Open-BIO

Opening bio-based markets via standards, labelling and procurement

Work Package 9: Social Acceptance

Deliverable N° 9.2 / Annex III

Acceptance of Bio-Based Products by Public Procurement Officials

June 2015

Final

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Project website: www.open-bio.eu

Disclaimer

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° KBBE/FP7EN/613677.

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1. Introduction

This background report presents the results of the second round of a two-stage Delphi survey among experts in the field of public procurement and in particular green public procurement (GPP). The main objective of this two-stage Delphi survey is the identification of key factors influencing the acceptance of bio-based products in public procurement. The second round of the survey serves primarily to validate the preliminary findings of the first round, described in detail in Annex III to the Open-Bio Report D9.1, and to further deepen the understanding of the reasons and appropriate instruments to overcome for the limited use of specifications for bio-based content in public procurement.

1.1. Methodology

This study adopts the Delphi method to generate a generalized view on factors influencing the acceptance of bio-based products in public procurement, based on the informed opinion of experts on public procurement and green public procurement. The Delphi method was chosen to generate a *generalized* view on the market acceptance of bio-based products. Rather than collecting data on the actual buying behaviour, it solicits the informed opinion of experts on the acceptance of bio-based products in public procurement in *general*.

The Delphi method represents an approach for aggregating and consolidating opinions from experts on a particular subject. The method involves two or more survey rounds, so that results from the initial survey can be validated and refined at the second stage. In this way, the method aims to synthesize the collective expertise of the respondents, thus increasing the accuracy of the resulting assessment (for more information on the Delphi method see Häder (2009) and Linstone & Turoff (2002)).

1.1.1. Survey development

The first round questionnaire was developed in an iterative process. Besides the review of the literature on policy and market developments in the field of bio-based products and on current practices in the field of green public procurement and innovation-oriented public procurement, it involved multiple feedback rounds with partners in the Open-Bio project. Finally, a preliminary version of the survey was tested by a group of procurement officials. The first survey was conducted in April / May 2014 and collected responses from 171 participants. Its key findings have been published in the Open-Bio Report D9.1.

The questionnaire of the second survey draws on the main findings of the first survey round and takes up resulting questions. Again, project partners had the opportunity to comment on the questionnaire draft to ensure that the survey results would provide relevant inputs to the related work programme of the Open-Bio project.

1.1.2. Survey administration

The first round of the survey was administered as an online survey, available in English as well as Czech, Danish, Dutch, French, German, Italian and Slovenian. The distribution of the survey took place via a diverse set of European and national multiplier organizations in the field of public procurement and green public procurement.

The second round of the Delphi study was designed as a closed group survey that exclusively addressed those experts that had already participated in the first survey round and declared their willingness to be contacted for a second survey. This approach helped to ensure that participants were motivated to share their opinions, possessed the necessary background information and a profound sector expertise to improve the outcome of the first round further. The 107 (out of 171) first round participants who had provided their contact details for this purpose were invited per email to take part in the second survey round.

The online questionnaire was only available in English, French, German and Italian, which largely corresponded to the language preferences of the invited experts (less than 10% had chosen to respond to the Czech, Danish, Dutch or Slovenian questionnaire in the first round). The survey was accessible from the 4th of February to the 16th of March 2015. A first invitation was sent out by email on Wednesday the 4th of February. Each contacted expert received a personalized key to access the questionnaire. The personalized key permitted to match the responses of the second survey to the information the person had already provided in the first survey. An email reminder was sent on the 16th of February. To increase the response rate, experts who had not responded by the 23rd of February 2015 were contacted by telephone and individually asked to participate in the survey.

Overall, 61 respondents completed the second round survey, which corresponds to a very high response rate of 57% of all the invited experts and a total share of 35.7% of the experts who took part in the first Delphi round.

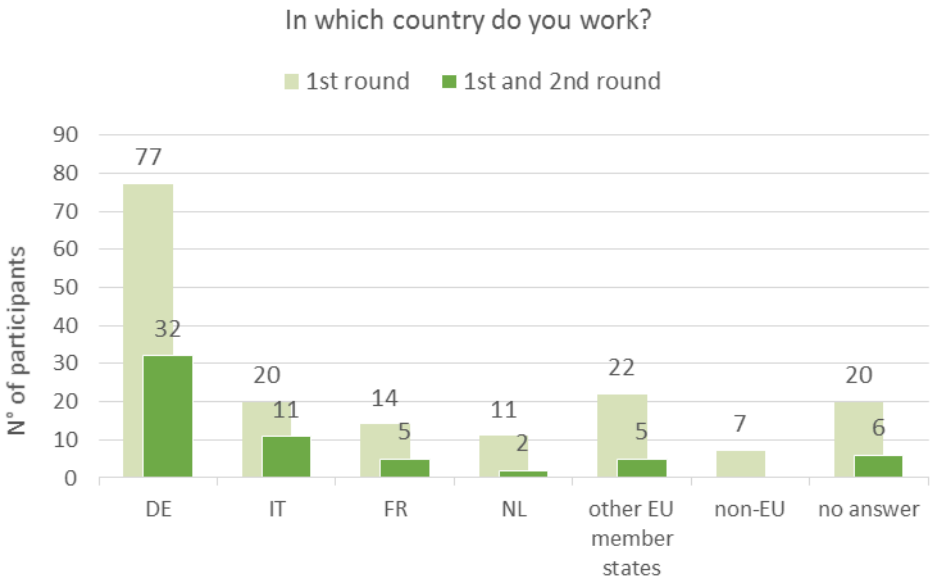
1.2. Respondent profiles

By matching the data of the first and the second round through personalized keys, we were able to analyse the respondent profiles of the second round and to control for potential effects of self-selection. Overall, we find no indication for concerns about a strong bias towards a specific subgroup of experts compared to the first survey round.

1.1.1 Geographic distribution of respondents and their organizations

The survey was completed by respondents from eight different EU member states, defined according to their place of work. Similar to the first round, the largest number of the second survey respondents indicated Germany (53%, compared to 48% in the first round) as their place of work followed by Italy (18%, compared to 12% in the first round) and France (8%, compared to 8% in the first round). Overall, the country shares differ only slightly from those in the first survey round. However, it should be noted that in the second round non-EU-respondents (4% in the first round) dropped completely out of the sample

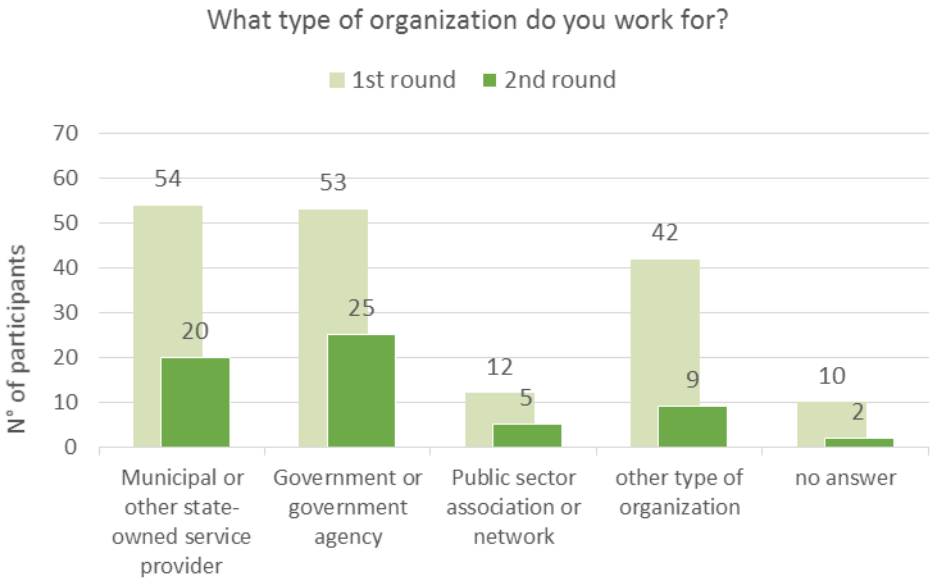
Figure 1: Geographic distribution of respondents and their organizations

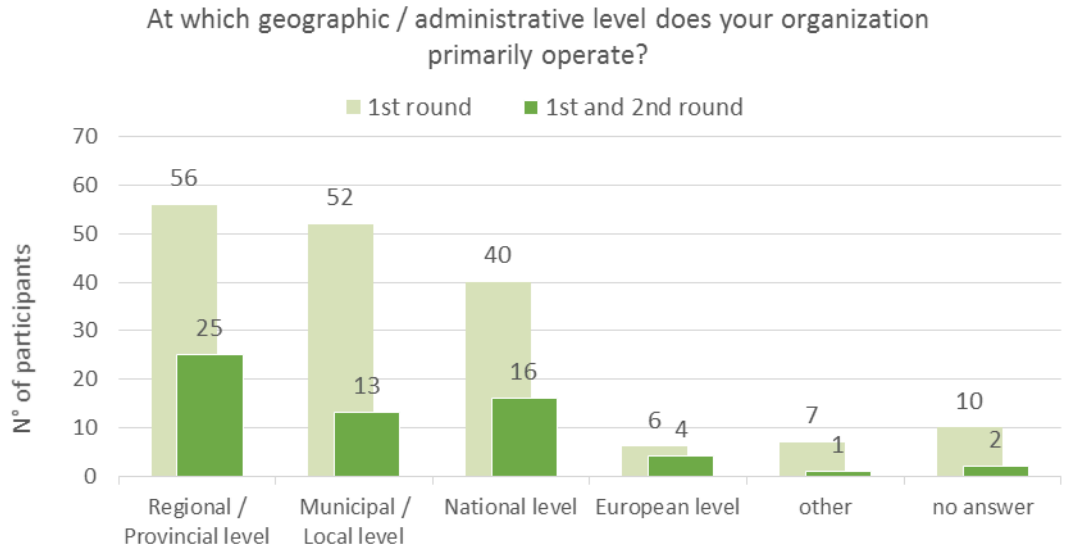


1.2.1. Organizational affiliation of respondents

Similar to the first round, over two thirds of respondents work either directly for the government or a government agency (41%) or for a municipal or other state-owned service provider (33%). The share of respondents that work at the regional / provincial level (41%) has further increased compared to the first survey round. In the second round, the second largest share of respondents operates at the national level (26%) surpassing the formerly second-place group of respondents working at the municipal / local level (21%). Less than 10 percent work at the European-level (7%).

