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Deliverable 5.2: Report on quality characteristics of varieties to be used in organic farming

C. Micheloni (AIAB) and G.Plakolm (HBLFA)
with contribution from
L. C.Deleuran (DARCOF), R. Roviglioni and Alessia Cannavacciuolo (AIAB), E. Lammerts van Bueren (LBI) and E. Fromm (HBLFA)

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Foreword

This report contains the work carried out in the EU-funded project “EEC 2092/91 (organic) Revision” (No. SSPE-CT-2004-502397), Work Package 5, Task 5.2, which deals with the “quality characteristics of varieties to be used in organic farming”.

The main objective of this task has been to identify key characteristics, which varieties should offer in order to fulfil organic production demands from agronomic and market perspectives, verifying if they differ from parameters commonly considered in conventional variety evaluation.

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Executive Summary

The key questions which will be addressed in this report are:

- Which variety characteristics are important for organic farming and are they different from conventional farmers demand?
- What is an “appropriate“ variety for organic farming?
- Is the actual variety offer available to organic farmers satisfactory? Is it different per crops type and/or per geographic area?
- How should variety trials be conducted in order to supply the information needed by organic operators?

The main answers may be synthesized as follows:

Characteristics of varieties to be used in organic farming are partly different from the ones requested in conventional farming. Main differences are related to yield stability, processing properties and root-system development;

The definition of “appropriateness”, related to variety for organic farming, is not easy to state as it may involves different aspects, depending on perspective (producers, processor, trader etc.). A list of characters that should be considered within the “appropriateness” concept is presented in the report;

Among involved Members States experts there is no common evaluation of the actual variety availability: in general if for cereals there is a reasonably good level of availability, for vegetables and fodder crops mixtures the situation is never very positive even if it varies greatly among Member States;

Valuable guidelines for cereal variety testing in organic farming have been produced by the COST 860 action “SUSVAR” (Sustainable low-input cereal production: required variety characteristics and crop diversity) and they are summarized in the report;

Guidelines for vegetable variety testing are difficult to identify as among vegetables species the characteristics and requirements are very different. In the report some indications are reported.

Recommendation for variety evaluation and testing in organic farming

Several recommendation result from the report. For clarity sake they have been grouped in 3 parts, depending on which institution they are aimed to:

Recommendations to EU and international authorities:

- To implement the possibility offered by EU directives on seed trading (EEC Dir. 66/402¹; EEC Dir. 66/401² and EC Dir. 2002/55³) to run controls on seeds for organic farming additional to the routine controls. This possibility may be used to evaluate variety appropriateness to organic farming conditions and consequently orientate the choice of varieties that seed companies offer to the organic sector.
- To consider specific variety traits requested by organic farming systems in the test for variety inclusion into the registers of varieties.

Recommendations to Member States:

¹ Council Directive 66/402/EEC of 14 June 1966 on the marketing of cereal seed. (Official Journal 125 , 11/07/1966 P. 2309 – 2319)

² Council Directive 66/401/EEC of 14 June 1966 on the marketing of fodder plant seed (OJ 125, 11.7.1966, p. 2298–2308)

³ Council Directive 2002/55/EC of 13 June 2002 on the marketing of vegetable seed (OJ L 193, 20.7.2002, p. 33–59)

- To keep record of the variety requested for derogation and make it public. It may be a useful instrument for seed producers' orientation.
- To include specific local (National/Regional) demands from organic farmers in the variety trials. It means to include varieties that are supposed as fit to organic conditions by farmers but also to include specific characteristics in the evaluation criteria.
- To promote public breeding for organic farming and to support spin-off of seed companies dedicated to organic seed production. A low-cost option may be participatory breeding that combines the advantages of introducing variety traits asked for by organic producers and facilitate dissemination.

Recommendations to other stakeholders:

- To involve nurseries in the debate about organic variety choice as they result to be an important bottle-neck for the use of organic seeds in vegetable production.
- To promote timely programming of variety used and amounts of seed needed among producers in order to facilitate seed producers and distributors but at the same time to grand producers the right variety choice.

1 Scope of the report

The overall objective of project Work-Package 5 is to evaluate the degree of dependence of organic farming from conventional seeds and to identify main obstacles in the use of seeds from organic sources at EU level. Final recommendations will be developed to support the EU Commission in the further development of tools, aimed at facilitating and harmonizing the use of organic seeds.

Within the general scope of the Work-package, the objectives of task 5.2 are:

- to identify the characteristics that varieties of cereals, vegetables, fodder crops etc. are important for a good performance in organic farming and processing;
- to analyse variety test run in several Member States in order to evaluate if the methodology used is appropriate for the needs of organic farming;
- to analyse the degree of appropriateness of actual organic variety availability in Member States.

