Results of an Organic Market and Stakeholder Survey about methods in processing of organic food

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ProOrg – Results of an Organic Market and Stakeholder Survey about methods in processing of organic food

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A ProOrg Report

Code of Practice for Organic Food Processing (ProOrg)

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CORE Organic is the acronym for "Coordination of European Transnational Research in Organic Food and Farming Systems". As an ERA-NET action, it intends to increase cooperation between national research activities. CORE Organic Cofund is the continuation of the ERA-Nets CORE Organic I, II and Plus. The CORE Organic Cofund consortium consists of 25 partners from 19 countries.

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Summary

The market for organic food is currently growing rapidly and reached 112 billion US dollars in 2019 (Willer, 2021). A large part of the organic food consumed is processed. This is a consequence of the increasing urbanization of lifestyles, as a result of which demand is rising for processed organic products that are easy to transport and store or are in demand as "ready to eat" (van den Berg, 2018).

So far, processing-related features of organic food production have been rather neglected in the public discussion and standard setting in Europe, with few exceptions. For instance, in Switzerland, the private label organisation Bio Suisse, in particular, goes far beyond the requirements of State Organic Regulations in its processing guidelines.

Nevertheless, binding standards or recommendations specifically for organic food processing in Europe are lacking today.

There are manifold food processing technologies ranging from traditional technologies such as sun or oven drying to highly specialized ones that can only take place in a professional setting, such as high pressure pasteurization (HPP). The range of possible processing technologies depends also on the product characteristics and therefore on the product type.

The European ProOrg project, therefore, strives to support organic food processors in finding answers about the best choice for so called gentle processing methods and to get a better understanding how to interpret the term of “gentle food processing” in suitable methods for organic food processing. In order to provide processors with suitable strategies and tools, a Code of Practice for organic processors is the core of the ProOrg project. It is intended to support processors to select suitable technologies and innovations which are in line with organic principles.

The report provides a contribution to the development of the Code of Practice from a market actors and other stakeholders perspective about the acceptance of relevant methods in organic food processing. Together with the results of different consumer surveys as part of ProOrg it complements the information basis of European organic food processors.

The Organic Market and Stakeholder Survey (OMSS) was conducted as part of the "ProOrg" project in spring 2021. The market actors and stakeholders were surveyed based on a standardized questionnaire and targeted to reach 1’000 business email addresses of organic stakeholders all over Europe with an expected response rate of at least 25%. The questionnaire consisted of 20 questions and covered, among others, the importance of quality aspects in the selection of processing technologies, the acceptance of quality changes in organic food processing, and the acceptance and rejection of potential technologies for organic processing.

A total of 310 stakeholders took part in the online OMSS. Descriptive statistical methods have been used, such as the measure of frequency and the measure of the mean. To compare means or frequencies between the whole sample and the group of participating processors, cross tabulation has been applied.

A central question was whether a Code of Practice (CoP) is welcomed among organic stakeholders including representatives of the organic food processing industry. According to the results of the survey two thirds of all respondents would welcome a CoP for organic food processors.

The food processing method can affect 1) the taste and 2) the nutritional content of the food. It also can have an impact on 3) the environment (e.g. water and energy consumption, CO2 emissions, etc.). Hence, the study authors wanted to gain insights how important the three aspects are in the decision process whether a certain method can be considered as suitable for organic food processing or not.

The results indicate that the relative importance of all quality aspects is high but varies depending on the food categories. In tendency, maintaining a high nutritional value is most important, while the influence on the sensory quality seems to be slightly less important for the choice of a processing technology. The relative importance varies between the tested food categories (food in general, staple foods, convenience foods, luxury foods), with the queried quality aspects being more important for staple foods for daily consumption than for luxury and convenience foods.

Further, respondents were asked to decide whether food still can be considered as "organically processed" if the sensory quality, the mineral content, the nutritional value and the environmental impact have influenced due to the application of a certain food processing method. In general, respondents do not accept a large change in mineral content. In contrast, a change in vitamin content as a result of processing steps seems to be rather accepted by the respondents. Comparing the different product groups, respondents accept a lower degree of change in quality characteristics for staple foods than for luxury foods and convenience foods. In contrast, the kind of product doesn't matter with regard to ecological consequences through the choice of a processing method. To avoid negative ecological impacts of organic food processing seems to be of high importance in the choice of the suitable technology.

Besides, respondents to the survey were asked to indicate how suitable different technologies are with the aim to extend the shelf life of food. The most accepted technologies in the order of acceptance are Drying, Pasteurization, Deep Freezing, Freeze Drying, Microfiltration, High Temperature Pasteurization, Sterilization, Bactofugation, Reverse Osmosis, Ultra-High Temperature Processing (UHT), and High-Pressure Processing (HPP). Cold Plasma Treatment and Irradiation are the least accepted.

For those technologies queried for improving the product use or maintaining the quality attributes, the order of acceptance was as follows: Cutting, Peeling, Washing (fruits, vegetables), Pressing (fruits, vegetables), Fermentation to maintain product quality, and Milling to process grains. Besides, Puffing for processing cereals, the Homogenization of milk, the HPP treatment for milk or fruit juices or the Extruding processes are rather accepted, although less than the previously listed methods. The technology that was by far the least accepted is the use of Microwave Irradiation, e.g. for thawing meat and fish.

It can be concluded, that the type of used technology matters to the organic market actors and stakeholders: A CoP is highly welcomed by the stakeholders, and those technologies, which have only less impact on the quality parameters of food and the environment are clearly preferred, particularly in processing of staple food, such as dairy products or products, based on fruit and vegetable processing, which have been focussed in ProOrg.

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1. Introduction

The organic food market is currently rapidly growing and a major part of the organic food sold and consumed are processed (Willer et al., 2021), although the growth of processed organic food is slower compared to the growth of unprocessed organic food (Van den Berg, 2018).

Hence, the organic food industry needs to adopt and innovate processing methods to keep the pace of increasing requests from the consumer and retailer market.

Previous studies have revealed that processing technologies can have an impact on several dimensions of food quality, including changes in sensory, biochemical, and nutritional properties (Kahl et al. 2014). Nevertheless, the usage of technologies in organic food processing is hardly regulated, apart from few private organic standards.

And less is known about the acceptance of organic market actors and stakeholders in regard to different food processing methods and their influence on food quality attributes.

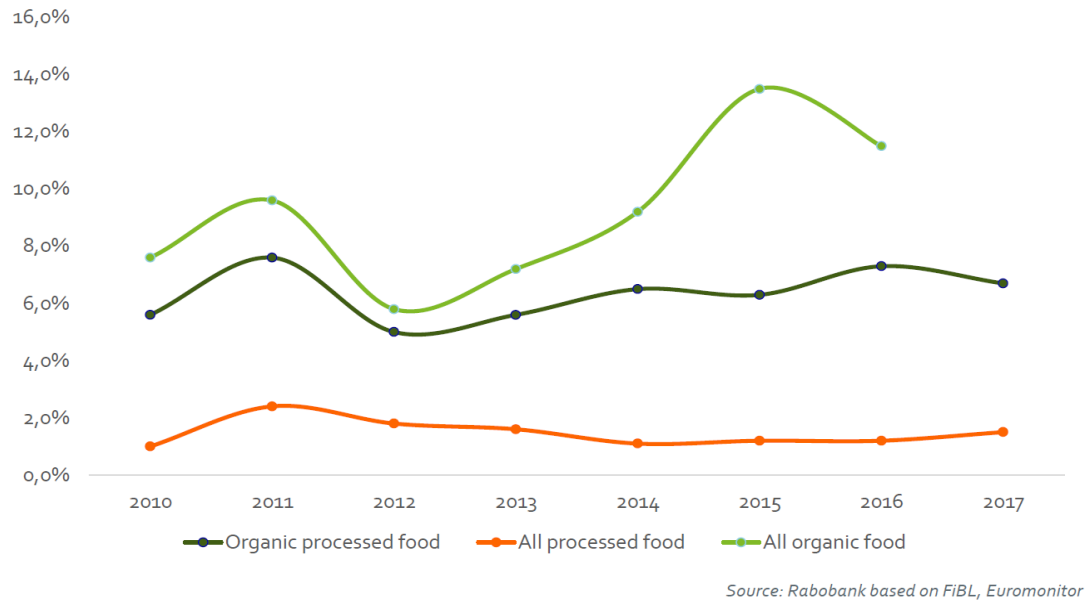

Figure 1: Annual growth rates of organic food, organic processed food and all processed food between 2010 and 2017. Source: Van den Berg, 2018

For that reason an Organic Market and Stakeholder Survey (OMSS) was designed as part of the "ProOrg" project. ProOrg is a "CORE organic" (Coordination of European Transnational Research in Organic Food and Farming Systems) collaboration between 27 partners in 19 countries/regions on initiating transnational research projects in the area of organic food and farming. ProOrg supports organic food processors to make the best choice for careful, minimal, and mild processing methods.

The overall project goal of ProOrg is to develop a set of strategies and tools that can support organic food processors in the selection process of appropriate technologies and innovations, which are in line with the organic principles to choose gentle processing methods which preserve the core quality of the raw materials. To provide this set of strategies and tools a Code of Practice (CoP) shall be developed to provide guidance. A CoP is highly requested as there is a lack of mandatory standards and indications (principles and related criteria) (Kretzschmar and Schmid, 2011). Relevant criteria to assess the

appropriateness of processing technologies are their environmental impact, the sensory quality and nutritional value after a product has been processed (Kahl et al., 2014).

Against this background, the main objective of the OMSS is to gather sound information on the role of different processing technologies and processed food quality categories for the future of the organic market development.

As target groups processors, experts from different scientific disciplines, traders, labelling organizations and other relevant stakeholders, as well as individual companies has been approached and invited to participate in the OMSS.

The results of the OMSS will support the process of developing the CoP. Moreover, the results shall guide processors about the acceptance of the processing technologies for channel listings on retailer level and decisions in the product development made on the food processor level. It is expected that also decisions on the communication strategies of processors how to declare and promote food technologies might be influenced through the main findings of the survey.

The following report addresses the intention and objectives of the OMSS, introduces the questionnaire and present the main findings and conclusions.

2. Objectives and methods

2.1 Objectives of the survey

The empirical research presented in this report is based on previous work conducted in the frame of the ProOrg project. Against the background that ProOrg strives to develop a set of strategies and tools (Code of Practice) that can help organic food processors in the selection of appropriate technologies, the results of the OMSS shall give an overview of the market and stakeholder opinions for making the best choice to identify careful, minimal, and mild processing methods.

The objective of the OMSS is to gather information about the relevance and acceptance of processing technologies to retailers, processors, and other stakeholder groups of the organic sector. By this, the findings of the market surveys will provide major information about the relevance of the processing technologies for channel listings on retailer level and decisions in the product development made on the processor level.

Moreover, it is expected that decisions on the communication strategies of processors will be influenced by the findings of the survey.

Finally, the results also shall support the process to elaborate the CoP through sharing of insights from the market and stakeholder side to better understand how different stakeholder groups and market actors perceive the benefits or threats of certain (new) processing technologies in the organic sector. The OMSS also was aimed at learning about still accepted changes of quality attributes through the used processing methods to still consider specific technologies as in line with the organic principles or not.

It was of particular interest to compare the results between persons who work at processing companies and those who look at the organic food processing sector from a different external perspective.

2.2 Composition of the survey

The market actors and stakeholders were surveyed based on a standardized questionnaire.

The survey was targeted to reach 1'000 business email addresses of organic stakeholders all over Europe with an expected response rate of at least 25% and at least 20 responses from stakeholders of project partner countries.

The questionnaire consisted of 20 questions and was divided in eleven thematic blocks:

- Introductory questions and personal information about the respondents,
- Definition of the term gentle processing,
- Questions related to organic food processing and regulatory issues,
- Questions related to organic food processing and inspection issues,
- Statements about the general risk exposure of the respondents when it comes to use modern technologies in food processing,
- Importance of quality aspects in the assessment of food processing technologies,
- Acceptance of changes in quality properties during organic food processing,
- Acceptance of the (potential) use of technologies for organic food processing,
- Assumed consumer preferences of available technologies for organic food processing,
- Statements about communication / declaration of processing technologies,
- Need of market actors and stakeholders to use a CoP to select appropriate processing method.

A glossary about the processing methods was provided to the respondents to enable them to assess all listed food processing methods in case that respondents were not familiar with all methods.

Apart from examining the suitability of methods for organic food processing at general, the authors also were interested, which processing methods are assumed to be preferred by consumers in regard to those products focused in the ProOrg project:

- dairy products (drink milk),
- processed fruits (fruit juice), and
- processed vegetables (tomato passata, tomato puree).