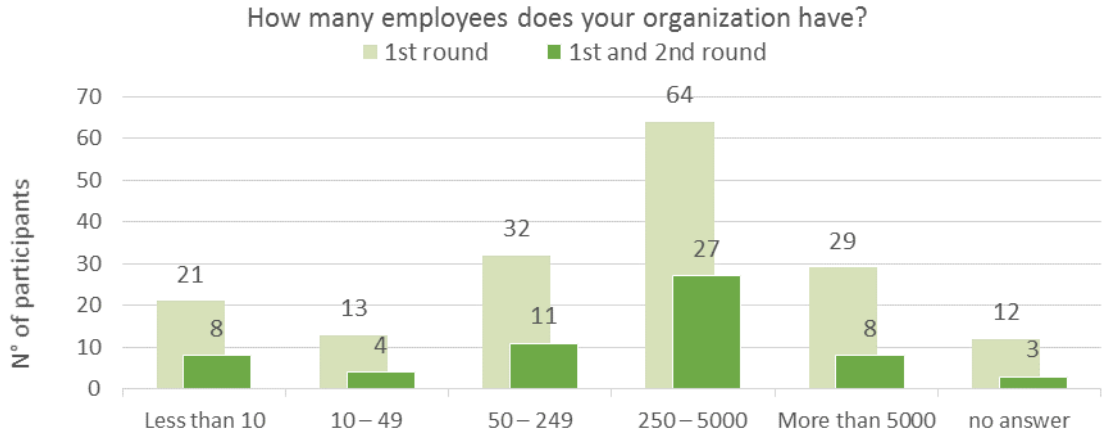
Figure 2: Type and geographic / administrative level of respondents' organizations





The distribution of size categories is similar to the distribution of the first round. The largest number of the second survey respondents work for organizations with 250 to 5000 employees (27), followed by organizations with 50 to 249 employees (11). In the second round, the share of small organizations with less than 10 employees (8) increased, representing a share of respondents' organizations equally big to the number of organizations with more than 5000 employees (8).

Figure 3: Size of respondents' organizations

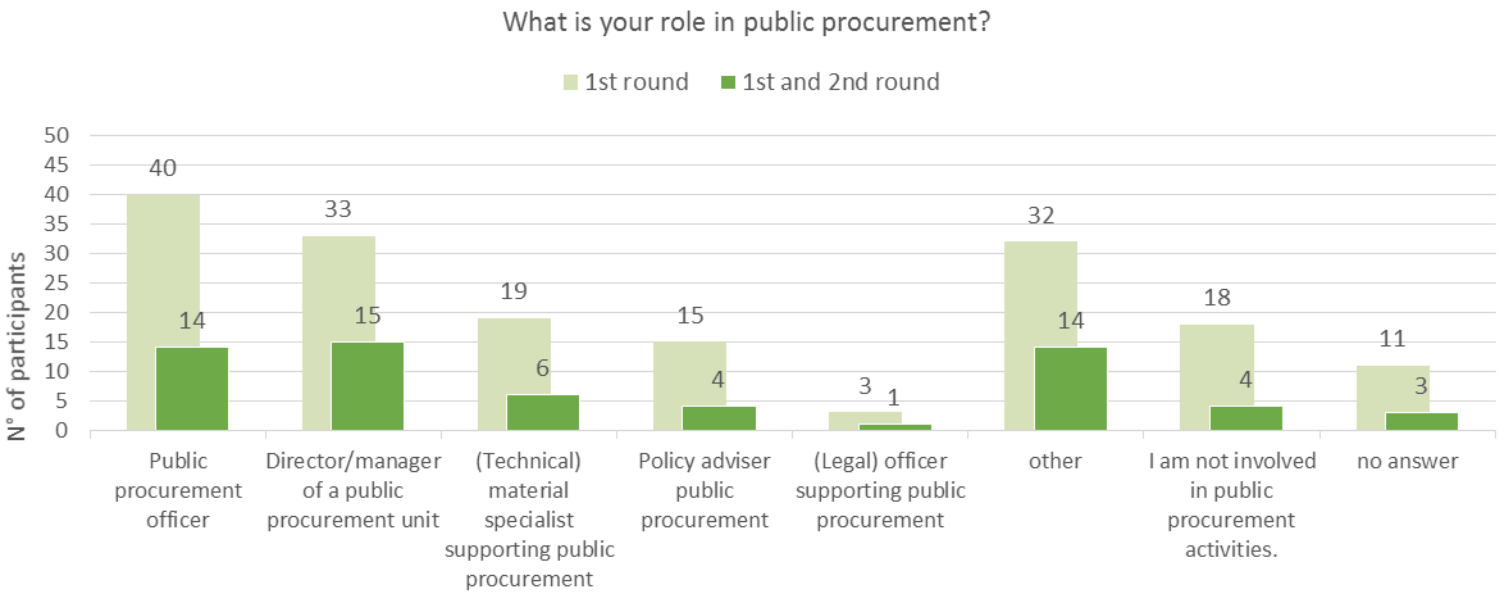


1.2.2. Role in public procurement

In the second round, the share of survey respondents directly involved in the practice of public procurement increased (60%). A quarter of the second round survey respondents operate as directors or managers of a public procurement unit (25%, compared to 19% in the first round), taking over the largest share from respondents directly involved in the practice of public procurement as procurement officers (remained at 23%). They are complemented by

the group of (technical) material specialist (10%) and (legal) officer supporting public procurement (2%). Similar to the first round, a further 28 percent of respondents are either policy advisers in the field of public procurement or pursue another related occupation. The share of survey respondents not involved in public procurement activities decreased in the second round (6%, compared to 11% in the first round).

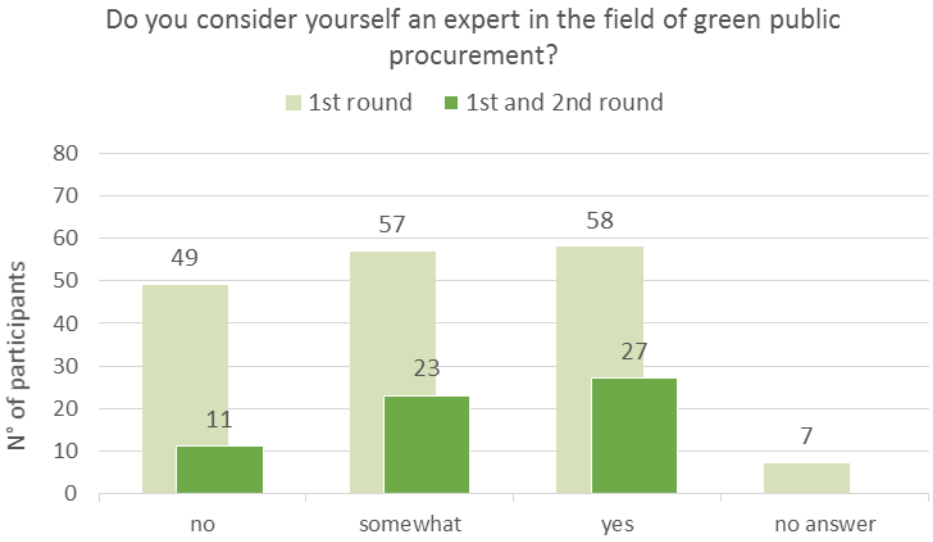
Figure 4: Respondents' roles in public procurement

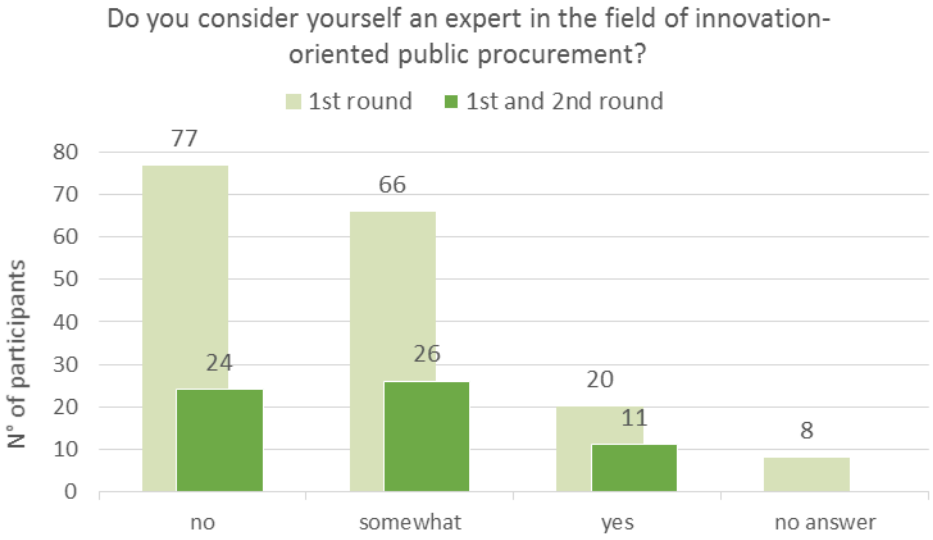


1.2.3. Individual expertise

In the first round, respondents were also asked to indicate their level of expertise in the field of green and innovation-oriented public procurement. The respondents with expertise were more likely to participate in the second round than those with no expertise in the respective fields. Consequently, the share of respondents claiming to have at least some expertise in the field of green public procurement increased (82%, compared to 67% in the first round). The trend can be also observed in the field of innovation-oriented public procurement; six out of ten survey respondents in the second round think they have at least some expertise in the field (compared to 5 out of 10 in the first round). However, the respondents with no expertise in the field of innovation-oriented public procurement do still represent a considerable share (24 out of 61, almost 40%).

