-	++	+++	++

- slight; + fair; ++ moderate; +++ severe



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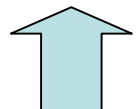
# Critical Factors in Production and Storage of Organic Food and Feed

**Climate**

**Crop management**  
**Soil treatments**  
**Variety**



Previous Crop → **Production**



**Plant Protection**

**Harvest/  
Drying**

**Storage  
at Mill**

**Storage  
before Market**

**Storage  
at Farm**

← **Organic** →

**Crop Rotation**



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# ORGANIC HACCP

QUALITY MONITORING AND TRACEABILITY THROUGHOUT THE CHAIN

**Review of consumer criteria values and concerns**

**Description of current production and control methods**

**analysis of safety and quality aspects using HACCP procedures**

**Recommendations to actors on the chain of production, distribution and consumption:**

**Producers, Processors, Retailers, Consumers, Policy makers, Scientists etc.**



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## Focus on 7 quality and safety criteria:

- **Microbial toxins and abiotic contaminants**
- **Nutrient content\*** and food additives<sup>(\*)</sup>
- **Pathogens**
- **Freshness and taste\***
- **Natural plant toxicants**
- **Fraud\***
- **Social and ethical aspects\***

\* **Criteria new to Critical Control Point Analysis**



## Critical Control Points (CCPs)

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### Critical Control Point (CCP)

- A step at which **control can be applied** and is essential to prevent or eliminate a **risk (instead of a food safety hazard)** or reduce it to an acceptable level



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# Data Collection from Farm to Fork 1

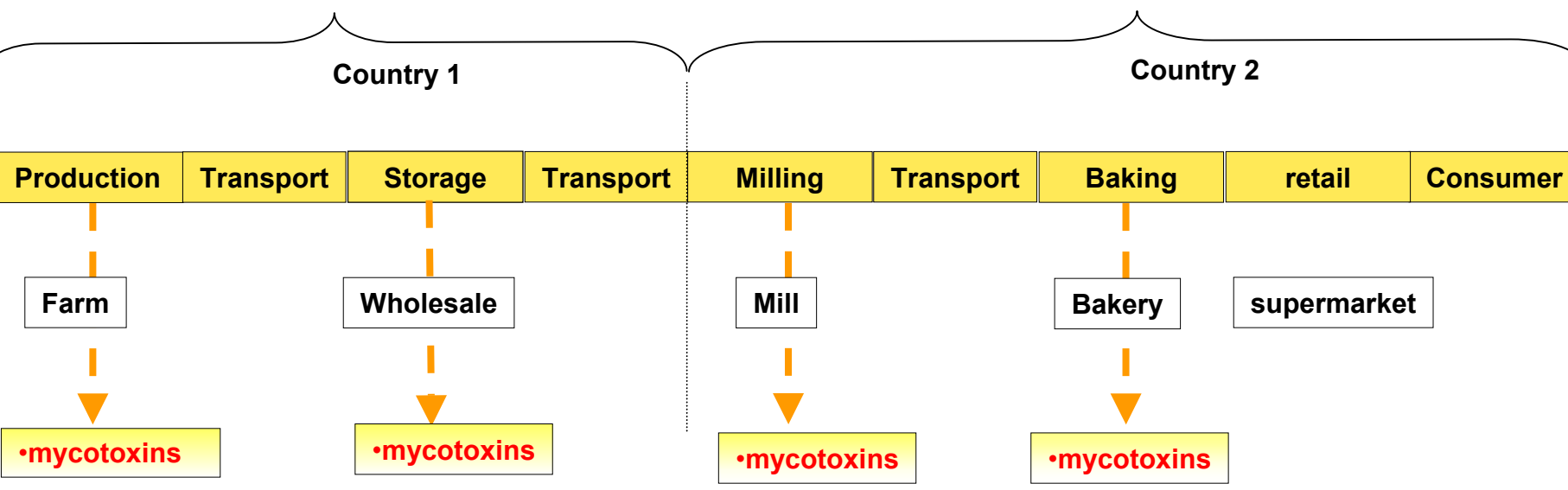
- **Crop production**
  - Tomatoes
  - Cabbage
  - **Wheat**
  - Apples
  - Grapes
- **Animal production**
  - Eggs
  - Milk
- **Processors**
  - Mills
  - Bakeries
  - **Dairies**
  - Wineries
- **Wholesalers**
- **Transport**
- **Retailers**



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## Data Analysis

### Wheat bread food chain





## Results

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# Results Database and CCPs

**Enter CCPs**  
To edit a critical control point: Select commodity and click on a step box

Commodity: Milk

**Chain M1 (A)**

- by multiple producers
- Transport of milk by transport company
- Processing of milk by dairy
- Packing of milk by dairy
- Transport of packed milk by dairy

Each step includes buttons for: Certification/Inspection, Management, Labour, Farm situation, Equipment, and Storage.

Commodity: Milk Chain: M2 (DK) Criteria: Fraud

**Production of milk by multiple producers**

**Feed**

**Fraud**

A. Efficient inspection strategy will discourage the use of higher than allowed or non-organic (concentrate) feed or additives.

