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Consumer preferences of sustainability labeled cut roses in Germany

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Abstract:

The study investigated preferences of consumers of food retailing outlets in Germany for sustainability labeled cut roses. A sample of 1,201 respondents of an online survey was used to analyze their preferences based on a conjoint experiment in which a bunch of ten roses was considered which differed concerning the labeling certificate, country of production of the plants, price, packaging, smell and blossom size of the roses. Latent class analysis revealed existence of consumer heterogeneity with around two thirds of the respondents being strongly in favor of sustainability labels. Thereby Fairtrade labeled roses got an overall positive assessment whereby organic roses were only preferred by 31% of the respondents. In addition, paper or no packaging, strong smell and uniform big blossom sizes got overall positive consumer evaluations in the experiment. The study concludes that sustainability labeled plants might be an option for producers to append additional value to horticultural products in Germany.

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1. Introduction

Sustainable consumption of private consumer has increased over the last decades and appears to show signs of a lasting trend. Several studies carried out in recent years show that green, local, ethical, or other forms of sustainable consumption are considered of a growing number of households (e.g. Harvey et al., 2014). Thereby sustainability is defined by the United Nations as: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987), with sustainable consumption referring to consumers' sustainability related attitudes and behaviors. In this sense sustainable consumption relates directly to the influence that individual consumers feel their actions have on present and future outcomes (van Bohemen et al., 2012)

Sustainable consumption showed increasing trends in various product groups and countries in recent years. In Europe, for example, the yearly revenues of products being labeled with sustainable information from European-wide operating food retailer MIGROS has increased up to a factor of 1.7 in some product assortments between 2013 and 2016 to a total of €2.2 billion (MIGROS, 2017). Besides sustainably produced food products, other agricultural and horticultural products had to be taken into account in order to fulfill the rising demand of retailers and consumers.

The market of sustainably produced horticultural goods started out with eco-labelled herbs, fruits and vegetables Germany. Labeling organic agricultural farm products has a long tradition in Germany, considering that the DEMETER organization introduced their label back in 1928 (Schlossberger and Schnell, 2009). In recent years, other aspects of sustainability have gained on relevance in the field of ornamental plants as well, as the introduction of the GGN (GlobalGAP Number) consumer label in 2017 (TASPO, 2017) or the MPS consumer label “Fair Flowers Fair Plants” (MPS, 2017) show for the example of the market in Germany. According to the statistics of AMI (Agrarmarkt Markt Information Company, 2016) the market of ornamental plants and flowers had annual sales of about €8 billion in Germany in recent years. Especially the market segment of cut flowers with sales of €3

billion in 2016 is in the leading position since a lot of years. In 2016 44 % of sold cut flowers in Germany were roses (TASPO, 2017b) which have been in this dominant position since a long period of time. Based on a report of CBI (Center for Promotion of Imports from developing countries) (Ministry of Foreign Affairs of the Netherlands, 2016), “Germany is the largest market for cut roses in Europe” with an increase of imports from €272 million to €309 million between 2011 and 2015.

In recent years, a movement aiming to counteract against “decreasing valuation” and falling prices of the products can be observed in the field of ornamental plants in Germany. In addition to specific production methods and other activities in the organization and management of the value chain, this also requires improvement of communication towards consumers concerning the “specific quality” of sustainable products which are often documented in particular ways of certifications. By now little is known to which extent some sustainability criteria demanded by certifications on production side are affecting consumers’ choices of the horticultural products. Results from recent scientific studies show that the health aspect is influencing choices of purchase of sustainable products (Annunziata et al., 2016; de Carvalho et al., 2015), but this aspect is considered less relevant in relation to non-edible products. In case of horticultural plants consumer segments have been identified by Behe et al. (2013) in the USA and Canada, whose purchase decisions for ornamental plants were determined by ecological aspects. Further Gabriel (2011) could also prove that environmental aspects were the main motive for purchasing plants in biodegradable pots, despite a higher price compared to the standard product. Previous studies also identified plant origin as an important product attribute for consumers when purchasing horticultural plants with preferences for domestically or regionally produced plants (Rombach et al., 2018; Schomburg and Drechsler, 2016; Yue et al., 2011b; Hudson and Griffin, 2004). In addition, some studies also analyzed consumers the effects of “fair labeled” horticultural products on consumers with such labels considering environmental issues as well as social aspects in particular in developing countries. Those studies in general found preferences and positive consumer reactions (e.g. higher willingness to pay) for such “fair labeled” horticultural plants (Rombach et al., 2018; Klahre, 2016; Michaud et al., 2013).

On the one hand it is necessary to communicate product related sustainability attributes toward consumers and thereby support product differentiation, on the other hand plethora of certificates results in a confusing assortment and overwhelmed consumers. Additionally to labels, there are other visually recognizable possibilities to communicate specific issues at the point of sale. Related to ornamental plants the design and material of the package for example plays an important role. Thus, the paramount aim of the project is to identify sustainability criteria, which contribute in a substantial manner to consumer choices related to the analyzed cut roses as an example of horticultural products.

Thereby the main emphasis of this study was

- Identifying relevant sustainability criteria for consumers related to production and distribution of cut roses
- Analyzing consumer preferences for different types of purchased cut roses in food retailing outlets in Germany
- Clarifying the existence of consumer heterogeneity related to sustainability labeled cut roses

The following chapter 2 gives an overview about the used methods and materials, including the development and implementation of the choice experiment. In chapter 3, the results of the conjoint analysis and latent class cluster analysis are presented. Finally, the results are discussed in Chapter 4 including a critical reflection on the method applied and some suggestions concerning future studies.