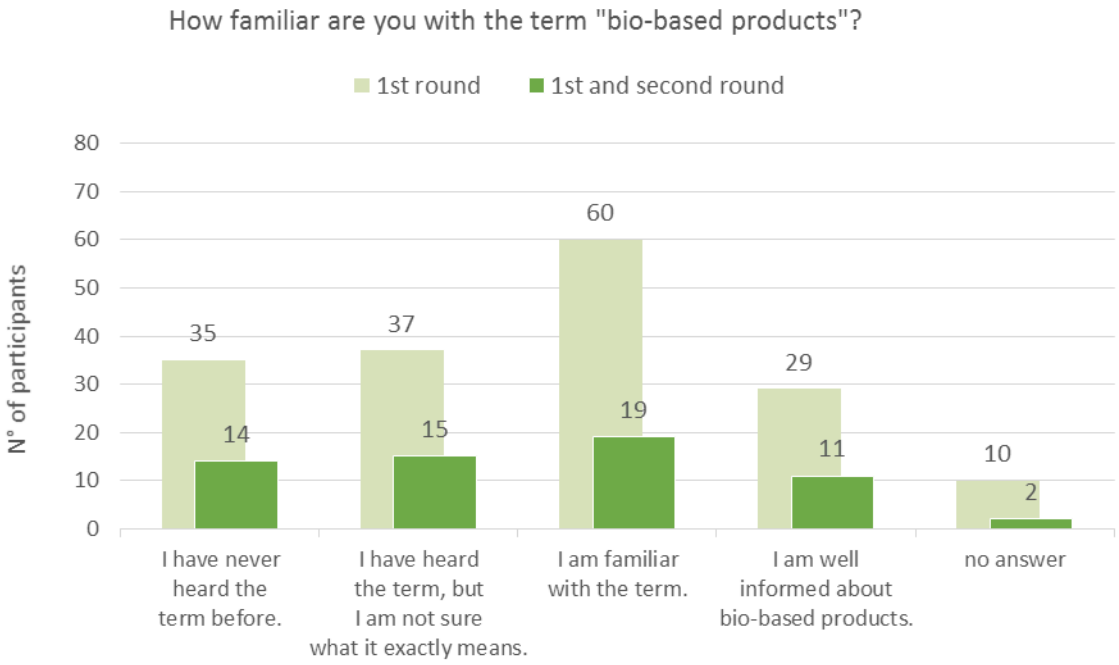
Figure 5: Individual expertise in green and innovation-oriented public procurement





The distribution of the familiarity with the term “bio-based products” among the respondents remained virtually the same with half of respondents indicated to be familiar with the term “bio-based products.

Figure 6: Respondents' familiarity with the term "bio-based products"



1.2.4. Procurement practices in respondents' organizations

Compared to the first round, the share of respondents' organizations practicing green public procurement increased (70%, compared to 62.5% in the first round). The same trend can be observed for respondents' engaging in innovation-oriented public procurement (49%, compared to 42% in the first round). However, the share of respondents' organizations with an administrative guideline or directive related to green public procurement remained approximately the same (around 40%). The same holds for a guideline or directive for innovation-oriented public procurement. Less than 20 percent of organizations have such a guideline or directive. Furthermore, in the second round, the share of those who have a green public procurement guideline also claiming to monitor its implementation with performance indicators remained slightly above 50 percent.

Figure 7: Green public procurement in respondents' organizations

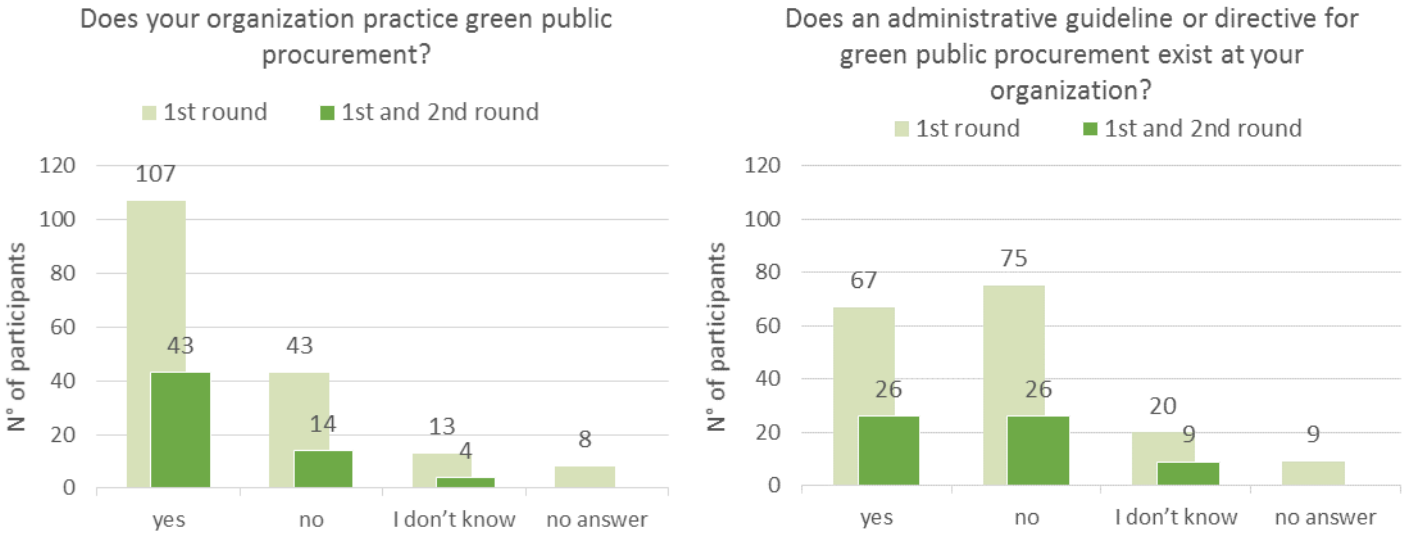
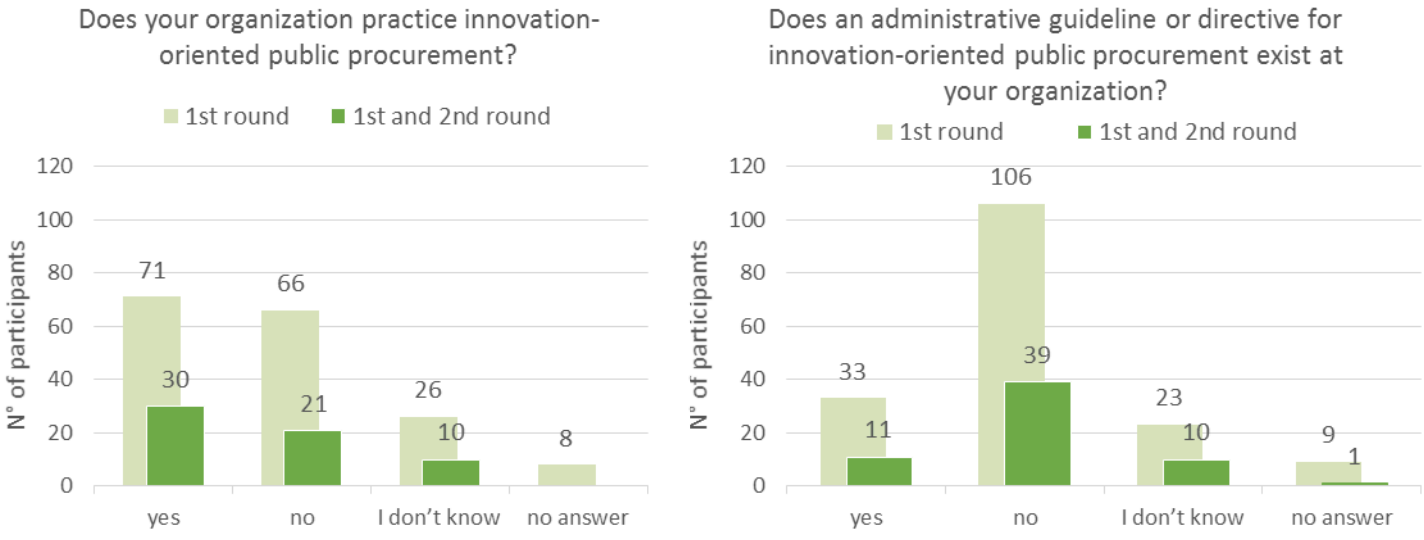


Figure 8: Innovation-oriented public procurement in respondents' organizations



Among organizations that do not have guidelines or directives for green or innovation-oriented public procurement, the share of respondents expecting such an instrument to be adopted in the near future (within the next year) remains below 10 percent. In addition, the share of those respondents expecting a green public procurement guideline or directive to be adopted within 1 to 5 years remained the same (about a third), while the share of those respondents expecting this for innovation-oriented public procurement slightly increased (28%, compared to 23% in the first round).

1.3. Survey Structure

The objective to validate the first round results and to deepen the understanding of previous findings determines the structure of the second survey questionnaire. In the principal part of the survey, participants are given a summary of main findings from the first survey round and are asked to indicate the level of agreement of the presented results with their personal experiences and opinions. In case of disagreement, respondents are given the opportunity to express an alternative view on the issue.

The survey consists of four parts. The first part validates the preliminary findings with regard to the importance of certain environmental aspects as decision criteria in the current practice of green public procurement. The second part focuses on validating the results concerning the effectiveness of instruments and measures to promote the uptake of bio-based products in public procurement. The third part tries to elicit the most important reasons for the limited use of specifications on bio-based content in procurement practices. The fourth part addresses the potential use of eco-labels in supporting the procurement of bio-based products.