B. Motivation for observing the regulation can be supported by:

1. Unannounced visits by well educated inspectors.
2. Professional assessment of production versus declared feed regime by inspector.

Farmers should always demand and verify certificate of organic origin from feed manufacturers to ensure that they comply with regulations.

C. The risk in this chain is medium. The listed measures are not implemented in this chain and the farmers state that fraud on the farm level is possible. The farmers trust their feed suppliers and do not always have documentations. The farmers might be motivated to cheat, since two out of three consider their income situation less than fair. The farmers see the inspectors as "policemen", would like advice on how to avoid fraud but are afraid to ask questions. The risk can change to high if organic feed quality is poor, organic feed expensive or not easily available, or when production targets are not met.

Questionnaire

**RESULTS**

- Report on consumer conceptions
- Critical Control Points
- Leaflets

CONFERENCE



- A. Explanation why there is a Critical Control Point at a this step
- B. Measures to control the hazard
- C. Evaluation of how well the risk is controlled in the chain
- D. Methods to control the risk at a later step



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# Critical Control Points – Milk Chains

Feed	M1 (A)	M2 (DK)	M4 (N)	M5 (DK)
<p>Mould infested feed - subsequent forming of mycotoxins</p>	<p>risk variable; own feed production (3), dry and fresh roughage but also buy concentrate; <b>QA concept (1);</b> trust their feed supplier (2)</p>	<p>risk variable; own food production (3), dry/fresh roughage, silage, grain, grass pellets and corn. Concentrate (2), trust their supplier and accompanied certificate; <b>no QA concept (3).</b></p>	<p>medium risk; farmer buys feed from a neighbour, no awareness for feed checking; <b>no QA concept (1).</b></p>	<p>medium to high risk; own food production (3), dry/fresh roughage, silage and grains, buys concentrate; farmer checks the feed upon delivery by visual control (1); <b>none of the farmers is aware of the risk or uses a QA system.</b></p>

Production of milk

certification inspection management labour farm situation equipment housing feed fodder storage animal health care storage of milk customer contact





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# Critical Control Points – Milk Chains

Fodder Storage	M1 (A)	M2 (DK)	M4 (N)	M5 (DK)
Inappropriate storage condition	<p>low to medium risk; awareness of risk available; temperature control (1); no temperature control (2) but keep different types of fodder separate/in special containers, have established drying facility/cold air ventilation. <b>No use of QA concept (3).</b></p>	<p>medium to high risk; awareness for risk not available (3); storage under simple conditions (2); storage in gas-tight silo (1); <b>no QA concept for feed (3).</b> Taking samples for analysis (1), trusts feedstuff supplier (1).</p>	<p>low risk; storage under simple condition for some feed; major portion contains fresh and dry roughage/silage. <b>No QA concept (1).</b></p>	<p>low to high risk; partially awareness for risk Simple storage (3) Checking concentrate upon delivery (1), stores grain in gastight silos (1); observation of mould growth &gt; better storage facilities necessary. <b>No QA concept.</b></p>

Production of milk

certification inspection management labour farm situation equipment housing feed fodder storage animal health care storage of milk customer contact





## Critical Control Points – Egg Chains

CCPs	E1 (NL)	E3 (N)	E4 (UK)
Feed	<p><b>Similar results as in the milk chains</b></p> <p>➤ <b>no quality assurance concept in place</b></p>		
Fodder Storage			




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# ORGANIC HACCP

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## Results Wheat Production and Storage

Technical Leaflet Organic HACCP



ORGANIC HACCP  
QUALITY MONITORING AND TRACEABILITY THROUGHOUT THE CHAIN

### Production of Bread Wheat

Control of Quality and Safety in Organic Production Chains

Kirsten Brandt, Lorna Lück, Gabriela S. Wyss, Hanne Torjusen






Photo: Reaz Ghoshen, UNB/I

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In co-operation with



This leaflet provides a practical overview of what can be done at the steps of wheat production and storage, to ensure that the safety and quality of organically produced bread is assured all the way until the product reaches the consumer.

This is a test version. If we receive suggestions for improvements or other comments on [organo.haccp@fhnw.at](mailto:organo.haccp@fhnw.at) or one of the postal addresses on the back by 15<sup>th</sup> January 2006, we will send you the final version of all the leaflets in the series.

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## Technical Leaflet Production of Wheat

### Seed and variety selection

- Baking quality

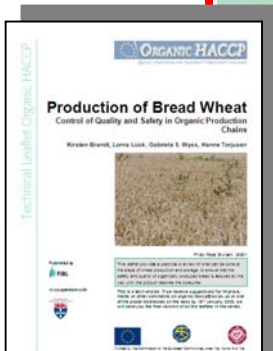
### Growing of wheat

- Soil fertility
- Leaching of nutrients

### Drying and storage

- Introduction of mould infested feed > mycotoxin formation

- Harvest with good control of humidity and temperature, even in a year with bad weather conditions.
- Ensure swift drying to correct water content, normally 14-15%.
- Establish a quality control routine, where the appearance (smell, colour) of the grain and signs of insects are checked and humidity and temperature measured.