2.3 Target group of the survey

The main target group of the survey are international organic stakeholders in Europe such as market representatives of processors, retailers, but also representatives of labelling organisations, policy makers, scientists and consultants, who work on the organic food and agricultural sector.
The sampling procedure was directed to reach the listed target groups directly by using the personal networks ProOrg project partners as well as national organic sector associations and IFOAM Organics EU to distribute the invitation plus link to the online survey.

2.4 Survey period

The period of the online survey was from 01 February to 15 April 2021.

2.5 Data compilation

The collected data have been compiled in *LimeSurvey*, later exported to MS Excel for further investigations and data analyses.

2.6 Statistical methods

Descriptive statistical methods have been used, such as the measure of frequency and the measure of the mean. To compare means or frequencies between the whole sample and the group of participating processors, cross tabulation has been applied.

3. Research questions

The definition of research questions serves two purposes: They determine where and what kind of research has to be planned and are essential to structure and guide the analysis of the results.

The research questions are divided according to the thematic blocks of the empirical investigation, which were introduced in chapter 3.2.

1) **Do the market actors and organic stakeholders have the same understanding about the term "gentle processing"?** The authors assume that the respondents have a broad variety of concepts for "gentle processing" in mind, depending on their level of expertise and their professional background.
2) **a) Do participants agree that the use of technologies in organic food processing should be strictly regulated in the EU Organic Regulation?** The authors assume that most participants in the survey would agree that the use of processing technologies should be regulated. On contrary, those respondents belonging to the group of processors of food would rather disagree as a regulation would limit the flexibility of processors to freely decide for a processing method.
   b) Do participants agree that the processing of organic products is sufficiently regulated in the EU Organic Regulations? The authors assume that most respondents would disagree but most participants belonging to **Processor of food** would agree that the processing of organic products is sufficiently regulated in the EU Organic Regulations.
3) **a) Do participants agree that there is no need for any organic inspection for organic processing when state food inspectors would check all relevant organic standards as well?** The authors assume that most participants would negate that question, but most participants belonging to **Processor of food** would agree, that there is no need for any additional inspection by organic certification bodies when state food inspectors would be obliged to integrate organic inspections in their ordinary food safety inspection routines.
   b) Do participants agree that for organic processing units, an inspection rhythm based on the individual risk would be sufficient, rather than regular annual inspections?
   The authors assume that a majority of participants would disagree on integrity reasons while participants belonging to **Processors of food** would agree as less regular inspection intervals would reduce the certification costs.
4) **Do participants agree on the adverse changes of product quality and health characteristics and environmental impact when new food processing technologies would be used?**
   The authors assume that all participants would disagree the following statements of the so called neophobia scale
   a) New food technologies decrease the natural quality of food.
   b) Society should not depend heavily on technologies to solve its food problems.
   c) New food technologies have long-term adverse environmental effects.
   d) New food technologies have long-term adverse health effects.

5) **Are expected product quality changes (such as sensory quality, nutritional value) assessed as important for the selection of a processing method?**
The authors expect that a change in product qualities (e.g. the nutritional value, sensory quality and environmental) through processing are considered as important to decide for a processing methods, but it depends on the product: a) The preservation of the sensory quality (product taste) is considered as more important for staple food than for convenience food. B) The preservation of the nutritional value (vitamin and mineral content) is considered more important for staple food than luxury foods and convenience food. c) The environmental impact is important for the selection of a processing method, no matter the type of product.

6) Do the participants accept food processing methods still as suitable for organic food processing when they would influence the quality characteristics of food negatively?
The authors assume that the majority of participants only would accept a method as suitable for organic food processing when changes in product qualities (such as the nutritional value, sensory quality and environmental integrity) would be minor.

7) **Do the market actors and stakeholders believe that some processing methods are more suitable for organic food processing than others**?
The authors assume, that the technologies to improve shelf-life which are most accepted for organic products are Freezing, Drying, and Pasteurization as these methods have been considered as *gentle* in consumer surveys. Processing methods such as Pulsed Electric Fields, Irradiation, Cold Plasma Treatment, Sterilization, Microwave Processing or Ultrasound could be considered as rather artificial methods with a high-level impact on quality attributes and therefore wouldn't be accepted.

8) **Do the market actors and stakeholders believe that consumers prefer specific processing methods to process organic milk, juice and tomato sauce over others**?
The authors assume that the respondents believe
a) that for milk consumers prefer the well-known treatment of Pasteurization over UHT and Bactofugation and Homogenized Milk over Non-homogenized Milk.
b) that consumers prefer Direct (pressed) orange juice over juice made on Concentrate and Pasteurized organic juice over HPP treated organic juice.
c) that consumers prefer Pasteurized organic tomato sauce/passata over Sterilized organic tomato sauce/passata.

9) **Do participants agree that consumers should be informed about the used processing technology on the packaging?**
The authors assume that most participants agree that a) consumers should be informed, on the packaging, about the processing technology that has been used and b) most participants agree that the processing technology applied to a food product should be prominently declared on the front of the packaging.

10) **Do the participants agree on the need for a Code of Practice (CoP)?**
The authors assume that participants agree that a CoP would help food processors to identify and decide which processing technologies are best suited for organic food processing.

4 Results of the OMSS

4.1 Size and composition of the sample

Altogether 447 representatives from market actors or organic stakeholders participated in the survey of which 310 data sets could be analysed. Other records were deleted due to incompleteness or inconsistency.

To analyse the results the total sample was grouped by the criteria

- kind of stakeholder group,
- country group of participant's origin, and
- years of technical expertise in the organic processing sector and standards.

4.1.1 Sample composition by stakeholder group

The respondents have been asked, to which of the presented stakeholder groups they are belonging to.

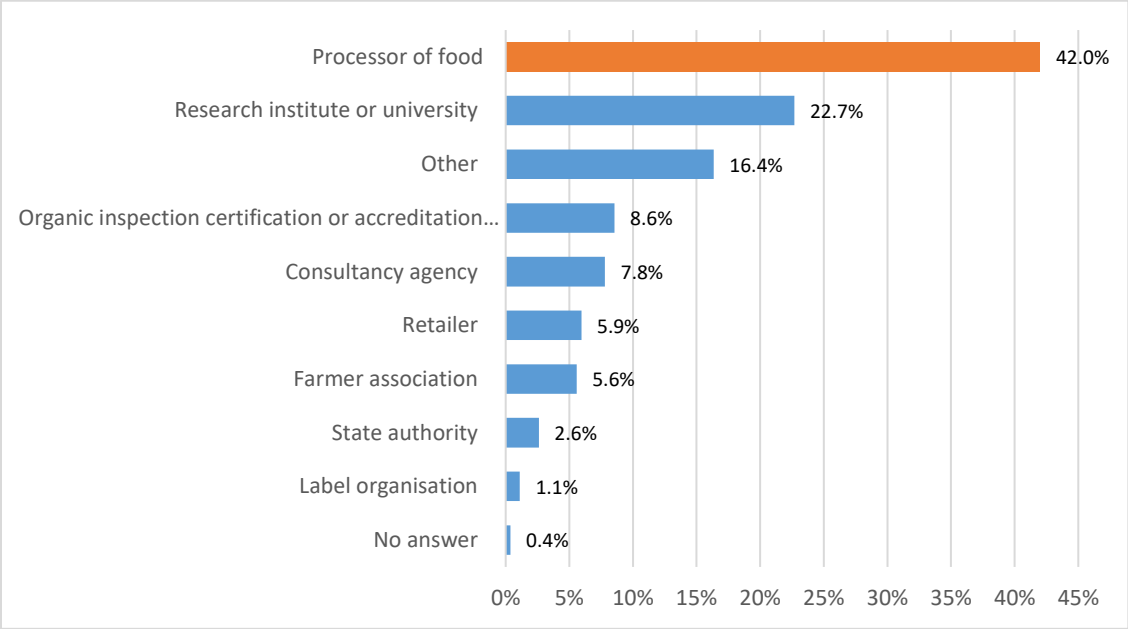

Figure 2: Composition of the sample by stakeholder group, Source: own calculation. Source: own calculation
Question: Which of the following best describes which stakeholder group you belong to? (n = 310)

The biggest group were respondents working in the food processing industry (42,0 %), followed by respondents working for research institutes or universities (22,7 %). The lowest number of participants belong to the groups of retailers and farmer associations (both 6 %) and label organisations (1,1 %).

4.1.2 Composition sample by country of origin

The respondents have been asked about the country from where they are operating their main professional activities.

Most respondents are operating their business in ProOrg partner countries, such as from France (47), followed by Germany (44), Switzerland (36) and Italy (31).

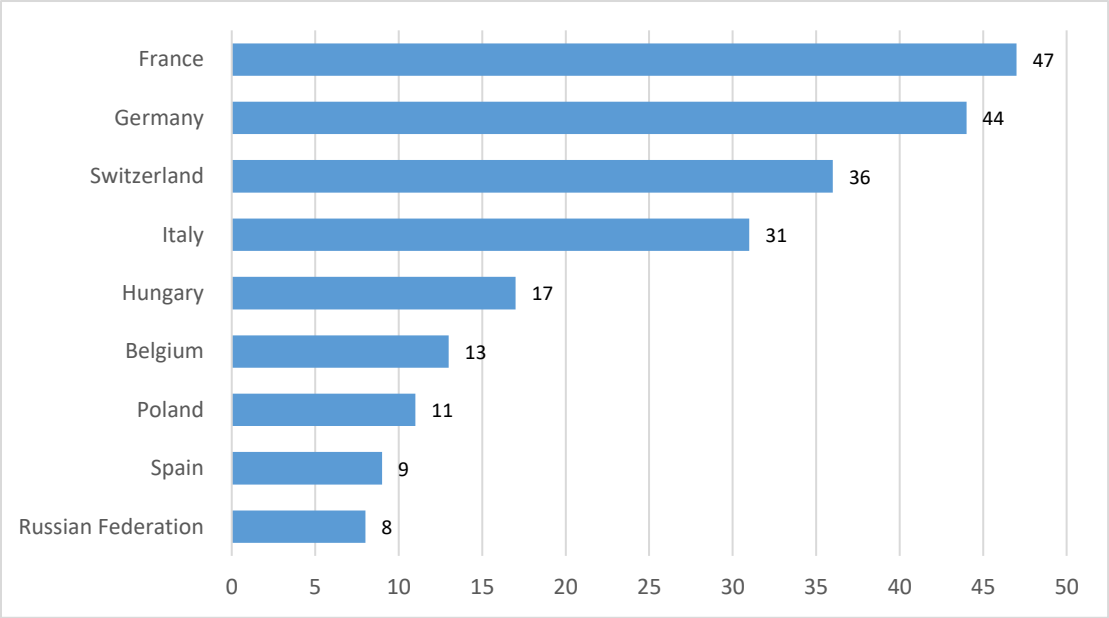

Figure 3: Composition of the sample by country of origin of the survey participants. Source: own calculation
Question: Which is the main country of your activities? (n= 310)

Grouping the sample by regions of origin, a majority of respondents came from German speaking (n = 86) and other Western European countries (n = 132). But also Eastern European countries are sufficiently represented in the sample with 55 respondents. A smaller number of participants even came from overseas countries.

4.1.3 Working experience

In order to get a better understanding about the working experience and expertise, participants had to state how many years they have been working in, or for the organic sector?

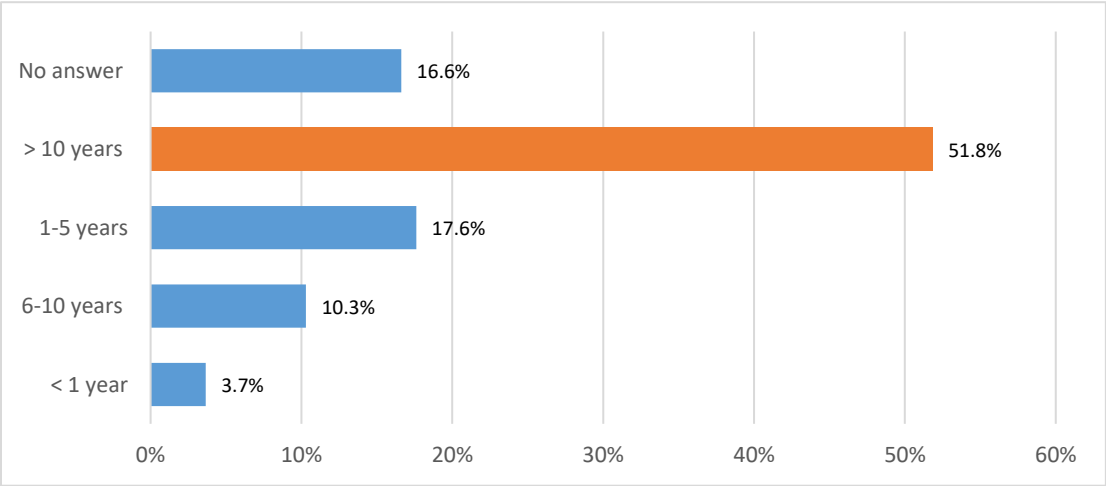

Figure 4: Composition of sample by years, working in the organic sector. Source: own calculation
Question: How many years have you been working in or for the organic sector? (n = 310)

According to the data, more than half of the participants had more than ten years of working experiences in the organic sector. And only 3,7 % of the respondents were new in the organic business with less than one year of working experience, i.e. the majority of the respondents can be considered as stakeholders with long-standing organic sector experience.

