



**Open-BIO**

**Opening bio-based markets via standards,  
labelling and procurement**

**Work Package 9: Social Acceptance**

**Deliverable N° 9.1**

**Annex II: Acceptance of Bio-Based  
Products in the Business-to-Business  
Market**

**Part 1: Detailed Discussion of Results**

**Part 2: Data on Differences Across Countries  
and Expert-levels**

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## Part 1: Detailed Discussion of Results

### 1 Overview

This report represents an annex to the first deliverable of work package 9 on “Social Acceptance” in the Open-Bio project. It presents empirical findings on the acceptance of bio-based products in the business-to-business market. The report results represent preliminary findings derived from the first round of a two-stage Delphi survey among business experts in the bio-based economy. The main objective of this two-stage Delphi survey is the identification of key factors influencing the acceptance of bio-based products in the business-to-business market. In addition, it addresses a number of key issues on the role of standardization and information systems, including labelling, for the market acceptance of bio-based products. The results pertaining to information systems and labelling will inform related work in the Open-Bio project in work packages 7 (“Labelling”) and 8 (“Product Information List”).

#### 1.1.1 Background: Acceptance in the business-to-business market

In the context of the following study, the term acceptance refers to the willingness of firms to adopt and purchase bio-based products. It goes beyond weaker forms of acceptance - sometimes referred to as “acceptability” (Huijts, Molina, & Stegb, 2011) - defined as supportive attitudes towards a new technology or innovation. Following this definition, the aim of the study is to identify critical factors influencing the acceptance of bio-based products in the business-to-business market. More specifically, this means identifying the factors driving the adoption and purchase of bio-based products by firms.

Studies have shown that the drivers of the adoption of environmentally-friendly products or practices by firms are manifold (Henriques & Sadorsky, 1999; Vaccaro, 2009). A central driver is frequently environmental regulation (Chen, 2008; Jänicke & Lindemann, 2010). In the absence of strong regulatory incentives, a second motivation for firms to adopt environmentally-friendly products or business practices may be the expectation that this will provide them with a competitive advantage (Bansal & Roth, 2000; Berry & Rondinelli, 1998; Chen, 2008). This expectation in turn may stem from multiple trends. Firms may aim to gain a competitive advantage by anticipating future regulatory trends (Porter & van der Linde, 1995). They may also seek to differentiate their brand and product offerings from competitors, secure a premium price for green offerings or access green market niches (Bansal & Roth, 2000; Chen, 2008, 2010). The latter three drivers all depend on the assumption that there is sufficient awareness among consumers regarding the related environmental issues. In addition, firms may respond to external pressures from stakeholders who demand environmentally-friendly practices from businesses (Bansal & Roth, 2000; Berry & Rondinelli, 1998; del Río González, 2005). Finally, the adoption of green products or practices may be independent from the environmental benefits offered by the respective product or practice and may be driven by other cost- or performance-related (co-)benefits (Berry & Rondinelli, 1998; Porter & van der Linde, 1995).





Conversely, factors that might prevent firms from adopting a new product or innovation include factors like perceived uncertainties or risks regarding the new technology, the cost of adjusting supply chains and equipment to a new product and high initial investment costs (del Río González, 2005). Finally, the decision to adopt a new product or technology is a firm-specific decision, which strongly depends on the specific enterprise, its strategy and capacities (del Río González, 2005; Henriques & Sadorsky, 1999; Mills & Williams, 1986; Vaccaro, 2009). Hence, acceptance of bio-based products in the business-to-business market is not a homogeneous phenomenon but varies from firm to firm.

## 2 Methodological approach

### 2.1 The Delphi method

This study aims to provide a comprehensive perspective on the acceptance of bio-based products. It seeks to identify the most decisive factors influencing firm decision's to adopt and purchase bio-based products. The issue of firm heterogeneity, as alluded to in the previous section, makes this a challenging task. This is further compounded by the significant degree of heterogeneity among bio-based products themselves. Rather than representing a discrete product type with a specified field of application, bio-based products represent a broad spectrum of final and intermediate goods.

Despite these different forms of heterogeneity, developing a comprehensive perspective on the acceptance of bio-based products is essential for providing relevant inputs to ongoing sector-wide policy and standardization processes. To tackle this challenge, this study adopts the Delphi method. The Delphi method represents an approach for aggregating and consolidating opinions from experts on a particular subject. Rather than collecting data on the behaviour of individual survey respondents or the organizations they represent, it solicits their informed opinion on a selected topic. The method involves two or more survey rounds, so that results from the initial survey can be validated and refined. 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 Häder (2009); Linstone & Turoff (2002)).

### 2.2 Survey development

For this study, experts in the field of bio-based products, primarily from the business community, responded to a series of questions on the market acceptance of bio-based products as well as related questions on standardization and information systems, including labelling. The related questionnaire was developed in an iterative process, involving a review of the literature on policy and market developments in the field of bio-based products, a series of key informant interviews from businesses associations and potential buyers of bio-based products and multiple feedback rounds with project partners in the Open-Bio project as well as representatives from relevant working groups on bio-based products in the European Committee for Standardization (CEN). Moreover, questions on standardization and information systems were designed





in close cooperation with partners in the Open-Bio project to ensure that the results would provide relevant inputs to the related work program of the Open-Bio project.

All survey questions were formulated as general questions on the market for bio-based products as a whole. The aim was to ensure that all responses refer to one and the same point of reference (i.e. the market for bio-based products as a whole), thus minimizing variations based on the fact that respondents refer to their own specific business activity rather than the market for bio-based products as a whole.

In addition, the responses were analyzed *ex post* to identify any variations in the response patterns of different respondent sub-groups based on characteristics, such as the respondents' type of business activity, involvement with different types of bio-based products, country of residence and level of expertise in the field of bio-based products (see section 3 for an overview of respondent profiles). No statistically significant differences were identified for type of business activity or type of bio-based product, suggesting that the majority of respondents answered the questions as intended, i.e. in relation to the market for bio-based products in general rather than to the particular case of the respondents' own business activity or product. A number of statistically significant differences were identified in relation to the respondents' country of residence (i.e. location of the respondents' work place) and their declared level of expertise regarding the field of bio-based products. This is also consistent with the survey objectives, as these factors are, in fact, expected to influence response patterns. Relevant differences in these two areas are highlighted where appropriate in the following discussion of the results. For a comprehensive overview of the data disaggregated by country and expert-level, please see Part 2 of this annex.

### 2.3 Survey administration

The first round of the survey was administered as a pen and paper survey and as an online survey. The pen and paper survey was available in English only and was distributed at the "International Conference on Bio-based Materials" held from April 8 – 10, 2014 in Cologne, Germany and at the "Industrial GreenTec" exhibition in Hannover from April 7-11, 2014. It generated a total of 84 completed questionnaires.

The online distribution of the survey took place via a diverse set of European and national multiplier organizations in the field of bio-based products, including industry associations, research institutes and network organizations. The online survey was available in English, French, German, Italian and Spanish. In total, the online survey registered over 600 accesses and was completed and submitted by 240 respondents.

The combined total number of responses was 324. A total of 232 (71.6%) respondents left their contact details, this indicating their willingness to participate in the second survey round.



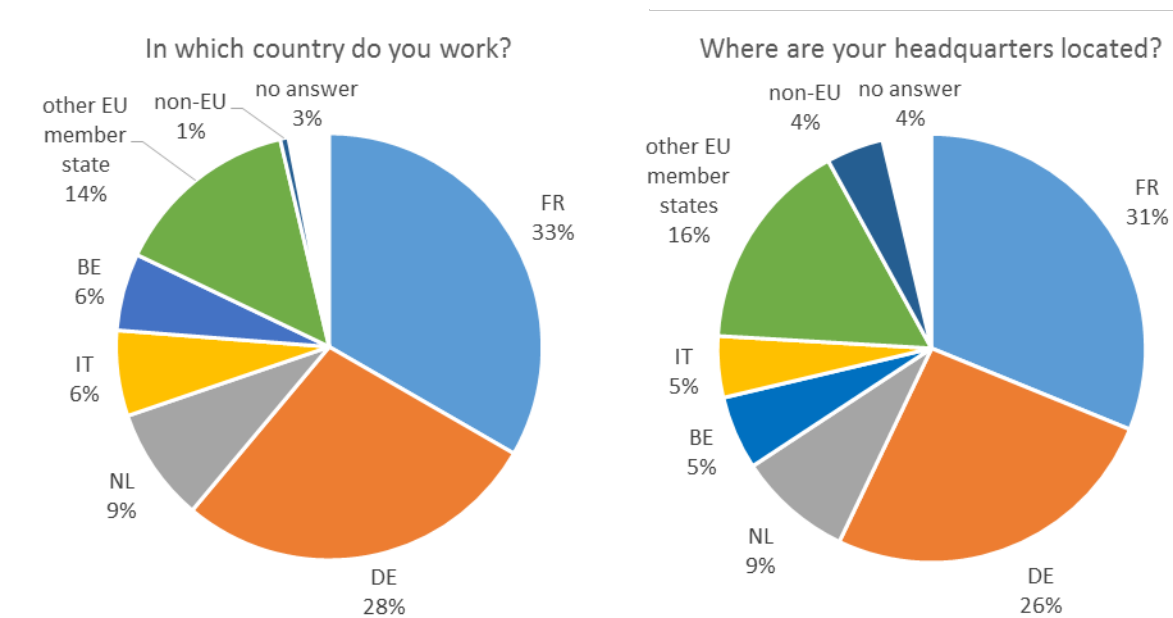


### 3 Respondent profiles

#### 3.1 Geographic distribution of respondents and their organizations

The survey was completed by respondents from 17 different EU member states and a number of non-EU member states, defined according to their place of work. The largest number of respondents indicated France (33%) as their place of work followed by Germany (28%), the Netherlands (9%), Italy (7%) and Belgium (6%). The geographic distribution of headquarters is broadly similar albeit with a slightly higher number of respondents indicating both other EU member states (15%) and non-EU member states (5%).

**Figure 1: Geographic distribution of respondents and their organizations**

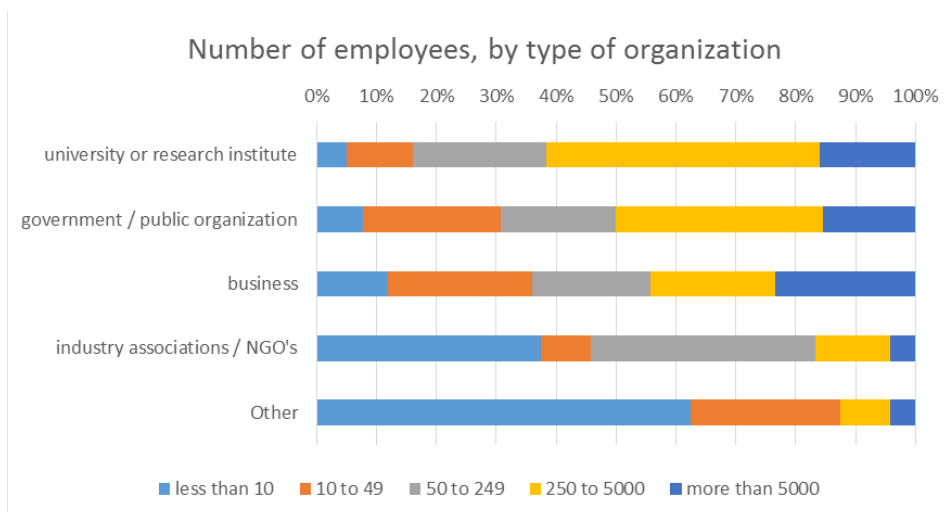
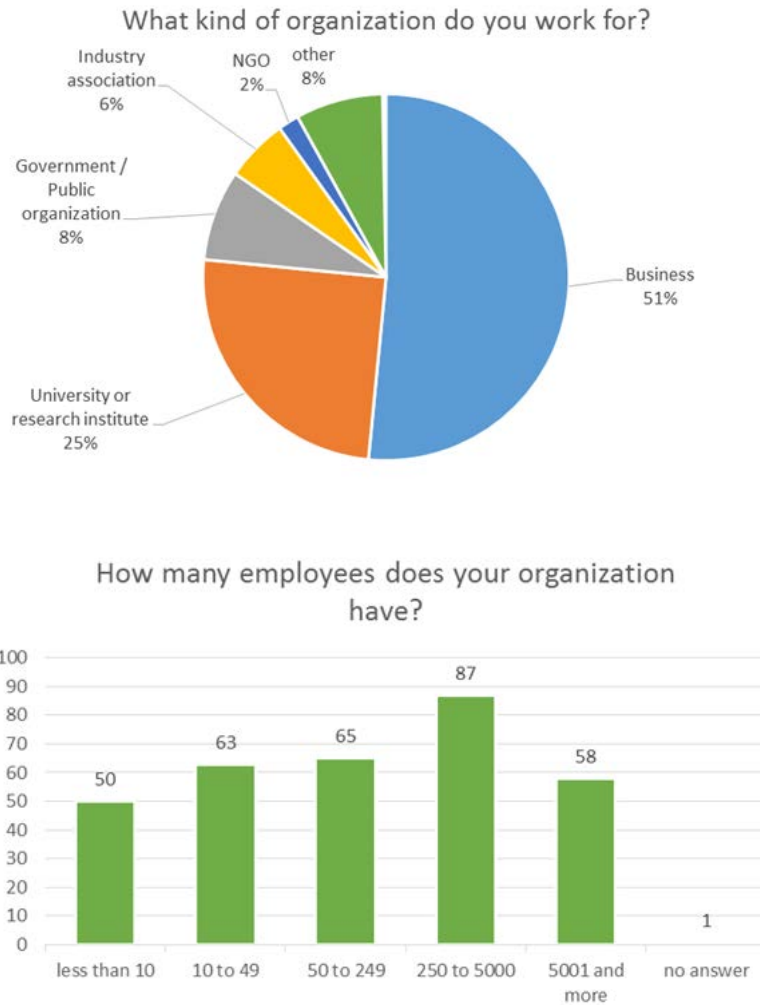


#### 3.2 Organizational affiliation of respondents

Slightly over half of the respondents work for businesses (51%). The second largest share of respondents works at universities and research institutes (25%), followed by representatives of government and public agencies (8%), and industry associations (6%). Only a small share represents non-governmental organizations (2%). The size of respondents' organizations is distributed fairly evenly across the five categories (see Figure 2 below), albeit with slightly more respondents in the range of 250 to 5000 employees (27%) and slightly less than average with less than 10 employees (15%). Among the businesses, the distribution is also fairly even albeit with a significantly smaller share of firms with less than 10 employees.



**Figure 2: Type and size of respondents' organizations**





### 3.3 Role in the bio-based industry

#### 3.3.1 Reliance on bio-based sources

Over 60 percent of respondents' organizations are actively engaged in the production, purchase and/or trade of bio-based products or materials. The declared reliance on bio-based sources reveals relatively strong participation from both organizations with only marginal involvement in the sector (i.e. less than 10 percent reliance on bio-based sources) and organizations whose activities are already primarily centred around markets for bio-based products (i.e. more than 50 percent reliance on bio-based sources). Each group represents about a quarter of the total respondents and close to a third of those respondents who replied to the question (excluding respondents who selected "not applicable" or who failed to answer the question).