2. Material and methods

To analyze the preferred attributes of sustainability labeled roses, a Choice-based-conjoint analysis was conducted. Consumer segments could be determined by applying a latent class analysis afterwards.

2.1 General characteristics of the methods

Conjoint analysis is one of the most common and popular methods used in consumer studies. The aim of a conjoint analysis is to determine utility values for selected attributes of a product by means of consumer preferences (Albers, 2009; Green and Srinivasan, 1978). In general a choice-based conjoint

analysis incorporates a decision by a participant of the same product which varies among the attributes. Based on random use theory and discrete choice analysis it is assumed that the participants maximize their benefits and that conclusions can be drawn from the selection decisions regarding the utility values of attributes and levels (Albers, 2009). Participants are assumed to choose the alternative which has the highest utility for the participants himself. The respondent implicitly makes trade-offs between the attributes associated with each project by choosing the preferred project. Through changing the level of each attributes for the projects, the impact from each attribute on the choice of project can be calculated.

Choice-based-conjoint analysis is a widespread methodology in science and practice of market research for analyzing preferences due to its realistic approach which simulates real buying decisions. Choice-based-conjoint analysis has been applied in several studies dealing with consumer preferences for environmentally friendly products (Bask et al., 2013; Sammer and Wüstenhagen, 2006). Furthermore, hypothetical attributes can be integrated if new or rarely available products are analyzed, as it is the case for organic roses which are currently rarely on the market in Germany. In case that it is possible that heterogeneous consumer preferences might exist, Hierarchical Bayes is the preferred estimation method.

Additionally, a latent class analysis was performed to identify consumer segments within the sample. As such, part worth utilities and the probability that each respondent belongs to each segment could be estimated simultaneously. Thereby the whole sample was divided into homogenous subgroups with similar part worth utilities. Afterwards different cluster solutions were calculated and the number of segments was determined using performance indicators such as the Consistent Akaike Information Criterion (CAIC) or Chi Square (Sawtooth Software, Inc., 2004).

2.2 Implementation of the choice experiment

The development and application of a choice experiment includes various steps. After the defining question, relevant and realistic product attributes and characteristics have to be identified and an

appropriate experimental design has to be implemented. Then the questionnaire is developed and an appropriate sample is chosen. The statistical analysis of the results completes the process.

When conducting a choice-based conjoint analysis, it is advised to keep the number of relevant attributes low to avoid excessive demands on the respondents which could negatively influence the quality of the result (Green and Srinivasan, 1990; Sawtooth Software, Inc., 2013). In this study, four different attributes were used including the product price which was linked to another product attribute. These attributes were derived from scientific literature, an analysis of available products, the outcome of expert interviews as well as a pre-study aiming to investigate relevant sustainability criteria for purchaser of horticultural products.

2.2.1 Expert interviews

After screening scientific literature, advice was sought from actors related to the production of horticultural plants on an international fair (IPM 2017) in Essen, Germany. In total six expert interviews were carried out with participants represented positions from seed producing companies, retailing and wholesale companies to a certification organization (Fairtrade Germany). All of the invited experts were able to share valuable insights owing to their longstanding and successful careers and due to their diverse fields of activities within the market of ornamental plants. The interview partners were chosen carefully from the exhibitors' list of the IPM 2017 after exploring their backgrounds. In total eighteen of them were contacted by email to schedule an appointment, but finally representatives for six companies accepted our invitation. Each interview lasted approximately 60 minutes, was recorded and transcribed later. The covered questions were related to personal experiences with aspects of sustainability within the own company, labeling and the communication towards consumers out of perspective of producers and the certification organizations.

The expert interviews showed that sustainability is an important driver for the marketing and selling of ornamental plants. Thereby social aspects were regarded to have the greatest influence on consumers since it is easier for consumers to identify themselves with these aspects. Also ecological aspects like reduced water consumption, reduced plastic waste, reduction of peat-use and protection of

insects seem to affect the purchase choices of consumers. In addition, the interview partners also described the difficulties of forwarding information to the buying consumers due to e.g. limited space on the package, labels are not known by consumers and are not easy to understand and additional information at the point-of-sale is difficult to realize and often not used by consumers. Nevertheless, the opinion that sustainability labels are affecting consumer choices positively was supported by the majority. The organic BIO-labels and Fairtrade were mentioned as the most common ones, which are specially designed for consumers and this tendency is also endorsed in a study of the Zukunftsinstitut (Seitz, 2013). The interviewed experts agreed that sustainability labels are gaining momentum in the field of ornamental plants by raising awareness and guaranteeing a specific “quality” during the production process. Furthermore, most of the interviewed experts confirmed that regionally produced horticultural products might be an interesting option as well following the currently running trend in food production in Germany.

2.2.2 Pre-study on sustainability criteria

Following the expert interviews a short online-based pre-study was carried out in order to more clearly define relevant sustainability criteria in horticultural plants. The survey was designed with the online tool LimeSurvey (version 2.67.3), distributed via local newspaper, email and social media platforms and no incentives were offered to the participants: A total of 143 people participated in this pre-study, which was conducted for two weeks in August 2017. Due to incomplete answers 99 participants were finally taken into consideration. Due to the high consumer preferences and availability of roses all over the year round we decided to focus our pre-study on cut roses and participants were asked to evaluate a list of the potentially relevant purchasing criteria for cut roses using a 5-point Likert-scale from “very important” to “not important at all”. The results of this question are shown in Figure 1 indicating that certifications especially the BIO label (7.1%) is considered to have a low impact on consumer choice. This result might be explained by the currently low availability of organic roses in the German market. On the other hand social aspects in particular no child labor (62.6%) is affecting the purchase decision strongly. Fair working conditions and the protection of farmers (38.4% each) also seem to have an impact on consumer choice although the

corresponding Fairtrade label only was selected by 19.1% of the participants. Consumers also attain relevance to some inherent characteristics like the color of the roses (46.5%), a high quality (43.4%) and the form of the blossom (34.4%). In contrast to features of social sustainability, ecological aspects seem to have a lower impact on consumer choice. Besides reduction of plastic waste (44.4%) on third place all the other ecological aspects are ranked between 33.3% for protection of bees and 14.1% for reduced peat use (Fig. 1).