4.1.4 Expertise in the field of organic food processing and organic processing standards

The participants were asked to self-assess their expertise about organic food processing and about the standards of organic food processing on a scale from 1 (Novice = "I'm just beginning at this") to 7 (Expert = "I'm very skilled and experienced at this").

On the scale from 1 - 7, the participants range themselves on average of 4,5 on how they would describe their own expertise in the field of *organic food processing* and with a score of 4,4 on how they would describe their own expertise in the field of *standards of organic food processing*.

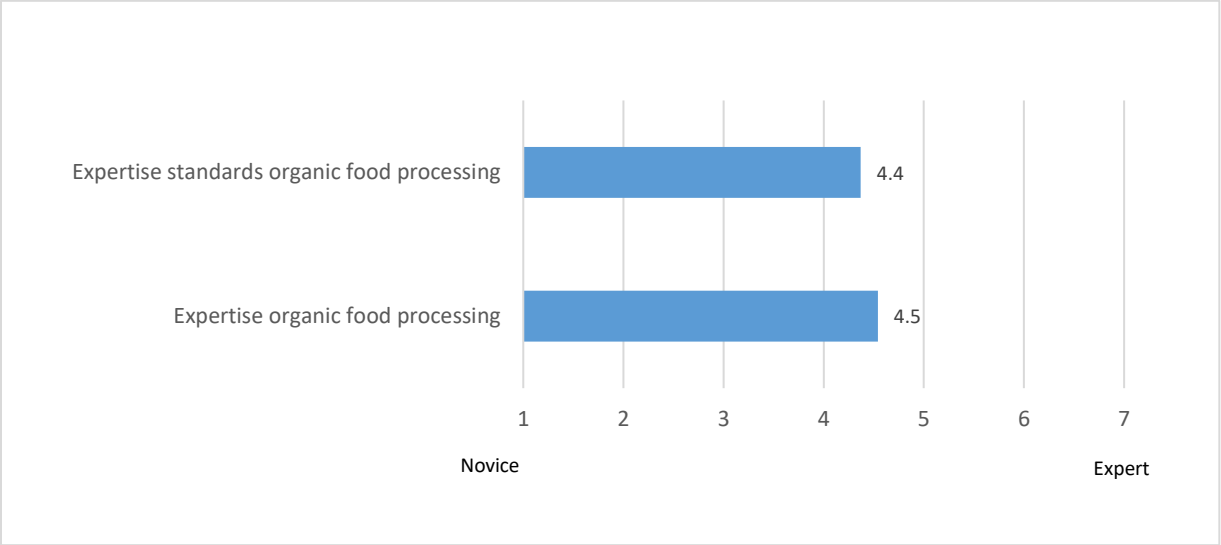

Figure 5: Self-assessment of respondents in regard to their technical expertise of organic food processing and food processing standards. Source: own calculation
Question: How would you self-assess your expertise in the field of organic food processing / of standards of organic food processing? (n = 310)

4.2 Definition of the term "Gentle processing"

A conceptual background for organic food processing is given by the underlying paradigms and principles of organic farming and organic food as well as on organic processing. However, as the term "gentle processing" is frequently used but nowhere defined in writing, the participants were asked in an open-end question to define the term "gentle processing" in own words.

The answers indicate that organic stakeholders have very individual definitions and interpretations in mind when they think about "gentle food processing".

They most frequently described "gentle processing" in the following way with their own words. "Gentle processing" is:

- when as little intervention is done as possible and as much as necessary for an excellent taste or to extend the shelf life of food products,
- when all or the most valuable components and ingredients of the raw material are preserved in the processed food as much as possible,
- when the sensory parameters are not or less affected by the applied technologies,
- when the natural quality of the raw material is respected during all processing steps,
- when the true character of the product has been preserved after all processing steps.

4.3 Organic food processing and regulation

The participants were asked if the processing of organic food is sufficiently regulated in the EU Organic Regulations.

For this question and the following questions the results are presented differentiated between answers of all respondents and those answers of respondents working for processing companies. This comparison allows a conclusion to be drawn if the insight view of the processing industry is congruent with the view of other organic stakeholders.

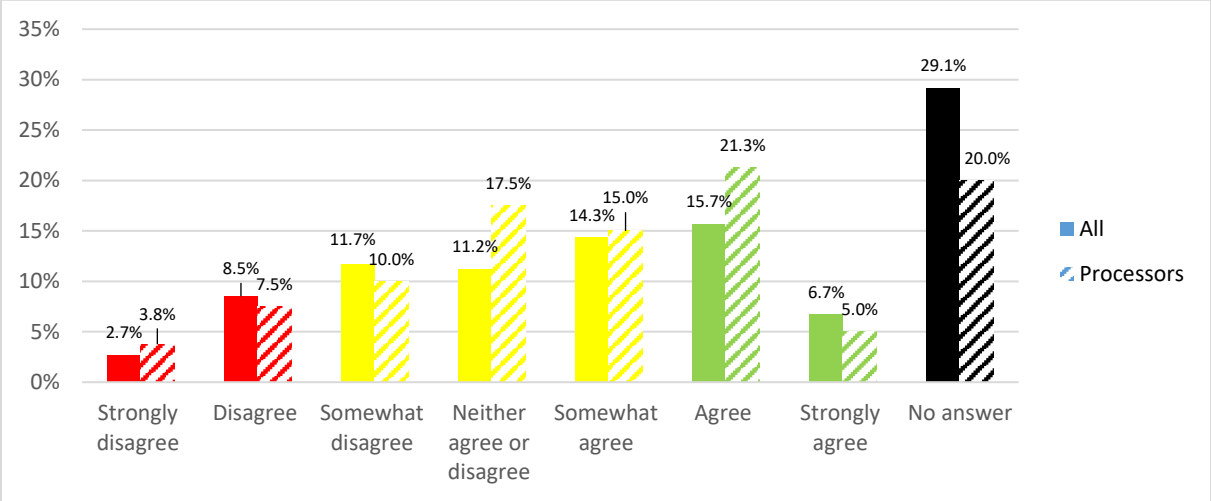

Figure 6: Stakeholder opinion whether organic processing is sufficiently regulated in the EU Organic Regulations or not. Source: own calculation

Statement: The processing of organic products is yet sufficiently regulated in the EU Organic Regulations. (n = 310)

A higher percentage of the participants (22,4 %) agree or strongly agree that organic food processing is sufficiently regulated in the EU Organic Regulations and only 11,2 % disagree or strongly disagree to this statement (see Figure 6). Even a higher percentage of processors agree and strongly agree to the statement compared to the total sample.

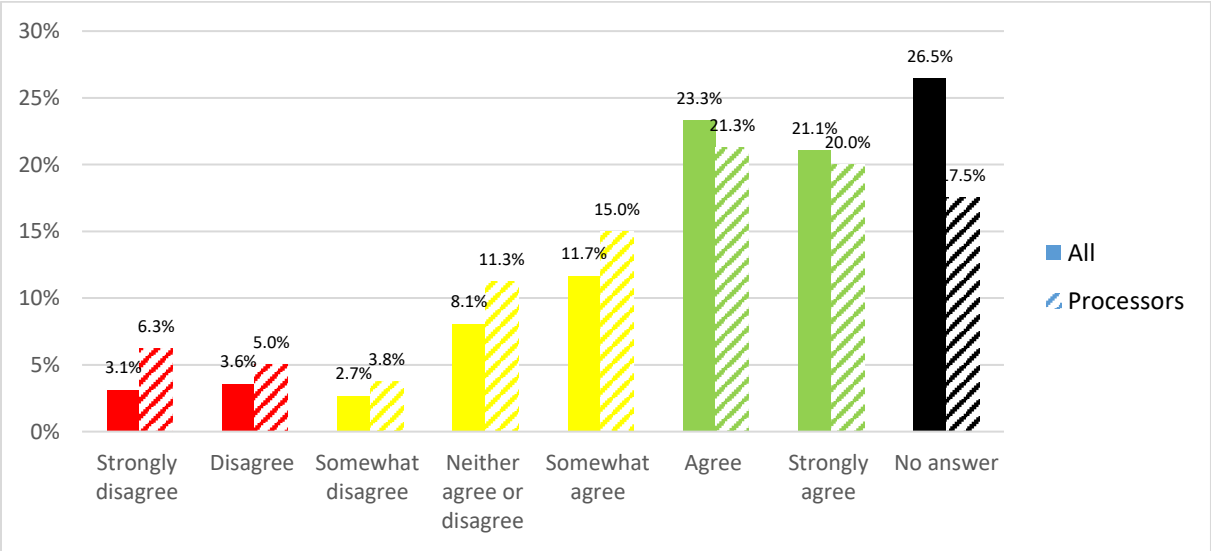

Figure 7: Stakeholder opinion whether the use of possible technologies in organic processing should be regulated more strictly in the EU Organic Regulations or not. Source: own calculation

Statement: The use of possible technologies in organic processing should be regulated more strictly in the EU Organic Regulations. (n = 310)

In another statement, respondents were asked to indicate whether or not new technologies in organic processing should be strictly regulated in the EU Organic Regulation.

Many participants (44,6 %) agree or strongly agree that new technologies in organic processing should be strictly regulated in the EU Organic Regulation. The processors among the respondents slightly less agree and more often disagree with the statement compared to the whole sample (see Figure 7).

4.4 Organic food processing and inspection

Among organic food processors, it is discussed whether separate organic inspections are still needed or whether the state food inspectorate could take over this task and by this to save certification costs. Especially smaller organic processors are suffering from organic certification costs.

Hence, the participants were asked if, for organic food processing, there would be no need for any additional organic inspection when state food inspectors would check all relevant organic standards within their regular audit procedures.

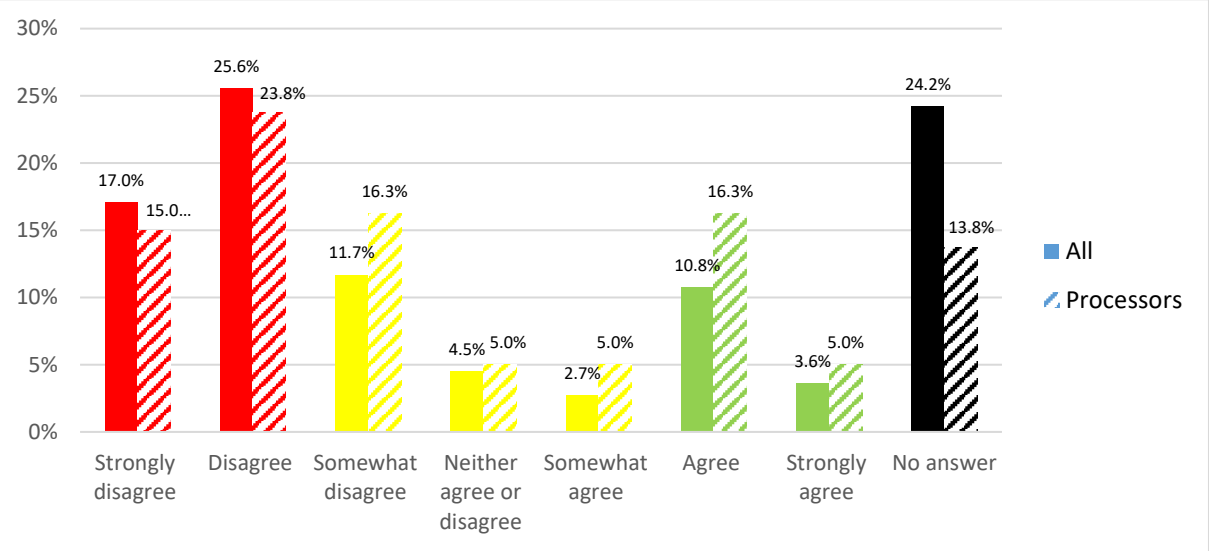

Figure 8: Stakeholder opinion whether there is a need for a separate organic inspection. Source: own calculation
Statement: For organic processing, there is no need for any organic inspection when state food inspectors would check all relevant standards anyway (n = 310)

The majority of the scoring persons disagree or strongly disagree to the statement, that there is no need for any organic inspection in organic food processing. However, a higher percentage of processors agree with the statement compared to the whole sample of the stakeholders (see Figure 8).