**Figure 3: Reliance on bio-based sources among respondents' organizations**



#### 3.3.2 Type of business activities

Regarding the specific type of business activities, the largest number of respondents declared to be involved in the production of inter-mediate bio-based products (42%). This was closely followed by the production of end-products (35%). A combined total of 24 percent of respondents declared to be involved in the purchase and/or trade of bio-based products. It should be noted that many respondents declared their involvement in multiple categories. Of those involved in the production of bio-based products (52%), about two thirds are exclusively producers, representing about one third of all respondents. Those exclusively involved in the purchase of bio-based products represent only approximately 4 percent of the total. A total of 126 respondents or 39 percent declared that they do not produce, purchase or trade bio-based products.

**Figure 4: Types of business activities among respondents' organizations**

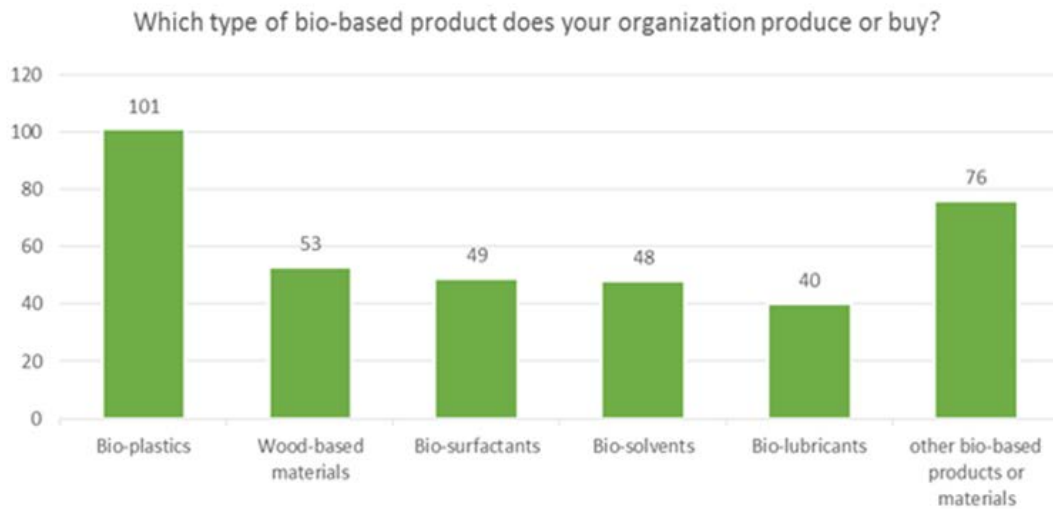


### 3.3.3 Type of bio-based product

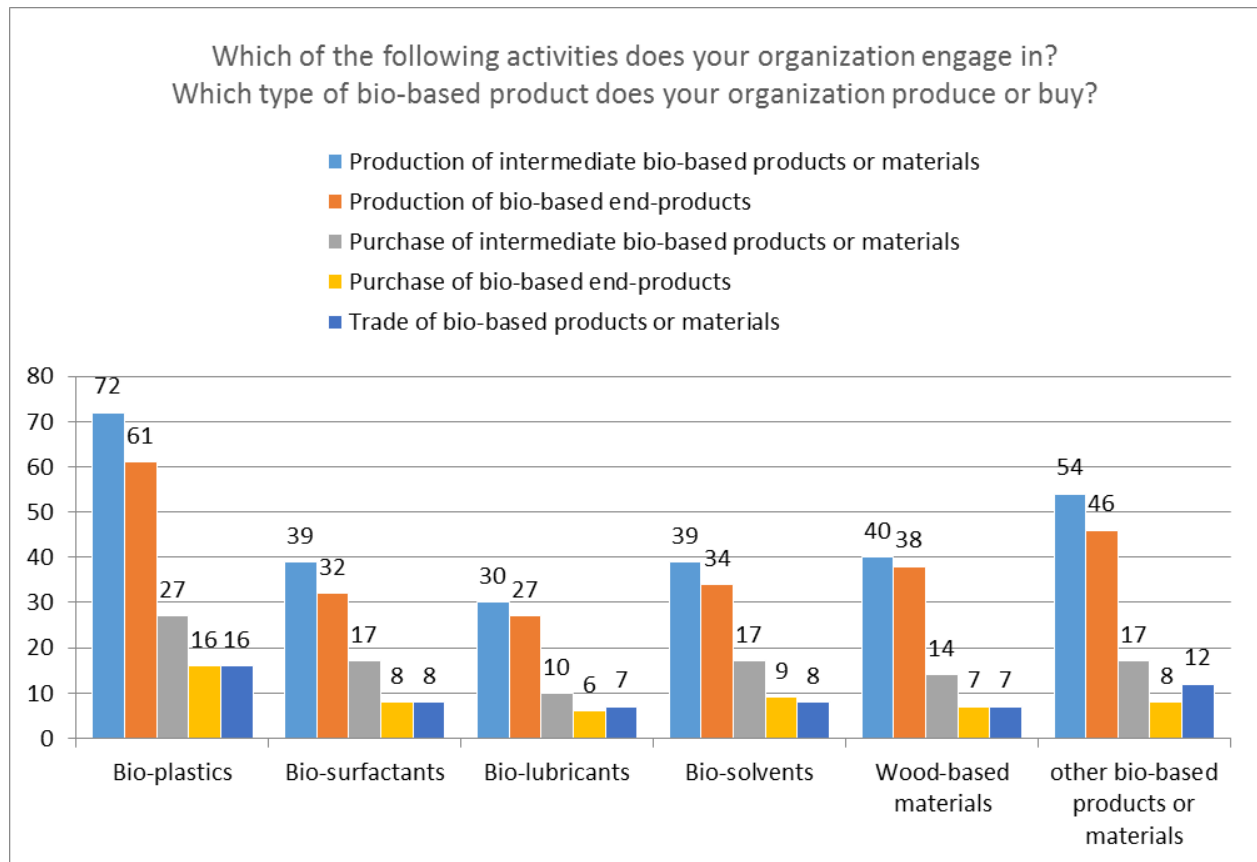
In a separate question, respondents were asked to indicate, which type of bio-based product their organization buys or sells. The largest number of respondents declared to produce or buy bio-plastics (31%). Among this group, close to 40 percent, or 12 percent of the overall total, are involved exclusively in that product category. This was followed by the category “Other bio-based products or materials” with 23 percent and wood-based materials with 16 percent. Among the latter, about one quarter, or 4 percent of the overall total, are involved exclusively in the field of wood-based materials. The remaining product types ranged from 15 percent for bio-surfactants to 12 percent for bio-lubricants. Beyond bio-plastics and wood-based materials, only a very small number of respondents indicated that they are involved in only a single product category. Finally, as indicated in Figure 6, the distribution of the types of business activities is broadly similar across the various product types.



**Figure 5: Involvement of respondents' organizations in production or purchase of different types of bio-based products**



**Figure 6: Type of business activities by product type**

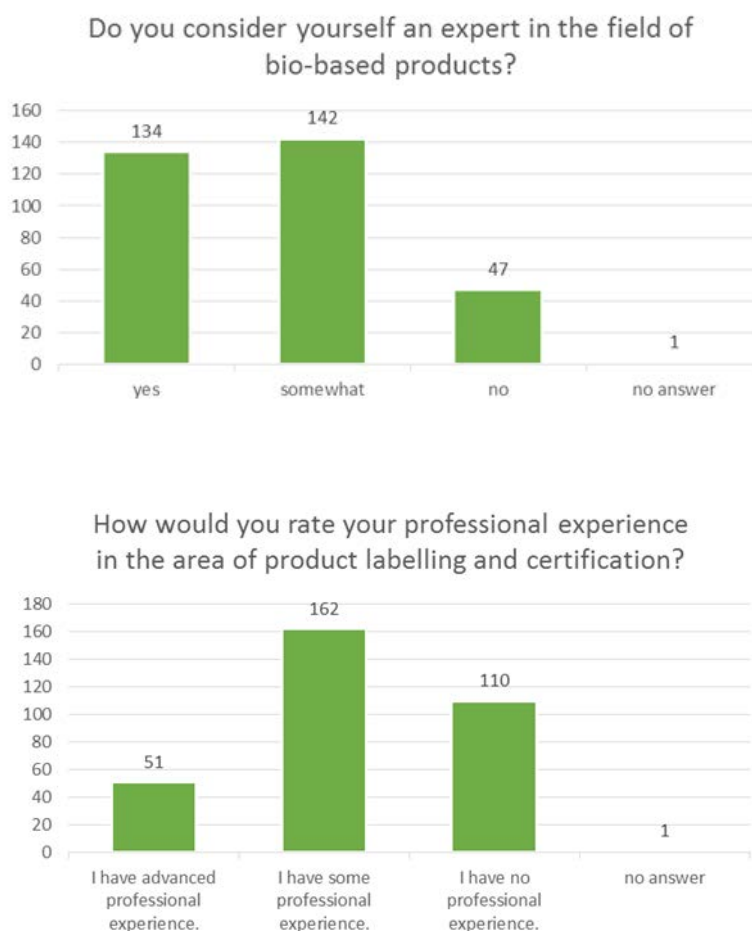




### 3.3.4 Individual Expertise

Respondents were also asked to indicate their level of expertise in the field of bio-based products as well as labelling and certification. More than 85 percent claimed to have at least some expertise in the field of bio-based products. Of this, slightly less than half (i.e. 41 percent of respondents) consider themselves experts. Approximately 15 percent declared that they have no special expertise in the field of bio-based products. Regarding the area of labelling and certification, only 16 percent of the total claimed to have advanced professional experience in the field. Exactly 50 percent indicated to have some professional experience, and approximately one third of respondents indicated to have no professional experience regarding labelling and certification.

**Figure 7: Declared level of expertise among of respondents: bio-based products and labelling and certification**





## 4 Acceptance of bio-based products in the business-to-business market

### 4.1 Questionnaire design

The core question on the acceptance of bio-based products in the business-to-business market had two components). Respondents were asked to assess the importance of drivers and barriers of the future development of the B2B market for bio-based products (see Figure 8 for the specific questions). Each question was followed by a list of items derived from relevant literature on the market for bio-based products (see for example, BIOCHEM (2010); Bremmer & Plonsker (2008); European Bioplastics (2012); OECD (2013)). Respondents were asked to rate the importance of each item on a scale of 1 (very low) to 5 (very high).

The terms “driver” and “barrier” were used as proxies for factors supporting or impeding acceptance of bio-based products in the B2B market. As discussed above (see section 2.2), respondents were asked to provide their opinion on the drivers and barriers of the B2B market for bio-based products as a whole rather than on drivers and barriers relevant to their own business venture in the sector. This was further underlined by referring to the *future* development of the B2B market for bio-based products.

**Figure 8: Survey questions - market drivers and barriers**

How would you rate the importance of the following factors as drivers of the future development of the B2B market for bio-based products?	Importance as a market driver					How would you rate the importance of the following factors as barriers to the future development of the B2B market for bio-based products?	Importance as a market barrier				
	Very low				Very high		Very low				Very high
	1	2	3	4	5		1	2	3	4	5

### 4.2 Survey results - Market drivers

#### 4.2.1 General findings

Figure 9 presents the responses regarding the perceived drivers of the market uptake of bio-based products. The items are ranked in descending order according to the average of all responses (i.e. the sum of all responses ranging from 1 to 5 divided by the total number of respondents who answered the particular item).

It should be noted that 15 out of 17 items were considered important market drivers with over 50 percent of respondents rating their importance as market drivers as high or very high. The item with both the highest average and the most ratings in the categories high and very high was “positive public image”, which suggests that bio-based products currently enjoy a high





level of “acceptability”<sup>1</sup> among the public. This is further underlined by the very small number of respondents choosing the rating “low” (8 respondents) or “very low” (1 respondent) for this item.

The item with the second highest average is “independence from fossil fuel”. This indicates that replacing finite fossil-fuel resources with renewable, bio-based resources is viewed as the most important societal trend underlying the development of bio-based markets. The following four items suggest that the potential of bio-based products to help address environmental challenges - most importantly climate change - as well as the compliance with corresponding regulatory measures are also considered of key importance. The question of biodegradability and compostability, on the other hand, received comparatively low ratings. It is interesting to note, however, that this item revealed important discrepancies across countries. Specifically, Italian respondents placed a very high importance on this item (see section 4.2.2 for a more detailed discussion of cross-country differences).

Despite the importance of a number of environmental issues, the customers’ willingness to pay a green premium is not considered an important market driver, representing the lowest ranked item. Less than 40 percent of respondents offered a rating of “high” or “very high” for this item. The potential to attract new customers, on other hand, was considered comparatively more important, ranking 11<sup>th</sup> with approximately 60 percent offering a rating of “high” or “very high”.

Regarding cost and performance-related aspects, the ability of bio-based products to offer new or improved functionality or improved performance received higher ratings than cost-related aspects. The importance of the former was rated as “high” or “very high” by 63 percent of respondents, while only 54 and 47 percent of respondents provided corresponding ratings for “lower production cost” and “life-cycle cost savings”, respectively.

Following the question on market drivers, respondents were given the opportunity to list any additional items of importance not listed in the questionnaire. A number of items stand out:

- Local employment creation (6 respondents)
- Hygiene (2 respondents)
- Corporate Social Responsibility (2 respondents)
- Time savings (2 respondents)
- Market pull by major corporations, like Coca Cola (1 respondent)
- Green public procurement (1 respondent)

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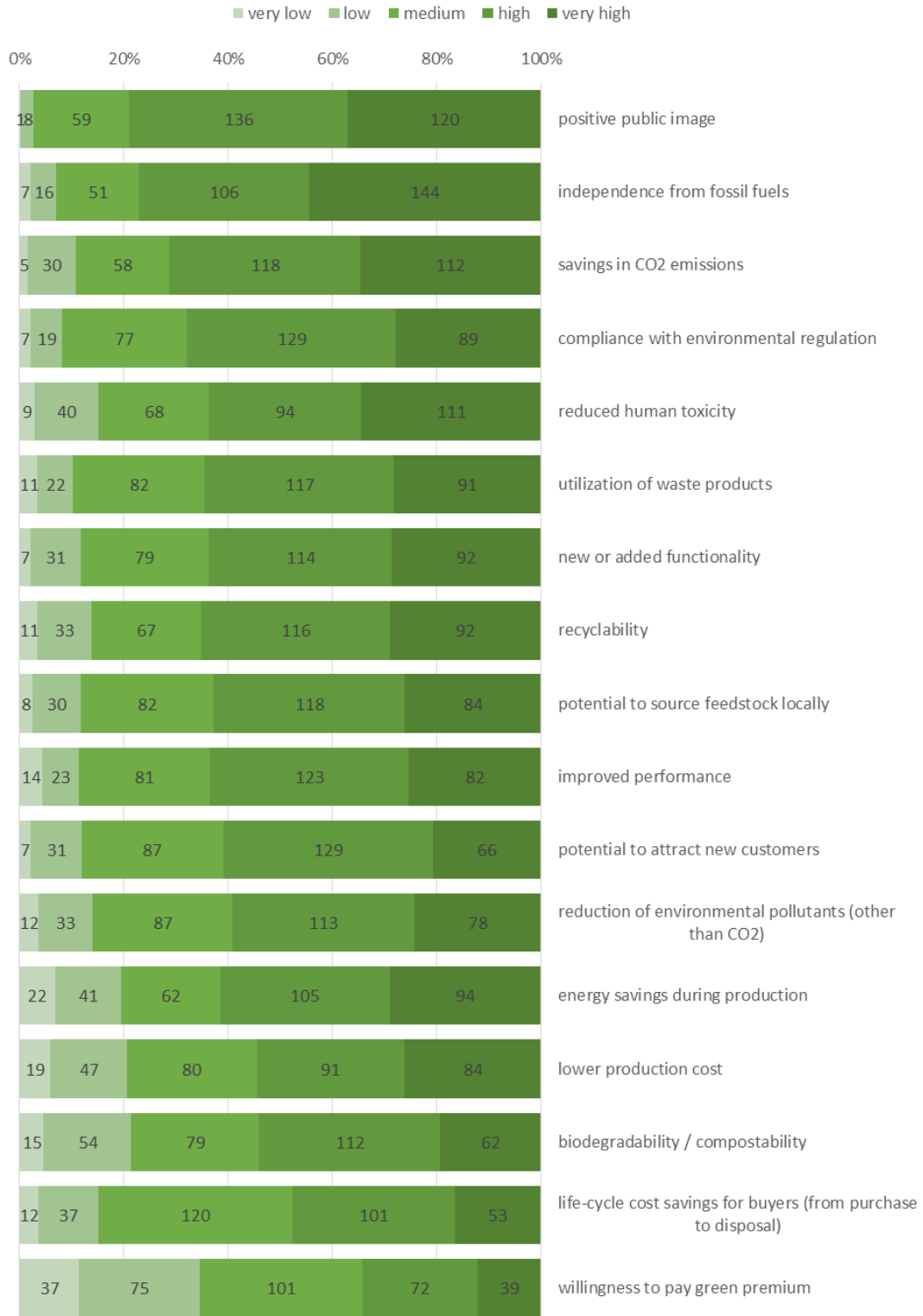
<sup>1</sup> As indicated in section 2 above, „acceptability“ is a relatively weaker form of acceptance than the definition adopted for this report. It represents a supportive attitude towards a new technology or innovation, but does not necessarily imply any active support in the form of adoption or purchase.