Figure 1 Relative importance of sustainability criteria when purchasing cut roses

Further, the participants of the pre-study were asked about recognition and trust regarding four defined sustainability labels which are currently used on the German market. Three of the chosen labels are associated with ornamental plants (i.e. Fairtrade, BIO and Das Grüne Zertifikat) but also used in other segments (e.g. food products). These are the labels also mentioned by the experts in the interviews to be the most common for consumers. One additional label connected to environmental protection (“Blauer Engel”) was included in the pre-study as well due to its long presence on the market. The results of this pre-study show, that Fairtrade (96.8%) and BIO (Eco) (60.6%) are the two most prominent labels in connection with ornamental plants. Although, when it comes to trust there is a noticeable difference between the scores of Fairtrade (84.5%) and BIO (Eco) (39.3%). In general the majority of the respondents of the pre-study see the purpose of labels in informing the consumers, but 40% of the participants see this task only partially fulfilled. Concerning quality of the labeled products, 44% of the respondents are undecided but 41% tend to believe that labels are promoting a higher quality. Since the selected labels are particularly indicators for social and ecological sustainability, we also asked if participants know the meaning of these terms. More than half of them tend to be aware of the meanings of the two concepts (65 % for ecological sustainability and 58% for social sustainability).

2.2.3 Product attributes of the choice experiment

Table 1 Choice-based-conjoint analysis – Attributes of roses

The product attributes of the analyzed cut roses chosen for this choice experiment are presented in table 1. The specific product attributes which had no reference to sustainability included the size of the blossom as well as the smell of the roses as quality characteristics inherent to these plants. Although appearance of horticultural plants was identified as a relevant quality parameter of consumers in previous studies (e.g. Behe et al., 1999; Berghage and Wolnik, 2000; Hudson and Griffin, 2004) most of these studies concentrated on the role of color of the blossom or characteristics of leaves. Since red roses are by far the most sold color variant of this plant in Germany, this color was given in the introduction of the conjoint experiment. An analysis of products already available on the market, the results of the performed expert interviews as well as the results of a pre-study on sustainability criteria showed the relevance of the size of the blossom as well as the smell as important attributes for consumers when buying roses. Both attributes are difficult to assess for consumers in quantitative terms so that they were transferred to three qualitative levels (table 1) for each attribute.

The sustainability related aspects were divided into two attributes of which one relates to the specific conditions during production of the roses. Since consumers cannot control or evaluate these conditions even after the product is bought or consumed, such characteristics are regarded as credence attributes (Yue et al., 2011a; Michaud et al., 2013). The specific conditions during the production of credence products are generally transferred to consumers using specifically defined certification schemes as well as the respective labels to inform them. Therefore we named the respective attribute “labeling”. All of the used sources showed (table 1) that Fairtrade and organic labels are the most important labels which consumers have in mind when thinking about sustainability. Therefore we included these attribute levels in the CBC experiment complemented with a “No label”-alternative. Due to the focus on labeling the original labels were included in the choice task (Fig. 2). Since currently one particular label of an organic farmers’ organization called Bioland is mostly used in the market of roses in Germany, this particular label was used for the experiment. In order to avoid unrealistic product alternatives we added two other components to the attribute “labeling”. Since the origin of the plants was identified as important selection criteria of consumers in previous studies (Hudson and Griffin, 2004; Yue et al., 2011a) we linked a specific country of origin to the three levels of this attribute. Since most of the labeled Fairtrade roses sold in Germany are imported from Africa

(Fairtrade Germany, 2015), Kenya as the most important production country of roses was used in the conjoint experiment (Fairtrade International, 2016) combined with a hint of “supporting developing countries” (table 1). Currently organic roses are hardly available on the market in Germany (Oekolandbau, 2017) and if so they are produced in this country as well. Consequently a production of the organic roses in Germany was assumed in the conjoint experiment combined with a hint of “supporting regional production” (table 1). The “No label”-alternative had no information about the country of origin of the roses in the conjoint experiment. Since the prices of products are essential in any economic transaction and were found to strongly impact consumers’ decisions, prices are mostly included in studies analyzing consumer preferences (Yue et al., 2011b; Michaud et al., 2013). Therefore we included this attribute in the conjoint experiment as well and investigated the actual prices on the market of roses in Germany. Therefore three price levels were calculated based on the offers on the market. We compared the prices of roses at local providers with respect to the specific labels and used a constant average price for each labelling attribute level to avoid unrealistic product profiles. So with € 3.99 the most expensive alternative were BIO roses produced in Germany, followed by the Fairtrade bunch produced in Kenya for € 1.99, and the cheapest roses without any labeling were offered for € 1.65. By combining the three components of “labeling” (i.e. the labeling certificate, the production country of the roses and their prices) it is aimed to simulate a purchase situation as realistic as possible.