Furthermore, the participants were asked if an inspection rhythm based on an individual risk assessment for organic processing units would be sufficient rather than a regular annual inspection.

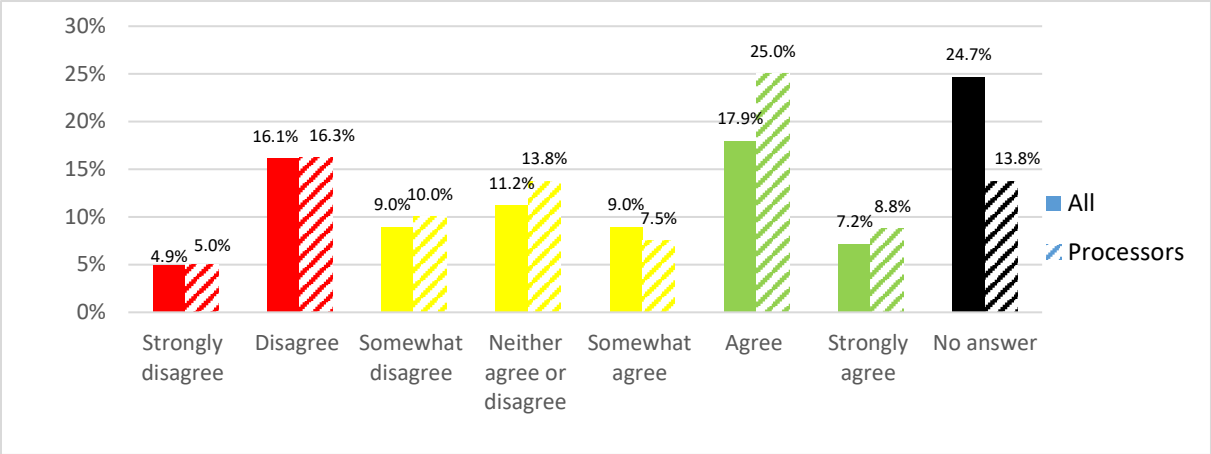

Figure 9: Stakeholder opinion whether an annual organic inspection could be replaced by an alternate inspection rhythm, which would take into account the risk exposition of the processing company. Source: own calculation
Statement: For organic processing units, an inspection rhythm based on individual risk, rather than regular annual inspection, would be sufficient. (n= 310)

Slightly more participants agree or strongly agree (25,1 %) as disagree or strongly disagree to that statement (21,0 %) and many respondents are also undecided in their opinion whether an inspection rhythm based on individual risk for organic processing units is preferable to a regular annual inspection (see Figure 9).

However, a clearly higher percentage of the processors would rather welcome that the frequency of the organic inspection would depend on the result of an individual risk assessment.

4.5 Risk exposition

The fear of many people in regard to novel food technologies are well documented in many publications (Cox & Evans, 2008). The ability to identify population segments that have greater or lesser neophobia, thus enabling the identification of early adopters of innovative products and is a useful tool for assessing reactions for assessing receptivity to foods produced by novel technologies.

In order to get a better understanding about the general risk exposition of the surveyed participants, they had to respond to different statements regarding the expected impacts of novel food technologies on product quality attributes.

Relation of new food technologies and the natural quality of food

The respondents had assessed if new food technologies would decrease the natural quality of food.

Most participants (41,7 %) are indifferent and neither would agree nor disagree that new food technologies per se decrease the food's natural quality (see Figure 10). However, a higher percentage of processors compared to the total sample disagree or strongly disagree with the statement (25,0 %). That means that staff who is working for food processors in tendency less believe in a strong relation between novel technologies and a negative quality impact as other organic stakeholders.

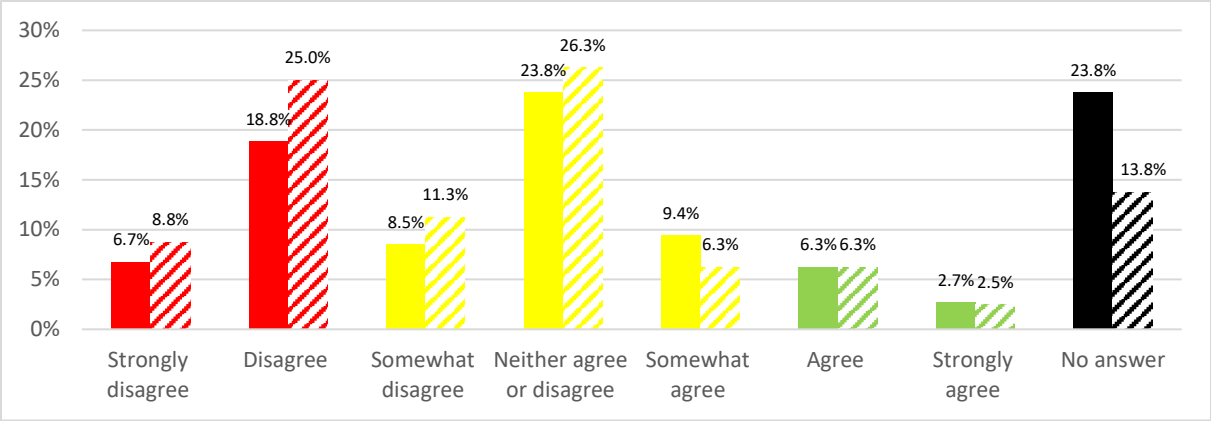

Figure 10: Stakeholder opinion whether new food technologies would decrease the natural quality of food. Source: own calculation
Statement: New food technologies decrease the natural quality of food. (n= 310)

<u>Should a society heavily depend on technologies to solve its food problems?</u>

The participants were asked if the society should not depend heavily on technologies to solve its food problems.

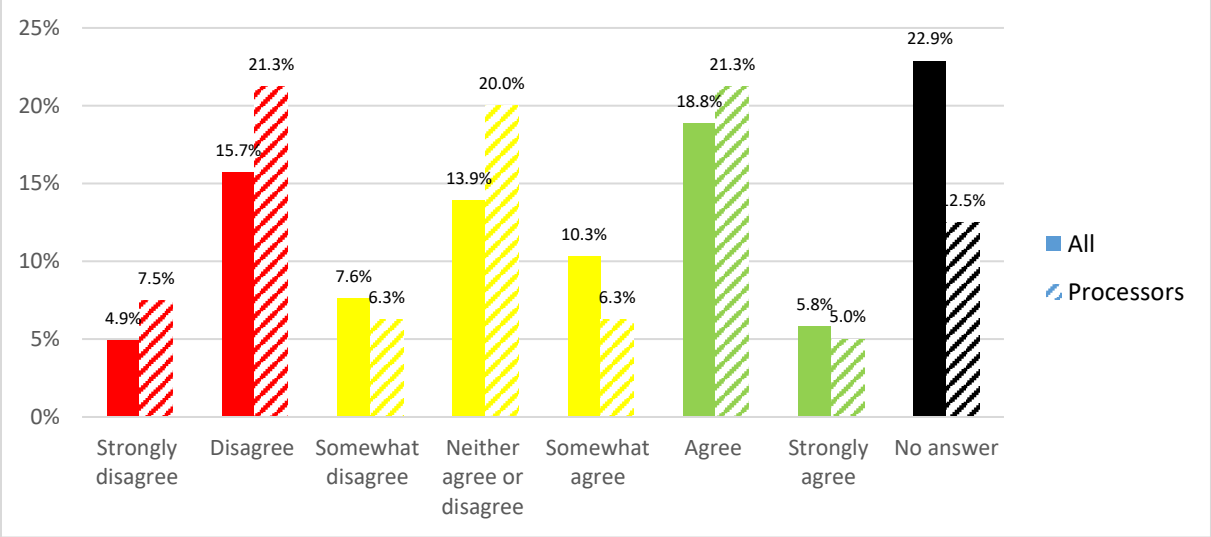

Figure 11: Stakeholder opinion whether a society should depend on new food technologies or not. Source: own calculation
Statement: Society should not depend heavily on technologies to solve its food problems. (n= 310)

The most participants are undetermined in regard to this question or simply couldn't answer. However among the respondents, who are working for food processors a higher share either agree or disagree to that statement as the entire sample (see Figure 11). It indicates also a certain polarisation of opinions among processor's staff regard this question.

Have new food technologies long-term adverse environmental effects?

The participants were asked if new food technologies have long-term adverse environmental effects.

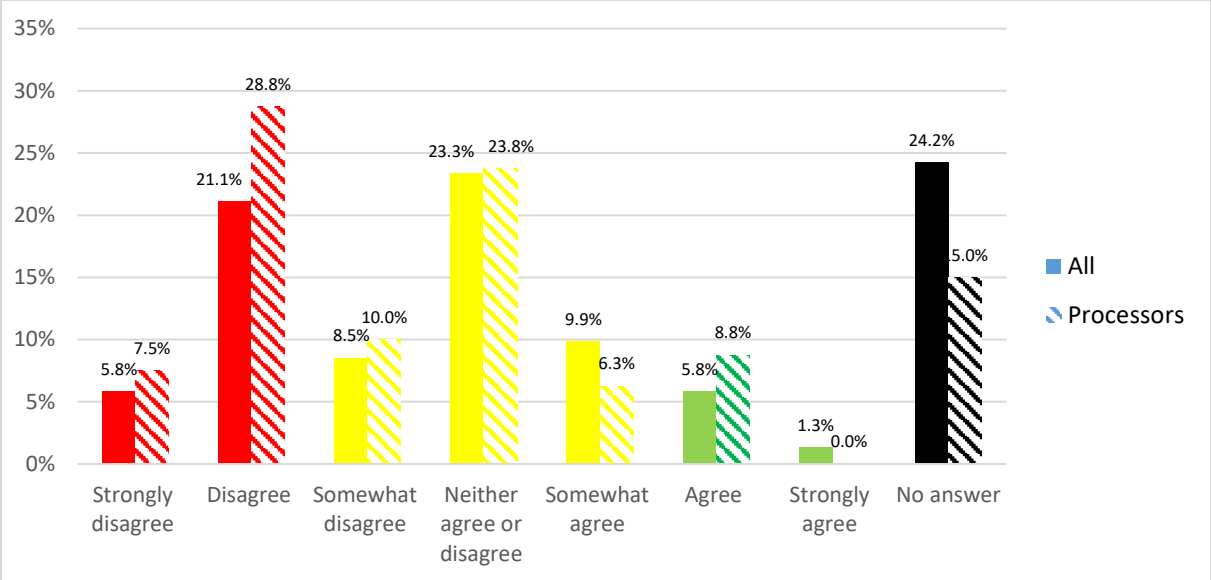

Figure 12: Stakeholder opinion whether new food technologies long-term adverse environmental effects or not. Source: own calculation
Statement: New food technologies have long-term negative environmental effects. (n= 310)

Most participants also here are undetermined (41,7 %) or were not able to give any answer at all (24,2 %) whether new food technologies have long-term adverse environmental effects or not. However, a higher percentage of processors disagree or strongly disagree (36,3 %) with this statement and don't believe per se on negative environmental effects of new food processing technologies (see Figure 12).

Have new food technologies have long-term adverse health effects?

The participants also were asked if new food technologies have long-term adverse health effects.

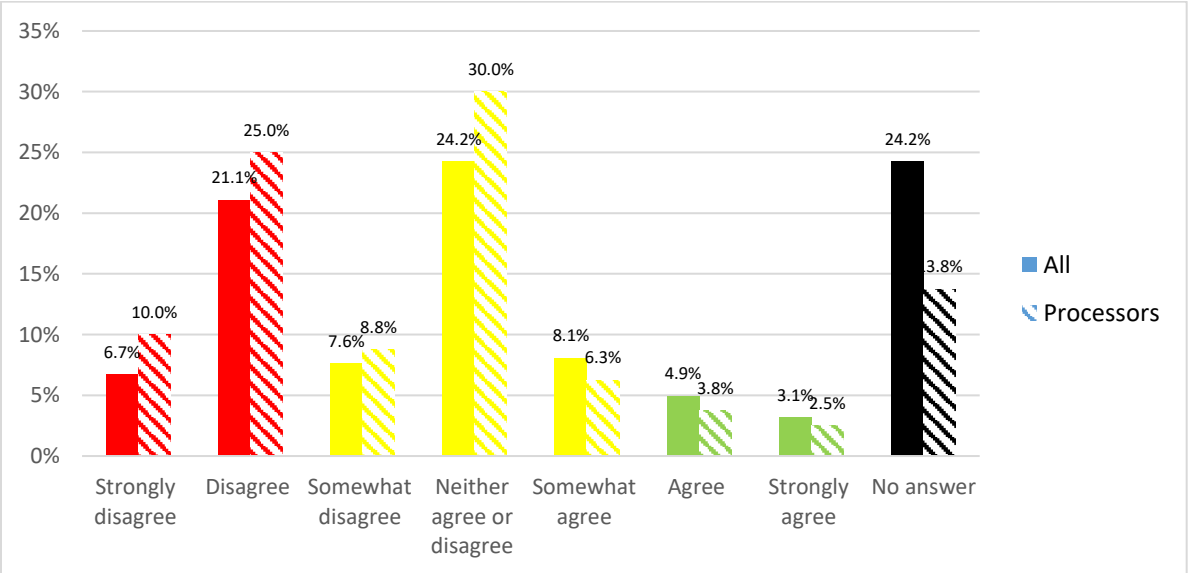

Figure 13: Stakeholder opinion whether new food technologies have long-term adverse health effects or not. Source: own calculation
Statement: New food technologies have long-term negative health effects. (n= 310)

On average participants rather disagree or are undetermined and only a very low share of the sample believes that new food technologies would have long-term negative health effects (see Figure 13).