**Figure 9: Importance of market drivers, ranked according to average of all responses**

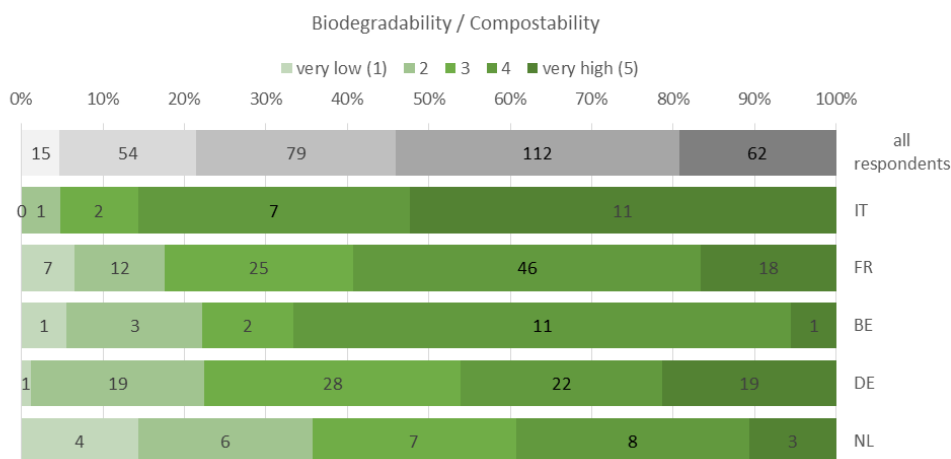




4.2.2 Cross-country differences: particularities of the bio-based economy in Italy, France and the Netherlands<sup>2</sup>

The most significant cross-country difference, which emerges from the survey results, is the high importance placed on the item “biodegradability / compostability” as market driver by Italian respondents relative to the remaining respondents (see Figure 10). As Figure 25 in Part 2 of this Annex indicates, the difference between the Italian average and the averages for France, Germany and the Netherlands as well as “other countries” were all found to be statistically significant. Moreover, among Italian respondents the item received the second highest level of support of all items, while the item’s overall ranking was 15th of 17 items. A similar albeit less pronounced pattern is visible for the item “recyclability” (see Figure 11), which ranked 3rd among Italian respondents and 8th overall. These results strongly suggest that acceptance within the Italian B2B market is strongly linked to discussions on end-of-life options in the Italian context, in particular the biodegradability of plastic materials. This finding is also supported by the Italian position in the debate on an EU Directive to reduce lightweight plastic bag consumption in the EU (EPRS, 2014).

Figure 10: Cross-country differences for **Biodegradability / Compostability**

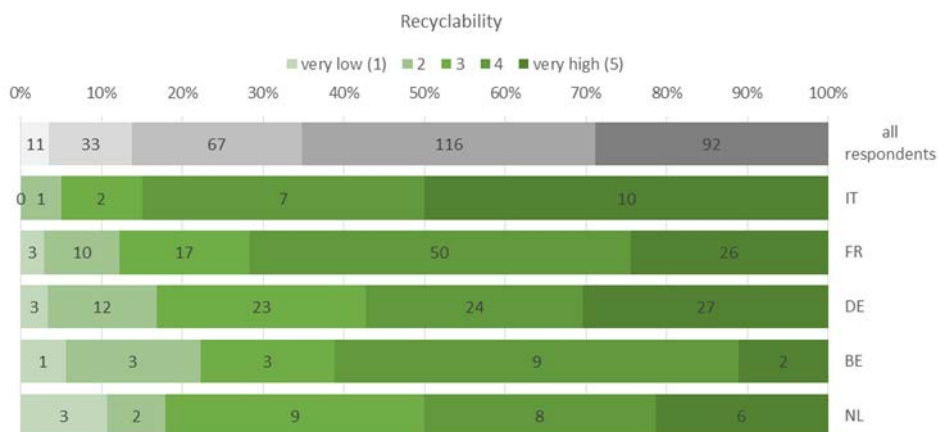


<sup>2</sup> For a detailed overview of data on cross-country differences and differences according to expert-level in the field of bio-based products see Part 2 of this Annex.



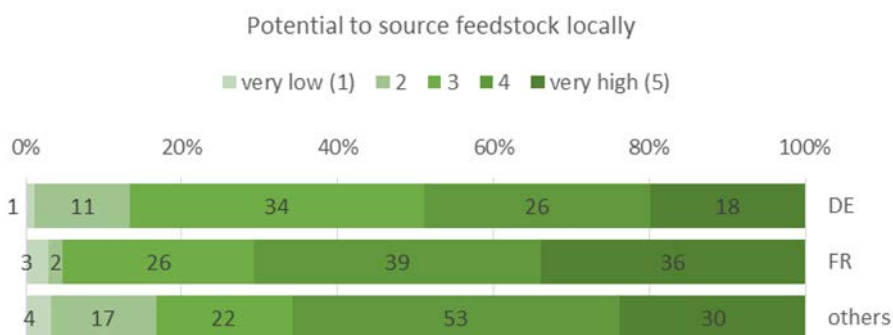


**Figure 11: Cross-country differences for Recyclability**



Another important cross-country difference relates to the particular importance that French respondents place on the item “Potential to source feedstock locally” compared to respondents from Germany in particular, for which a statistically significant difference could be identified. While the item ranks 2<sup>nd</sup> among French respondents, it ranks 9<sup>th</sup> overall. In addition, French respondents place particular importance on the item “Independence from fossil resources”, which has the highest ranking of all items among French survey participants. These findings seem to suggest that the acceptance of bio-based products in France is strongly linked to efforts to gain independence from foreign fossil resources and to develop domestic supply chains. This is further underlined by multiple additional comments by French respondents, such as “employment creation”, “creation of non-relocatable jobs”, “creation of new jobs”, “creating new jobs in rural areas” and “territorial development via local markets”.

**Figure 12: Cross-country differences for Potential to source feedstock locally**



Finally, Dutch respondents attributed a lower level of importance to a number of environment-related items than the other countries, revealing statistically significant differences in several cases. This was the case for “Reduced human toxicity”, “Reduction of environmental pollutants





other than CO<sub>2</sub>", "Bio-degradability / Compostability" as well as "Willingness to pay green premium" (see Figure 25 in Part 2 of this Annex). No significant difference is visible for the item "Savings in CO<sub>2</sub> emissions", on the other hand. Moreover, the performance and functionality-related items (i.e. "Improved performance" and "New or added functionality") ranked relatively higher among Dutch respondents than overall. This may suggest that the Dutch bio-based economy is more strongly driven by (low carbon) technology development than in some of the other countries, most notably Italy, where the environment-related considerations discussed above figure more prominently in the current context.



### 4.3 Survey results: Market barriers

#### 4.3.1 General findings

Figure 13 displays the responses regarding the perceived barriers of the market uptake of bio-based products. Following the same logic as in the previous section, the items are ranked in descending order according to average response for each item. Overall, the results on market barriers are broadly consistent with the findings on market drivers. While the environmental benefits are considered important drivers of bio-based products, environment-related issues do not figure among the most important market barriers. The only environment-related issue considered to be of high or very high importance by over 50 percent of respondents related to the “difficulty in *communicating* environmental benefits”. This was followed by “uncertainty regarding environmental benefits”, which 48 percent of respondents gave a rating of “high” or “very high”. The importance of the remaining environmental issues was rated as “low” to “medium” by 60 percent or more of the respondents.

Important market barriers concern issues related to cost of production, the regulatory environment, volatile feedstock prices, and performance-related issues. The “higher cost of production” of bio-based product is clearly viewed as the most important barrier with 80 percent of respondents rating it as “high” or “very high”. “Uncertainty about future regulation” follows, albeit with a significant gap, with 68 percent.

Despite the important role of a positive public image in driving the market for bio-based products, “lack of public awareness” figures relatively high on the list. This indicates that additional awareness-raising may have an important potential for strengthening this driver of market development. The relative importance of the difficulties in communicating environmental benefits further underlines that activities aimed at resolving these communication problems are important for supporting the uptake of bio-based products.

Feedstock-related issues mainly concern the volatility of prices and uncertainty regarding available feedstock. Absolute limits in the availability of feedstock and the social and environmental impacts of feedstock production did not figure as prominent barriers.

Cross-country differences figure less prominently among the market barriers than among the market drivers. Only the item “Lack of public awareness” reveals a statistically significant difference between Italian and French respondents. While Italians consider it to be more important than the overall average, French respondents find it to be relatively less important. Instead, a number of relevant differences across experts and non-experts on bio-based products were identified (see section 4.3.2 below).

Finally, the following additional items listed by respondents in the comment section following the question stand out. It should be noted that in contrast to the comments on market drives, there was very little overlap across respondents’ comments:

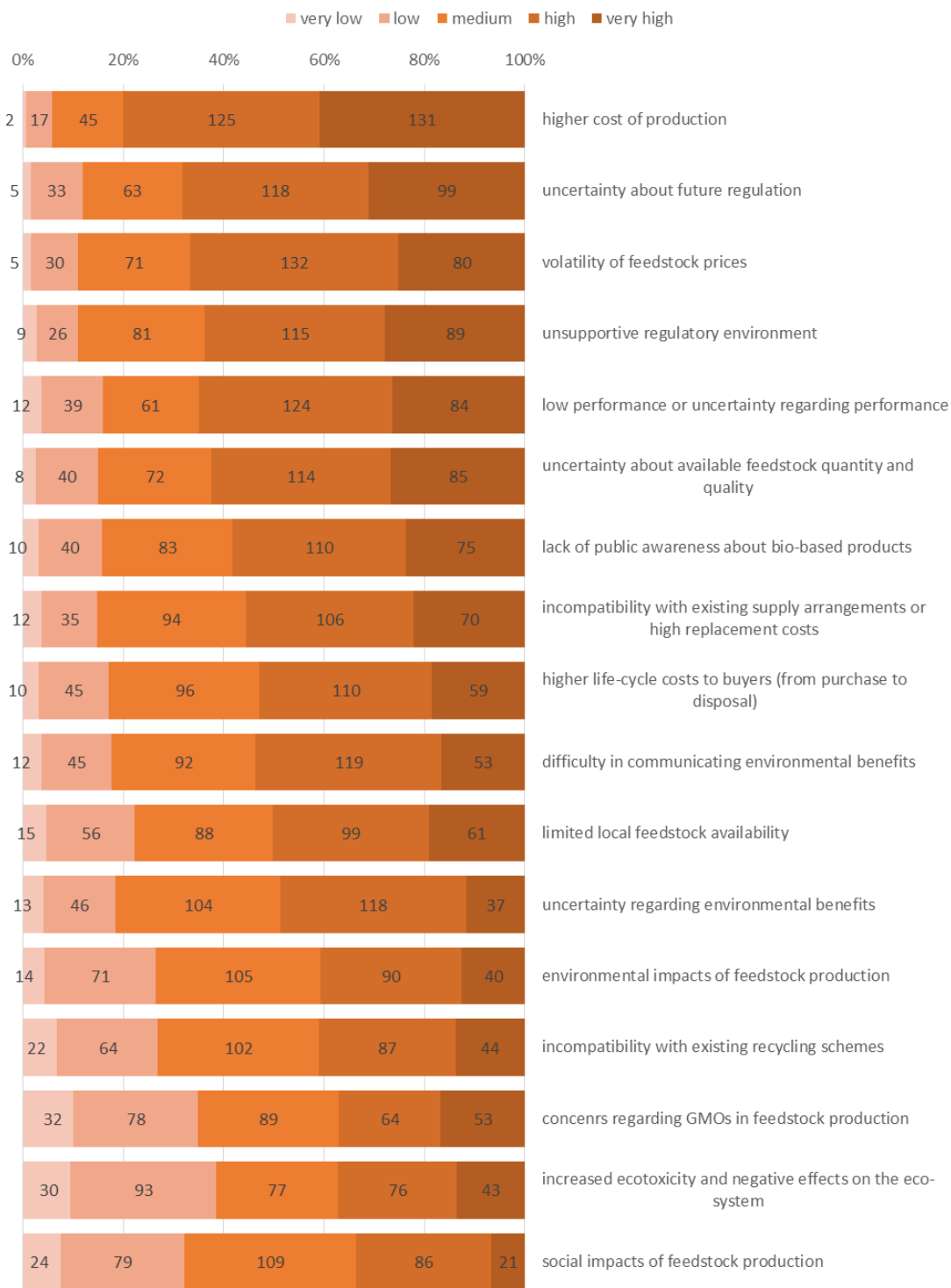
- Bad image / negative communication (2 respondents)
- Difficulty in obtaining finance (2 respondents)





- Strong increase in feedstock prices with increase in production (1 respondent)
- Unfavourable price for sugar / glucose in Europe (1 respondent)

