Organic Farming and Food Quality

Margo Field

Organic Farming and Food Quality

Edited by **Margo Field**

Callisto Reference

New York

Published by Callisto Reference,
106 Park Avenue, Suite 200,
New York, NY 10016, USA
www.callistoreference.com

Organic Farming and Food Quality
Edited by Margo Field

International Standard Book Number: 978-1-63239-493-4 (Hardback)

Printed in China.

Organic Farming and Food Quality

Preface

The purpose of the book is to provide a glimpse into the dynamics and to present opinions and studies of some of the scientists engaged in the development of new ideas in the field from very different standpoints. This book will prove useful to students and researchers owing to its high content quality.

The process of organic farming and food quality has been described in detail in this insightful book. Organic farming does not necessarily require farmers to adopt conventional (primitive) techniques of farming. Several farming methodologies that were used in the past still hold utility in the present day scenario. Organic farming integrates the best of these methods with modern scientific knowledge. The aim of this book is to provide a compilation to the readers, which describes a multitude of distinct existing studies on organic farming, making it easy for them to compare methodologies, outcomes and conclusions. As a result, studies from countries like Poland, Slovenia, Romania, Finland, etc. have been integrated in this book. By acting as a platform to compare outcomes and conclusions from distinct countries and continents, this book will help in developing a novel perspective in organic farming and food production quality as well as help researchers and students from all over the world to attain novel results in this field.

At the end, I would like to appreciate all the efforts made by the authors in completing their chapters professionally. I express my deepest gratitude to all of them for contributing to this book by sharing their valuable works. A special thanks to my family and friends for their constant support in this journey.

Editor

Contents

	Preface	VII
Section 1	**Organic Farming**	1
Chapter 1	**Organic Cereal Seed Quality and Production** Ivana Capouchová, Petr Konvalina, Zdeněk Stehno, Evženie Prokinová, Dagmar Janovská, Hana Honsová, Ladislav Bláha and Martin Káš	3
Chapter 2	**Environmental Impact and Yield of Permanent Grasslands: An Example of Romania** Samuil Costel and Vintu Vasile	24
Chapter 3	**Option Models Application of Investments in Organic Agriculture** Karmen Pažek and Črtomir Rozman	45
Section 2	**Organic Food Quality and Sustainability**	61
Chapter 4	**Organic and Conventional Farmers' Attitudes Towards Agricultural Sustainability** David Kings and Brian Ilbery	63
Chapter 5	**"Healthy Food" from Healthy Cows** Albert Sundrum	87
Chapter 6	**The Quality of Organically Produced Food** Ewa Rembiałkowska, Aneta Załęcka, Maciej Badowski and Angelika Ploeger	113
Chapter 7	**Production and Distribution of Organic Foods: Assessing the Added Values** Leila Hamzaoui-Essoussi and Mehdi Zahaf	142

Section 3 Alternative Feed 164

Chapter 8 **The Use of Cactus as Forage for Dairy Cows in Semi-Arid Regions of Brazil** 166
Marcelo de Andrade Ferreira, Safira Valença Bispo, Rubem Ramos Rocha Filho, Stela Antas Urbano and Cleber Thiago Ferreira Costa

Permissions

List of Contributors

Section 1

Organic Farming

Chapter 1

Organic Cereal Seed Quality and Production

Ivana Capouchová, Petr Konvalina, Zdeněk Stehno,
Evženie Prokinová, Dagmar Janovská,
Hana Honsová, Ladislav Bláha and Martin Káš

Additional information is available at the end of the chapter

1. Introduction

At least 1.8 million hectares of main cereal species are under organic management (including in-conversion areas). As some of the world's large cereal producers (such as India, China and the Russian Federation) did not provide land use details, it can be assumed that the area is larger than shown here [1]. Comparing this figure with FAO's figure for the world's harvested cereal area of 384 million hectares [2], 0.5 percent of the total cereal area is under organic management.