Mainly, respondents from processing companies disagree or strongly disagree with the statement (35,0 %).

4.6 Importance of quality criteria in organic food processing

The specific method of food processing can have an impact on the taste and the nutrient content of the food item. In addition, it can have an impact on the consumption of environment resources or climate relevant emissions (like water and energy use, emission of CO_2, etc.).

Thus, the market actors and stakeholders were asked how important these three aspects to them are at general, to consider whether a processing method would fit to organic food processing or not. To answer the questions, the respondents should use a scale from "1 = totally unimportant" to "7 = totally important".

Moreover, the respondents should differentiate in their scoring between the following food categories:

- food in general,
- staple food for daily consumption,
- luxury food,
- convenience food.

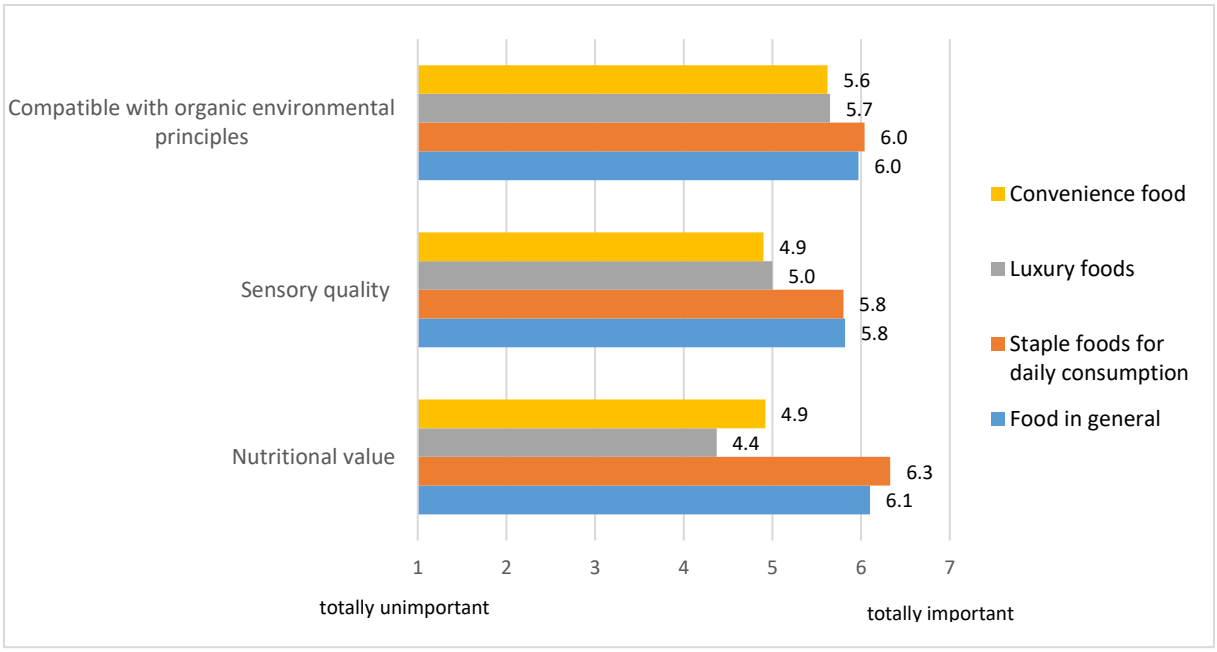

Figure 14: Importance of quality aspects in organic food processing, by different food categories. Source: own calculation
Question: How important are the following three aspects to you, to consider whether a processing method would fit to organic or not. (n = 310)

General results

As general result can be summarized that the importance of quality aspects and the compatibility with environmental principles is relatively high among organic market actors and stakeholders to consider whether a processing method would fit to organic food processing or not.

However, it varies slightly by different food categories. In tendency the preservation of the nutritional value by using food processing technologies seems to be most important while the sensory quality seems to be least important (but also on a high level of importance).

The importance varies among the four food categories, most regarding the nutritional level und least regarding the environmental level. More respondents stated that the studied quality aspects are more important for staple food of daily consumption than for luxury food and convenience food.

Results by food category

Food in general: Most important is the preservation of the nutritional value, least important the sensory quality.

Staple food: Most important is the preservation of the nutritional value, least important the sensory quality.

Luxury food: Most important is the environmental compatibility of the used processing method (e.g. water and energy usage, emission of harmful gases), least important the nutritional value.

Convenience food: Most important is the environmental compatibility of the used processing method (e.g. water and energy usage, emission of harmful gases), least important the sensory quality.

4.7 Acceptance of changes in quality in organic food processing

In a next set of questions, the market actors and stakeholders were asked whether or not food can be considered still as "organic" food when the taste, the mineral substances, the vitamin content and the environmental impact are significantly changed and influenced by the use of a specific organic food processing method.

The respondents received questions in the following way (example with "vitamin content"): *How much change of the vitamin content of the product, after being processed, could you accept to still call this product organic (Assuming no vitamins are added)?*

To answer the questions, the respondents always should use a scale from "7" to "1".

Example "vitamin content": *7 = the vitamin content of the unprocessed product keeps the same in the processed product. 6 = very low change of vitamin content. 5 = low level change of vitamin content. 4 = partly change of vitamin content. 3 = big change of vitamin content. 2 = very big change of vitamin content. 1 = the original vitamin content of the unprocessed product was completely changed in the processed product.*

Also for that set of questions, the respondents should again differentiate between the following food categories:

- food in general,
- staple food for daily consumption,
- luxury food,
- convenience food.

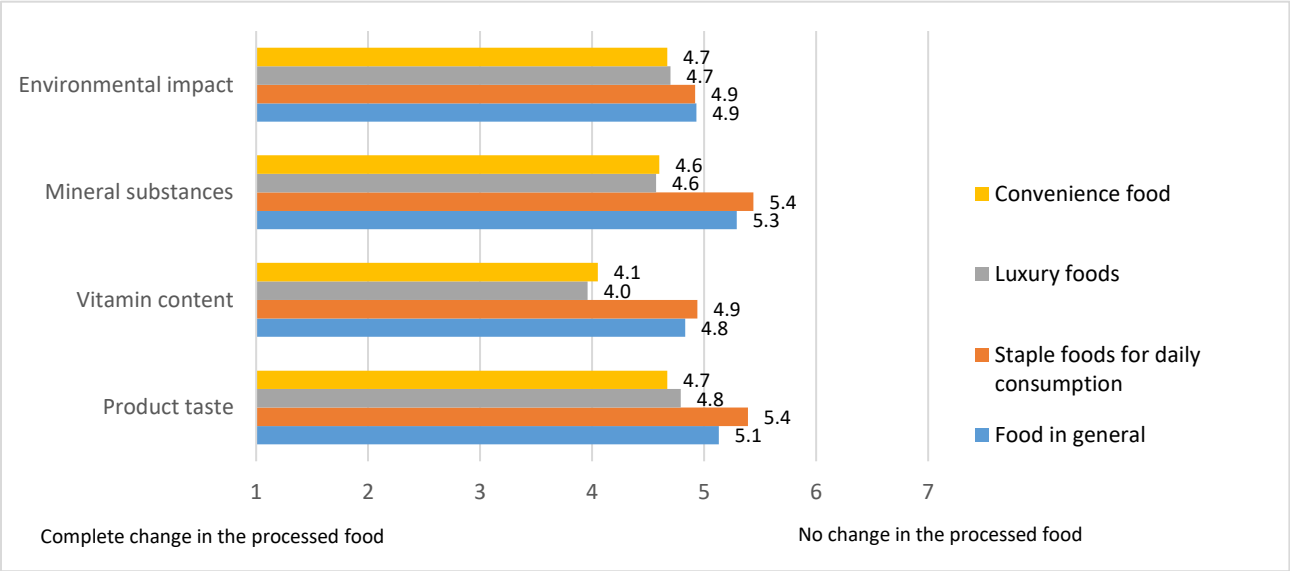

Figure 15: Accepted change in product taste, vitamin content, mineral substances, and environmental impact through the used food processing methods. Source: own calculation
Question: The quality aspects listed can be used to decide whether or not processed organic food can be described as an organic product. We are interested in how much you think organic food can change during processing and still be considered as organic. (n = 310)

General results

The results indicate that respondents accept a change in product taste, vitamin content, content of mineral substances just on a low level. The same applies for an acceptance of just a low negative environmental impact through the used food processing method.

Besides, the respondents would accept a slightly higher change level of the vitamin content compared to the level of mineral substances. Between the different product categories, the respondents accept for staple food a lower change in quality attributes compared to luxury and convenience food. Only regarding a negative environmental impact the market actors and stakeholders make nearly no difference among the product groups and would accept only fewer negative impacts to still consider the food as organically processed.

Results by food category

Food in general

There is least tolerance in regard to a change of the mineral substances, followed by product taste, environmental impact and vitamin content.

Staple food: There is least tolerance in regard to a change of the mineral substances, followed by product taste, vitamin content and environmental impact.

Luxury food: There is least tolerance in regard to a change of the product taste, followed by the environmental impact, mineral substances and the vitamin content.

Convenience food: There is least tolerance in regard to a change of the product taste and the environmental impact, followed by the mineral substances and the vitamin content.

4.8 Acceptance of food processing methods

In another set of questions the participants were asked to assess different processing technologies if they are rather suitable for organic food processing or rather not. For that purpose different technologies were listed, which are already used in organic food processing or could be used.

A distinction was made between technologies to enhance the shelf-life of food and technologies to improve the product use or preserve the quality.

Technologies to improve shelf-life

The participants were asked to indicate how suitable different technologies are for organic food processing to enhance the shelf-life.

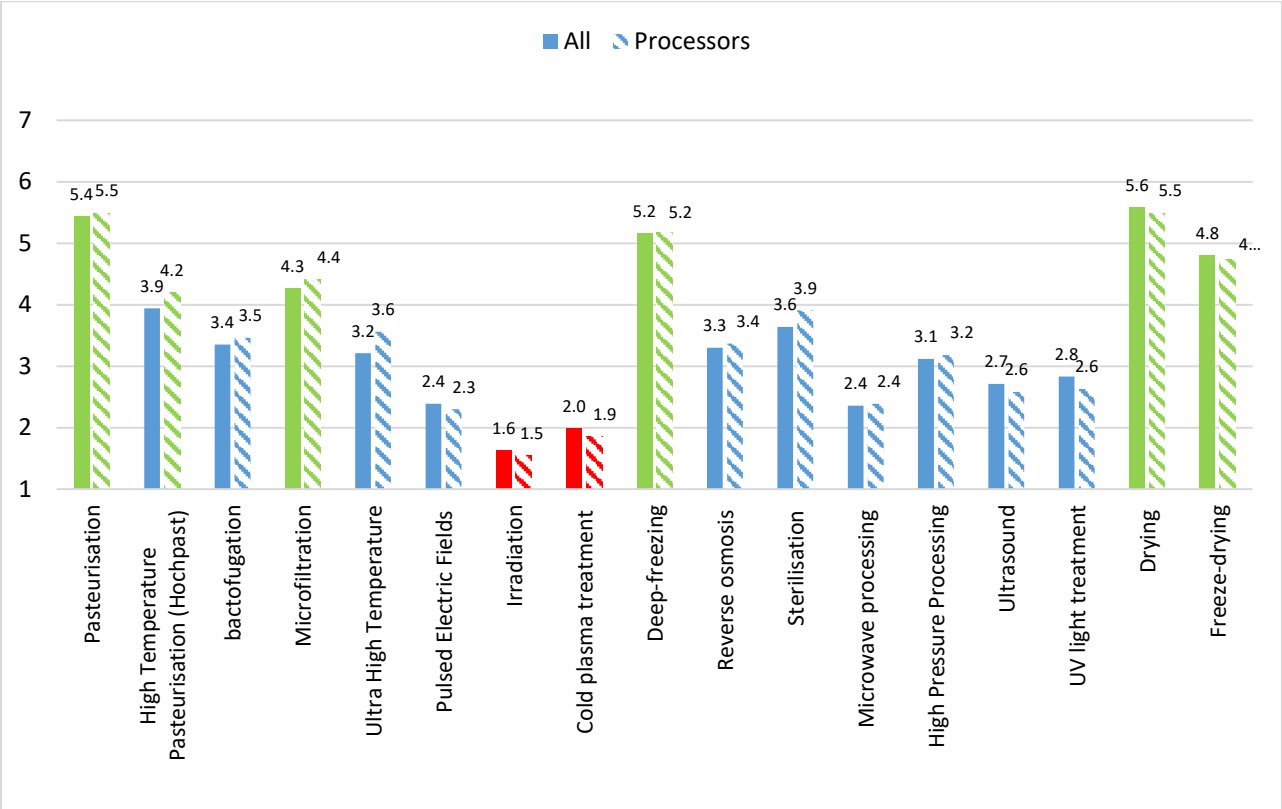

Figure 16: Suitability of different technologies for organic food processing to enhance the shelf-life. Source: own calculation
Question: Some technologies to improve shelf life are more suitable for organic food processing than others. Please indicate how suitable the listed technologies are for organic food processing.
Scale between 1 = absolutely unsuitable to 7 = totally suitable (n = 310)

The technologies to improve shelf-life which were assessed by the respondents to be most suitable for organic food processing are Pasteurization, Drying, Deep-Freezing, Freeze-Drying and Microfiltration. High Temperature Pasteurization was only assessed above a score of "4" by the processor group. Also Ultra High Temperature treatment was assessed more positively by the processors among the whole sample (see Figure 16).