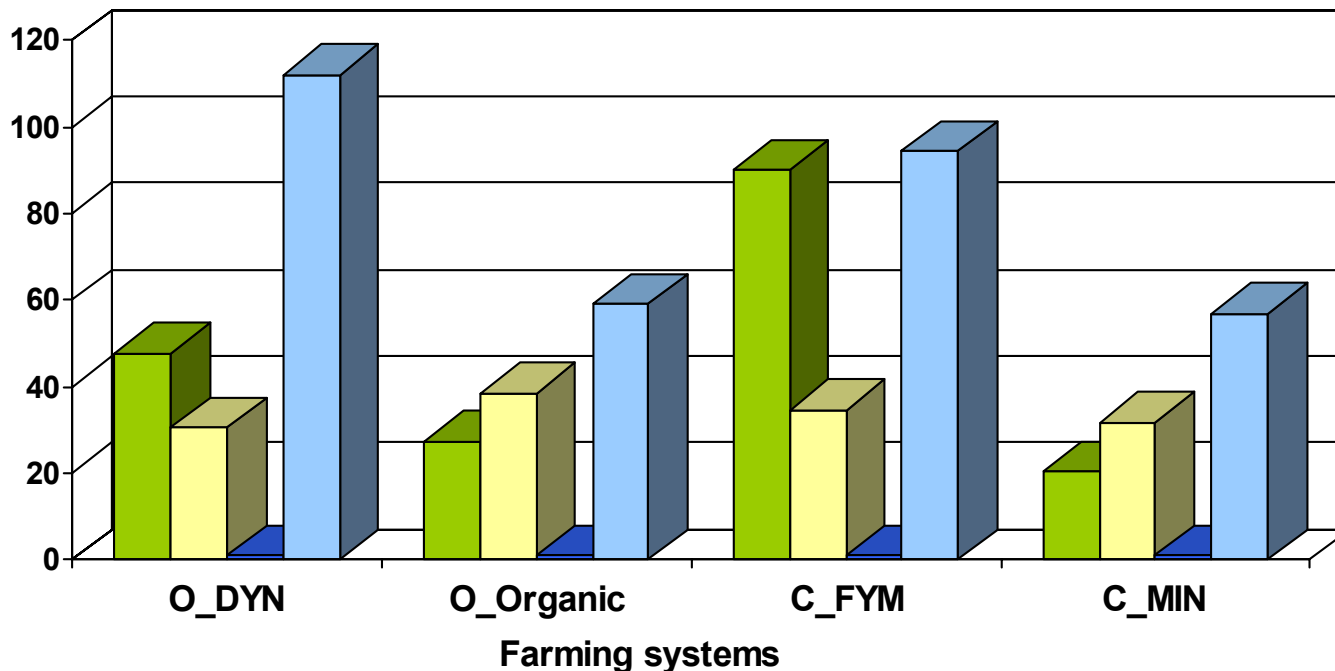
## Other Research

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- **Higher risk of exposure to mycotoxins with organic food?**

# DON and NIV levels in conventional and organic grain samples

Hahn *et al.* (2004). Wheat quality in organic and conventional farming as assessed by analytical and holistic methods, in review



■ DON 1998, n.s. ■ DON 2000, n.s. ■ NIV 1998, <d.l. ■ NIV 2000, n.s.

**Other studies reporting higher infection and/or mycotoxin levels in conventional samples:**

**Lepschy & Beck (1997)/ Dornbush *et al.* (1993)/Piorr (1990)**

# Food Standards Agency Survey on Milk 2001, UK

- 100 milk samples, 50 retail and 50 farm gate conventionally and organic produced
- Analysis for aflatoxin and ochratoxin A
- Results:

Samples	Aflatoxin M <sub>1</sub> n.n.	Aflatoxin M <sub>1</sub> ≤0.05 µg/kg (MRL, EU)
Organic	100%	-
Conventional	97%	3%

- Ochratoxin A was not detected in any of the samples
- Conclusion: Survey results do not raise any food safety concerns.

- **...From studies carried out from 1995-1999 it cannot be concluded that organic farming leads to an increased risk of mycotoxin contamination. It is important to emphasise that good agricultural, handling and storage practices are required in organic as in conventional agriculture to minimise the risk of mould growth and mycotoxin contamination....**
- **As organically raised livestock are fed greater proportions of hay, grass and silage, there is a reduced opportunity for mycotoxin contaminated feed to lead to mycotoxin contaminated milk.....**

# General Conclusions

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- No relevant differences between farming systems from the literature or experimental studies
- Major contamination sources in all farming systems > must be taken seriously
- A well maintained quality assurance system has to be set up based on occurrence, detection, and prevention
- Good agricultural, handling and storage practices are required in both organic and conventional agriculture to minimize the risk of mould growth and mycotoxin contamination.