Wheat (*Triticum* L.) in general and bread wheat (*Triticum aestivum* L.) in particular, is the most frequent crop in organic farming, the same as in conventional farming. It is grown on a total area of more than 700 000 ha [1]. Bread wheat is the most important crop in the Czech Republic as well. In 2010, it represented almost 25 % of the organic farming land [3]. An organically grown bread wheat provides a low yield rate (3.26 $t.ha^{-1}$) [3]. As for the conventional farming, the yield rate amounts to 5.24 $t.ha^{-1}$ [4]. The organically grown bread wheat yield rate achieves 62 % of the conventionally grown bread wheat. Foreign literary sources often mention the organically grown bread wheat achieving up to 80 % of the yield rate provided by the conventionally grown bread wheat [5].

Oat is one of the most suitable cereal species for organic farming [6]. As it has low requirements on growing conditions, it is a suitable crop for organic farming in Central Europe [7]. There is a relatively wide range of use of oat. Naked oat is a suitable food crop [8]. Common oat is mostly used as a fodder crop [9]. It is the second most frequent crop (just after bread wheat) in the Czech organic farming system. The common oat growing area represents 5,000 hectares and its average yield rate represents 2.5 t/ha [3].

The paragraph above indicates a lower productivity of the organically grown cereal crop stands. A deficiency of certified organic seeds and a serious necessity of an application of own farm saved seed are the factors that might provoke it. For this reason, a question of quality in various provenances of seed is to be answered in this chapter.

2. Legislation of use of seed in organic farming

The Council Regulation (EC) No. 834/2007 of the 28th of June 2007, and the Commission Regulation (EC) No. 889/2008, of the 5th of September 2008, are the most important European legislative instructions addressing organic farming, and are binding for all member states of the European Union. They lay down the law to solely use organic seeds in order to establish organic crop stands. The seed must originate from plants being grown in compliance with the organic farming rules for at least one generation. Seed multiplication is an extremely difficult process. The reproduction crop stand and seed must meet the requirements of the seed certification and authorization procedure as conventional plants and seed do, but organic farming does not allow the use of any pesticides or mineral nitrogenous fertilizers, etc. Organic farmers may use certified organic seeds or farm seed in order to establish the crop stand. They may also apply for an exception (derogation) and use the conventional untreated seed.

2.1. Farm saved seed use

Use of the farm seeds (the seeds produced at a own organic farm) is allowed and any obligatory application for authorization is not required. A farmer should, however, take into account that repeated application of the farm seeds may have a negative effect on the yield rate and health of the crop stand. If the farm seeds of a registered variety are used, a farmer must pay fees to the owner of the breeding rights. Such fees are lower than the standard price for the license (it is even included in the price for the certified organic seeds). The fees (which are usually obligatory but reasonable) for the application of the farm seeds and potato seedlings are not obligatory for small farmers. Moreover, each member state of the European Union has regularized the amount of the fees with legislative regulations.

2.2. Conventional seed use

If there are not any organic seeds available, or left from the previous farming years, seeds coming from the conventional crop stands are allowed. Anyway, the seed needn't be treated with any plant treatment, which are not allowed by the organic farming regulation. An application for an exception to be made,regarding the use of the conventional seeds within the organic farming system, is considered and granted by a public authority (it is usually an accredited organisational unit of the Czech Ministry of Agriculture). The total amount of exceptions tends to be limited, but there is a deficiency of the organic seeds available on the market.

2.3. Information on the availability of the certified organic seeds

Each member state of the European Union is obliged to set up „a database of organic seeds" (Database). A producer or a supplier of the organic seeds is obliged to insert all the varieties into the Database (the variety missing in the Database is considered as an unavailable variety). Before registering the variety (i. e. inserting it into the Database), the farmer has to provide proof at a review he was put under. The control system must comply with the regulations of the European Union. Moreover, the farmer must prove his seeds meet all the legislative requirements for reproductive material. Data inserted into the Database are regularly updated. There is a list of the obligatory items: the scientific name of the species and variety, the supplier's name and contact, the country which the variety has been registered in, the date the seeds have been available from, the amount of seeds, the name and number code of the control institution which has executed the least control and has issued the certificate on the organic seeds and potato seedlings. If the variety is missing in the official Database, an exception can be granted and the conventional seeds are allowed to be applied. Each member state of the European Union has set up its own database. There is a list of the certified organic seeds databases available in EU member states (Table 1).