Figure 2 Fairtrade and organic label used in the conjoint experiment with cut roses

In order to complement the sustainability related aspects of the analyzed product, we added the type of packaging of the roses as fourth attribute to the conjoint experiment. According to previous studies (Lindh et al., 2016a, b; Steenis et al., 2016) consumer associations regard packaging mostly linked to convenience and sustainability. These findings also demonstrated that further benefits like e.g. naturalness, healthiness and overall quality of the packed product are related with the type of packaging. Lindh (2016a) pointed out that paper-based packaging is considered more environmentally friendly than plastic. For defining the different attribute levels we compared the currently used types of packaging for cut roses in the German market, which resulted in the three levels plastic, paper and

no packaging. During the expert interviews and in the conducted pre-study especially the reduction of plastic waste was mentioned to have an important impact on consumer choices in the horticultural field.

2.3 Realization of the survey and statistical analysis

Data for this online survey were collected by a service provider with an online panel in December 2017. In order to get a representative sample for Germany, 2,442 responses were collected in total. Approximately 34% of the original respondents disqualified due to completing the survey in only half of the time (5.5 min.) than the average or by showing no variance in regards of their answers. The target group of this survey included people, who have bought cut flowers in the last twelve months. The quotation of gender and age followed the average German population structure based on statistical records (German Census, 2011), considering that the most important discounters in Germany (i.e. ALDI and Lidl) showed a very similar age distribution of their customers (Best 4 Planning, 2017). Within two weeks of data collection 1,332 participants completed the CBC and after cleaning this data a total of 1,201 responses have been retained.

The questionnaire and choice experiment were conducted using Sawtooth Software. The choice experiment included ten random choice tasks with three alternative product concepts for each task in addition to a None-option. Introducing the choice experiment it was indicated that without having any special reason the participant wants to buy a mono bunch of cut roses (10 pieces) and should decide which one of the offered alternatives he/she prefer over the others. It was mentioned in the introduction that the roses were available in the color the participant wished and all of the roses had the same shape and freshness. A total of 300 questionnaire versions were generated for each product using the random task generation method 'Balanced Overlap', which enabled level overlap within individual tasks. By allowing some levels to repeat, and forcing the respondents to decide between the same attribute levels, the precision of interaction effects is improved.

The hierarchical Bayes procedure was used to estimate the importance values of the four analyzed product attributes as well as the part-worth utility values of the different attribute levels. According to

Netzer et al. (2008), hierarchical Bayes is a likelihood-based and random-effects method and consists of two levels. At the upper or population level, it is assumed that individuals' part-worths are described by a multivariate normal distribution. At the lower or individual level, it is assumed that the probability that a respondent will choose a particular alternative is governed by a multinomial logit model (Sawtooth Software, 2009). The two levels allow the algorithm to "borrow" missing information about the individual level from the population level. By doing this, the procedure deals with preference heterogeneity by estimating individual level parameters (Baier, 2009).

3. Results of the choice experiment

3.1 Sample description

Table 2 shows the socio-demographic sample characteristics as well as the purchasing habits of the respondents. The distribution of age and gender follows the structure of the German population (German Census, 2011). Further, almost all of the respondents (94.7%) state to have purchased in supermarkets or discounters in the recent three months. This in turn is important because 80 % of German consumers at least occasionally purchase cut flowers while shopping groceries in supermarkets (Innofact, 2010). Half of the participants buy flowers at least once a month and approximately 20% even more often (table 2).

Table 2 Socio-demographic structure and purchasing habits of the respondents

3.2 Consumer preferences for sustainability labeled roses

In a first step, the general importance of every attribute and the preferences for individual attribute levels were analyzed. The importance of each attribute was calculated by dividing the difference between the highest and lowest utility value of each attribute by the sum of all the attributes' differences. The results for the entire sample, which are based on Hierarchical Bayes estimation, are shown in figure 3 highlighting the overall importance of the attributes and figure 4 showing the part-worth utility coefficients of each attribute level. The values of the part-worth utilities have been re-scaled to zero-centered differences by the program for better comparability.

With an average contribution of 49% to the overall utility, labeling was the most important product attribute of the analyzed roses. Respondents clearly preferred the Fairtrade label with a high positive part- worth utility value. Although both utility values of the other two labeling alternatives being negative, it is remarkable that the no label alternative got a better estimation than organic roses (figure 4). The second most important attribute was the smell of the roses with an average contribution of 25%. Roses with a strong smell were favored over those with weak smell while roses with no smell were negatively evaluated. Concerning the type of packaging which had an overall contribution of 18% to the total utility of respondents, there was no clear differentiation in preferences for a paper packaging or no packaging of the roses. However, respondents clearly rejected plastic packaging of the roses (figure 4). Finally, the form of the blossom of the roses was the least important attribute, with a remaining average contribution of around 8%. Thereby big blossom sizes were preferred over small or varying sizes. The None-Option produced a clear loss of benefit, which indicates that consumers have an interest in sustainability labeled roses in comparison to roses without such product attributes.

Figure 3 Average attribute importance of sustainability labeled roses (%)

Figure 4 Consumer preferences for different attribute levels of sustainability labeled roses (Zero-Centered Diff)

3.3 Segmentation of the respondents

Table 3 Goodness of fit of the subgroup estimation for the LCA

Different market segments were identified through a latent class analysis which indicated varying consumer preferences. Solutions with two to up to five clusters were calculated to find out the number of clusters (table 3). A solution with four clusters was chosen respecting indicators such as the Percent Certainty, CAIC and Relative Chi-Square. Although these values do not have an optimum for a solution with four clusters, decreasing distances indicate a meaningful solution. The Percent certainty value as an index for goodness of the solution compared to the null solution, shows that we improved the data with approximately 31 % for the four clusters (table 3). Furthermore, solutions with more

clusters produce very small segments, which can be an indication of too many clusters. Cluster sizes, the particular importance of attributes and utilities for the 4-cluster solution are listed in table 4.