Those technologies to improve shelf-life considered to be least suitable for organic food processing are Irradiation and Cold Plasma Treatment. The assessment was allocated almost equally by processors and other interviewed stakeholders.

Technologies to improve the product use or to preserve the quality

The participants were asked to indicate how suitable different technologies are for organic food processing to improve or to preserve the quality.

The technologies which are assessed to be most suitable for organic food processing are Cutting, Peeling, Washing (fruits, vegetables), Pressing (fruits, vegetables), Fermentation to preserve the product quality and Milling to process cereals (see Figure 17).

The technologies which are assessed to be least suitable for organic food processing are Radio Waves for thawing meat and fish. The assessment was allocated almost equally by processors and other interviewed stakeholders.

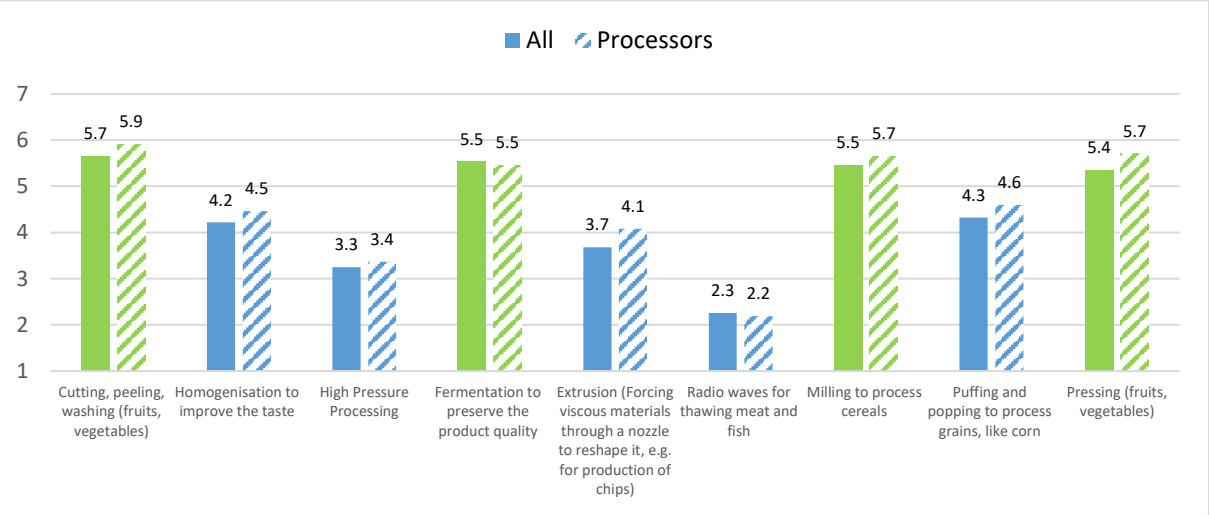

Figure 17: Suitability of different technologies for organic food processing to improve or to preserve the product quality. Source: own calculation
Question: Some technologies to improve the product use or preserve the quality are more suitable for organic food processing than others. Please indicate how suitable the listed technologies are for organic food processing.
Scale between 1 = absolutely unsuitable to 7 = totally suitable (n = 310)

4.9 Consumer preferences of processing methods

After examining the suitability of certain methods for organic food processing at general, the authors also were interested to understand, which processing methods are preferred by consumers in regard to the focused products of the ProOrg project, milk, fruit juice and tomato puree. For that purpose the respondents had to rank listed processing methods by the order of the assumed consumer's preference. This question is highly relevant as market actor, such as organic processors select and list only those food items with processing methods which are preferred or at least accepted by their customers.

Methods to produce organic milk

The participants indicated the order, from most preferred to the least preferred technology from a perceived consumer perspective

Table 1: Assumed consumer preferences of technologies by product (organic milk – methods to extend the shelf-life)

Processing method	Whole sample	Processors
Milk // Pasteurisation	77,3%	71,8%
Milk // Bactofugation	10,0%	4,2%
Milk // UHT (Ultra High Temperature)	7,3%	15,5%
Milk // HPP (High Temperature Pasteurisation)	5,5%	4,2%

Question: From your experiences with consumers, what do you think, what food processing technologies a majority of organic consumers would prefer in your country? Please indicate the order, from most preferred to least preferred (n = 310) Source: own calculation

Most participants believe that the consumers would prefer the method Pasteurization (77,3 %) over Bactofugation (10,0 %) UHT (7,3 %) and High Temperature Pasteurization (5,5 %) to enhance the shelf-life of milk. The order is slightly different when only the group of respondents with a background of processing is filtered. Especially the preference for milk which is treated by Bactofugation is assessed as lower from the processors while the processors believe that UHT would have a higher consumer preference (see Table 1).

In another question the authors wanted to know whether the majority of the consumers would prefer a Homogenized organic milk over a Non-homogenized milk.

Table 2: Assumed consumer preferences of technologies by product (organic milk – homogenization)

Processing method	Whole sample	Processors
Milk // Homogenized	55,5%	52,2%
Milk // Non-homogenized	44,6%	47,8%

Question: From your experiences with consumers, what do you think, what food processing technologies a majority of organic consumers would prefer in your country? Please indicate the order, from most preferred to least preferred (n = 310) Source: own calculation

Most participants believe that the consumers would prefer a Homogenized organic milk (55,5 %) over a Non-homogenized milk (44,6 %). There is nearly no difference in result between the whole sample and respondents from processing companies (see Table 2).

Methods to produce organic orange juice

The participants indicated the order, from most preferred to the least preferred technology from a consumer perspective for organic orange juice.

Table 3: Assumed consumer preferences of technologies by product (organic orange juice – pressed versus concentrate)

Processing method	Whole sample	Processors
Juice // Direct, pressed	92,9%	90,3%
Juice // Concentrate	7,1%	9,7%

Question: From your experiences with consumers, what do you think, what food processing technologies a majority of organic consumers would prefer in your country? Please indicate the order, from most preferred to least preferred (n = 310) Source: own calculation

The most participants believe that the consumers clearly would prefer direct (pressed) organic juice (92,9 %) over concentrated juice (7,1 %). There is nearly no difference in results between the whole sample and respondents from processing companies (see Table 3).

Table 4: Assumed consumer preferences of technologies by product (organic orange juice – pasteurized versus HPP)

Processing method	Whole sample	Processors
Juice // Pasteurized	67,9%	78,6%
Juice // High Pressure Processing (HPP)	32,1%	21,4%

Question: From your experiences with consumers, what do you think, what food processing technologies a majority of organic consumers would prefer in your country? Please indicate the order, from most preferred to least preferred (n = 310) Source: own calculation

The most participants believe that the consumers would prefer Pasteurized organic juice over juice which is treated by High Pressure Processing (HPP). Even a higher share of processors believes in the consumer preference for Pasteurized organic orange juice (see Table 4).

Methods to produce organic tomato sauce / passata

Finally, the participants indicated the order for three methods to enhance the shelf-life for tomato sauce / passata, from most preferred to the least preferred technology from a consumer perspective.

Table 5: Assumed consumer preferences of technologies by product (organic tomato sauce / passata – methods to extend the shelf-life)

Processing method	Whole sample	Processors
Tomato Sauce, Passata // Pasteurization	62,4%	64,8%
Tomato Sauce, Passata // HPP treated	19,3%	15,5%
Tomato Sauce, Passata // Sterilized	18,4%	19,7%

Question: From your experiences with consumers, what do you think, what food processing technologies a majority of organic consumers would prefer in your country? Please indicate the order, from most preferred to least preferred (n = 310) Source: own calculation

The most participants assume that the consumers would prefer a Pasteurized tomato sauce over a HPP treated and a Sterilized sauce. The Pasteurization as preferred method applies equal for processors and the entire sample. However, processors assume differently to the whole sample, that consumers would prefer on the second rank a Sterilized over a HPP treated sauce (see Table 5).

4.10 Communication and declaration of processing methods

One major result of the consumer studies in Workpackage 6 of the ProOrg project was the fact that consumers have a low level of expertise and just a vague understanding about food processing methods (Hueppe & Zander, 2021).

Hence, to find an effective way for declaration of products and consumer communication about processing methods is essential to foster the most gentle and sustainable processing methods in future. Different case studies of quite convincing and rather product declaration and consumer communication about processing methods have been listed in Borghoff et al., 2021.

Within the course of the OMSS the participants were asked if consumers should be informed on the packaging, about the processing technology that has been used.

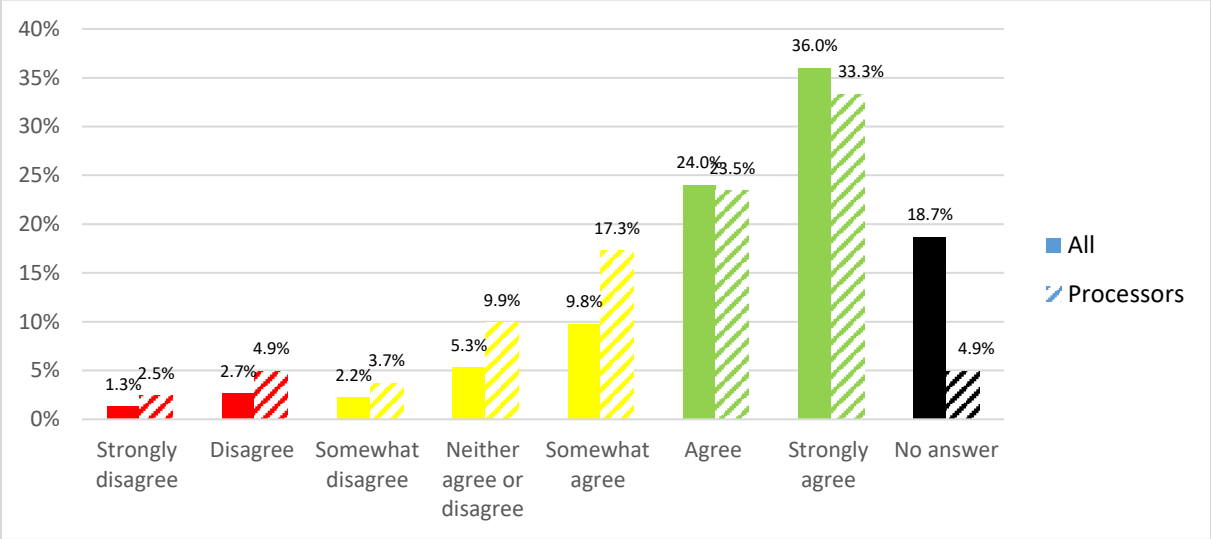

Figure 18: Stakeholder opinion whether consumers should be informed about the processing method on the packaging. Source: own calculation
Statement: Consumers should be informed, on the packaging, about the processing technology that has been used.
(n = 310)

The majority of the participant (60,0 %) agree or strongly agree that consumers should be informed, on the packaging, about the processing technology that has been used (see Figure 18).

Additionally, the market actors and stakeholders were asked if the processing technology used in the food processing should be prominently declared on the front of the packaging.