3. Production of cereal seeds - An example from the Czech Republic

An increasing number of existing organic farms indicates that certified organic farming has been becoming more and more attractive. The number of Czech organic farms amounts to 3,920 and the organic farms cover a total area of 482,927 ha which represents 11.40 % of the whole agricultural land area [4]. Arable land, nevertheless, covers only 12.27 % of the total area (it means 59,281 ha). The above-mentioned data reflect an unsuitable structure of the organic farming. It has arisen from the previous setting of subventional instruments but also the fact that the arable land farming has always been very difficult and required specific knowledge.

The total area of land where the organic cereals are grown amounts to almost 30,000 ha. Bread wheat is the most frequent cereal species grown in accordance with the organic farming principles in the Czech Republic. In 2010, it covered 8,872 ha of the organic land and represented 22 % of all the organically grown cereal species in the Czech Republic [4]. Although it belongs to the most demanding cereal species, it is able to provide an even higher yield rate than the other organically grown cereal species (e. g. bread wheat – 3.26 $t.ha^{-1}$, spelt wheat – 2.91 $t.ha^{-1}$, rye – 2.82 $t.ha^{-1}$, barley – 2.82 $t.ha^{-1}$, oat – 2.54 $t.ha^{-1}$, triticale – 2.95 $t.ha^{-1}$; all the above-mentioned yield rate values were measured in 2010).

3.1. Supply of organic seeds in the Czech Republic

Data concerning the structure of multiplication crop stands, certified seed and the range of seed at the market, were obtained from the Department of seed and planting materials of the Central Institute for Supervising and Testing in Agriculture and the Ministry of Agriculture of the Czech Republic.

Country	Link
Austria	http://www.ages.at
Belgium	http://www.organicxseeds.com
Bulgaria	http://www.organicxseeds.com
Cyprus	http://www.moa.gov.cy
Czech Republic	http://www.ukzuz.cz
Denmark	http://planteapp.dlbr.dk
Estonia	http://www.plant.agri.ee
Finland	http://www.evira.fi
France	http://www.semences-biologiques.org
Germany	http://www.organicxseeds.com
Greece	http://www.minagric.gr
Hungary	http://www.nebih.gov.hu
Ireland	http://www.organicseeds.agriculture.gov.ie
Italy	http://www.ense.it
Latvia	http://www.vaad.gov.lv
Luxembourg	http://www.organicxseeds.com
Netherlands	http://www.biodatabase.nl
Poland	http://ec.europa.eu/agriculture/organic
Portugal	http://www.dgadr.pt
Slovak Republic	http://www.uksup.sk
Slovenia	http://www.arhiv.mkgp.gov.si
Spain	http://www.magrama.gob.es
Sweden	http://www.jordbruksverket.se
United Kingdom	http://www.organicxseeds.com

Table 1. Database of the certified organic seeds registered in each member state of the European Union (data updated within 1st July 2012)

Between 2008/09 and 2010/11 there was a gradual increase in the land area used for organic cereal seed production. Nevertheless, they represented 1.5 % (349 ha) of the total organic land area in 2009 in the Czech Republic. Regarding the average model seeding rate of 220 $kg.ha^{-1}$, we would need 5,008 t of seed to plant the entire area of cereals in a particular year. In 2009, the average grain yield of organic cereals in the Czech Republic represented 2.94 $t.ha^{-1}$[10]. It means we would need a multiplication area of 1,703 ha providing that 100% of the seed were certified as organic seed. In 2009, seed were reproduced on 20.5% of the required land area. It is unrealistic that 100% of grown seed will

be certified as organic. A comparison between the allowed multiplication land surface and amounts of allowed winter wheat seed shows that the major part of harvested seed have not been certified as organic seed in 2009 (Table 2). In the same year, 90.95 t of the winter wheat seed were certified as organic. However, this winter wheat was grown on 125 ha of land. It means that the major part of the harvested material did not meet the requirements of the seed certification procedure (same as the major part of the other cereal species). The range of the reproduced organic cereal species is very narrow. The growing of the suitable varieties on the local farm land and under local climatic conditions is strongly limited, because of limited organic seed availability.