Table 4 Market segmentation – Results of the latent class analysis

Cluster 1 includes almost one third of the respondents (31.0%) and is characterized by having a rather balanced importance for the attributes labeling (38.8%), smell (30.4%) and type of packaging (24.1%) thereby showing increased importance for the latter two. The utility loss of the None-Option is clearly above average within this cluster. The most remarkable results related to this cluster refer to the members' preferences concerning the labeling attribute: The respondents of this cluster prefer organic roses produced in Germany with the highest price also in comparison to Fairtrade roses produced in Kenya and clearly reject non-labeled roses. Presumably this group values the labels and the joint information more and neglects the higher price. If so, we can assume that the consumers in this class favor regional and environmentally friendly production but also consider the social aspect. The preferences for the other attribute levels within this cluster are in line with the general tendencies of the entire sample. Cluster 1 can be characterized as Bio-Enthusiasts due to the identified preferences.

24.4% of all respondents belong to cluster 2. These respondents seem to be particularly interested in the labeling with an above-average contribution of more than 56% to the overall importance. In contrast the packaging of the roses is not very relevant for the members of this cluster (7%). The None-option is also negatively evaluated by this group of respondents. They have clear preferences for the non-labeled roses with the lowest price level, evaluate the Fairtrade roses still positively and show clear rejection of organic roses with the highest prices. The smell and blossom-related preferences of this group are in line with the general evaluations. Despite the low relevance for the attribute packaging paper packaging is preferred over no packaging and plastic packaging being still rejected. Altogether this cluster can be called Economizers.

Respondents belonging to cluster 3 makes up 32.5% of the overall sample. These respondents are particularly interested in the labeling attribute, which contributes to 61.7% of the overall utility instead

of 49% in the entire sample. Also packaging has an above average relevance for this cluster, while these respondents do not seem to care too much about the quality characteristics of the flower as such like blossom and smell. With their preferences of the included levels of packaging, smell and blossom being in line with the evaluations of the entire sample, the members of this cluster show a very strong preference for Fairtrade roses and reject both organic and non-labeled roses. Probably the joint effect of the certification and the middle-ranked price leads to this result, and this could be interpreted that the members are especially interested in social sustainability issues. The None-option is also rejected by this cluster which finally can be characterized as Fairtrade enthusiasts.

Finally, the respondents in cluster 4 seem to prefer “classical roses”, what is demonstrated by the high utility gain of the None-Option as well as the high importance values in particular of smell (59.8% compared to 25.2% in average) but also of blossom (10.2 % compared to 7.8% in average). These results distinguish cluster 4 from the other three clusters. Thereby the members of this cluster have a very strong preference for strong smell and uniform big blossoms of the roses. They also prefer Fairtrade roses and clearly reject the organic product alternative. Altogether this cluster can be called Classical rose fanciers.

4. Discussion and conclusions

This study reveals that German consumers have general interest in sustainability labeled horticultural products, shown by the clear loss of benefit for the None-Option in the choice experiment. The in the attribute “labeling” combined components of a labeling certificate, the country of origin of the plant and the price was considered being the most important attribute in our study. These findings are supported by previous studies analyzing at least single dimensions of sustainability issues in Germany (Rombach et al., 2018. Klaehre, 2016) and other countries (Michaud et al., 2013; Yue et al., 2011a, b; Hudson and Griffin, 2004). In the study on hand, the used packaging material was also regarded as relevant for consumer’ preference evaluation of the analyzed cut roses what is also supported by previous studies (Lindh et al., 2016a, b; Magnier et al., 2016; Steenis et al., 2016). The inherent characteristics of the roses contributed to around one third to the overall utility of respondents

with smell of the roses being the dominant attribute which is partially supported by previous studies (Behe et al., 1999).

The results of the latent class analysis give clear indications of the existence of consumer heterogeneity with major differences between the four groups being identified with regard to the respondents' part-worth utility values as well as the importance of the analyzed product attributes. Within this study, two groups were clearly in favor of sustainability labeled cut roses being aware and sensitive either to the social dimension of sustainability represented by the Fairtrade label or they strongly preferred organic roses produced in Germany. The linked higher product price was accepted by the respondents of these two clusters. Altogether, respondents belonging to these two groups made up 63% of the sample. In contrast, around 37% of the respondents were only partially interested in sustainability labeled cut roses. These respondents seemed to take more notice of low prices (which were connected to the No-label alternative) or preferred "classical" roses with strong smell and big blossom size. As this study examined cut roses as an example for horticultural products, the results maybe cannot be transferred to all horticultural products in Germany.

Within the "labeling" attribute, Fairtrade roses were strongly preferred by the entire sample. This was particularly true for the cluster of the Fairtrade enthusiasts, but Fairtrade roses received positive part-worth utility values in all four identified clusters (table 4). This finding might be due to the fact that a rather moderate price (€ 1.99 for bunch of ten roses) was linked to the Fairtrade certificate and that shoppers in discounters and supermarkets in Germany might be rather familiar with this label due to the growing market volume of fair-traded plants and other products in recent years (Statista, 2016). The strong preferences for Fairtrade roses did not seem to be restricted by the fact that Kenya was mentioned of being the country of origin in the study on hand although previous studies on horticultural products found preferences for domestically grown plants in Germany (Rombach et al., 2018; Klaehre, 2016; Schomburg and Drechsler, 2016) and other countries (Yue et al., 2011b; Hudson and Griffin, 2014). A similar tendency for consumer preferences for regionally produced products can be observed in the food markets as well (e.g. Meyerding, 2016; Menapace et al., 2011; Van Loo et al., 2011).