**Figure 13: Importance of market barriers, ranked according to average of all responses**

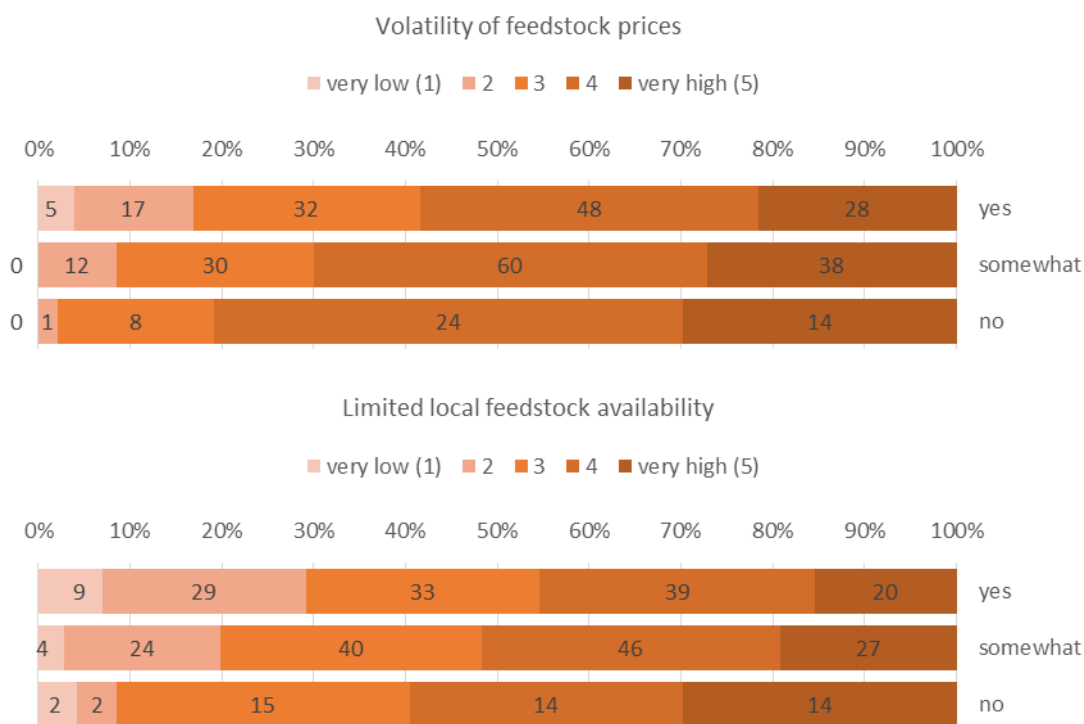




4.3.2 Differences according to expert levels: feedstock-related misperceptions as a barrier<sup>3</sup>

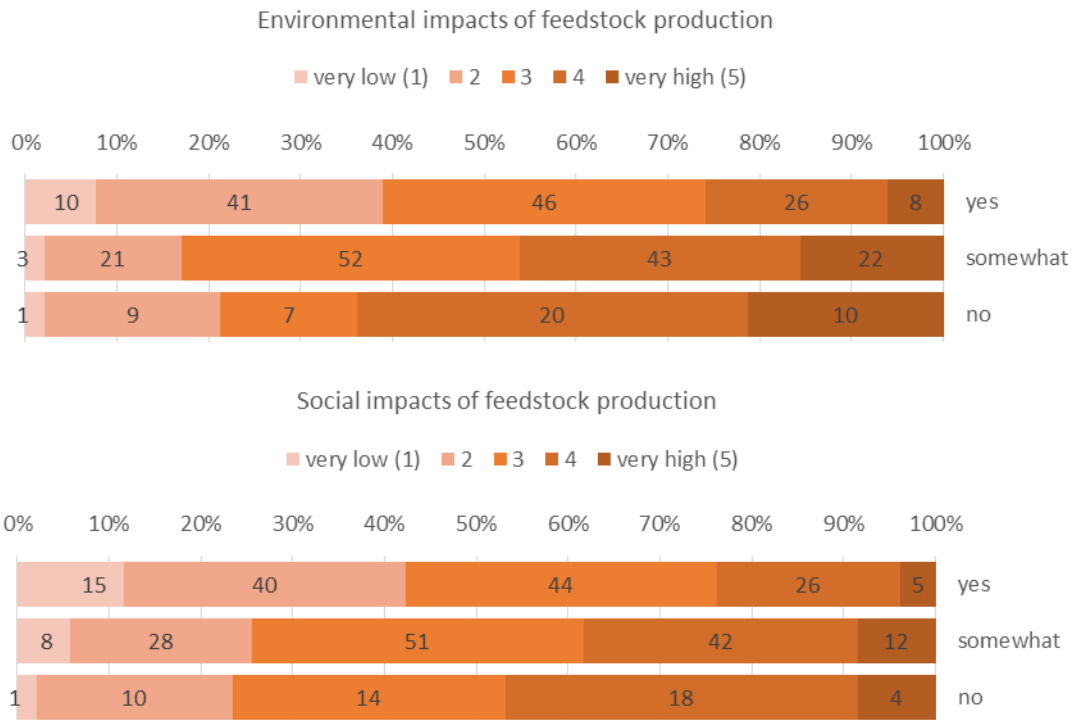
The responses regarding market barriers do not reveal any important differences across countries or product categories. Instead responses differ significantly based on the declared level of expertise of the respondents, in particular for items related to feedstock supply (for a detailed overview of cross-country differences and differences according to expert-level in the field of bio-based products see Part 2 of this Annex). Remarkably, respondents who express to have no expertise in the field of bio-based products consistently consider feedstock-related items to be of higher importance than those who claim to be market experts. For the items, volatility of feedstock prices, limited local availability of feedstock and the environmental and social impacts of feedstock production differences in group means across expert levels are statistically significant at the 5%-level. The item volatility of feedstock prices is considered the most important market barrier among non-experts, while it only ranks 8th among experts. The same trend holds for the assessment of increased ecotoxicity and negative effects on the ecosystem as market barrier, which non-experts consider significantly more important than experts.

Figure 14: Differences according to expert-level for feedstock-related items



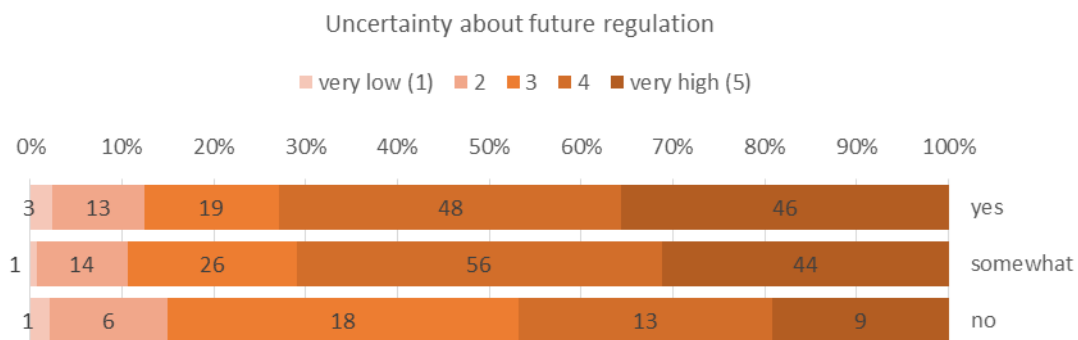
<sup>3</sup> For a detailed overview of data on cross-country differences and differences according to expert-level in the field of bio-based products see Part 2 of this Annex.





In contrast, self-declared experts consider the two items related to the regulatory environment to be more relevant than non-experts. For the item uncertainty about future regulation, the difference in group means is statistically significant at the 5% level.

**Figure 15: Differences according to expert level for *Uncertainty about future regulation***







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## 5 Labelling

### 5.1 Objectives and questionnaire design

The European Union's Bioeconomy Strategy calls for the development of a European label for bio-based products as a measure for promoting new markets for bio-based products in Europe (European Commission, 2012). In this context, the Open-Bio project is developing and assessing feasible options for establishing such a label at the European level. In support of this work, the survey on the acceptance of bio-based products in the B2B market has incorporated a set of questions on different design options for such a label. The survey results serve as an input to related analytical efforts and discussions with relevant stakeholders. To effectively inform the labelling work conducted within the Open-Bio project, the labelling questions were developed in close cooperation with Nova Institute, the Open-Bio project partner leading the work package on labelling (WP7). In addition, relevant literature was consulted to identify key issue areas.

Product labelling and eco-labels in particular represent important instruments for promoting markets for environmentally-friendly products. By providing information on the environmental characteristics of the related products, they offer potential buyers the possibility to select a product based on features that would otherwise remain unobservable (Bleda & Valente, 2009; Teisl & Roe, 1998). If the label enjoys a high level of credibility and communicates relevant information to buyers, it may even offer the basis for a mark-up in price compared to similar products (Keeping & Shiers, 1996; Morris, 1997; Rotherham, 2005). To be effective, however, a product label must also be accepted by firms who shoulder the initial labelling costs (Amacher et al., 2004). The most basic question incorporated in the survey, therefore, simply inquires whether survey participants consider the creation of a European label for bio-based products as an important measure for promoting the market for bio-based products.

In addition, the specific design of an eco-label and the format and type of information it communicates to potential buyers has an important influence on its effectiveness in supporting market acceptance of the labelled product (Heiskanen & Timonen, 1995). In particular, the choice between a single issue label or a multi-criteria label has important implications for the effectiveness of the label, which may vary depending on the specific product (Strandbakken & Stø, 2002). Three additional questions address this issue by inquiring about preferences regarding the incorporation of additional environmental criteria or sustainability criteria regarding feedstock production. More specifically, the survey inquires whether respondents support the integration of a bio-based label within the European Union's Ecolabel scheme. A final question solicits respondents to assess the need for additional icons or label features to help communicate isolated environmental or sustainability criteria (see Figure 16 with the specific survey questions).



**Figure 16: Survey questions - Labelling**

The introduction of a European labelling scheme for bio-based products is currently under discussion to help promote the uptake of bio-based products in the market.

**Please indicate to what extent you agree or disagree with the following statements on a possible labelling scheme for bio-based products:**

	I strongly disagree					I strongly agree				
	-2	-1	0	1	2	-2	-1	0	1	2
• The creation of a European label for bio-based products is important for promoting the market for bio-based products.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• A European label for bio-based products should only require compliance with criteria on bio-based content. Other criteria - if included - should be optional.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• A European label for bio-based products should also require compliance with key environmental criteria (in addition to criteria on bio-based content). Only bio-based products which comply with the defined environmental criteria should be able to carry the label.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• A European label for bio-based products should also require compliance with sustainability criteria related to the bio-based feedstock used. Only bio-based products which comply with these sustainability criteria should be able to carry the label.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• A European label for bio-based products should be integrated within the existing EU Ecolabel.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• A European label for bio-based products should offer optional icons or label features to indicate ...										
... biodegradability.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... compostability.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... recyclability.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... sustainable feedstock production.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
... the use of GMO-free feedstock.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Please specify any other attribute that should be indicated by a European label for bio-based products (optional):**



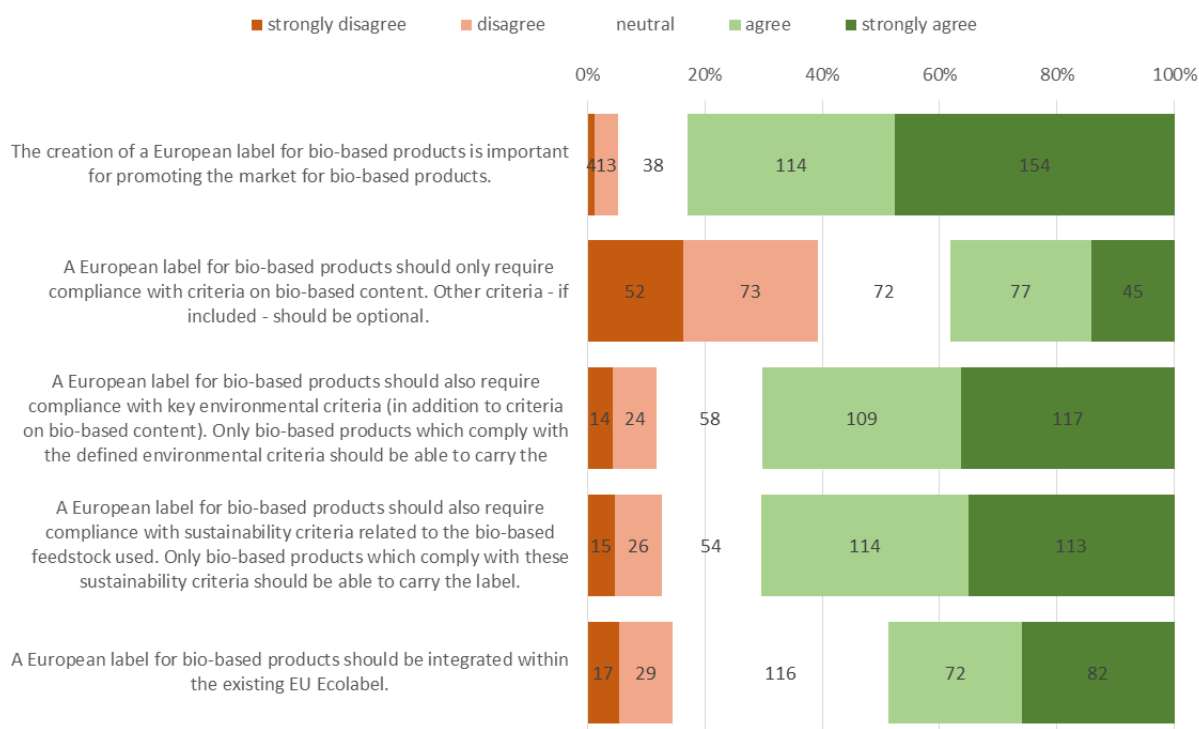


## 5.2 Survey results

### 5.2.1 A European label for bio-based products and the role of supplemental sustainability criteria

Respondents predominantly agree that *the creation of a European label for bio-based products would promote the market for bio-based products*. A clear majority of respondents also agree that such a label should not only include criteria on bio-based content but should also encompass further *mandatory* environmental criteria as well as sustainability criteria related to the feedstock used. In accordance with this result, the statement proposing that any additional environmental criteria included in a label for bio-based products should be purely *optional* received the lowest level of support. Finally, slightly less than 50 percent of respondents support the integration of a bio-based label within the existing EU Ecolabel. The high number of neutral answers (36%) to this question indicates the relatively high level of uncertainty regarding this issue among respondents. None of the mentioned labelling questions revealed significant differences across the subsamples of respondents, including experts and non-experts in the field of labelling and certification.