Since 2009, organic farmers have asked for permit to use a lot of conventional untreated seed. In 2009, 398 exceptions for 1,664 t of seed were granted (Table 3). Except for the certified organic seed (Table 2) and conventional untreated seed (Table 3), the organic farmers also used their own (saved) seed in order to establish the crop stands. There is not enough information on the applied amount of farm saved seed. Therefore, the following model amount of seeds was used for 2009: amount of certified organic seed = 281 t/seeding rate of 0.22 $t.ha^{-1}$ = 1,277 ha of the seeded surface; amount of conventional untreated seed = 1,664 t/seeding rate of 0.22 $t.ha^{-1}$ = 7,564 ha of the sown surface. The area of grown cereals represented 22,762 ha - 1,227 ha - 7,564 ha = 13,971 ha where the farm saved seed were used. The share of each seed type is presented in Figure 1.

Species	2008-2009				2009-2010				2010-2011[2]	
	Seed production		Certified seed		Seed production		Certified seed		Seed production	
	NV[1]	ha	NV	t	NV	ha	NV	t	NV	ha
Winter wheat	5	72	4	73	7	125	5	91	4	102
Spring wheat	1	13	1	23	-	-	-	-	1	15
Spelt	2	66	2	159	2	89	2	79	3	143
Spring barley	2	21	1	21	2	26	-		3	20
Triticale	-	-	-	-	1	18	1	8	2	45
Winter rye	-	-	-	-	1	8	1	8	2	37
Naked oat	2	28	2	23	2	34	2	28	1	15
Oat	2	27	-	-	2	50	2	40	2	44
Total	14	**227**	**10**	**299**	**17**	**349**	**13**	**254**	**18**	**422**

Remark: [1]NV = number of varieties; [2]no seed certified

Table 2. Seed production and certified seed offered in the Czech Republic

The use of organic seed becomes more important in many European countries thanks to the legislative measures and increasing demand for the organic products [11]. It is, nevertheless, one of the most developing parts of organic agriculture [12]. However, the total supply of

organic seed is still quite low. The high proportion of common farm seed coming from repeated seeding contributes to a reduction of the yield rate of the crop stands [13]. The seed certification process is very demanding, as the organic seed undergo the review of the Central Institute for Supervising and Testing in Agriculture of organic farming [14], but organic farming regulations do not allow the use of any pesticides, etc. [15].

Species	2009		2010	
	Number of exceptions	Seed (t)	Number of exceptions	Seed (t)
Bread wheat	66	271	112	515
Spelt	5	78	9	8
Barley	47	129	77	319
Triticale	86	651	76	455
Rye	23	12	20	42
Oat	161	523	174	444
Total	398	1664	468	1783

Table 3. Exceptions for conventional untreated seed use in the Czech Republic

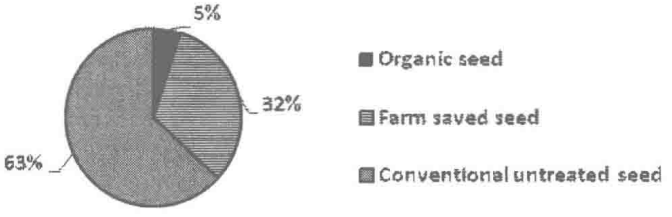

Figure 1. Seed use in organic farming in the Czech Republic (2009) (%)

3.2. Preference and expectations of the Czech organic farmers related to seeds

A questionnaire survey was carried out between 2009 and 2010; 329 questionnaires were sent to organic farmers working on arable land, of which 42% were sent back. The farmers were asked to answer nine questions. The questionnaires were converted into electronic versions and assessed by the contingency tables in the Excel program.

A further part of the questionnaire aimed to find out how organic farmers find and gather information on seeds. The main information resources are as follow: the internet, consultancy, from the Association of Organic Farmers and seed companies. The official database of the certified organic seed (http://www.ukzuz.cz/Folders/2295-1-Ekologicke+osivo.aspx) is also frequently used by the organic farmers (Table 4). The obligation to document the absence