In contrast to the Fairtrade attribute level, the organic label of the analyzed cut roses only got positive consumer evaluations in the cluster of the Bio-Enthusiasts and was clearly rejected in the other three clusters as well as within the entire sample. This result might be due to the fact that a price of € 3.99 for a bunch of ten roses was linked to the used Bioland certificate which might be perceived by shoppers in discounters and supermarkets in Germany as being too high for the analyzed cut roses. In general the high consumer acceptance of organic labels which can be observed for the food market in Germany (MIGROS, 2017; Meyerding, 2016) does not seem to correspond with analogous consumers' preferences for non-edible organic products. As some studies related to the food sector showed that consumers' preference for an organic label mainly depend on their perceived positive health aspects (Annunziata et al., 2016; de Carvalho et al., 2015; Garcia-Yi et al., 2015), it can be assumed that health aspects are being less important related to non-edible products like cut roses thus leading to lower preference of the BIO label. Additionally Loureiro and Lotade (2005) argued that consumers were not quite aware or could barely imagine the environmental impact of coffee cultivations in distant regions, what might be also transferable to the analyzed cut roses.

The results concerning the levels of the attribute packaging were homogeneous over all four clusters as well as for the entire sample with paper packaging or no packaging of the cut roses being preferred over plastic packaging. This result might be influenced by the current public debate on reducing plastic waste in Germany which popped up during the realization of the survey. However, previous studies for other areas also showed a positive consumer evaluation in particular for paper packaging (Lindh et al., 2016a, b). Respondents' preferences related to the analyzed levels of the attributes smell and blossom size of the cut roses showed the expected tendencies. Strong smell is preferred over weak or no smell of the roses (Douc   et al., 2013) as well as uniform big blossom sizes being positively evaluated by all four clusters as well as the entire sample, in accordance with the findings of Prince (1980).

A choice-based conjoint analysis was conducted to analyze consumers' preferences of sustainability labeled roses in Germany. CBC is regarded as a reasonable instrument to measure consumer preferences and thus has practical relevance by simulating real life purchase situations

(Gilbride et al., 2008). Concerning sustainability oriented attitudes and behavior, respondents often exaggerate their positive behavior patterns in a conventional interview situation. This fundamental methodological problem of surveys or interviews can be alleviated by a choice-based-conjoint analysis. Within such a study respondents tend to focus on particular characteristics in a choice set and to seek strategies which simplify their decision. This is generally regarded not as a limitation of the study results as this selection strategy corresponds to the real life behavior of consumers (Espinosa et al., 2014; Grebitus and Seitz, 2014). A None-Option was used, in which respondents had to choose between the different sustainability labeled roses and a conventional alternative. In this way, the real market situation was simulated with a restricted set of product alternatives and respondents who refused the sustainability labeled roses could be identified. Furthermore, a latent class analysis identified four consumer groups with different preferences based on the respondents' utility functions and gave additional detailed insight into consumer heterogeneity.

Nonetheless, the methodological approach of our study faces some limitations. Although a real purchase situation was simulated, the buying process was hypothetical in the sense that respondents did not have to spend any money (Allenby et al., 2005; Grebitus and Seitz, 2014). An investigation at the point of sale with a very limited number of defined product alternatives would be a promising approach in future studies but could not be realized in the project on hand due to practical barriers like e.g. availability of the respective plants over a longer period of time or willingness of retail chains to participate in such an experiment. Future studies could examine further examples of sustainability labeled products and possible target groups. Another limitation of this study represents the fact that this survey was restricted to respondents living in Germany. Although the German market for horticultural plants in general and cut flowers in particular has the highest market volume in Europe (Center for Promotion of Imports from developing countries) (Ministry of Foreign Affairs of the Netherlands, 2016), results from other countries could enhance the knowledge about consumers' interests in sustainability labeled horticultural plants, which is a topic of worldwide relevance. Finally, the use of an online panel can be regarded as a further limitation. However, thereby respondents across Germany could easily be reached and - based on the quota according to age and gender - the relevant target groups were representative in our sample. Members of online panels are often more familiar

with standardized surveys what could have an influence on their responses (Callegaro et al., 2014; Hillygus et al., 2014). An attempt to minimize this effect was made by excluding respondents with uniform response patterns and very short answering times.

Despite these limitations, our study provides clear insight into consumer preferences for sustainability labeled roses as an example of horticultural plants. Such products are an option for producers to append additional value to horticultural products which often suffer under price reduction tendencies. The study shows that there are differing target groups in this market with varying preferences and price expectations which can be targeted by producers and retailers. Some of these target groups even accept a (limited) price premium. Producers are recommended to fulfill the specific expectation of the different groups identified in this study.