2 Methodology and sources of information

In order to address the research objective, information has been gathered through:

- a literature review performed in 2005 and up-dated in 2007, on variety testing for organic farming and used quality characteristics parameters;
- a series of in-depth interviews to stakeholders and experts in organic seed (seed producers, seed users, such as farmers and advisor, and inspection bodies);
- review of EU and international regulations on seed trading and definition of plant variety;

Details on each source of information are reported below.

2.1 Literature review

A literature review was performed, concerning variety trials in organic farming and criteria used for their evaluation. It includes papers on cereal, vegetables and fodder mixtures. It has been conducted in 2005 and up-dated in February 2007. The outcome is a list of publications, characterized according to the subjects:

- variety trials
- definition of quality parameters in organic seed production.

Each paper was classified and its contents summarized in tables (Please see Annex 1 for the complete review).

2.2 In-depth interviews

On the basis of a commonly developed guideline (see Annex 2) 14 interviews were conducted in Austria, The Netherlands, Denmark and Italy. The countries were selected in order to be representative of the 3 EU climatic zones (Northern Countries, Central Europe and Southern Europe). They are as well countries with different rate of organic seed use (see D 5.3) and with different agricultural productions.

The topics dealt with during the interviews were:

- variety characteristics to be considered for organic farming use;
- evaluation of actual variety offer in organic farming;
- personal evaluation of the National annual derogation report;

- evaluation of derogation reasons;
- proposals for future activities on the issue of variety availability in organic farming.

Originally the selection of experts to be interviewed focussed merely on researchers but it clearly appeared that it was not adding important further information that were already collected through the literature review. It then appeared useful to involve as well other expertises resulting with a large group of interviewed as summarized in table 2.1

Table 2.1 Description of the sample of experts interviewed on variety characteristics for organic farming and

Category	Number of experts	Field of experience
Organic seed producers	2	1 cereals and 1 vegetables
Organic seed multiplier	1	vegetables
Advisors	6	2 vegetables, 1 bio-dynamic and 3 cereals and other arable crops
Farmers	3	2 cereals and 1 vegetables
Organic cereal processor	1	cereals
Certification body	1	generalist

The information gathered from the questionnaires was elaborated as qualitative data.

2.3 Review of regulations on seed trading and definition of plant variety

To evaluate the legal definition of seed “quality” and to determine which characteristics requested in organic production are not therewith included a review of EU legislation concerning seed trading, seed quality definition and variety definition was conducted.

Following EU Regulatory documents were studied:

- Directive 66/401/EEC on trading of grass seeds.
- Directive 66/402/ EEC on cereal seeds trading.
- Directive 70/457/ EEC on seed trading within the EU.
- Directive 2002/53/ EEC on common catalogue of varieties of agricultural species.
- Directive 2002/54/EC on sugar-beet seeds trading.
- Directive 2002/55/ EC on vegetables seeds trading modified by Dir. 2006/124 CEEC.
- Directive 2002/56/ EC on seed potatos trading.
- Directive 2002/57/ EC on oleic and proteic plants seeds trading.

Besides the International frame developed by UPOV (International Union for the Protection of New Varieties of Plants) was analysed.

3 Results

Results and outcomes are reported in the following four sections:

- 3.1 **Definition of “conventional” variety characteristics** based on legislative definition the frame of conventional variety characterization is described;
- 3.2 **Identification of specific variety traits to be evaluated for organic farming appropriateness**, based on the literature review and in-depth interviews the list of “extra” parameters that are identified as important for organic farming in the evaluation of varieties is developed;
- 3.3 **Analysis of actual variety tests and experiences with organic variety test**, based on literature survey analysis of actual experiences in Member States are commented and recommendation developed;
- 3.4 **Evaluation of actual available range of variety in organic assortment**, based on in-depth interviews an evaluation of the varieties actually available as organic seed is drawn.

3.1 Definition of “conventional” variety characteristics

Definition of variety traits and characteristics is done Internationally by **The International Union for the Protection of New Varieties of Plants (UPOV)** that is an intergovernmental organization established by the International Convention for the Protection of New Varieties of Plants. The Convention was adopted in Paris in 1961 and it was revised in 1972, 1978 and 1991. The objective of the Convention is the protection of new varieties of plants by an intellectual property right. Practically it was developed as a tool for protection of intellectual rights of breeders.