**Figure 17: A European label for bio-based products - general questions**

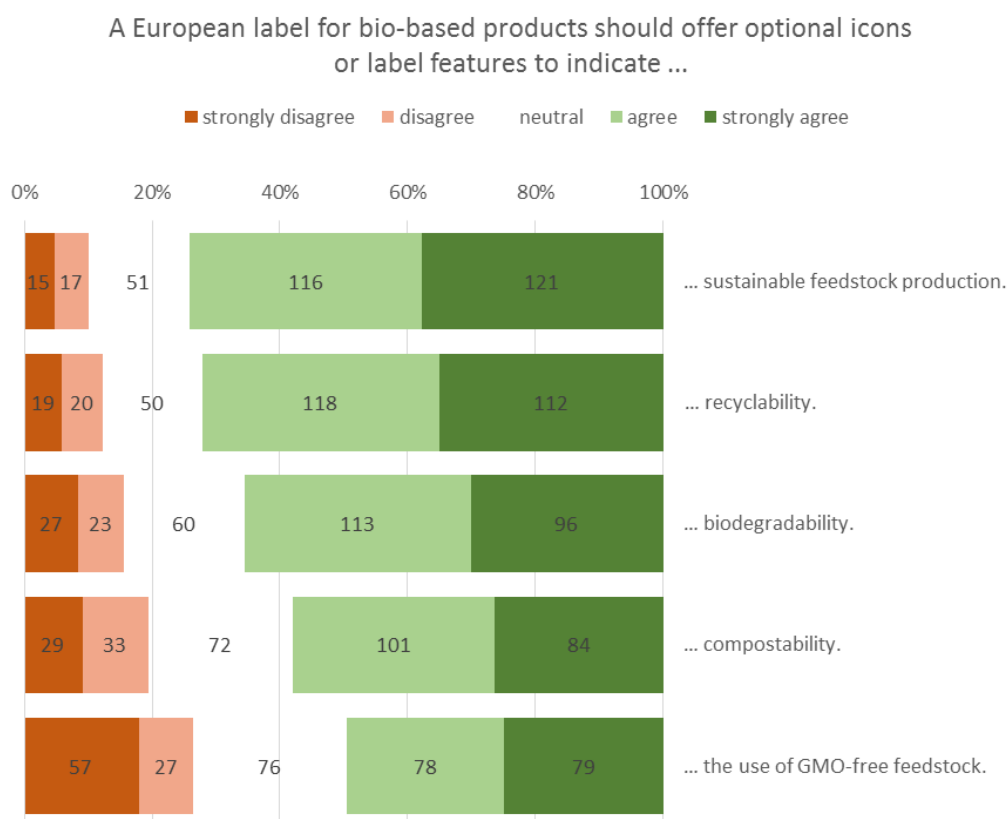




### 5.2.2 Optional label features

In a further question, respondents were asked to provide their opinion on whether a label on bio-based products should offer optional icons or label features to indicate compliance with a number of specific environmental and sustainability criteria. Among the available options, respondents indicated the highest level of support for an optional label feature indicating *sustainable feedstock production*. A clear majority also support optional label features for *biodegradability* and *compostability*. The item on *the use of GMO-free feedstock* finds least agreement with slightly under 50 percent.

**Figure 18: A European label for bio-based products - optional label features**



In the comment section following the labelling question, respondents suggested the following additional attributes to be indicated by European label for bio-based products:

- Social sustainability / Social aspects (4 respondents)
- Origin of feedstock (2)
- Non-food feedstock ( 2 respondents)
- Ethical concerns (1 respondent)
- Percent of fossil-based material replaced by bio-based material (1 respondent)





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### 5.2.3 Differences across countries and expert-levels<sup>4</sup>

As noted above, the general questions on a European label do not reveal any statistically significant variations across different respondent groups. Regarding the question on optional icons and label features, significant differences in group means can be observed across countries and expert levels. However, these differences are primarily limited to the level of agreement and, with a few exceptions, do not affect the ranking of items. The comparison of country-level responses shows that Italian respondents are particularly affirmative when asked about additional label features. Similarly, non-experts in the field of bio-based products support additional icons more strongly than experts. Dutch and self-declared experts are generally more reluctant in providing their support for these items.

As mentioned, the ranking of the items generally does not vary significantly across respondent groups. Two notable exceptions, however, stand out. Firstly, in contrast to all other respondents, Italians rank compostability higher than biodegradability. Secondly, Dutch respondents have a slight preference for biodegradability over recyclability rather than vice versa.

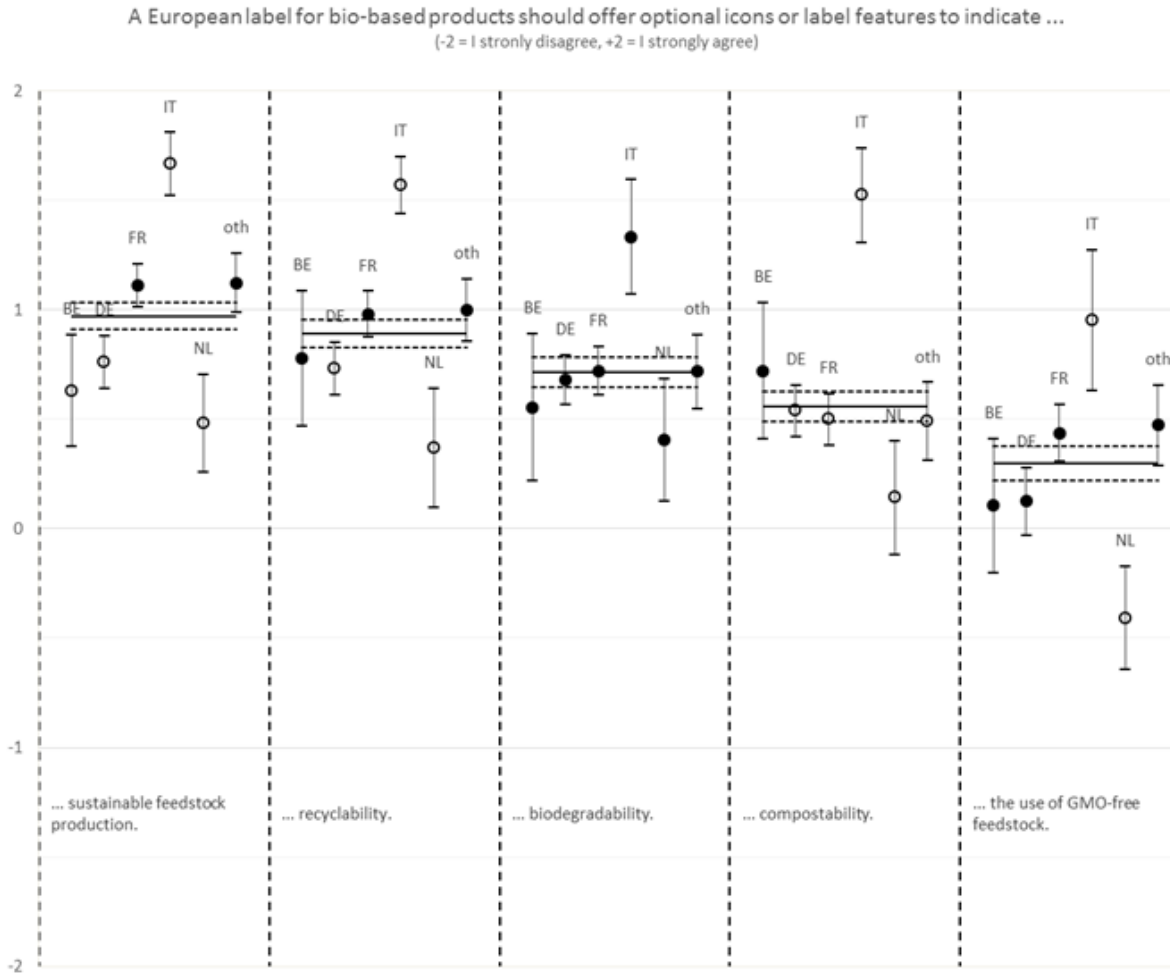
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<sup>4</sup> For a detailed overview of data on cross-country differences and differences according to expert-level in the field of bio-based products see Part 2 of this Annex.





**Figure 19: Optional icons or label features - Differences across countries**

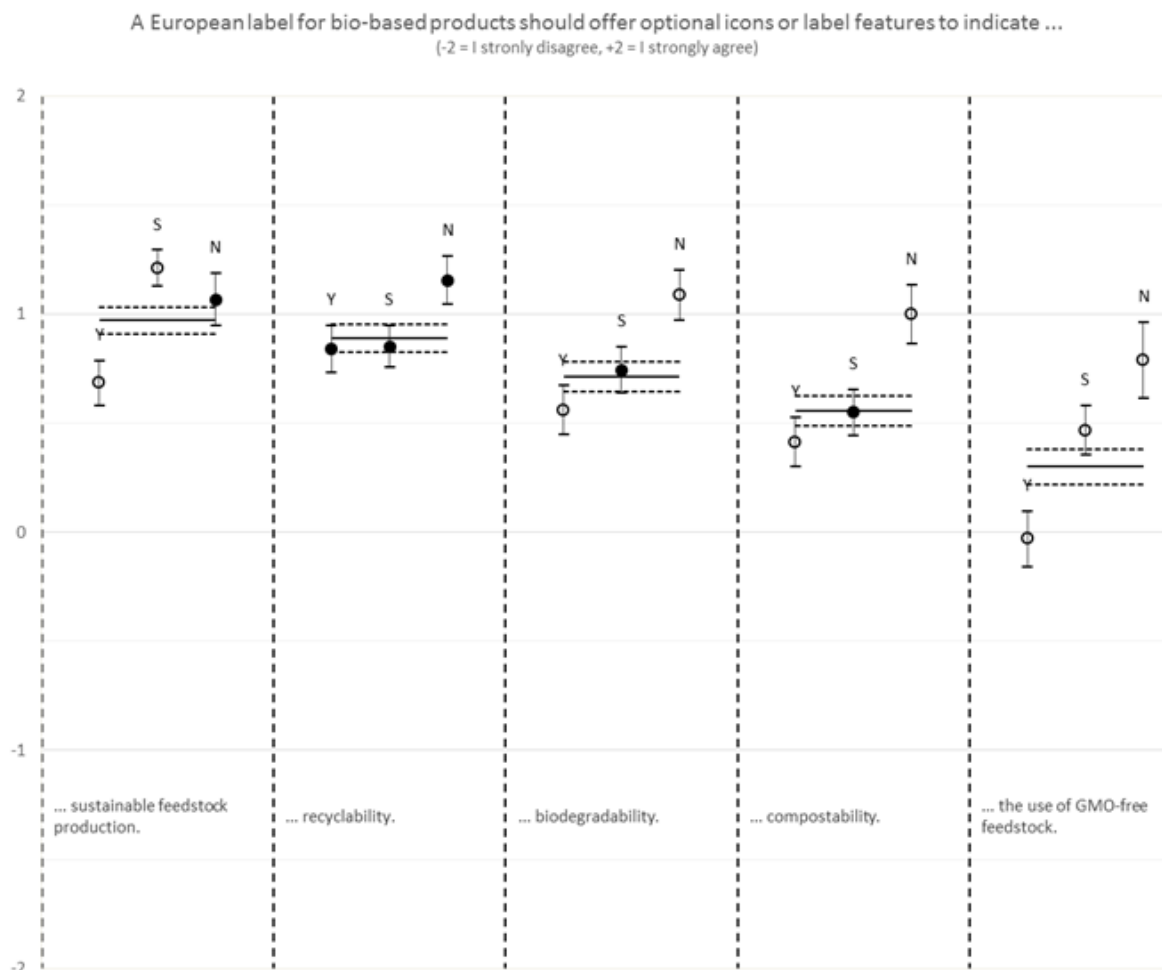


This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.





**Figure 20: Optional icons or label features - Differences according to expert-level**



This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

## 6 Product Information and Standardization

### 6.1 Objectives and questionnaire design

Public procurement in Europe represents an estimated 19 percent of total GDP (European Commission, 2014). As recognized by the European Commission (European Commission, 2006) as well as important member state governments (French, German and UK Governments, 2004), it thus offers a large potential as an instrument for creating demand for innovative and environmentally-friendly products. In this vein, the European Union’s Bioeconomy Strategy calls for measures to facilitate green public procurement of bio-based products, including the development of an initial European product information list.





Responding to this call, such a list is being developed by the Open-Bio project and will be published in the form of an online informational tool targeting procurement officers. To ensure that this list offers relevant product information to both private and public procurement officers, the survey has incorporated a question on the need for information on selected issues. In addition, respondents were asked to assess whether they consider it important that this information is standardized to facilitate comparison of similar products (see Figure 21 with questionnaire design). To facilitate comparison bet informational needs among private businesses and public procurement officers, the same set of questions has been posed in the survey among procurement experts. Finally, results from the question on standardization will not only inform the design of the online tool for procurement officers, but it will also feed into discussions within the CEN working groups on bio-based products.

Corresponding to these two objectives, the questions and corresponding answer options were developed in cooperation with the FNR (Fachagentur für Nachwachsende Rohstoffe), the project partner leading the development of the online tool, as well as members of the CEN working groups. Among other things, the survey incorporates items from a draft product information sheet proposed by CEN.

**Figure 21: Survey questions - product information and standardization**

For each item, please answer to what extent you agree or disagree with the following statements:	a) Importance of information					b) Standardization requirement				
a) Information on this item is very important for taking the decision to purchase a bio-based product.	I strongly disagree         I strongly agree					I strongly disagree         I strongly agree				
b) Information on this item should be standardized to facilitate the comparison of similar products.	I strongly disagree         I strongly agree					I strongly disagree         I strongly agree				
	-2	-1	0	1	2	-2	-1	0	1	2

## 6.2 Survey results

### 6.2.1 General findings

Figure 23 and Figure 24 present the responses regarding the perceived importance of information (Figure 23) and the perceived need for standardized information to facilitate comparison of similar products (Figure 24) for the various items included in the questionnaire. The items are ranked in descending order according to the average of all responses (i.e. the sum of all responses ranging from 1 to 5 divided by the total number of respondents who answered the particular item). The results show that most of the items included in the list were considered important for taking the decision to purchase a bio-based product. Moreover, with a small number of exceptions, the perceived importance of the items shows a positive correlation with the perceived need for standardization to facilitate comparison with similar products. For most items, respondents more strongly agree with the need for the standardization of information than with their importance for purchasing bio-based products. Figure 22 provides a graphical

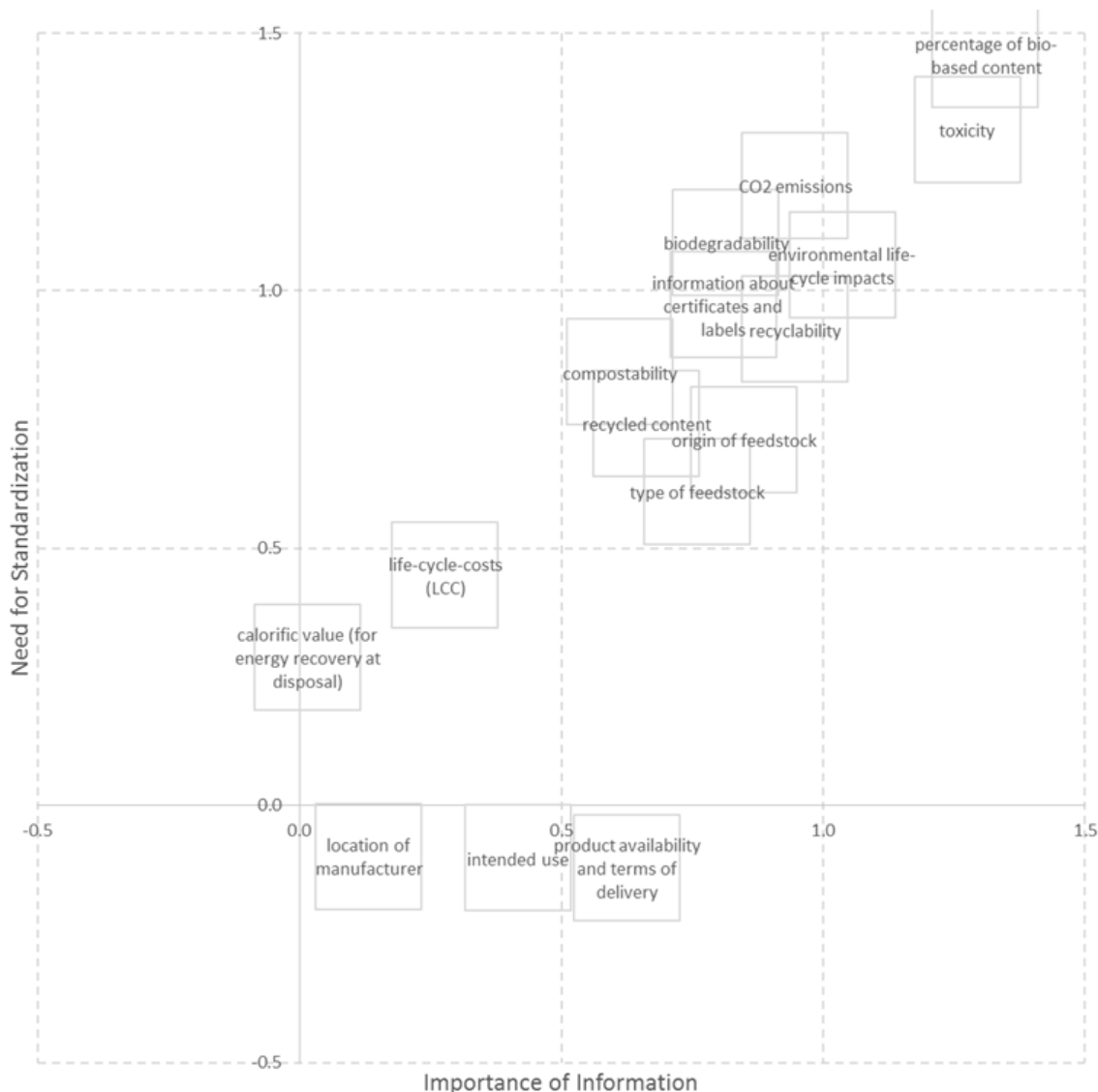






illustration of the positive correlation between the importance of information and the need for standardization.