2. Survey results

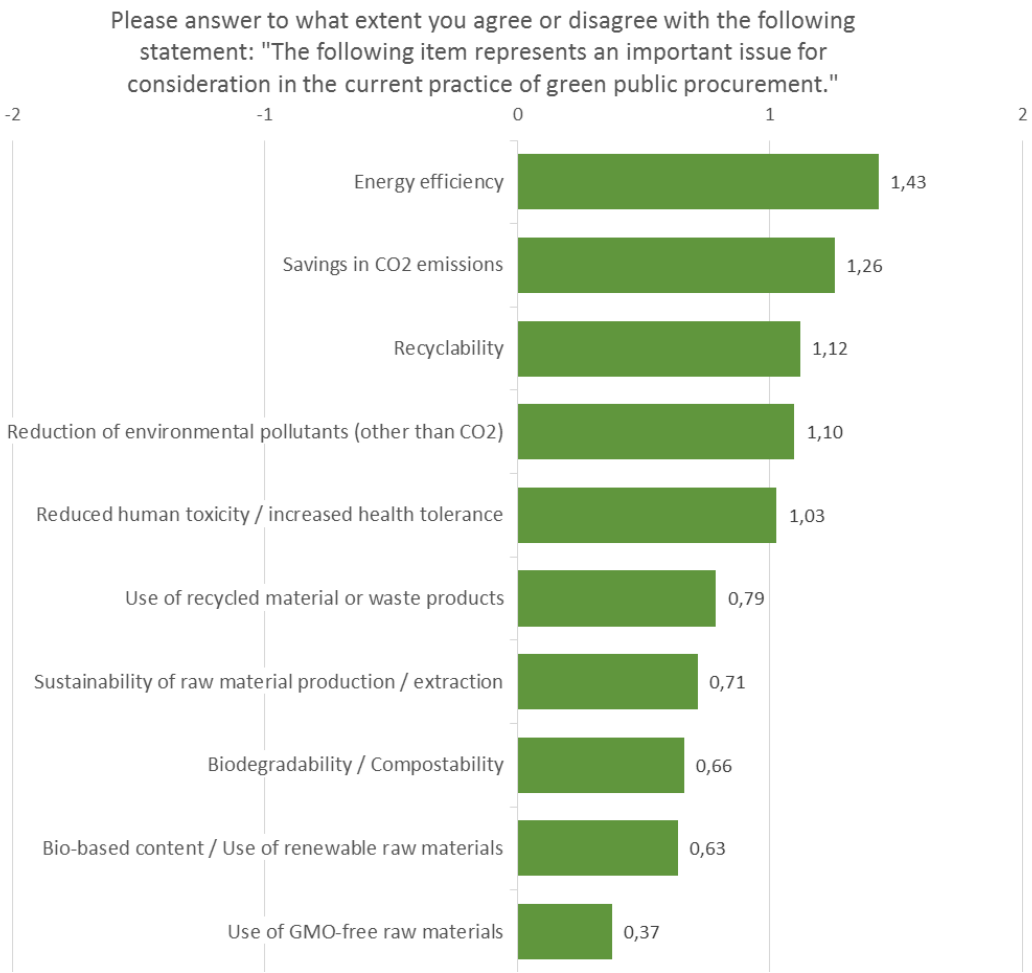
2.1. Environmental aspects in green public procurement practices

1.1.2 Results of the first survey round

Respondents of the first round were asked to assess the importance of various environmental aspects in the current practice of green public procurement. For each item, respondents indicated whether they agree or disagree on a scale of -2 to +2 with statements claiming that the listed items are important for current green public procurement practice.

Figure 9 presents the corresponding results. The items are ranked in descending order according to the average of all responses (i.e. the sum of all responses from - 2 to +2 divided by the total number of responses).

Figure 9: First round results – Environmental aspects in public procurement



The first round respondents perceived “Energy efficiency” as the most important environmental aspect today in green public procurement, whereas the item “Bio-based content / Use of renewable raw materials” figured among the least important environmental aspects in the current practice of green public procurement. Overall, the items related to the raw materials used for production, i.e. “Use of recycled material or waste products”, “Sustainability of raw material production / extraction”, “Bio-based content / Use of renewable raw materials”, “Use of GMO-free raw materials”, were considered to be relatively less important compared to most other items. Among the two end-of-life related options, “Recyclability” at the third rank was considered significantly more important than “Biodegradability / Compostability” at the eighth rank.

2.1.1. Results of the second survey round

In order to validate the first round results, in the second round survey respondents were asked to indicate whether they agree or disagree with the presented ranking. If respondents disagreed with the first round ranking, they had the chance to create an alternative ranking.

Figure 10: Agreement with the first round ranking of important environmental aspects

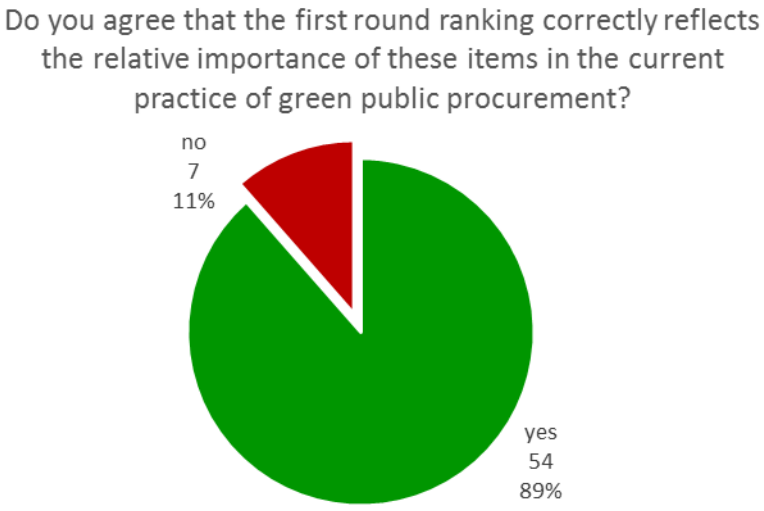


Figure 10 presents the respondents’ valuations. A vast majority of respondents (89%) indicates that they agree with the ranking that resulted from the first round. Only seven respondents disagreed and created their own rankings.

Table 1 contrasts the first round ranking, which most of the respondents in the second round could agree on, with the alternative rankings created by the remaining respondents. The items are ordered according to the average value of the first round responses. In the column “Alternative rankings”, the average position in the alternative rankings is reported as well as the corresponding change in the rank position of the respective item.

Table 1: Rankings of environmental aspects in green public procurement practices

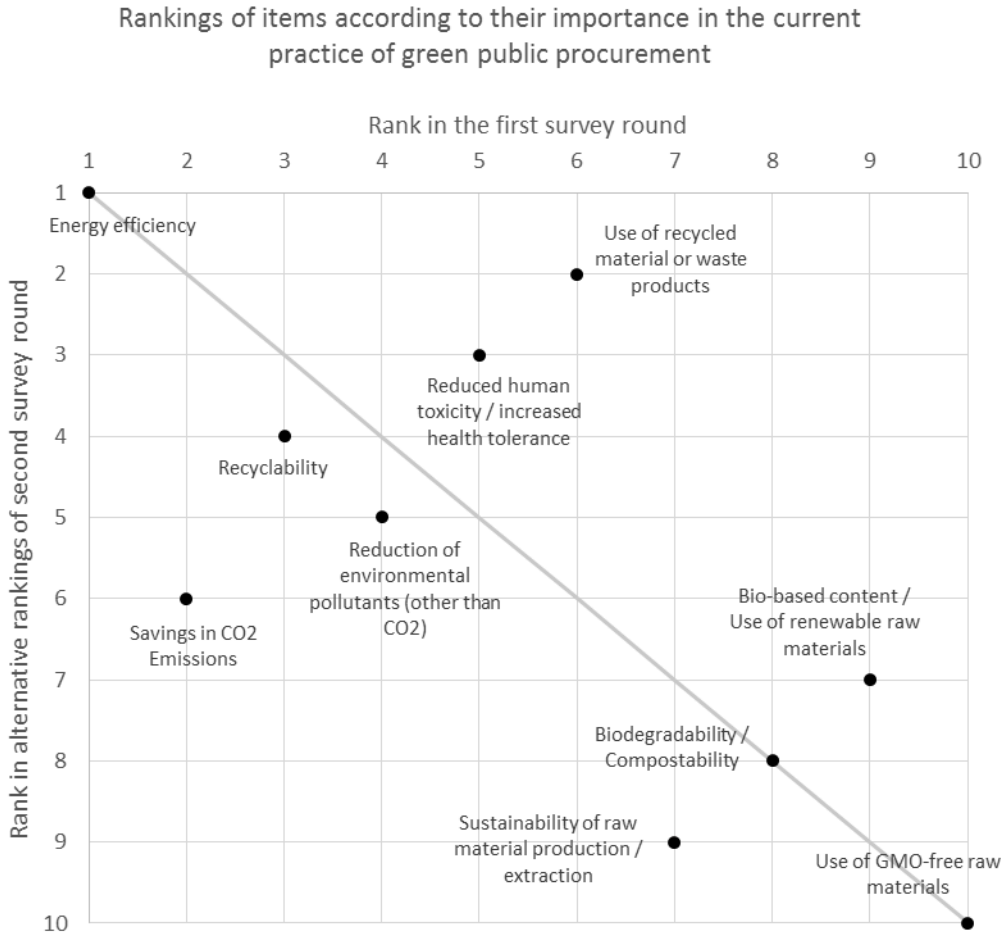
	Important items in the current practice of green public procurement	First round results	Alternative rankings		Overall results (61 experts)
		Average importance (Rank)	Average position (Rank) / change		Total weighted average position (Rank)
1	Energy efficiency	1.43 (1)	4.1 (1)	=	1.4 (1)
2	Savings in CO2 emissions	1.26 (2)	5.6 (6)	-4	2.4 (2)
3	Recyclability	1.12 (3)	4.7 (4)	-1	3.2 (3)
4	Reduction of environmental pollutants (other than CO2)	1.10 (4)	5.0 (5)	-1	4.1 (4)
5	Reduced human toxicity / increased health tolerance	1.03 (5)	4.4 (3)	+2	4.9 (5)
6	Use of recycled material or waste products	0.79 (6)	4.3 (2)	+4	5.8 (6)
7	Sustainability of raw material production / extraction	0.71 (7)	6.4 (9)	-2	6.9 (7)
8	Biodegradability / Compostability	0.66 (8)	6.1 (8)	=	7.8 (8)
9	Bio-based content / Use of renewable raw materials	0.63 (9)	5.7 (7)	+2	8.6 (9)
10	Use of GMO-free raw materials	0.37 (10)	8.6 (10)	=	9.8 (10)

Comparing the mean positions in the alternative rankings to the first round results, it turns out that the dissenting respondents in average consider “Savings in CO2 emissions” (-4) to be considerably less important. On the other hand, “Use of recycled materials” (+4) receives higher consideration.