Within this frame the EU developed its own set of regulations through the **The Community Plant Variety Office (CPVO)** that implements and applies the EU scheme. The CPVO has been operating since 1992, is a decentralised Community agency and is self-financing, mainly on the basis of the fees paid by breeders.

All Directives for seed trading within the EU (for cereals, fodder crops, vegetables etc.) report the possibility (for example in art. 43 of EU Dir.2002/55) for the Community to run specific trials and analysis on seeds “appropriate for organic farming”. This possibility have never been defined and implemented and it is even difficult to understand why seeds for organic farming are assimilated to seeds from third countries and seeds for *in situ* conservation of varieties.

Nevertheless it could be a possibility for evaluating real appropriateness of traded seeds to organic conditions.

Besides EU Dir. 2002/53 defines the rules administering a common EU variety catalogue based on the national ones. Only varieties listed on such catalogue may be traded within the EU.

A new variety may enter the register only if it proves its distinctness, stability and uniformity (evaluated through DUS tests). Besides it must demonstrate an acceptable value for cultivation and use (VCU). Protocols for DUS test are defined per species and each protocol may be downloaded from www.cpvo.eu.int .

All variety trials are using VCU parameters in the evaluation of varieties and based on the results of their performance on VCU a variety is accepted and maintained on the registers.

3.1.1 Conventional VCU vs organic VCU

What establishes the possibility for a variety to be traded and used within EU is its performance at VCU test. Those tests are run in conventional systems and evaluate production attitude and

processing (where applicable) attitude of the product. For a new variety to be accepted its characteristics should be higher than previously registered varieties.

In such test no attention is paid to variety traits that may result useful in organic agriculture. Vice versa there is the risk to exclude variety not highly performing under conventional conditions but that may perform better in organic context.

In last years several EU initiatives and projects tried to develop VCU schemes for organic (and low input) agriculture: Eco-PB (Ecological Plant Breeding) and COST 860 SUSVAR (Sustainable low-input cereal production: required varietal characteristics and crop diversity) are the main ones.

At Member State level in The Netherlands (since 2000 at experimental level), in Austria (since 1987) and in Latvia (since 2004) specific VCU test for organic farming are used, in Denmark and Sweden organic VCUs are still at experimental stage and in Switzerland parallel conventional and organic VCU test were run on wheat from 2002 to 2004 but some results suggest that in general no differences can be found in the variety performance in the two cultivation systems. The SUSVAR consortium reaches different conclusions and attests the need for variety trials to be conducted in organic contexts in order to allow complete evaluation of traits important for organic systems, for example resistance to harrowing, that is an element of weed competitiveness ability.

3.2 Identification of specific variety traits to be evaluated for organic farming appropriateness

From in-depth interviews a qualitative evaluation of experts demand has been elaborated and the following list represents what was expressed by the experts in descending order of importance:

- rapid and efficient root system development that allow to optimize nutrients up-take;
- resistance or tolerance to pest and diseases. On this issue the opinions are different and several experts suggested preference to tolerance instead of resistance as easier to find and more long-lasting than resistance;
- weed competitiveness;
- final product quality (different specifications for each species).

It copes almost perfectly with data found in literature, where main criteria proposed for organic VCU are:

- weed competitiveness and suppression ability
- nitrogen use efficiency
- yield stability
- tolerance to drought.

How to evaluate at field level mentioned characteristics has been suggested by several authors. For example Lammerts van Bueren (2002) suggest to implement plant traits evaluation in wheat through:

- recovery from mechanical harrowing
- tillering
- speed of closing the crop
- canopy density
- canopy habit
- green index
- distance of ear-flag leaf
- compactness of the ear
- resistance to sprouting
- mould presence on the ear.

While in the evaluation for use of wheat variety the same author suggest to include whole wheat bread (with no addition of improvers) production.

Similarly DEFRA (Department for Environment, Food and Rural Affairs in UK) suggest as „extra“ VCU characteristics for organic cereals varieties:

- growth habit and weed suppression capacity
- early vigour
- long straw
- tolerance to weeds
- suitability for late Autumn sowing.

Other authors (see Appendix 1 for complete list) worked out similar criteria for cereal evaluation that have been detailed compiled with in the COST 860-SUSVAR outcome, specifically in the Handbook for cereal variety testing for organic and low input agriculture. The handbook (that will be completed and up-dated in the last months of 2007) gives guidelines on all parts of variety trials work: from trial set up and statistical analysis to detailed parameters for evaluation of characteristics with the explanation about why those parameters have been selected.