**Figure 22: The relationship between the perceived importance of information and the perceived need for standardization**



Information on the *percentage of bio-based content* is considered the most important for taking the decision to purchase bio-based products. This is closely followed by toxicity. The only items that received less than 50 percent positive responses were the categories “intended use” (49%), “life-cycle costs” (44%), “location of manufacturer” (39%) and “calorific value” (33%).

As already mentioned, the perceived need for standardization is for the most part positively correlated with the perceived need for information. Accordingly, the items with the highest number of positive responses are also “bio-based content” and “toxicity”. The only exceptions to this pattern are the items “intended use” and “product availability and terms of delivery”, for





which the perceived importance of standardization is even lower than the relatively low level of importance attributed to these items. This pattern can be explained by the fact that these items do not lend themselves to formal standardization.

Finally, in the comment section following the question, the following additional informational requirements were mentioned:

- Percentage of bio-based material employed as replacement for fossil-based materials (2 respondents)
- Share of local value-added (1 respondent)

### 6.2.2 *Differences across countries and expert-levels*<sup>5</sup>

Overall, the analysis of the variation across countries and different levels of expertise revealed only relatively few statistically significant differences. Notable differences existed regarding the items related to the origin and the type of feedstock. French respondents attributed a significantly higher importance to both information and the standardization of information on the origin of feedstock than Dutch and German respondents. While the average of Italian respondents was even higher than for the French, a statistically significant difference only emerged vis-à-vis Dutch respondents for this item. Following the same pattern, a statistically significant difference was found between French and Dutch respondents for the type of feedstock, though only regarding the need for information rather than the need for standardization on the item. Finally, it is interesting to note that non-experts attributed a higher importance to information and standardization on origin of feedstock than experts.

Other notable differences across countries were found for the items compostability and recyclability. Consistent with the results on market drivers (see section 4.2.2) attributed a significantly higher importance to information on compostability than German and French respondents. Similarly, Italian respondents consider information on recyclability to be significantly more important than Dutch respondents. Finally, a slight yet notable difference between experts and non-experts was found regarding the perceived need for standardization of information on the percentage of bio-based content, which experts considered more important than non-experts.

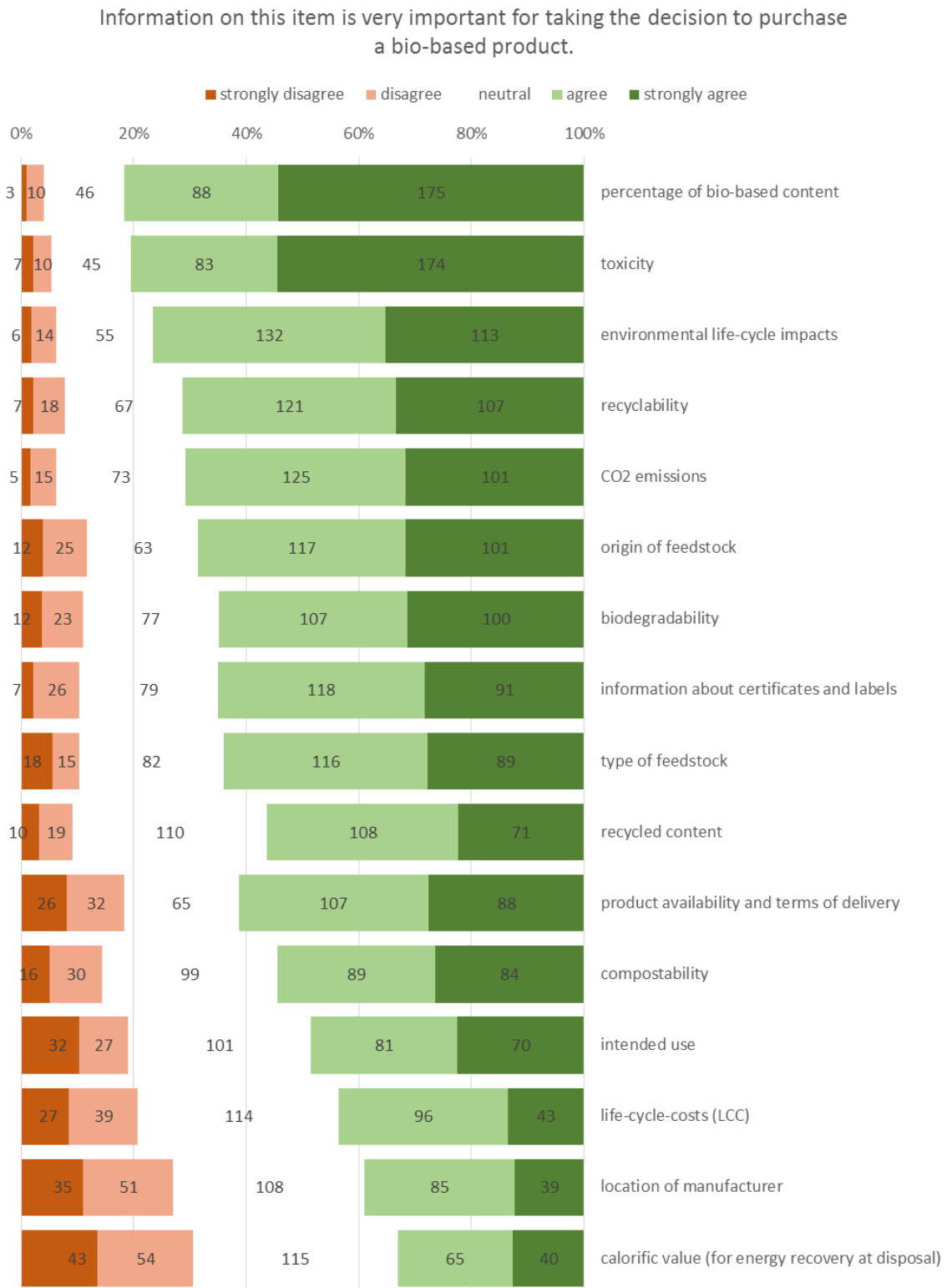
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<sup>5</sup> For a detailed overview of data on cross-country differences and differences according to expert-level in the field of bio-based products see Part 2 of this Annex.



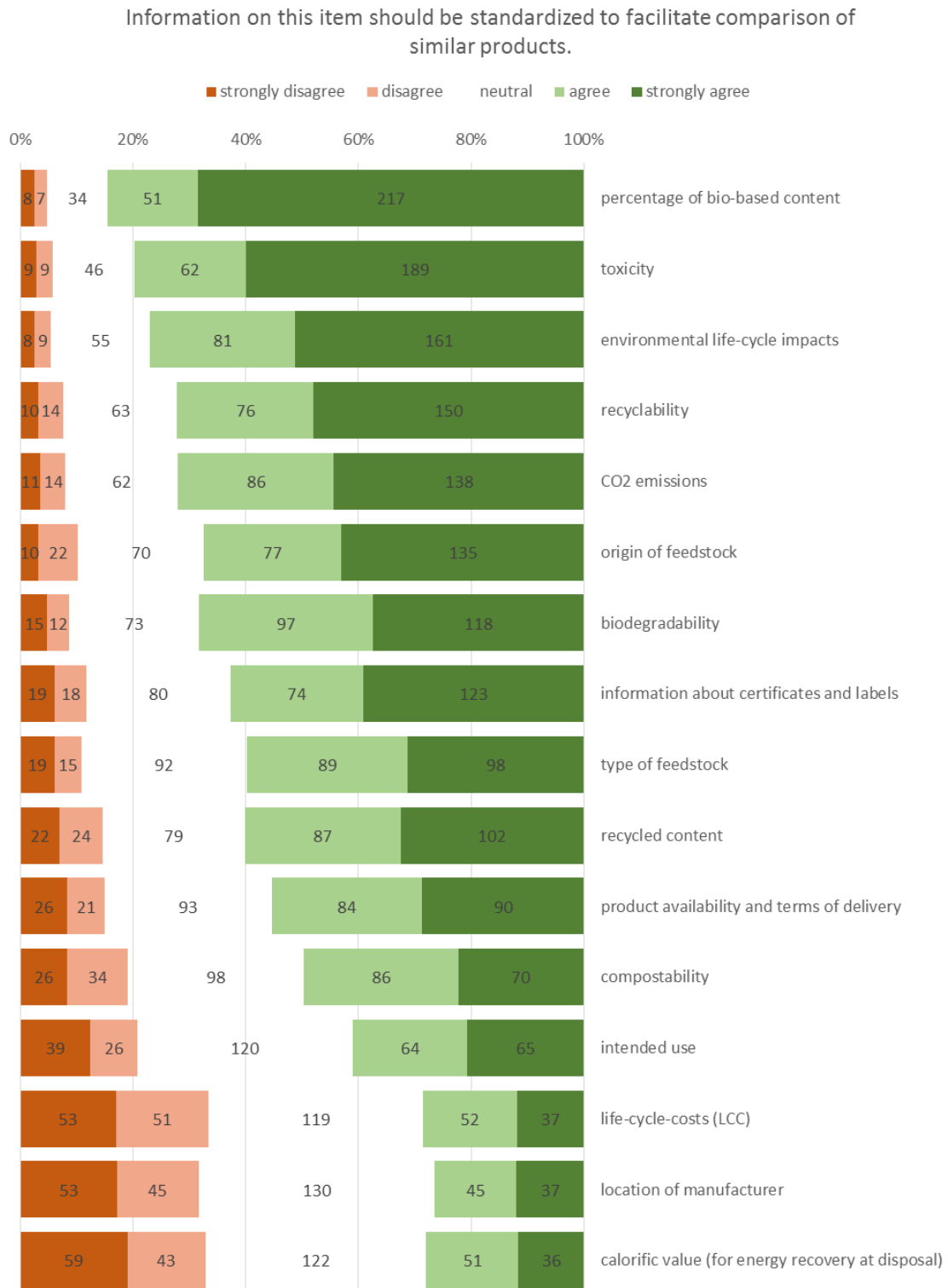


**Figure 23: Perceived importance of information for purchasing bio-based products, ranked according to the average of all responses**





**Figure 24: Perceived need for standardization, ranked according to the average of all responses**





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## 7 References

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## Part 2: Data on Differences Across Countries and According to Expert-level

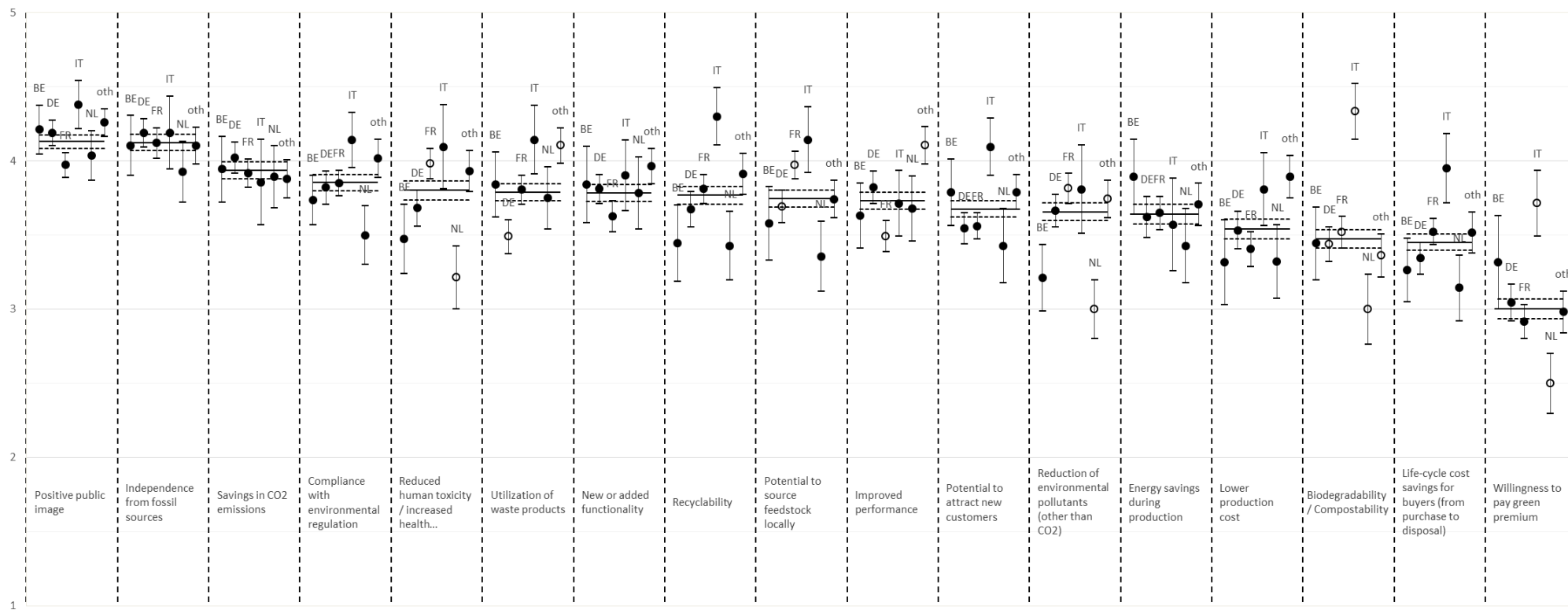
Part 2 of this Annex represents a detailed presentation of the data on the differences in response patterns across countries and across respondents with different levels of expertise in the field of bio-based products. These represent the only categories where significant differences could be identified. In the following, the differences in these two areas are depicted graphically for each survey question. In each graph, estimated means and standard errors for the entire sample of respondents are depicted as horizontal lines. For each sub-group (i.e. country-based respondent groups and respondent groups based on level of expertise), the estimated means are depicted as circles and standard errors as vertical bars. Hollow circles indicate that the respective group means differ significantly based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p-values for multiple comparisons.