Due to the overwhelming number of respondents in the second round agreeing with the presented ranking, the total weighted average of all second survey participants remains exactly the same and thus clearly corroborates the results of the first round.

In Figure 11, the average positions of items in the alternative rankings are plotted against the first round results to visualize the differences. It becomes apparent that apart from the two items mentioned above, all items are ranked similar to the first round with rank deviations ranging from 0 to ±2. It should be noted, that although “Bio-based content / Use of renewable raw materials” moves up by two rank positions in the alternative rankings, it nevertheless remains among the less important items.

Figure 11: Alternative rankings of environmental aspects



2.1.2. Conclusion

The second survey clearly confirms the findings of the first round regarding the importance of environmental aspects in the current practice of green public procurement. The ranking of items remains unchanged after considering the responses of all survey participants of the second round. Therefore, the preliminary conclusions of the first round remain valid.

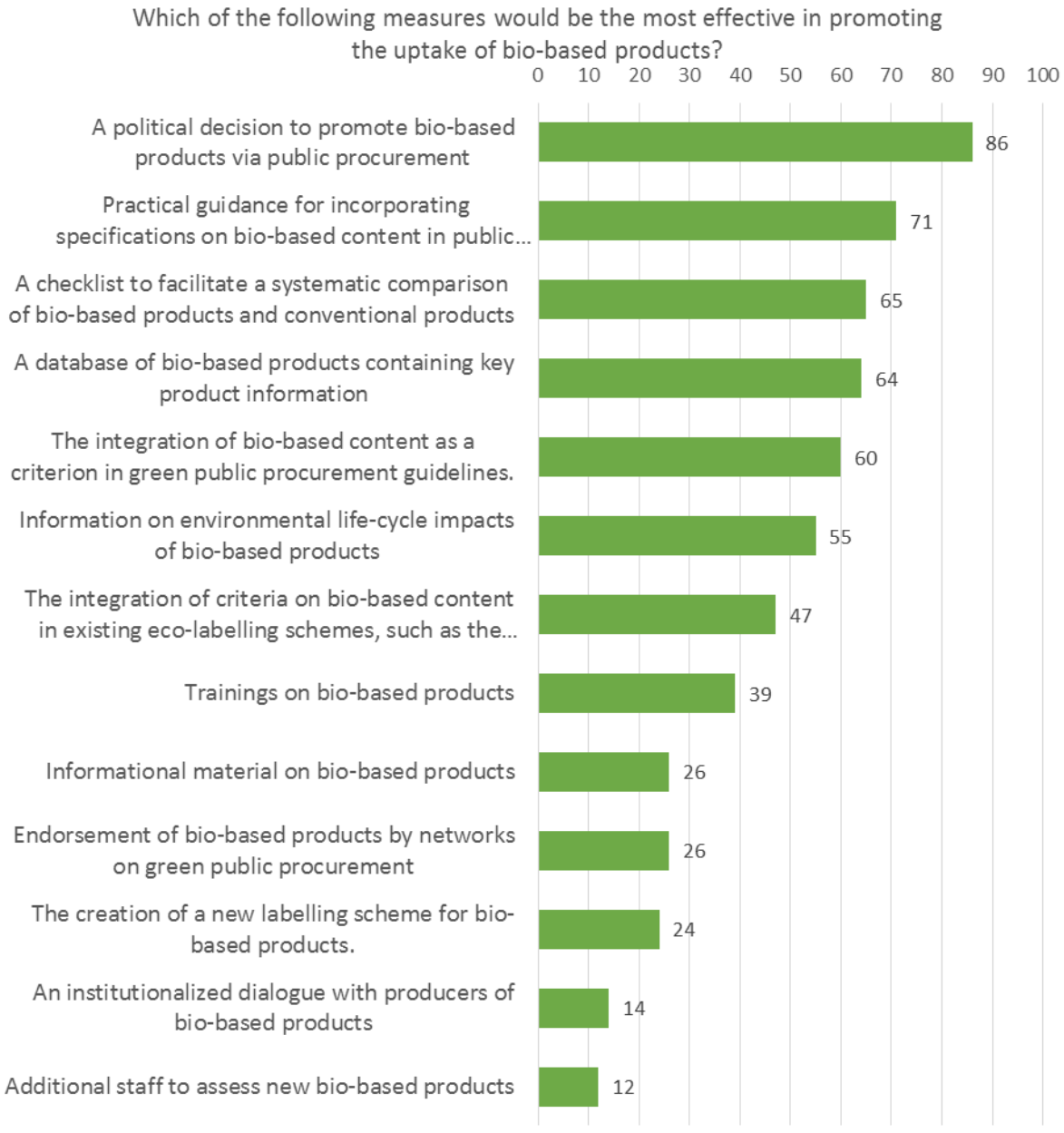
With regard to the uptake of bio-based products in public procurement, the results of the second survey round reinforce the previous impression that bio-based content as such is not an important environmental aspect typically considered in the current practice of green public procurement. Therefore, to increase the uptake of bio-based products in green public procurement, they need to demonstrate superior performance on other environmental criteria, such as energy efficiency, emission savings and ensure compatibility with existing recycling schemes.

2.2. Effective measures to promote bio-based products in GPP

2.2.1. Results of the first survey round

In the first round, respondents were asked to choose up to four measures (from a list of thirteen options), which they considered the most effective for promoting the uptake of bio-based products in public procurement. As a result, a ranking of measures was created (see Figure 12) based on the number of times each item was chosen by first round respondents (see Table 2).

Figure 12: First round results – Measures to promote bio-based products in GPP



The item “A political decision to promote bio-based products via public procurement” ranked first among the first round respondents, indicating the need for a stronger political signal in favour of integrating bio-based products in green public procurement schemes. In addition, practical guidance and tools to facilitate the procurement of bio-based products, including the development of a database with information on bio-based products, were considered as effective measures.

2.2.2. Results of the second survey round

Respondents of the second survey were asked to validate the first round findings on the effectiveness of measures to promote the uptake of bio-based products in public procurement. Specifically, they were asked whether they agree or disagree with the ranking of measures to promote the uptake of bio-based products in public procurement. In case of disagreement, they were asked to create an alternative ranking.

Figure 13: Agreement with the first round ranking of effective measures

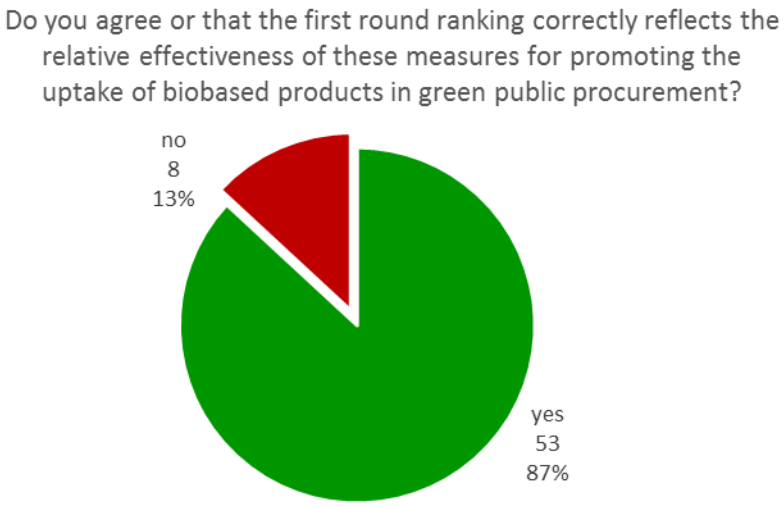


Figure 13 shows that more than 85% of the second survey respondents agreed with the ranking that resulted from the first survey round. Only eight respondents disagreed and provided an alternative ranking. Table 2 summarizes these alternative rankings and contrasts them to the ranking from the first survey round. The measures are listed according to the ranking of the first survey round. The average of the alternative rankings is contrasted with the first round ranking and the corresponding position changes are indicated.