Here below, as an example, the variety traits that SUSVAR consortium identified as important for “appropriateness” definition in cereals are summarized:

- weed competitiveness: is defined as a combination of plant physiology traits, allelopathic properties and harrowing resistance;
- disease resistance/tolerance assessed with different frequency and timing compared to conventional assessment systems;
- resistance to lodging;
- nutrient use efficiency (particularly N);
- processing quality (considering wholemeal characteristics and not only white flour).

Few indications from literature are found on vegetable species evaluation (Lindner et al. 2006). Interviewed stakeholders with experience in vegetable production indicate highly specific demands per species but in general agree on the need for:

- efficient root system development
- resistance/tolerance to main seed and soil-borne diseases
- quality of final product.

3.3 Analysis of actual variety tests and experiences with organic variety tests

None of the experts interviewed have direct experience with variety testing but in literature it appears clearly that in almost all Member States several public variety test were and still are run in the last decade. Normally the evaluation of varieties is done using the same parameters as for conventional ones with addition of few traits in the case of cereals but rarely for vegetables (except for resistance to pathogens in some cases).

In general the traits that are suggested to be taken into consideration for cereals are the same suggested as „extra“ for the VCU tests.

It is also to be considered how and where to run the organic variety trials. From several authors it is suggested to run those trials on sites managed organically from at least 3 years, using non-treated seed and managing the crop according to EU reg. 2092/91.

3.4 Evaluation of actual range of variety available in organic assortment

The opinion of interviewed experts reports very different situations in the Member States and among crop groups. In general the available range of variety offered in organic for cereals is evaluated from positive to very positive, while quite negative evaluation is given on grass seed mixtures, that seem very difficult to produce organically. Concerning vegetables the availability of main crops such as carrot, potato, onion and lettuce is evaluated as good, while for other species it seems very difficult to get satisfactory levels. Another problematic area is cover and catch crops whose seed availability in organic assortment appears extremely reduced.

For all crops a general concern was expressed for “extreme environmental conditions” where the variety choice is very limited and often not offered in organic. Many experts expressed as well the wish to consider new varieties as soon as they are available (and of course they are available in conventional first) at least in the variety tests.

When asked which other factors are negatively affecting the use of organic seeds the experts reported, in descending order of importance:

- availability at local level;
- large packaging not usable by small farmers;
- missing commitment of nurseries that, for vegetables, are the interface with seed producers instead of the farmers, and heavily orientate variety choice;
- specific market demands.

4 Conclusions

In the registration of new varieties and in the variety trials there is a need to introduce extra parameters that allows to evaluate if the variety is appropriate/valuable for use in organic farming and processing. As a consequence there is a need to introduce those extra parameters in VCU official tests and in variety evaluations. Even if debated among different authors it appears very useful to run the VCU test in parallel under organic and conventional conditions.

Parameters for evaluation of organic “extra” traits have been identified by several authors in cereals but are still not identified for vegetables, where at present major attention is given to pest and disease resistance and sensorial quality but the parameters for field evaluation are very different from species to species.

5. Recommendations

Several recommendations may be extrapolated and for clarity sake they have been grouped in 3 parts, depending on which institution they are aimed at:

Recommendations to EU and international authorities:

- To implement the possibility offered by EU directives on seed trading (EEC Dir 66/402; EEC Dir 66/401 and EC Dir. 2002/55) to run controls on seeds for organic farming additional to the routine controls. This possibility may be used to evaluate variety appropriateness to organic farming conditions and consequently orientate the choice of varieties that seed companies offer to the organic sector.
- To consider specific variety traits requested by organic farming systems in the test for variety inclusion into the registers of varieties.

Recommendations to Member States:

- To keep record of the variety requested for derogation and make it public. It may be a useful instrument for seed producers' orientation.
- To include specific local (National/Regional) demands from organic farmers in the variety trials. It means to include varieties that are supposed as fit to organic conditions by farmers but also to include specific characteristics in the evaluation criteria.
- To promote public breeding for organic farming and to support spin-off of seed companies dedicated to organic seed production. A low-cost option may be participatory breeding that combines the advantages of introducing variety traits asked for by organic producers and facilitate dissemination.

Recommendation to other stakeholders:

- To involve nurseries in the debate about organic variety choice as they result to be an important bottle-neck for the use of organic seeds in vegetable production.
- To promote timely programming of variety used and amounts of seed needed among producers in order to facilitate seed producers and distributors but at the same time to grand producers the right variety choice.