**Figure 25: Market drivers - Differences across countries**

How would you rate the importance of the following factors as drivers of the future development of the B2B market for bio-based products? (1 = very low, 5 = very high)



This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

Subgroups: In which country do you work? BE = Belgium, DE = Germany, FR = France, IT = Italy, NL = The Netherlands, oth = other countries.

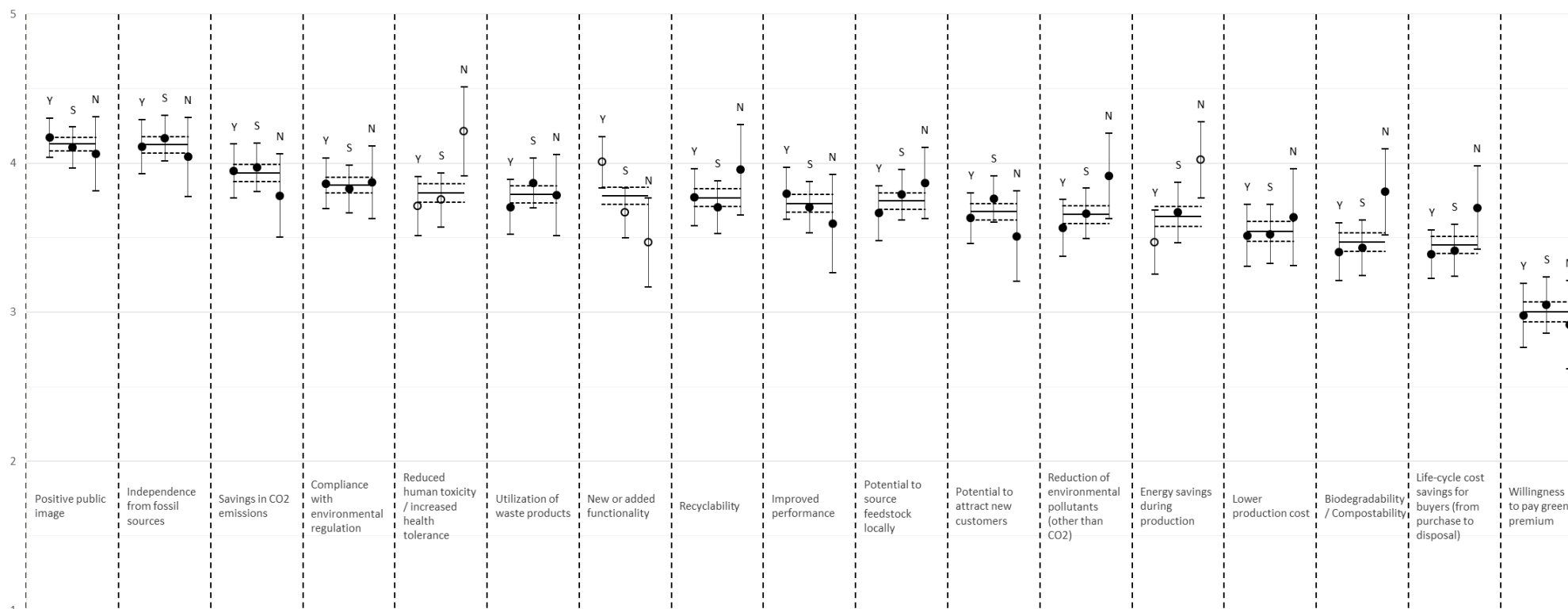






**Figure 26: Market drivers - Differences according to expert-level**

How would you rate the importance of the following factors as drivers of the future development of the B2B market for bio-based products? (1 = very low, 5 = very high)



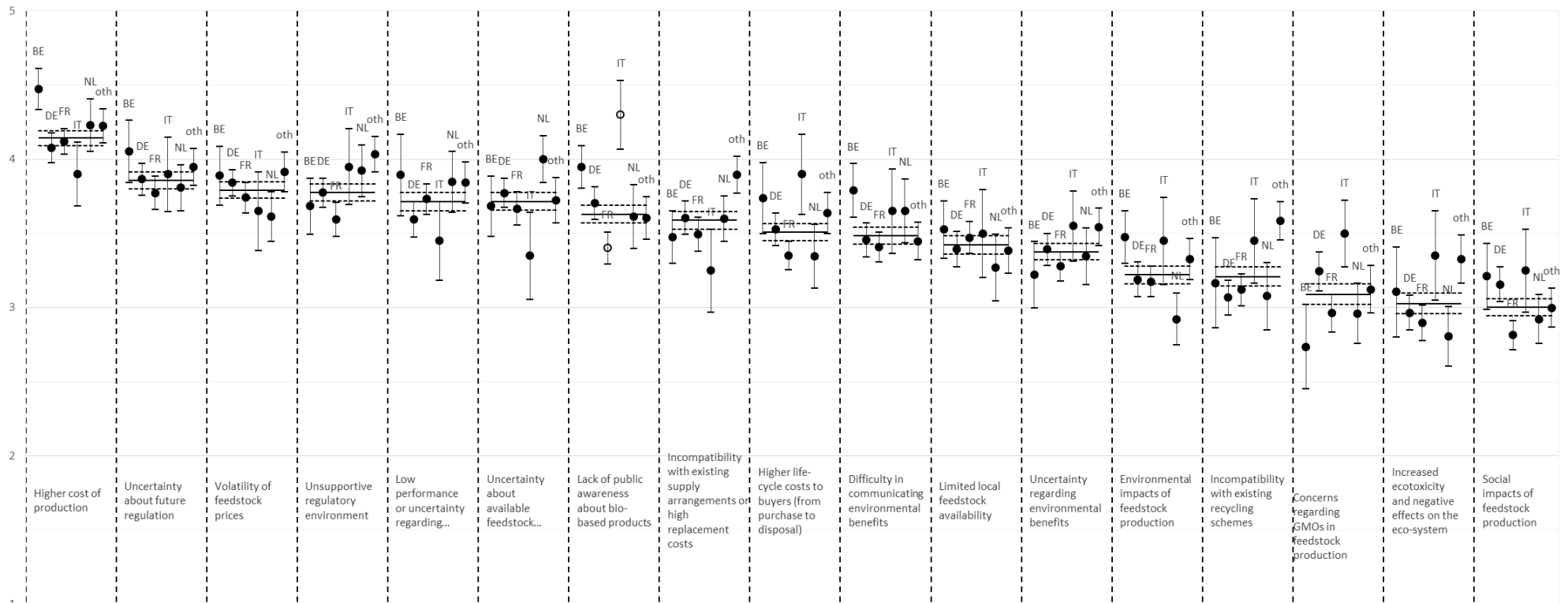
This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

Subgroups: Do you consider yourself an expert in the field of bio-based products? Y = yes, S = somewhat, N = no.



**Figure 27: Market barriers - Differences across countries**

How would you rate the importance of the following factors as barriers of the future development of the B2B market for bio-based products? (1 = very low, 5 = very high)

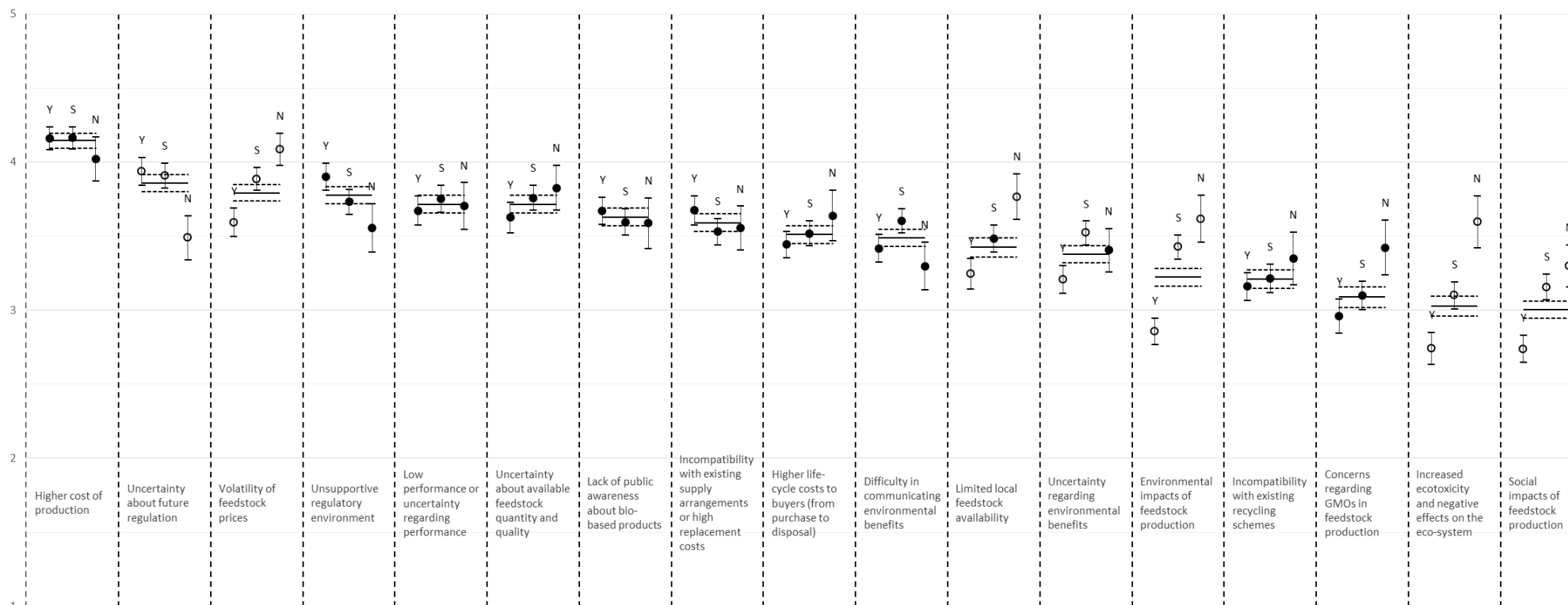


This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

Subgroups: In which country do you work? BE = Belgium, DE = Germany, FR = France, IT = Italy, NL = The Netherlands, oth = other countries.

**Figure 28: Market barriers - Differences according to expert-level**

How would you rate the importance of the following factors as barriers of the future development of the B2B market for bio-based products? (1 = very low, 5 = very high)

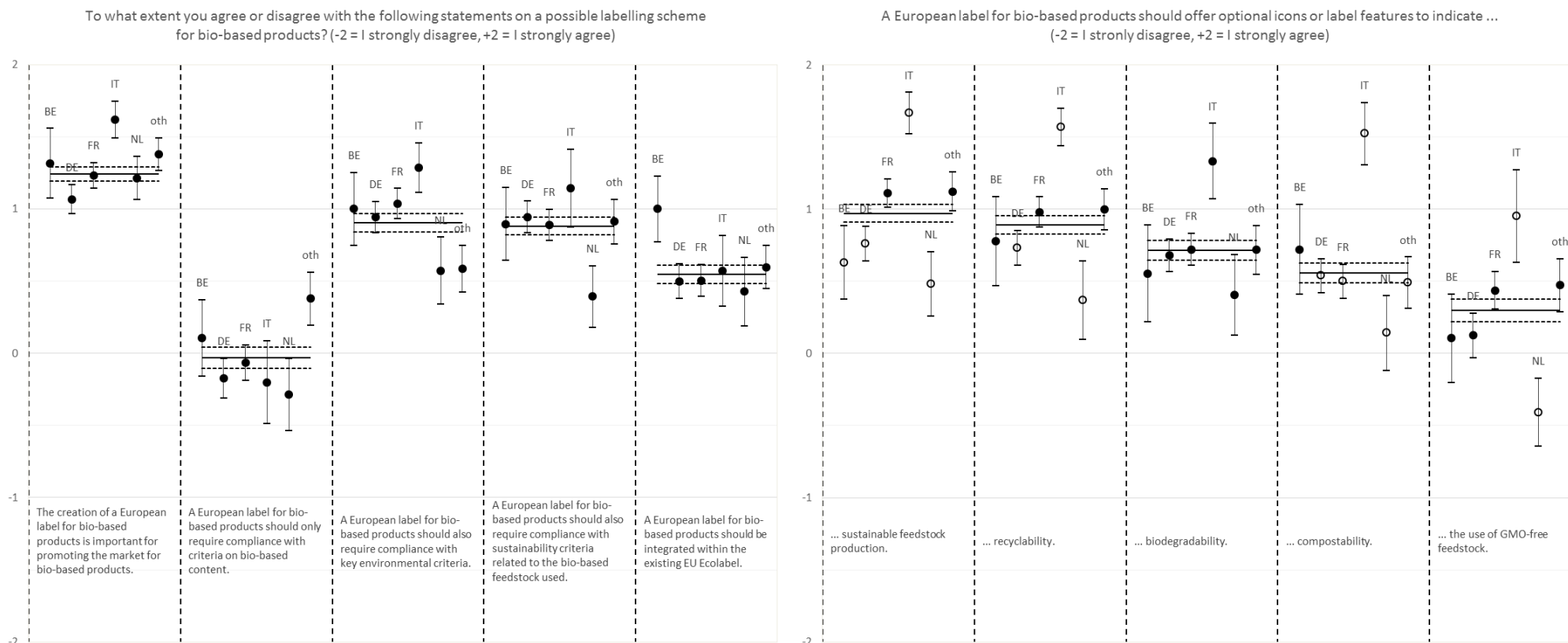


This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

Subgroups: Do you consider yourself an expert in the field of bio-based products? Y = yes, S = somewhat, N = no.



Figure 29: Labelling - Differences across countries



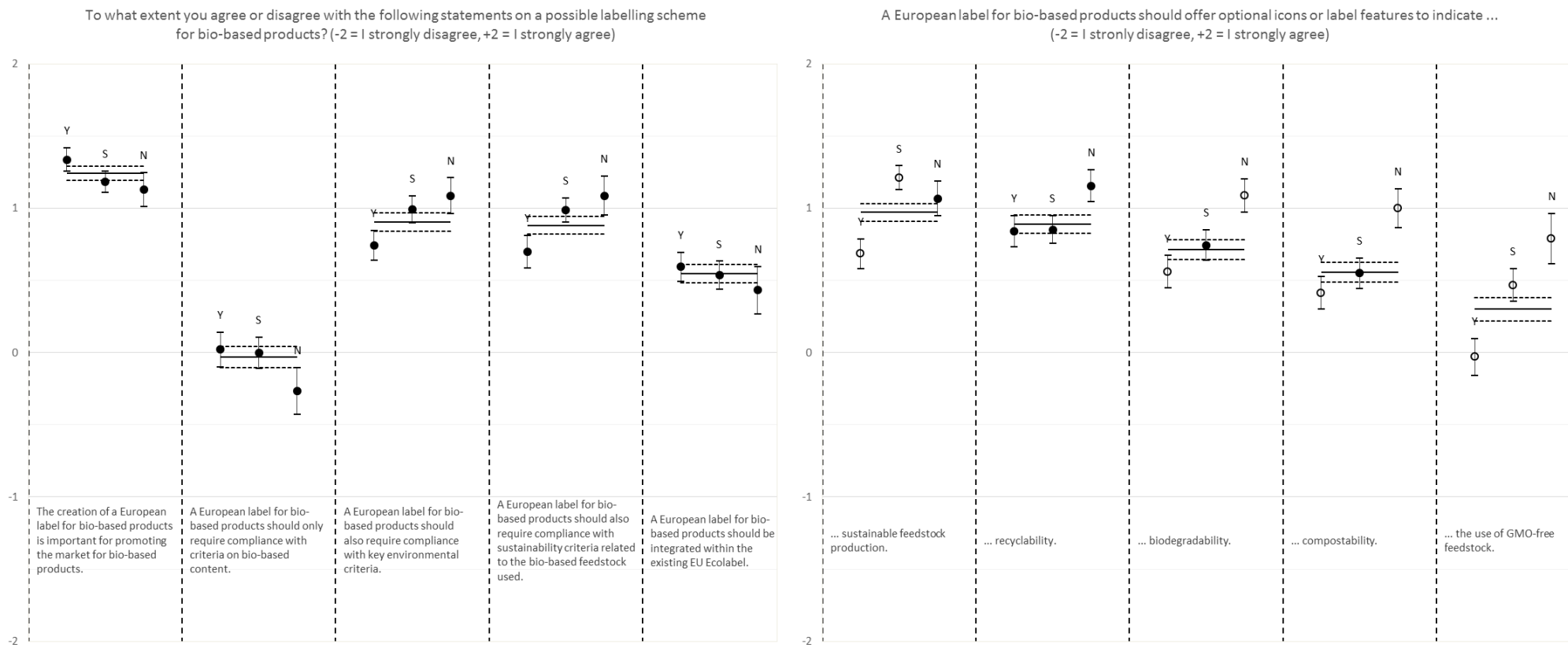
This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

Subgroups: In which country do you work? BE = Belgium, DE = Germany, FR = France, IT = Italy, NL = The Netherlands, oth = other countries.