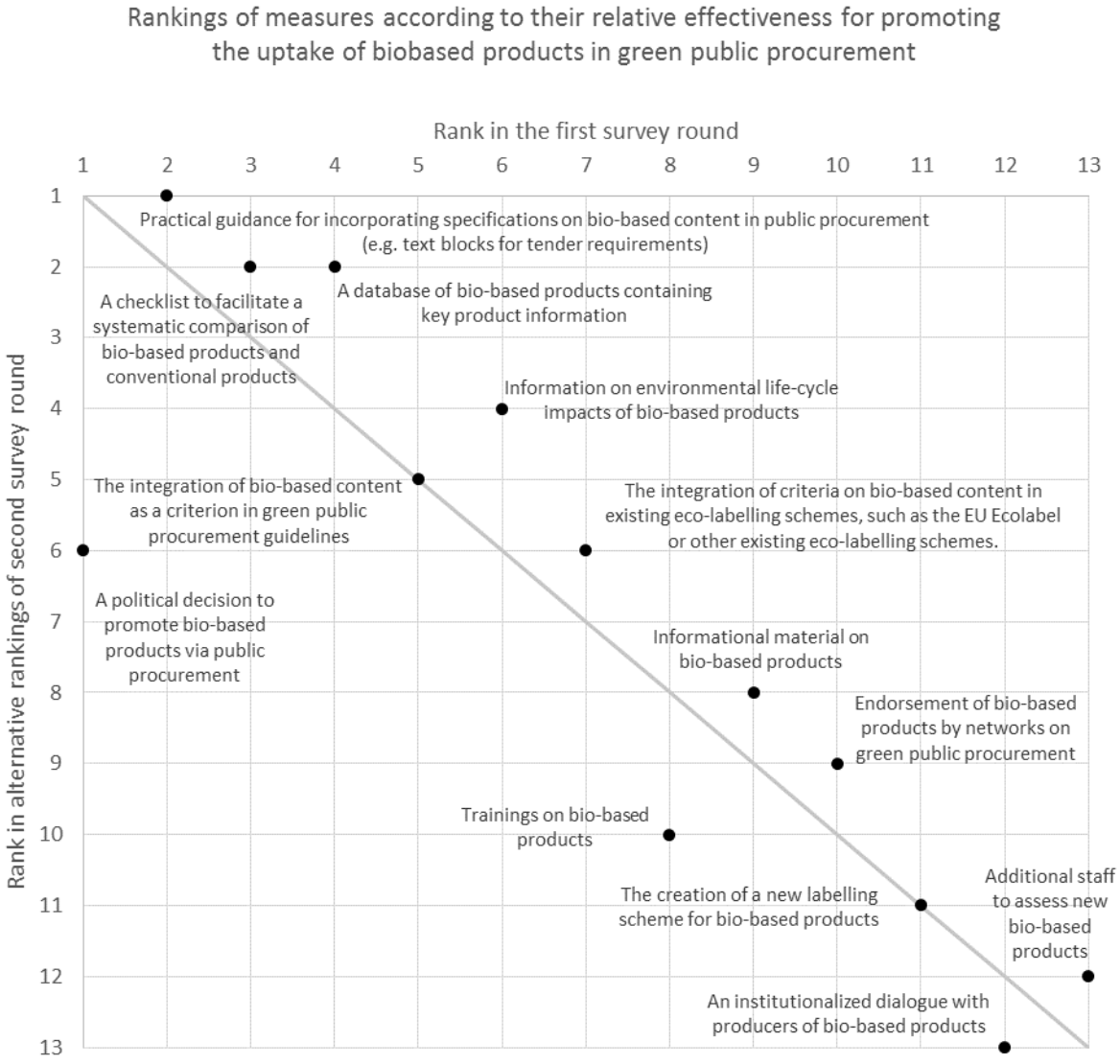
In Figure 14, the average alternative ranking positions are plotted against the first round results to visualize the differences between the two rankings. It becomes apparent that all but one item received a very similar ranking to the first round with deviations ranging from 0 to ±2. The only exception is the top measure from the first round ranking (“A political decision to promote bio-based products via public procurement”), which the eight dissenting respondents rank five positions lower (-5).

Table 2: Rankings of measures to promote bio-based products in public procurement

	Important items in the current practice of green public procurement	First round results	Alternative rankings		Overall results (61 experts)
		Share of respondents choosing the measure (Rank)	Average position (Rank) / change		Total weighted average position (Rank)
1	A political decision to promote bio-based products via public procurement	50.3% (1)	6.0 (6)	-5	1.66 (1)
2	Practical guidance for incorporating specifications on bio-based content in public procurement (e.g. text blocks for tender requirements)	41.5% (2)	4.1 (1)	+1	2.28 (2)
3	A checklist to facilitate a systematic comparison of bio-based products and conventional products	38.0 % (3)	5.0 (2)	+1	3.26 (3)
4	A database of bio-based products containing key product information	37.4% (4)	5.0 (2)	+2	4.13 (4)
5	The integration of bio-based content as a criterion in green public procurement guidelines.	35.1% (5)	5.5 (5)	=	5.07 (5)
6	Information on environmental life-cycle impacts of bio-based products	32.2% (6)	5.3 (4)	+2	5.9 (6)
7	The integration of criteria on bio-based content in existing eco-labelling schemes, such as the EU Ecolabel or other existing eco-labelling schemes.	27.5% (7)	6.0 (6)	+1	6.87 (7)
8	Trainings on bio-based products	22.8% (8)	9.0 (10)	-2	8.13 (8)
9	Informational material on bio-based products	15.2% (9)	6.6 (8)	+1	8.69 (9)
10	Endorsement of bio-based products by networks on green public procurement	15.2% (10)	8.4 (9)	+1	9.79 (10)
11	The creation of a new labelling scheme for bio-based products.	14.0% (11)	9.8 (11)	=	10.84 (11)
12	An institutionalized dialogue with producers of bio-based products	8.2% (12)	10.4 (13)	-1	11.79 (12)
13	Additional staff to assess new bio-based products	7.0% (13)	10.0 (12)	+1	12.61 (13)

Due to the overwhelming number of respondents agreeing with the presented ranking in the second round, the total weighted average ranking of all second survey participants is the same as the first round ranking and thus clearly corroborates the preliminary results.

Figure 14: Alternative rankings of effective measures



2.2.3. Conclusions

The second survey clearly confirms the findings of the first round regarding the most effective measures to promote bio-based products in public procurement. The ranking of items remains unchanged after considering the responses of all survey participants of the second round. Therefore, the preliminary conclusions of the first round remain valid.

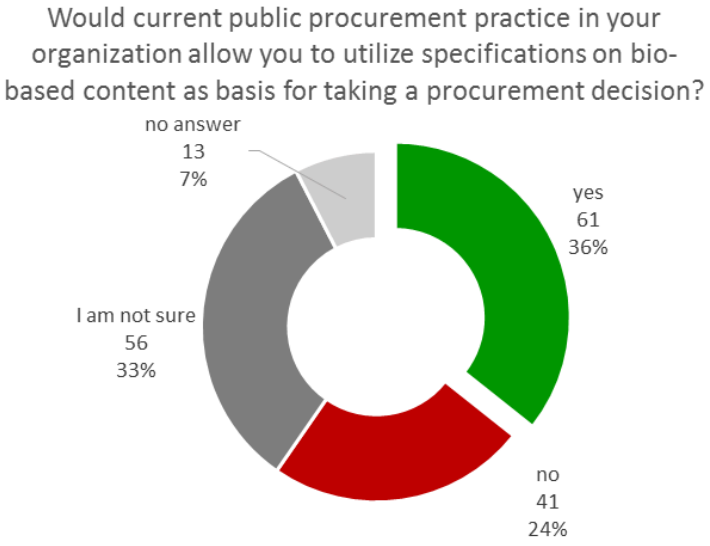
The few respondents who expressed their disagreement with the proposed ranking seem to have in common the rejection of “A political decision to promote bio-based products via public procurement” as the most effective measure, which they ranked significantly lower.

2.3. Bio-based content as criterion in public procurement

2.3.1. Results of the first survey round

In the first round, respondents were asked to indicate whether in the current practice of their own organization specifications on bio-based content could be utilized as a basis for taking public procurement decisions. Figure 15 illustrates the corresponding responses. Slightly over 40 percent were either unsure or failed to answer the question, indicating a high degree of uncertainty. Slightly less than one quarter indicated that procurement practices would not allow this (24%), while approximately one third indicated that this would be possible (36%). Among respondents who indicated that their organization practiced green public procurement or innovation-oriented public procurement, the share was slightly higher with 41 and 49 percent, respectively. Also considering the first round survey results regarding the importance of environmental aspects previously described in section 1.1.2, the responses clearly indicate that bio-based content does not yet represent an important criterion in the current practice of public procurement.