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Figures and Tables

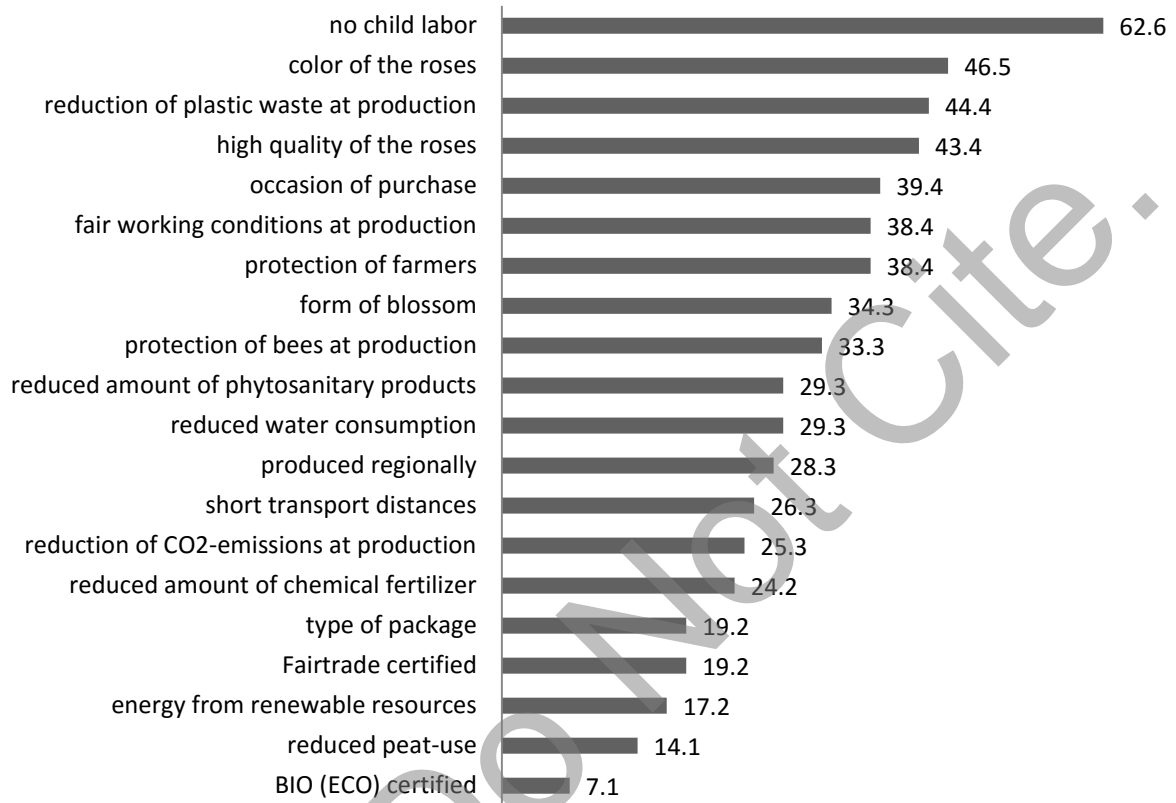


Figure 1

Relative importance of sustainability criteria when purchasing cut roses

Source: own survey



Figure 2

Fairtrade and organic label used in the conjoint experiment with cut roses

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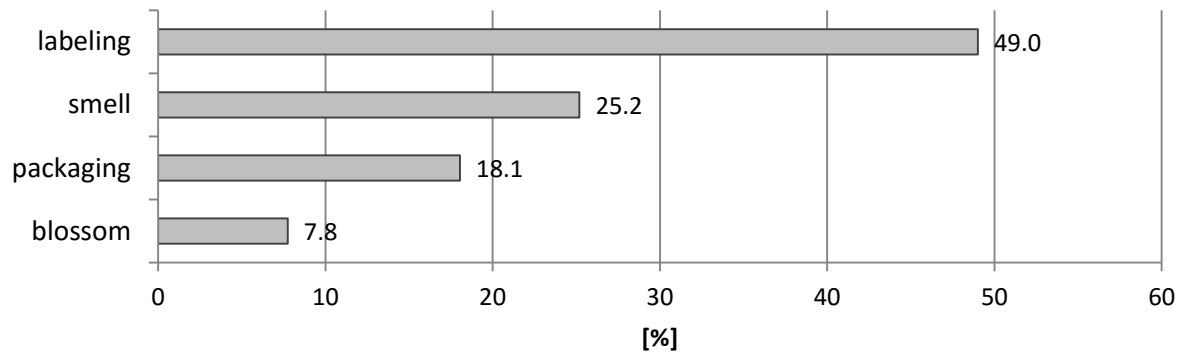


Figure 3

Average attribute importance of sustainability labeled roses (%)