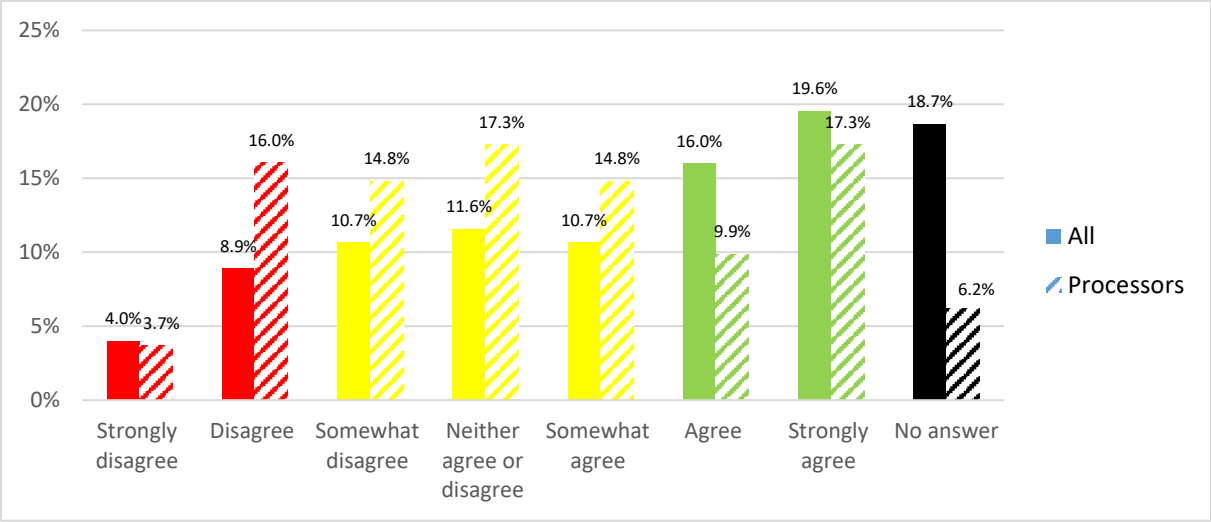

Figure 19: Stakeholder opinion whether the processing technology applied to a food product should be prominently declared on the front of the packaging. Source: own calculation
Statement: The processing technology applied to a food product should be prominently declared on the front of the packaging. (n = 310)

Regarding that statement there are remarkable differences between the whole sample and the group representatives from processing companies. While 35,6 % of the whole sample agree or strongly agree to that statement only 27,2 % of the respondents from processors agree or strongly agree. On contrast, 19,7 % of the processors disagree or strongly disagree, while just 12,9 % of the total sample disagree or strongly disagree (see Figure 19).

4.11 Code of Practice

Finally, the participants were asked if they think a Code of Practice (CoP) would be supportive for food processors to identify and decide which processing technologies are best suited for organic food processing.

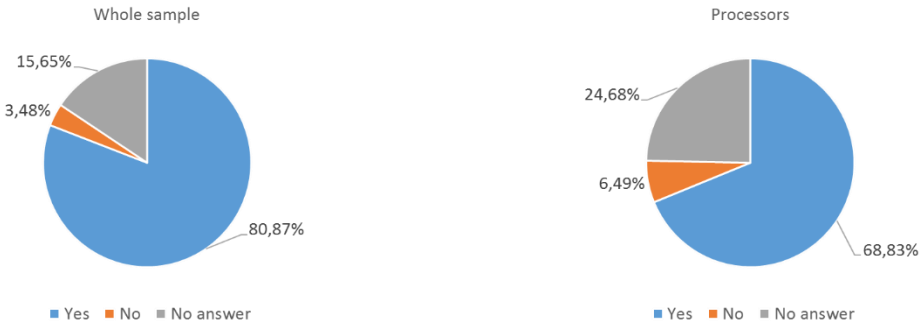

Figure 20: Stakeholder opinion whether a CoP would be helpful for food processors to identify and decide which processing technologies are best suited for organic food processing. Source: own calculation
Question: Would a code of practice be helpful for food processors to identify and decide which processing technologies are best suited for organic food processing? (n = 310)

Most participants (80,9 %) agree that a CoP would be a helpful tool. However it has to be mentioned, that a lower share of just 68,8 % of the main target group (processors) affirm to that question (see Figure 20).

5 Concluding summary

The main objective of the ProOrg project is to develop a "Code of Practice" (CoP). The CoP is addressed to organic food processors and labelling organizations with the aim to provide a set of strategies and tools that can help them making the best choice for careful processing methods and formulations free of additives, while addressing the organic principles, high food quality, low environmental impact, and high degree of consumer acceptance.

The Organic Market and Stakeholder Survey (OMSS) delivered important insights and opinions about relevant content to develop the CoP. The OMSS was conducted asan online survey and took place between February and April 2021. Altogether 310 market actors and organic stakeholders from all over Europe and also from overseas countries participated in the survey.

The results of the OMSS can be summarized and concluded as follows.

Broad consensus, that there is a need for a CoP

The results of the survey indicate that the vast majority of the market actors and stakeholders welcome a CoP. That means, there is a need for a tool to guide processors to make the best choice for careful and sustainable processing methods. After the successful elaboration of the CoP, appropriate communication strategies need to be developed subsequently to make the CoP known among the food processing companies and the organic and business associations.

The food processing technology in use matters

Those technologies which can be considered to have a low impact on the quality parameters of food and the natural/environmental resources are clearly preferred by the processors and other organic stakeholders, particularly in food for daily consumption.

The surveyed market actors and stakeholders would accept just a lower level of change in terms of product taste, vitamin content or mineral substances through the use of processing methods. Hence, the selection of the right processing technology is a sensitive issue for decision makers in the food processing industry and standard setters both.

In tendency, well known technologies seem to be rather preferred over novel technologies. An example to illustrate this phenomenon is the question if fruit juice or milk should be treated with Pasteurization or HPP (High Pressure Pasteurization). HPP is a cold pasteurization technique by which products, already sealed in its final package, are introduced into a vessel and subjected to a high level of isostatic pressure (300–600MPa) transmitted by water. HPP respects the sensorial and nutritional properties of food better than Pasteurization, because of the absence of heat treatment, and therefore maintains its original freshness throughout the shelf-life. Hence, HPP from a functional point of view could be considered as a more gentle processing method than the method of Pasteurization. Nevertheless, a higher number of participants (including processors) consider Pasteurization as more suitable for organic food processing than the method of HPP.

More information to market actors and stakeholders matters

The example of the rather low acceptance of HPP among stakeholders to enhance the shelf-life of milk or fruit juice described above, exemplifies that also among processors the possible positive or negative

impact of different food processing technologies are not well understood. As the answers to the general statements about the possible impact of new food technologies indicate that organic stakeholders are not critical per se against new technologies, more communication efforts would be needed to increase the transparency about the specific benefits and impacts of different technologies within in the target group.

In this context, any form of communication is welcome that not only presents processors with the price and functional advantages and disadvantages of individual processes, but also holistically describes and evaluates the most important quality and sustainability criteria of individual processes.

More information to consumers matters

A majority of organic stakeholders express the wish to find explicit information about the processing technology clearly declared on the front of a product packaging. Especially when new or less common processing technologies are applied, a sufficient set of information could be provided to the consumers that they can understand the benefits compared to other traditional or well-known technologies. However, as the results of the consumer surveys and tests under Workpackage 6 indicate, consumers have less knowledge about the most processing technologies at all. Therefore it should be considered not only to declare the used method on the packaging, but rather to declare the benefit in combination with the used method (e.g. “higher content of vitamins preserved by using HPP”).

Final remarks

In the past, the B2B and B2C communication focused mainly on organic agriculture, its standards and its benefits for humans, animals and the environment. However, it has been neglected to present the whole production cycle of organic food in a holistic way, including the steps and processes that are necessary to produce a carefully manufactured organic product.

In future, this communication gap should be closed, as the decision for or against a certain processing method can have a significant positive or negative influence on the overall ecological and quality balance of an organic product. Especially the organic associations as well as the organic processors have a great potential here, which is just waiting to be better exploited.

References

Borghoff, L., C. Strassner, T. Richter (2021): Organic Processed Food in Europe. CORE Organic Practice Abstracts. University of Applied Science Muenster.

Cox, D.N. and G. Evans (2008): Construction and validation of a psychometric scale to measure consumers' fears of novel food technologies: The food technology neophobia scale. In: Food Quality and Preference 19 (2008), 704–710.

Hueppe, R. and K. Zander (2021) Consumers' Perceptions Of Organic Food Processing – First Insights Into Milk And Juice Processing. Paper at: Organic World Congress 2021, Science Forum: 6th ISOFAR Conference co-organised with INRA, FiBL, Agroecology Europe, TP Organics and ITAB, Rennes, France, 8 - 10 September 2021.

Kahl, J., F. Alborzi, A. Beck, S. Bügel, N Busscher, U. Geier, D. Matt, T. Meischner, F. Paoletti, S. Pehme, A. Ploeger, E. Rembiałkowska, O. Schmid, C. Strassner, B. Taupier-Letage, A. Zalecka (2014). Organic food processing: a framework for concept, starting definitions and evaluation. Journal of the Science of Food and Agriculture, 94, 2582-2594.

Kretzschmar, U. and O. Schmid (2011). Quality and safety aspects of organic and low-input food processing: Results of a Delphi survey from an expert consultation in 13 European countries. NJAS – Wageningen Journal of Life Sciences, 58, 111–116

Van den Berg, M. (2018): An Odyssey Into a Parallel Universe. Organic Processed Food in Europe. Rabobank RaboResearch. Amsterdam.

Willer, H., J. Trávníček, C. Meier and B. Schlatter (Eds.) (2021): The World of Organic Agriculture. Statistics and Emerging Trends 2021. Research Institute of Organic Agriculture FiBL, Frick, and IFOAM – Organics International, Bonn.

Appendix

Questionnaire - Organic Market and Stakeholder Survey (OMSS)

Today, there is a lack of mandatory standards and indicators for organic food processing in Europe. We have started a project called ProOrg to address this lack by developing a set of strategies and tools (Code of Practice) that can help organic food processors in the selection of appropriate technologies. It will give guidance for making the best choice for careful, minimal and mild processing methods.

Before drafting a Code of Practice for processors, we need to know how different stakeholder groups and market actors perceive the benefits or threats of certain (new) processing technologies in the organic sector. We have invited you to participate in this survey because of your expertise in organic food processing.

The questions we ask are about your opinion, so there is no right or wrong. The survey typically takes around 15 minutes to complete. The survey is anonymous so your answers will not, and can not, be traced back to you.

For more information please visit: http://www.proorgproject.com/ or contact me at toralf.richter@fibl.org

Introduction

Do you agree to participate in the survey?

Please choose **only one** of the following:

- Yes
- No

Would you like to receive a short result report?

Please choose **only one** of the following:

- Yes
- No

Thank you for your interest. Please type in your email address and we will send you a copy of the survey results. We guarantee that your data, including your email address, will not be given to any third party and will only be used for the stated reasons. All data will be handled in accordance with the GDPR at all times.

Personal information

Which of the following best describes which stakeholder group you belong to?

Check all that apply

Please choose **all** that apply:

- Retailer
- Processor of food
- Farmer association
- Label organisation
- Consultancy agency

- Research institute or university
- State authority
- Organic inspection certification or accreditation body
- Other
- No answer

You answered 'other'. Can you please specify?

Only answer this question if the following conditions are met:

Which is the main country of your activities?

Choose one of the following answers from the country list

How many years have you been working in, or for, the organic sector?

Choose one of the following answers

- < 1 year
- 1-5 years
- 6-10 years
- > 10 years

How would you describe your expertise in the field of organic food processing?

1 = Novice (I'm just beginning at this),
...
4 = Medium (I have a useful level of knowledge or skills at this)
...
7 = Expert (I'm very skilled and experienced at this)
Each answer must be between 1 and 7 and only integer values may be entered in these fields.

How would you self-assess your expertise in the field of standards of organic food processing?

1 = Novice (I'm just beginning at this),
...
4 = Medium (I have a useful level of knowledge or skills at this)
...
7 = Expert (I'm very skilled and experienced at this)

Each answer must be between 1 and 7 and only integer values may be entered in these fields.

Importance of quality aspects

The processing method of a food item can have an impact on the taste and the nutrient content of the food item. In addition, it can have an influence on the environment (like water and energy use, emission of CO2, etc.).

On a scale of 1 = totally unimportant through to 7 = totally important, how important is it that an organic food processing method preserves the nutritional value (e.g. minerals, enzymes, vitamins, polyphenols) when processing the following products:
Each answer must be between 1 and 7 and only integer values may be entered in these fields.
Please write your answer(s) here:

- Food in general | from totally-unimportant to totally-important |
- Staple foods for daily consumption (such as dairy products, meat products, juices) | from totally-unimportant to totally-important |
- Luxury foods (such as chocolates, alcohol, snacks) | from totally-unimportant to totally-important |
- Convenience food (such as pizza, ready meals) | from totally-unimportant to totally-important

If you cannot or do not want to answer a sub-question, please do not move the dot on the scale and go to the next sub-question.