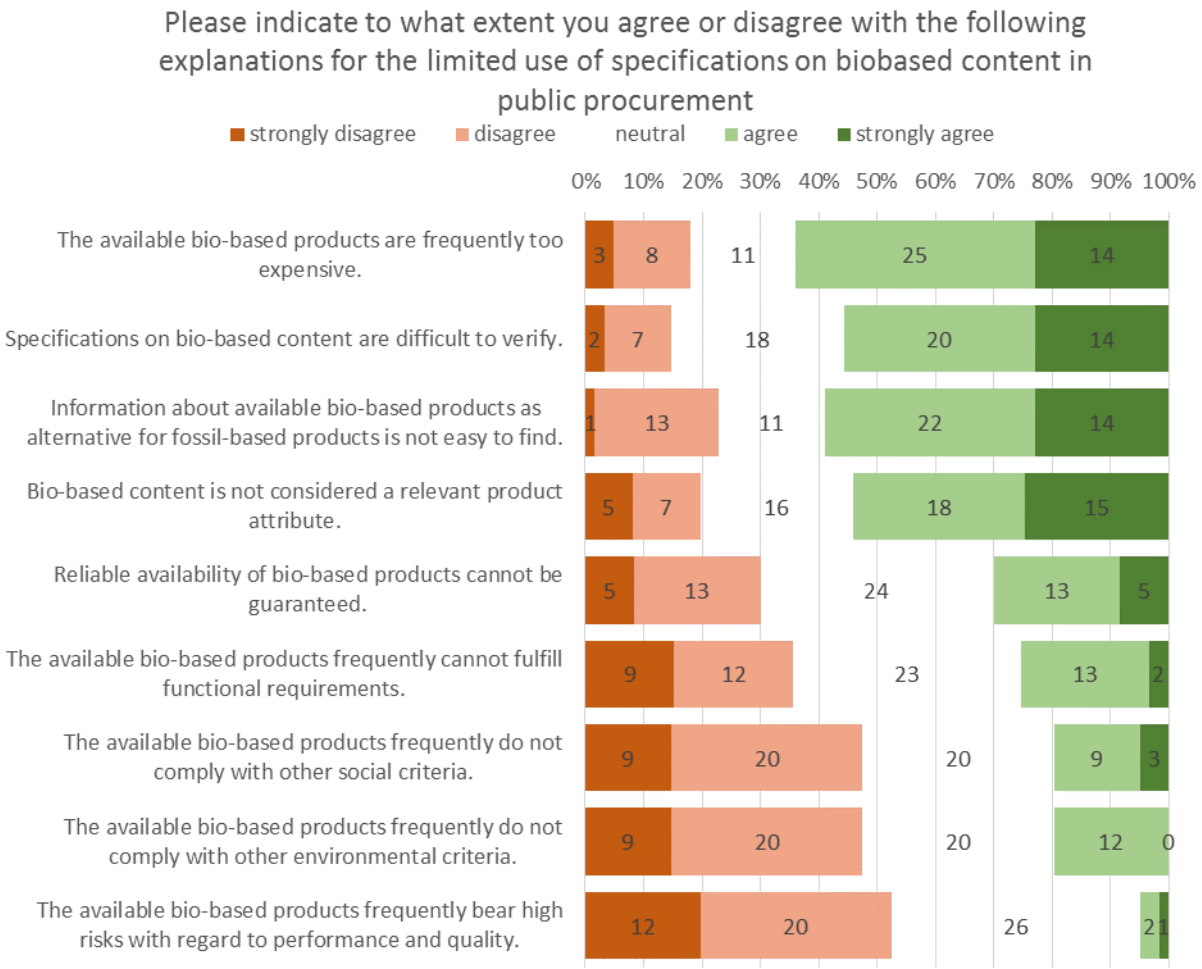
Figure 15: First round result – Use of specifications on bio-based content



2.3.2. Results of the second survey round

Given the clear conclusion from the first survey round that bio-based content does not yet represent an important criterion in the current practice of public procurement, respondents of the second survey round were confronted with a list of different statements explaining why this might be the case. Respondents were asked to indicate on a scale from -2 (strongly disagree) to +2 (strongly agree) to what extent they agreed or disagreed with explanations for the limited use of specifications on bio-based content in public procurement, taking into consideration their knowledge of common public procurement practices.

Figure 16: Explanations for the limited use of specifications on bio-based content



As becomes evident from Figure 16, there are four main reasons that a majority of respondents agrees on: (1) the higher price ("The available bio-based products are frequently too expensive."), (2) problems of verification ("Specifications on bio-based content are difficult to verify."), (3) the lack of information ("Information about available bio-based products as alternative for fossil-based products is not easy to find."), and (4) low relevance ("Bio-based content is not considered a relevant product attribute.").

Respondents' views are rather ambiguous with regard to the availability of bio-based products ("Reliable availability of bio-based products cannot be guaranteed.") and their functionality ("The available bio-based products frequently cannot fulfil functional requirements.").

Problems of compliance with social ("The available bio-based products frequently do not comply with other social criteria.") or environmental criteria ("The available bio-based products frequently do not comply with other environmental criteria.") or risks with regards to performance and quality of bio-based products ("The available bio-based products frequently bear high risks with regard to performance and quality.") are predominantly rejected as valid explanations for the limited use of specifications on bio-based content in public procurement.

Box 1: Other explanations for the limited use of specifications on bio-based content

Given the opportunity to provide other important explanations in a comment field of the second round questionnaire, respondents made the following comments:

- Lack of information and capacity building in this subject for people in charge of public procurement. Lack of political decisions and administrative guidelines that facilitate innovations in the public procurement procedures.
- "Bio-based" as such is not a criterion, as other criteria are considered to be key (e.g. reusability). It has to be shown that bio-based products are sustainable. You cannot simply assume that they will be more environmentally friendly.
- To get innovative products sometimes you need to use an innovative procurement method, some buyers see that as a risk.
- Apart from “information”, there is a lack of trustworthy specifications on the “bio-based content”
- 80% of the purchasing criteria are based on the dictate of cost, next to avoidance of learning efforts for the user, loyalty to suppliers / products.
- Little knowledge among public entities about bio-based products.

2.3.3. Conclusions

The use of specifications on bio-based content in procurement practices is still very limited. The second survey sheds light on the underlying reasons and identifies the main barriers for a broader use in the current practice of public procurement.

The reliability of the supply or the functional performance are not particularly problematic for the acceptance of bio-based products in public procurement. Procurement officers do also not see a specific problem of bio-based products in complying with social and environmental criteria, nor with guaranteeing stable performance and quality.

The concern with cost effectiveness in general creates a potential conflict with the aims of green public procurement and innovation-oriented procurement, which is not specific to the acceptance of bio-based products. However, “bio-based content” lacks the acceptance as a relevant product attribute that justifies preferred purchase under these procurement schemes. A pragmatic reason lies in the difficulty to verify respective claims. In order to make more intensive use of specifications of bio-based content, harmonized measurement standards and certification schemes need to be developed. More fundamentally, it is not evident at all and often questioned by the responsible persons whether and how “bio-based content” of a product translates into its performance in terms of sustainability.

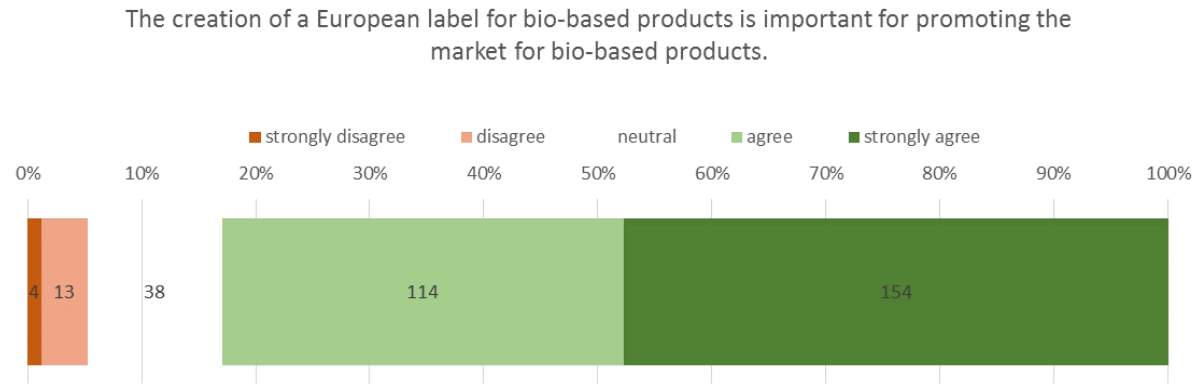
The acceptance of bio-based products in green public procurement would benefit from the provision of detailed product information that proves the superior performance of the bio-based product vis-à-vis a fossil-based reference product based on accepted environmental criteria.

2.4. Eco-labels in the context of green public procurement

2.4.1. Results of the first survey round

Product labelling and eco-labels in particular represent important instruments for promoting markets for environmentally-friendly products. The first round findings of the Open-Bio business survey support this view with respondents predominantly agreeing that "the creation of a European label for bio-based products would promote the market for bio-based products" (Figure 17). However, it is less clear what role eco-labels might play in promoting the uptake of environmentally-friendly products in public procurement.

Figure 17: First round result – Importance of a European label for bio-based products