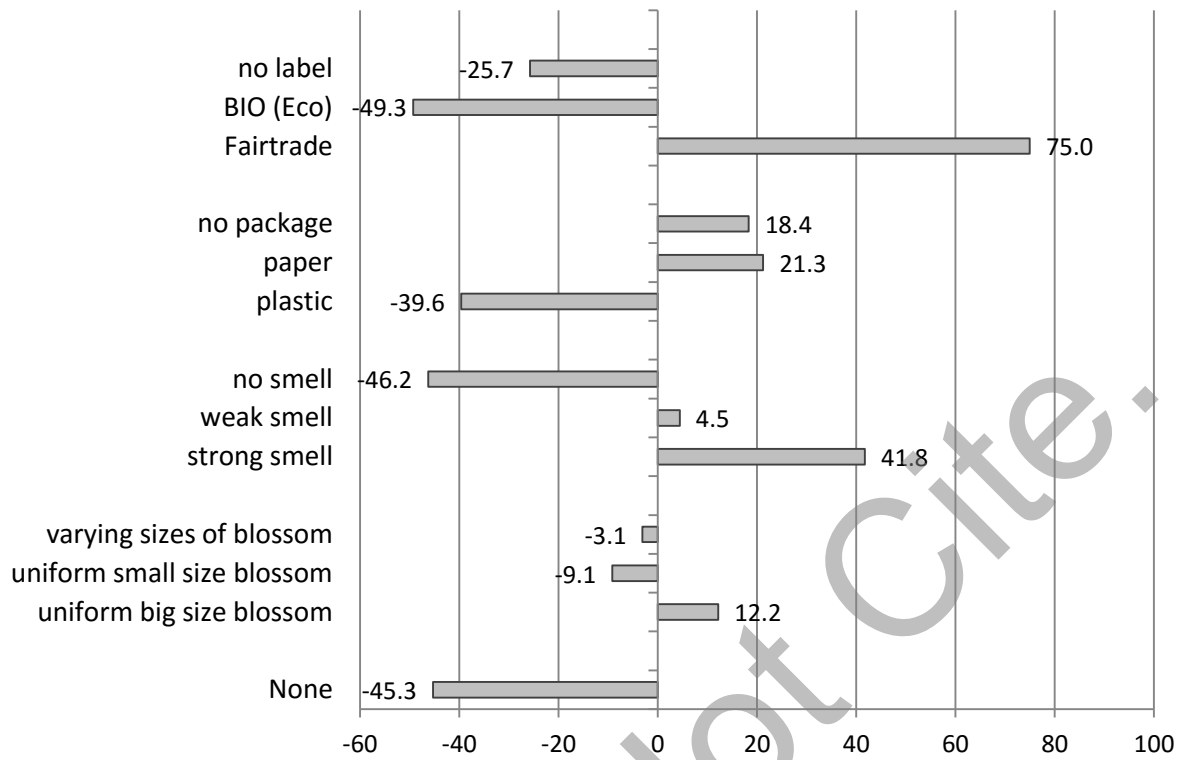


Figure 4

Consumer preferences for different attribute levels of sustainability labeled roses (Zero-Centered
Diffs

Table 1

Choice-based-conjoint analysis – Attributes of roses

Attribute	Attribute levels	Source
Labeling		
	Fairtrade – Kenya –support of developing countries – €1.99	Analysis of available products
	BIO(Eco) – Germany – support of regional production – €3.99	Expert interviews
	no label - €1.65	Pre-study on sustainability criteria Michaud et al., 2013 Klaehre, 2016 Hudson and Griffin, 2004 Yue et al., 2011a, b
Smell		
	strong smell	Analysis of available products
	weak smell	Expert interviews
	no smell	Pre-study on sustainability criteria Douc�� et al., 2013 Holland et al., 2005 Ellen and Bone, 1998
Type of packaging		
	paper	Analysis of available products
	plastic	Expert interviews
	no packaging	Pre-study on sustainability criteria Steenis et al., 2017 Magnier et al., 2016 Lindh et al., 2016a Lindh et al., 2016b
Blossom size		
	uniform big size blossoms	Analysis of available products
	uniform small size blossoms	Expert interviews
	varying sizes of blossoms	Pre-study on sustainability criteria Prince et al., 1980

Table 2

Socio-demographic structure and purchasing habits of the respondents

Sample characteristics		Respondents (n=1201)	Frequency (%)	German Census (2011) (%)
Gender				
	Female	634	52.8	51.0
	Male	567	47.2	49.0
Age				
	< 20	78	6.5	6.9
	20-29	159	13.2	13.8
	30-39	169	14.1	13.9
	40-49	195	16.2	16.8
	50-59	228	19.0	18.0
	60-69	164	13.7	12.9
	70+	208	17.3	17.8
Purchased in supermarket/discounter in recent three months				
	yes	1137	94.7	
	no	64	5.3	
Purchase frequency of cut flowers				
	< once a year	15	1.2	
	at least once a year	343	28.6	
	at least once a month	601	50.0	
	weekly	238	19.8	
	more than once a week	4	.3	
Household net-income per month (€)				
	<1,000	90	7.5	
	1,000-1,999	271	22.6	
	2,000-2,999	319	26.6	
	3,000-3,999	217	18.1	
	4,000+	178	14.8	
	not answered	126	10.5	

Table 3

Goodness of fit of the subgroup estimation for the LCA

Summary of best replications				
Group sizes	Replication	Percent Certainty	CAIC	Relative Chi-Square
2	2	23.6	25,650.9	7,845.4
3	2	28.1	24,246.3	9,353.9
4	1	31.0	23,390.2	10,313.9
5	4	33.0	22,833.3	10,974.7

Table 4

Market segmentation – Results of the latent class analysis

Attribute Importance (%)					
	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total
	<i>BIO-Enthusiasts</i>	<i>Economizers</i>	<i>Fairtrade enthusiasts</i>	<i>Classical rose fanciers</i>	
Segment Sizes	31.0%	24.4%	32.5%	12.2%	100%
Blossom	6.7	9.4	2.9	10.3	7.7
Smell	30.4	27.3	13.3	59.8	25.2
Package	24.1	7.0	22.1	10.1	18.0
Labeling	38.8	56.3	61.7	19.8	49.0
Part-worth utilities rescaled for comparability (zero-centered differences)					
Blossom					
uniform big size blossom	13.7	21.8	5.4	24.4	12.2
uniform small size blossom	-13.1	-15.8	-6.3	-7.7	-9.13
varying sizes of blossom	-0.6	-6.0	0.9	-16.7	-3.1
Smell					
strong smell	60.2	55.0	21.0	125.7	41.8
no smell	-61.5	-54.2	-32.0	-113.5	-46.2
weak smell	1.3	-0.7	11.0	-12.2	4.4
Packaging					
plastic	-64.1	-16.4	-57.4	-26.8	-39.6
paper	32.2	11.7	30.9	13.7	21.2
no package	31.9	4.7	26.5	13.1	18.4
Labeling					
Fairtrade	38.4	57.2	159.7	39.1	75.0
BIO (Eco)	58.4	-141.2	-87.1	-40.2	-49.3
no label	-96.8	84.0	-72.6	1.1	-25.7
NONE	-147.7	-68.9	-65.7	143.6	-45.3
The average maximum membership probability is 0.91958.					