On a scale of 1 = totally unimportant through to 7 = totally important, how important is it that an organic food processing method preserves the sensory quality (e.g. taste, smell, texture, visual appeance) of the product after being processed, when processing the following products:
Only numbers may be entered in these fields. Each answer must be between 1 and 7
Please write your answer(s) here:

- Food in general | from totally-unimportant to totally-important |
- Staple foods for daily consumption (such as dairy products, meat products, juices) | from totally-unimportant to totally-important |
- Luxury foods (such as chocolates, alcohol, snacks) | from totally-unimportant to totally-important |
- Convenience food (such as pizza, ready meals) | from totally-unimportant to totally-important

If you cannot or do not want to answer a sub-question, please do not move the dot on the scale and go to the next sub-question.

On a scale of 1 = totally unimportant through to 7 = totally important, how important is it that an organic food processing method is *compatible with organic environmental principles* (e.g. low water and energy usage, minimal emission of harmful gases) when processing the following products:
Only numbers may be entered in these fields. Each answer must be between 1 and 7
Please write your answer(s) here:

- Food in general | from totally-unimportant to totally-important |
- Staple foods for daily consumption (such as dairy products, meat products, juices) | from totally-unimportant to totally-important |
- Luxury foods (such as chocolates, alcohol, snacks) | from totally-unimportant to totally-important |
- Convenience food (such as pizza, ready meals) | from totally-unimportant to totally-important

If you cannot or do not want to answer a sub-question, please do not move the dot on the scale and go to the next sub-question.

Acceptance of changes in quality in organic food processing

The quality aspects listed below can be used to decide whether or not processed organic food can be described as an organic product. We are interested in how much you think organic food can change during processing and still be considered as organic.

How much change of the ***product taste***, after being processed, could you accept to still call this product organic?

7 = the taste of the unprocessed product keeps the same in the processed product.
6 = very low change of taste
5 = low level change of taste
4 = partly change of taste
3 = big change of taste
2 = very big change of taste
1 = the original taste of the unprocessed product was completely changed in the processed product.

Only numbers may be entered in these fields.

Each answer must be between 1 and 7

Please write your answer(s) here:

- Food in general is still organic when the taste is... | from completely changed to the same |
- Staple foods for daily consumption (such as dairy products, meat products, juices) are still organic when the taste is... | from completely changed to the same |
- Luxury foods (such as chocolates, alcohol, snacks) are still organic when the taste is... | from completely changed to the same |
- Convenience food (such as pizza, ready meals) are still organic when the taste is... | from completely changed to the same |

If you cannot or do not want to answer a sub-question, please do not move the dot on the scale and go to the next sub-question.

How much change of the ***vitamin content*** of the product, after being processed, could you accept to still call this product organic (Assuming no vitamins are added)?

7 = the vitamin content of the unprocessed product keeps the same in the processed product.
6 = very low change of vitamin content
5 = low level change of vitamin content
4 = partly change of vitamin content
3 = big change of vitamin content
2 = very big change of vitamin content
1 = the original vitamin content of the unprocessed product was completely changed in the processed product.
Only numbers may be entered in these fields.

Each answer must be between 1 and 7

Please write your answer(s) here:

- Food in general is still organic when the vitamin content is... | from completely changed to the same |
- Staple foods for daily consumption (such as dairy products, meat products, juices) are still organic when the vitamin content is... | from completely changed to the same |
- Luxury foods (such as chocolates, alcohol, snacks) are still organic when the vitamin content is... | from completely changed to the same |
- Convenience food (such as pizza, ready meals) are still organic when the vitamin content is... | from completely changed to the same |

If you cannot or do not want to answer a sub-question, please do not move the dot on the scale and go to the next sub-question.

How much change of the ***mineral substances*** of the product, after being processed, could you accept to still call this product organic? (assuming no minerals are added)?

7 = the mineral substances in the unprocessed product keeps the same in the processed product.
6 = very low change in mineral substances
5 = low level change in mineral substances
4 = partly change in mineral substances
3 = big change in mineral substances
2 = very big change in mineral substances
1 = the original mineral substances in the unprocessed product were completely changed in the processed product.
Only numbers may be entered in these fields.

Each answer must be between 1 and 7

Please write your answer(s) here:

- Food in general is still organic when the mineral substances are... | from completely changed to the same |
- Staple foods for daily consumption (such as dairy products, meat products, juices) are still organic when the mineral substances are... | from completely changed to the same |
- Luxury foods (such as chocolates, alcohol, snacks) are still organic when the mineral substances are... | from completely changed to the same |
- Convenience food (such as pizza, ready meals) are still organic when the mineral substances are... | from completely changed to the same |

If you cannot or do not want to answer a sub-question, please do not move the dot on the scale and go to the next sub-question.

How much change in the ***environmental impact*** (water and energy consumption, CO2 emissions) of the applied processing method could you accept to still call this product organic?

7 = the environmental impact of the unprocessed product keeps the same in the processed product.
6 = very low change of environmental impact
5 = low level change of environmental impact
4 = partly change of environmental impact
3 = big change of environmental impact
2 = very big change of environmental impact
1 = the original environmental impact of the unprocessed product was completely changed in the processed product.

Each answer must be between 1 and 7

Only integer values may be entered in these fields.

Please write your answer(s) here:

- Food in general is still organic when the environmental impact is... | from completely changed to the same |
- Staple foods for daily consumption (such as dairy products, meat products, juices) are still organic when the environmental impact is... | from completely changed to the same |
- Luxury foods (such as chocolates, alcohol, snacks) are still organic when the environmental impact is... | from completely changed to the same |
- Convenience food (such as pizza, ready meals) are still organic when the environmental impact is... | from completely changed to the same |

If you cannot or do not want to answer a sub-question, please do not move the dot on the scale and go to the next sub-question.

Acceptance of the (potential) use of technologies for organic processing

In this section, different technologies are listed, which are already used in organic processing or could be used.

We would like to know how you would define the term: “gentle food processing”, which is a term that is used to describe the principles of organic food processing.

Please type in three keywords or bullet points, to describe what "gentle processing" means to you.

Please write your answer here:

Some technologies to improve shelf life are more suitable for organic food processing than others. Please indicate how suitable the listed technologies are for organic food processing.

Scale between | from 1 = absolutely unsuitable to 7 = totally suitable |

Available options (please hover the mouse for more info):

Pasteurised | High Temperature Pasteurisation | Bactofugation | Microfiltration | UHT (Ultra High Temperature) | Pulsed Electric Fields | Pulsed light processing | Irradiation | Cold plasma treatment | Deep-freezing | Reverse osmosis | Sterilisation | Fermentation | Microwave processing | HPP (High Pressure Processing) | Ultrasound | UV light treatment | Drying | Freeze-drying

Each answer must be between 1 and 7 and only integer values may be entered in these fields.

Please write your answer(s) here:

- Pasteurisation | from absolutely unsuitable to totally-suitable |
- High Temperature Pasteurisation (Hochpast) | from absolutely unsuitable to totally-suitable|
- (Double) bactofugation | from absolutely unsuitable to totally-suitable |
- Microfiltration | from absolutely unsuitable to totally-suitable |
- UHT (Ultra High Temperature) | from absolutely unsuitable to totally-suitable |
- Pulsed Electric Fields | from absolutely unsuitable to totally-suitable |
- Irradiation | from absolutely unsuitable to totally-suitable |

- Cold plasma treatment | from absolutely unsuitable to totally-suitable |
- Deep-freezing | from absolutely unsuitable to totally-suitable |
- Reverse osmosis | from absolutely unsuitable to totally-suitable |
- Sterilisation | from absolutely unsuitable to totally-suitable |
- Microwave processing | from absolutely unsuitable to totally-suitable |
- HPP (High Pressure Processing) | from absolutely unsuitable to totally-suitable |
- Ultrasound | from absolutely unsuitable to totally-suitable |
- UV light treatment | from absolutely unsuitable to totally-suitable |
- Drying | from absolutely unsuitable to totally-suitable |
- Freeze-drying | from absolutely unsuitable to totally-suitable |

If you cannot or do not want to answer a sub-question, please do not move the dot on the scale and go to the next sub-question.

If you evaluated some technologies to improve shelf-life as absolutely unsuitable for organic food processing, please briefly explain why?
Please write your answer here:

Some technologies to improve the product use or preserve the quality are more suitable for organic food processing than others.
Please indicate how suitable the listed technologies are for organic food processing.
(e.g. cleaning, sensory quality, texture, shape, conservation of valuable natural ingredients):

Only numbers may be entered in these fields. Each answer must be between 1 and 7

Please write your answer(s) here:

- Cutting, peeling, washing (fruits, vegetables) | from absolutely unsuitable to totally suitable |
- Homogenisation to improve the taste | from absolutely unsuitable to totally suitable |
- HPP (High Pressure Processing) to improve the taste | from absolutely unsuitable to totally suitable |
- Fermentation to preserve the product quality | from absolutely unsuitable to totally suitable|
- Extrusion (Forcing viscous materials through a nozzle to reshape it, e.g. for production of chips) | from absolutely unsuitable to totally suitable |
- Radio waves for thawing meat and fish | from absolutely unsuitable to totally suitable |
- Milling to process cereals | from absolutely unsuitable to totally suitable |
- Puffing and popping to process grains, like corn | from absolutely unsuitable to totally suitable |
- Pressing (fruits, vegetables) | from absolutely unsuitable to totally suitable |

If you evaluated some technologies to improve the product use, or preserve the quality, as being absolutely unsuitable for organic food processing, please briefly explain why?

Please write your answer here:

Consumer preferences for processing technologies

We are interested in which of the following processing technologies for milk, juice, and tomato would be most preferred by the majority of organic consumers in your country

Organic milk

Please indicate the order, from most preferred to least preferred, in which these processing treatments would be preferred by consumers in your country.

All your answers must be different and you must rank in order.

Please select at most 4 answers. Please number each box in order of preference from 1 to 4

- Pasteurised
- High Temperature Pasteurisation
- Bactofugation
- UHT (Ultra High Temperature)

Organic milk

Please indicate the order, from most preferred to least preferred, in which these processing treatments would be preferred by consumers in your country.

All your answers must be different and you must rank in order. Please select at most 2 answers

Please number each box in order of preference from 1 to 2

- Homogenised
- Non-homogenised

Organic juice

Please indicate the order, from most preferred to least preferred, in which these processing treatments would be preferred by consumers in your country.

All your answers must be different and you must rank in order. Please select at most 2 answers
Please number each box in order of preference from 1 to 2

- Concentrate
- Direct (pressed)

Organic juice

Please indicate the order, from most preferred to least preferred, in which these processing treatments would be preferred by consumers in your country.

All your answers must be different and you must rank in order. Please select at most 2 answers
Please number each box in order of preference from 1 to 2

- Pasteurised
- High Pressure Processing (HPP)

Organic tomato sauce / passata:

Please indicate the order, from most preferred to least preferred, in which these processing treatments would be preferred by consumers in your country.

All your answers must be different and you must rank in order. Please select at most 3 answers

Please number each box in order of preference from 1 to 3

- Pasteurised
- Sterilised
- HPP treated

Now we have some statements about communication / declaration of processing technologies.

Please indicate how much you agree with the following statements:

Please choose the appropriate response for each item:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
Consumers should be informed, on the packaging, about the processing technology that has been used.							
The processing technology applied to a food product should be prominently declared on the front of the packaging.							

Now we have some general statements about organic processing.

Please indicate how much you agree with the following statements related to the regulation of organic processing:

Please choose the appropriate response for each item:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
The processing of organic products is sufficiently regulated in the EU Organic Regulations.							
New technologies in organic processing should be strictly regulated in the EU Organic Regulation.							

Please indicate how much you agree with the following statements related to the inspection of organic processing:

Please choose the appropriate response for each item:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
For organic processing, there is no need for any organic inspection when state food inspectors would check all relevant standards anyway.							
For organic processing units, an inspection rhythm based on individual risk, rather than regular annual inspection, would be sufficient.							

Please indicate how much you agree with the following statements related to the use of technologies in food processing:

Please choose the appropriate response for each item:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
New food technologies decrease the natural quality of food							
Society should not depend heavily on technologies to solve its food problems.							
New food technologies have long-term negative environmental effects.							
New food technologies have long-term negative health effects.							

Final Question

Would a code of practice be helpful for food processors to identify and decide which processing technologies are best suited for organic food processing?
Please choose only one of the following:

- Yes
- No

What do you think of a "Code of Practice" (CoP) for Organic Processors? Do you have any other comments?

Please write your answer here:

Thank you for completing our survey. Your answers are very valuable to us. If you have any questions or comments, please don't hesitate to contact us.