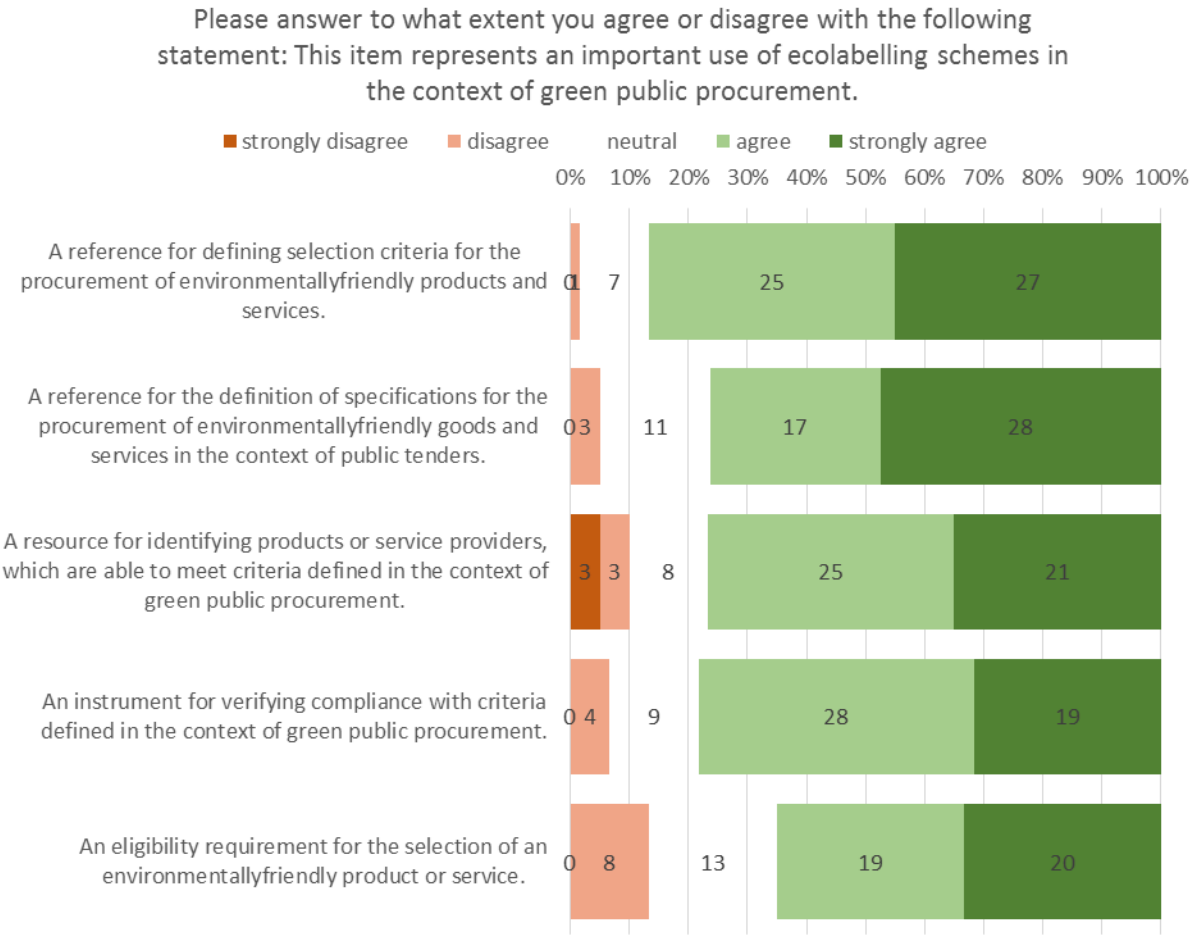


2.4.2. Results of the second survey round

In the second round of the Open-Bio procurement survey, respondents were therefore asked for their perspective on eco-labels in the context of green public procurement. For five statements, respondents indicated their level of agreement on a scale of -2 (strongly disagree) to +2 (strongly agree) with the fact that the items represented an important use of eco-labelling schemes in the context of green public procurement.

Figure 18 presents the results for all potential uses in descending order according to the average response. For each of the presented items a vast majority (≥ 65%) of respondents agrees that it represented an important use of eco-labelling schemes in the context of green public procurement. Eco-labels thus may serve as a reference for the definition of selection criteria, tender specifications or eligibility requirements, for identifying appropriate providers or verifying compliance with criteria defined in the context of green public procurement. Due to the small variance in the responses, a ranking of uses is not meaningful.

Figure 18: Eco-labels in the context of green public procurement



2.4.3. Conclusions

The results underline the multifaceted usefulness of eco-labelling schemes as instruments that facilitate the public procurement of environmentally-friendly products. The inclusion of criteria on bio-based content in the EU Ecolabel thus represents a promising strategy for promoting the uptake of bio-based products in the context of green public procurement.

3. Overall conclusions

The Open-Bio project used a two-stage Delphi survey approach to analyse the acceptance of bio-based products in public procurement. The first survey round has provided preliminary findings that have been validated and further refined in the second survey round. Regarding the importance of environmental aspects in procurement practices and the effectiveness of specific measures to promote bio-based products in public procurement, responses to the second survey clearly corroborated results and reinforced the preliminary conclusions of the first survey round detailed in Annex III to the Open-Bio Report D9.1. Additional questions that investigated the main barriers for the use of specifications on bio-based content and the role of eco-labelling schemes in the context of green public procurement yielded further insight into the acceptance of bio-based products by this specific stakeholder group.

For the context of public procurement, the term acceptance refers to the willingness of public procurement officers to adopt and purchase bio-based products. Following this definition, the study identified critical factors influencing the acceptance of bio-based products in public procurement. Given the strict rules and guidelines governing traditional public procurement procedures, the uptake of bio-based products in public procurement is closely linked to the question whether the targeted purchase of bio-based products can be justified based on existing practices and guidelines. In particular, green public procurement and innovation-oriented public procurement schemes may offer entry-points for this purpose. For this reason, the study has placed particular emphasis on current green public procurement practices, the more widespread practice among the two. It has explored the role of key environmental and cost-related aspects within this context and to what extent they may represent vehicles for supporting the increased purchase of bio-based products in public procurement.

3.1. Key factors for acceptance of bio-based products in public procurement

Among the cost- and performance related aspects considered in the current practice of public procurement, the price of a product represents the single most important decision criterion, followed by operating and maintenance costs. The high price therefore represents a main reason for the limited acceptance of bio-based products in public procurement. Given the cost efficiency imperative for public administrations, bio-based products need either to be less expensive or offer a clear advantage over competing fossil-based reference products that can justify the higher price.

Although green and innovation-oriented public procurement schemes represent potential entry points for justifying the purchase of bio-based products, the respective benefits are not evident. Uncertainty about the environmental or political benefits of bio-based products is one main reason for the limited use of specifications on bio-based content in public procurement.

Another identified reason for the disregard of bio-based content is the perceived difficulty to verify respective claims. Conceivably, the parallel existence of competing methods for determining the bio-based content of products creates legal uncertainties for public agents. The development of harmonized measurement standards and reliable certification schemes will certainly help to remove this barrier.

Furthermore, there is a general lack of information about available bio-based products. In the first survey, respondents had already expressed the strong demand for information to decide on the purchase of a bio-based product as well as the need for standardizing this information. Standardized information on toxicity, environmental life-cycle impacts and bio-based content are considered as most important to compare similar products for the public procurement of bio-based products. Many of the organizations already practice green public procurement or engage in innovation-oriented public procurement. However, administrative guidelines are often missing and uncertainty among public procurement officials is high whether specifications on bio-based content can actually be used as basis for taking purchasing decisions. The Delphi survey has identified the most relevant environmental aspects in the current practice of green public procurement.

We have to assert that bio-based content is not an important environmental aspect typically considered in the current practice of green public procurement. According to the overall ranking of important criteria in current green public procurement practices, “Bio-based content / Use of renewable raw materials” lists among the least important environmental aspects. In fact, the ranking of environmental aspects considered in current green public procurement practices indicates that impacts immediately related to the production, use and disposal of products (energy efficiency, savings in CO_2 emissions, recyclability) are currently more important than impacts of the production of raw materials (bio-based content / use of renewable raw materials, use of GMO-free raw materials).

As the results clearly indicate, the uptake of bio-based products in green public procurement is unlikely to occur based on the criterion of bio-based content alone. Bio-based content often lacks the recognition as a relevant product attribute. Given the importance of other environmental concerns, it is rather likely that the acceptance of bio-based products in green public procurement schemes will depend on an above-average performance along multiple environmental criteria. The particularly high level of importance attributed to energy efficiency and emission savings as environmental aspects considered in the context of green public procurement suggests that bio-based products, which can credibly claim to be climate-friendly, would have a significantly higher level of uptake in green public procurement. Similarly, bio-based products, which perform poorly with respect to end-of-life options, are not likely to benefit from green public procurement schemes. The results reveal that overall recyclability is a more important end-of-life consideration than biodegradability. The high level of importance attributed to recyclability calls for the integration into existing or the development of new recycling schemes to improve the acceptance of bio-based products in current green public procurement. It should be noted, however, that this ranking is reversed among Italian respondents. This suggests that public procurement may function as a driver of demand for different types of bio-based products in different European countries, a point to be considered when developing programs and measures for this purpose.

3.2. Measures to promote bio-based products in public procurement

Finally, regarding possible measures to promote the public procurement of bio-based products, the item "A political decision to promote bio-based products via public procurement" ranked first, indicating the need for a clearer political signal in favour of integrating bio-based products in green public procurement schemes or to promote the industry based on its innovativeness. It should however be noted that the few respondents that declared their disagreement and created alternative rankings all significantly downplayed this particular measure.

A political resolution would remove the barrier regarding the irrelevance of bio-based content as a product characteristic in public procurement. The success of the *BioPreferred Program* in promoting the uptake of bio-based products in the US economy provides a good example for the effectiveness of such a political decision. According to the official website[1], "the program's purpose is to spur economic development, create new jobs and provide new markets for farm commodities.", whereas environmental considerations are secondary. This demonstrates that social aspects other than environmental benefits, such as the purposeful early promotion of technological innovations, may also offer potential political arguments for increasing the acceptance of bio-based products among public procurement officials.

For the use of bio-based content as a decision criterion in green public procurement, the main challenge is to provide theoretical and empirical proof for a direct link of this product attribute and environmental performance. Many public procurement stakeholders seriously question the systematic relationship of the bio-based content of a product and its performance in terms of sustainability. This becomes evident from the following e-mail response of an expert to the invitation to participate in the survey:

> "My start point is quite different than yours. In your opinion, bio-based products are good for the environment. In my view, it's far to be systematically the case. They don't need a specific promotion if they are not really sustainable (considering the first mean of sustainable: no negative impacts for current and future generation; and not the sustainability as understood in the framework of biofuel directive), because their impact in term of soil degradation, toxicity, biodiversity,… can be higher compared with the mineral or fossil equivalents.
>
> I'm then in an uncomfortable situation to participate to your consultation."

As it seems rather difficult to establish the bio-based content as a proxy for environmental performance of a product in general, promoting bio-based products in the context of green public procurement will have to rely on a disintegrated strategy based on product categories. Environmental benefits related to bio-based content are easier to substantiate for specific product categories, such as lubricants, than for bio-based products in general.

[1] http://www.biopreferred.gov/BioPreferred/faces/pages/AboutBioPreferred.xhtml

Such an approach also underlies the EU Ecolabel, which defines different sets of criteria for environmental preferability based on product categories. Eco-labels thus may serve as a reference for the definition of selection criteria, tender specifications or eligibility requirements, for identifying appropriate providers or verifying compliance with criteria defined in the context of green public procurement. The possibility of including specifications on bio-based content for certain product categories in the EU Ecolabel will be further explored in the further progress of the Open-Bio project.

Furthermore, the surveyed experts also consider practical guidance and tools that facilitate the procurement among the most effective measures to support the uptake of bio-based products. The provision of tools for the direct comparison of bio-based and comparable conventional products with regard to information on accepted environmental characteristics would be instrumental. The development of an online accessible database for public procurement officials that provides detailed information on bio-based products has been designed based on the results of this survey and will be further developed within the Open-Bio project.