**Figure 30: Labelling - Differences according to expert-level**



This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

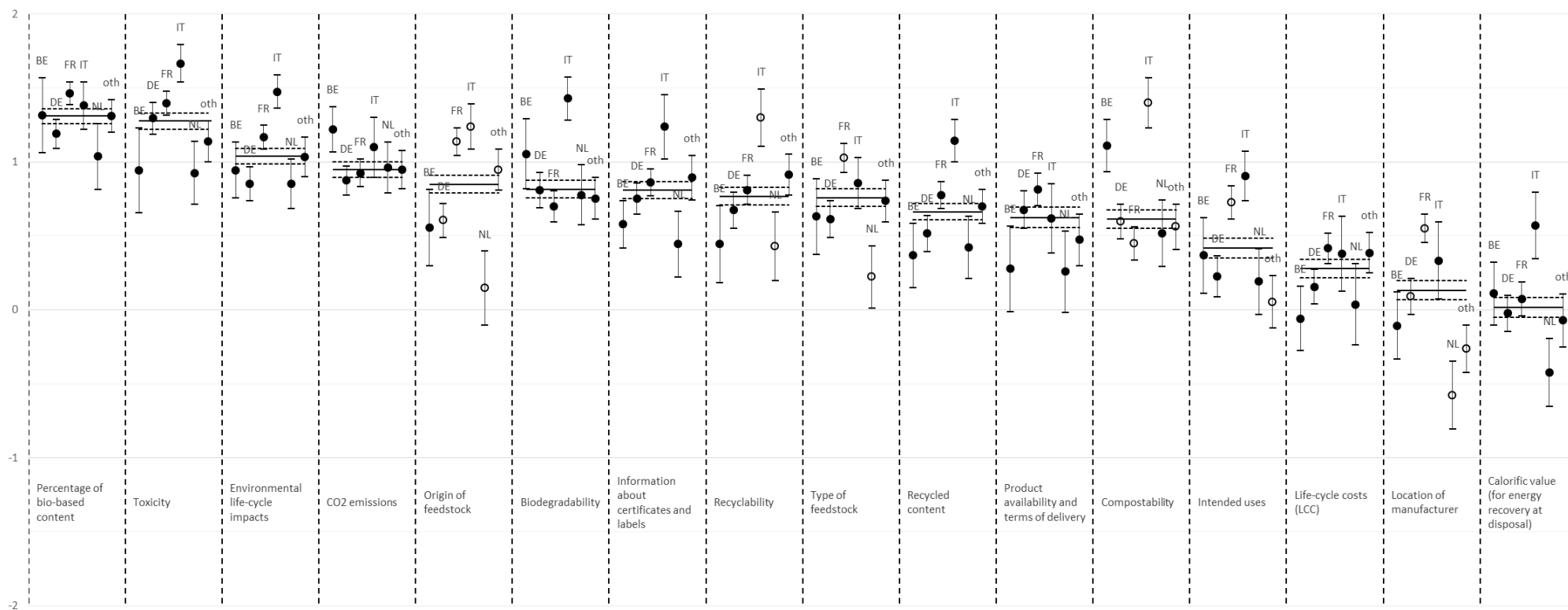
Subgroups: Do you consider yourself an expert in the field of bio-based products? Y = yes, S = somewhat, N = no.





**Figure 31: Perceived importance of information - Differences across countries**

Information on this item is very important for taking the decision to purchase a bio-based product. (-2 = I strongly disagree, +2 = I strongly agree)



This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

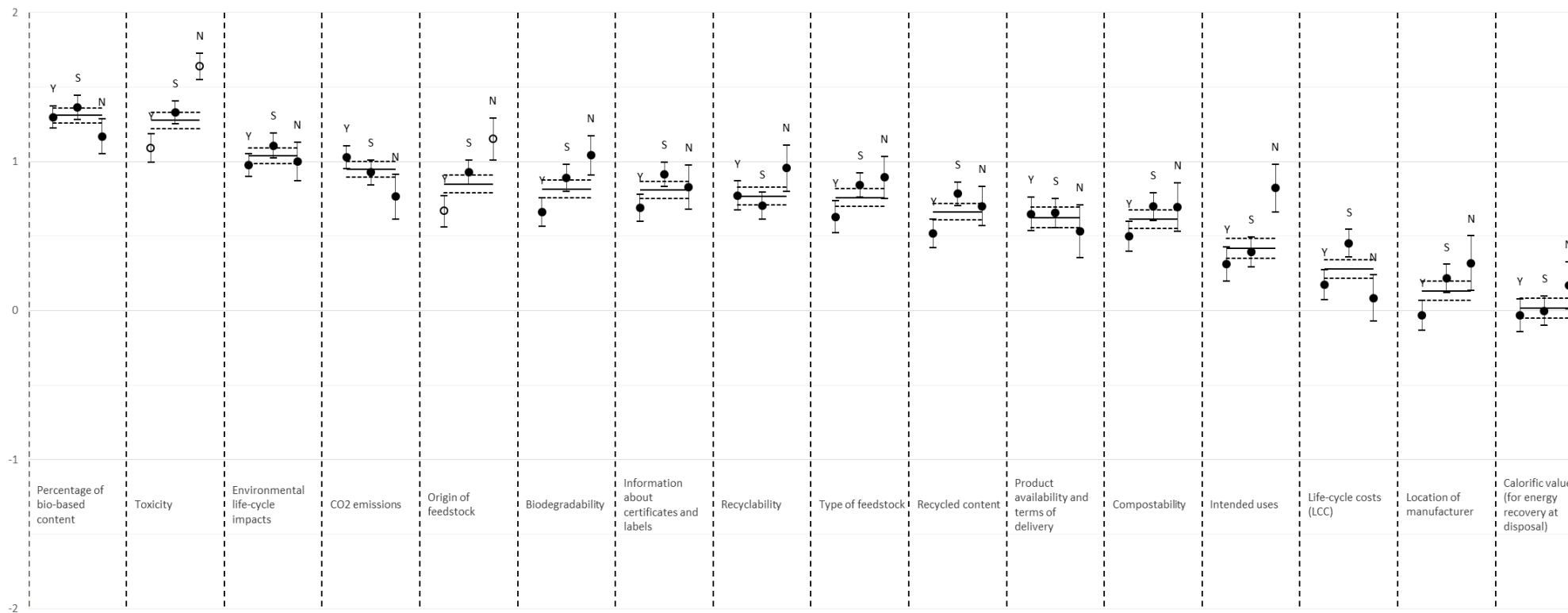
Subgroups: In which country do you work? BE = Belgium, DE = Germany, FR = France, IT = Italy, NL = The Netherlands, oth = other countries.





**Figure 32: Perceived importance of information - Differences according to expert-level**

Information on this item is very important for taking the decision to purchase a bio-based product. (-2 = I strongly disagree, +2 = I strongly agree)



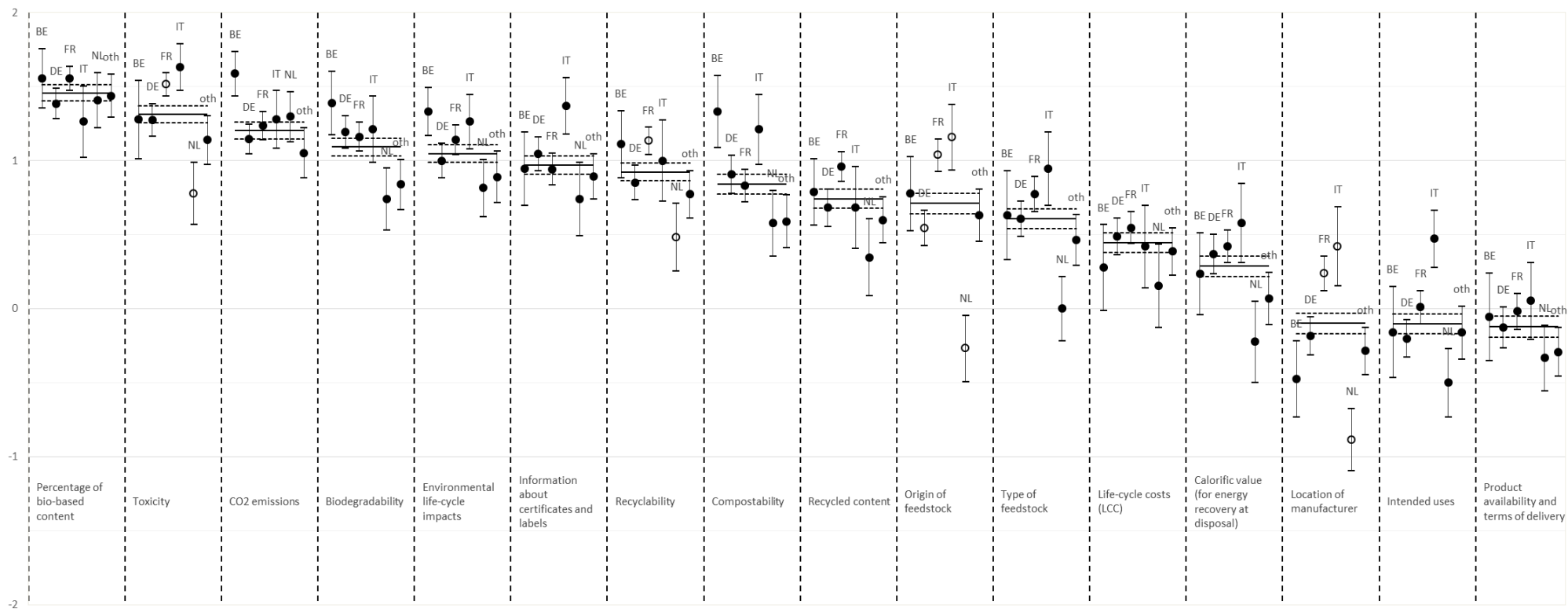
This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

Subgroups: Do you consider yourself an expert in the field of bio-based products? Y = yes, S = somewhat, N = no.



**Figure 33: Perceived need for standardization - Differences across countries**

Information on this item should be standardized to facilitate the comparison of similar products. (-2 = I strongly disagree, +2 = I strongly agree)

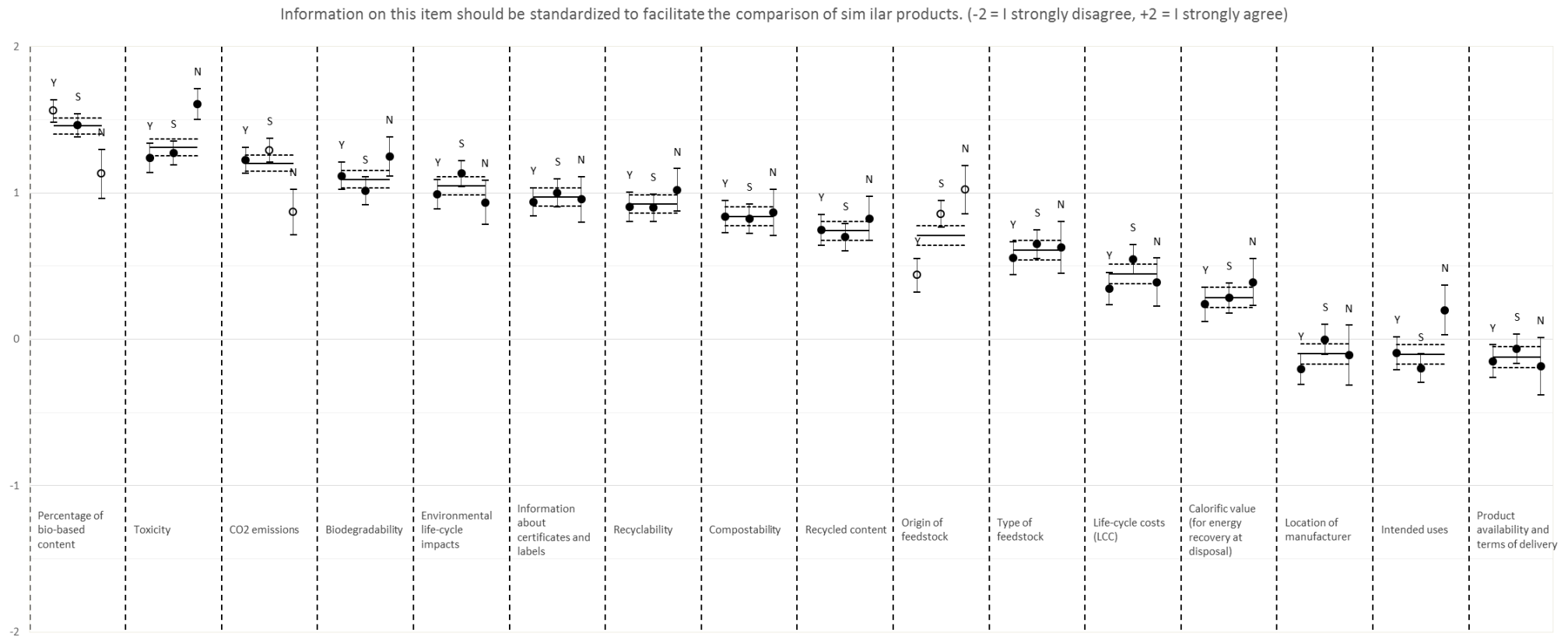


This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

Subgroups: In which country do you work? BE = Belgium, DE = Germany, FR = France, IT = Italy, NL = The Netherlands, oth = other countries.



**Figure 34: Perceived need for standardization - Differences according to expert-level**



This figure depicts estimated means and standard errors for the entire sample of respondents (horizontal lines) and for each group separately (circles with vertical bars). Hollow circles indicate group means that significantly differ based on two-sided tests at the 0.05 level in at least one pairwise comparison. Bonferroni correction is used to adjust p values for multiple comparisons.

Subgroups: Do you consider yourself an expert in the field of bio-based products? Y = yes, S = somewhat, N = no.