APPENDIX I: Literature survey outcome

Retrieved papers on the issue of variety trials characteristics in organic farming are reported below.

crop	Characteristics evaluated	paper	notes
wheat	All VCU	Baresel et al., 2006	Global evaluation of variety trials
Mainly cereals	overview	Belica et al., 2005	Collection of national and international research activities of variety trials and legal constrains
all	DUS test	Bonneuil, 2006	Critical review of DUS
all	OECD procedures	Debois, 2004	
cereals	All "extra" characteristics	Donner et al., 2006	Detailed review of variety trials for organic cereals
cereals	Agronomic and product quality	EFRC, 2004	
Oat and potato	Processing quality + Late blight resistance	Gaile, 2004	
Winter wheat		Kleijer et al., 2006a	Comparison of variety trials results in low input and organic systems for baking quality.
Winter wheat		Kleijer et al., 2006b	Comparison of variety trials results in low input and organic systems for agronomic performance.
Winter and spring faba-bean		Ghaouti et al. 2006	Participatory method for wide and decentralized genotypes evaluation.
all		Lammerts van Bueren et al., 2006	Overview of seed issue on organic farming with ethical considerations.
vegetables	Detailed (per species) guidelines for vegetables evaluation	Linder et al., 2006	
cereals	VCU	Schwaerzel et al., 2006	Comparison of variety trials results in extensive and organic systems for VCU.

Retrieved papers on the issue of definition of quality parameters in organic seed production are reported below.

crop	Quality parameters	paper	notes
cereals	Environment and consumers demand adaptation capacity	and Ceccarelli, 2005	
cereals	Adaptation capacity	Ceccarelli, 2006	
potato	Evaluation of Genotype x Environment interaction	Ellisseche et al., 2004	Result of different location of trials and different genotypes and seed production methods
luzerne	Weed competitiveness, pest and diseases resistance	Falcinelli et al., 2004	
cereals	Agronomic and final quality criteria	Larson, 2006	Old varieties for quality improvement
onion	Environmental farming adaptation	and Tiemens-Hulscher et al., 2006	et Evaluation of agronomic performance.

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Appendix II: guidelines for in-depth interviews

	WP 5: Dependence on organic seeds and multiplication materials
	Grid for in-depth interviews

Grid for in-depth interviews

scope of the interviews:

- a) to identify key quality characteristics for organic seeds;
- b) to have a feed-back on the derogation regime how applied in concerned Member States.

The seed health issue has already been covered by the questionnaire and the bibliographic survey, so it is not so important with the interview to focus on specific health problems.

who to run the interview: at least **2** persons per MS (if more ... better) 1 from the seed producers side and 1 from the seed users side (could be a farmer or a consultant, in case you interview more than a persons choose 1 related to cereal production and 1 to vegetable production). Better to choose persons not involved already with the questionnaire.

How to conduct the interviews: best option is to fix an appointment and run the interview "live". Second option, in case the first one is not possible, is to run the interview by phone after having sent by e-mail the questions and an extract of the derogation system on the specific Member State. Not advisable to have the questions answered by e-mail only. The interview may take about 45 minutes.

Questions

please use the questions as starting points or as a „tool“ for reaching the scope of the interview. Do not bind the conversation exclusively to them. Before the interview please show/send the interviewed an extract of the derogation report issued from your competent authority with highlighted the main „reasons for derogation“ and a rough evaluation of the amount of seed the derogations consist of.

1. Please list 5 characteristics (concerning health status, variety typology, agronomic performances.....) you evaluate as „very important“ in the seeds for organic farming.
2. Which of those characteristics do you find with a certain degree of easyness in organic seeds? In which crops?
3. Which of those characteristics do you not find in organic seeds? In which crops?
4. Out of the characteristics you listed (as found or not found) which ones have higher impact on the final production performance and may be not counterbalanced (or have difficulties in being counterbalanced) by agronomic measures during the growing phase of the crop?
5. Please choose 3 crops you are more familiar with. Are you satisfied by the variety choice offered in organic? If not, please specify what do you miss in terms of characteristics.

6. Looking at your national derogation report (from 2004 or 2005 if available): do you think reported data give the correct figure of the situation? If not why?
7. Do you have an explanation for main derogations granted (interviewer may choose the species where more derogations have been accepted)?
8. What do you think could be an improvement of the situation in the short term (5 years) and in the long run (20 years)? *Note for the interviewer: Please note that "improvement" may be not only increase of organic seed use but also a different regulation.*

Few data on the interviewed:

Describe the expertises of the person you interviewed and her/his specific task.

<i>Surname:</i>	<i>First name:</i>
<i>Institution:</i>	
<i>Activity (researcher, consultant, seed producer, farmer.....):</i>	
<i>Address:</i>	
<i>E-mail:</i>	
<i>Special expertise in this area:</i>	