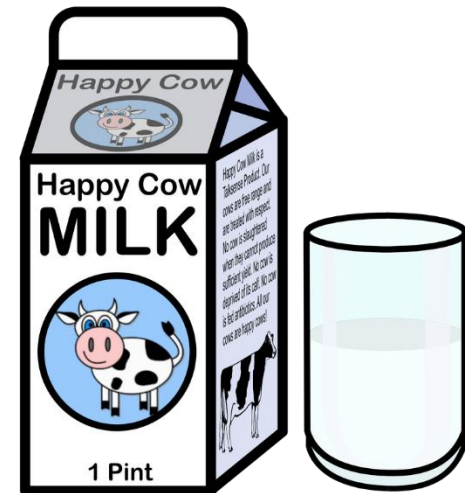


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- FreeWalk project: develop cattle housing systems with the aim to improve animal welfare, health, manure quality, and soil
- Cow housing systems studied:



Tie-stall

- cows placed in individual stalls
- tied by a neck chain
- cannot freely move in and out of the stall



Cubicle

- cows are in individual cubicles
- not tied to the cubicle
- can go in and out of the cubicles freely



Compost bedded

- cows placed in a communal walking and lying area
- consists of composting straw, manure, sawdust, wood shavings, or garden waste
- no stalls or cubicles and the cows can move freely



Artificial floor

- cows placed in a communal walking and lying area with an artificial floor
- floor has several layers in order to separate urine and feces.
- no stalls or cubicles and the cows can move freely

Consumers and animal welfare

- 94% of EU citizens believe it is important to protect the welfare of farmed animals, but gap in EU legislation remains for dairy cows and beef cattle
- Over half of EU citizens are willing to pay at least 5% more for animal welfare products; however, 35% are not willing to pay higher prices
- Almost 50% of EU citizens do not think there is a sufficient choice of animal welfare products in the marketplace
- Increased demand from consumers for sustainable food products and more humane animal production; alternative products such as hay milk, organic milk, and pasture-raised beef have successfully entered the market



Research Objectives

- Assess European consumer perceptions and willingness to pay (WTP) regarding food products from tie-stall, cubicle, compost bedded, and artificial floor cow housing systems. Organic and grazing is also examined.
- To evaluate consumer attitudes towards animal welfare, grazing, and re-using compost from the compost bedded system for a 'summer product'



Previous Research

- Studies have found different consumer market segments for improved welfare and organic animal products (Krystallis et al. 2009; de Jonge et al. 2015; de Graaf et al. 2016, Heise and Theuvsen 2017)
- Extensive research on willingness-to-pay (WTP) for animal-friendly products (e.g. reviews from Lagerkvist and Hess 2011; Clark et al. 2017).
 - much variability between species and a citizen/consumer gap; however, in general WTP has been found to be positive for farm animal welfare
- Few studies on cattle production and consumer WTP for Europe:
 - Increased consumer liking and WTP for organic beef compared to conventional (Napolitano et al. 2010; Garcia-Torres et al. 2016)
 - Animal welfare information affected consumer WTP for yogurt (Napolitano et al. 2008)
 - Different consumer segments for attitudes towards housing systems in Germany with a preference for pasture raised dairy cows (Weinrich et al. 2014)
 - Half of sampled consumers willing to purchase animal-friendly milk and perceived the milk to have better health benefits and quality (de Graaf et al. 2016)
 - Heterogeneous WTP for outdoor reared dairy cows in Italy (Tempesta and Vecchiato 2013)

Methods – Focus Groups

- Focus groups were conducted in Austria, Germany, and Slovenia to aid in identifying important perceptions and concepts to be tested in the quantitative survey
- Each location was chosen to represent different attitudes/WTP for animal products based on Eurobarometer 442 (EC 2016):
 - Slovenia- low WTP, wanting more protection
 - Germany- high WTP, wanting more protection and more choice in supermarkets
 - Austria- medium WTP, low need for better protection and high satisfaction with choice
- Two sessions each lasting ~90 minutes of 6-10 participants
- Discussion guide included questions about food choices, importance and definition of animal welfare in general and for cows, cow housing systems (with pictures), grazing, and the compost bedded 'summer product'



Methods- Quantitative Survey

- Survey conducted online in eight EU countries (Austria, Germany, Italy, the Netherlands, Norway, Slovakia, Slovenia, Sweden)
- Nationally representative with ~400-600 respondents per country:

	Total	Austria	Germany	Italy	Netherlands	Norway	Slovakia	Slovenia	Sweden
N	3693	415	633	592	423	401	410	397	422

- Participants screened to be non-vegan, milk consumers, and not currently live on a farm with livestock

- Topics measured include:

- General food and milk purchase behavior
- Perception and awareness of animal welfare
- Housing system preferences
- Attitudes towards 'summer products' from compost bedded housing system
- Socio-demographic information



Methods- Choice Experiment

- A discrete choice experiment using milk as a representative product was used to estimate the importance of animal welfare attributes and estimate WTP:

Attributes	Attribute Levels
Price	4 levels- varies per country
Grazing	Yes, No
Housing System	Tie-stall, cubicle, compost bedded, artificial floor
Production type	Conventional, organic

- Definitions for all attributes and cheap talk script given prior to first choice set
- Experimental design was optimized using NGENE software. Organic was constrained to always have grazing and be above the lowest price.
- 24 choice sets split into two blocks with two alternatives and a 'None' option. Example:

	Option A	Option B	Option C
Price	0.69 €	1.29 €	NONE- I would not choose either of these
Grazing	No	Yes	
Housing System	Tie-stall	Cubicle	
Production Type	Conventional	Organic	
I choose:			

- Latent class logit analysis to determine consumer groups

Focus Group Results- Overall Themes

- Animal welfare is important, although some distrust/confusion with labels
- Amount of space, slaughter conditions, transport, and personal care (e.g. naming, being gentle) were associated with animal welfare
- All groups generally agreed tie-stall is the worst housing system
- Overall positive reaction to both FreeWalk systems
- Cows should graze, even if there is an environmental impact
- Some discussion about lowering meat consumption and increasing government regulations
- Some concerns with re-using the compost for other food products, especially uncooked produce

Quantitative Sample Summary Statistics

Gender Frequency (%)

Male	50.56
Female	49.23

Age

18-24	11.32
25-34	17.76
35-44	18.6
45-54	20.31
55-64	16.33
65+	15.68

Education

No degree	3.25
High school	35.85
Trade/Vocational	31.98
University	27.08
Ph.D.	1.84

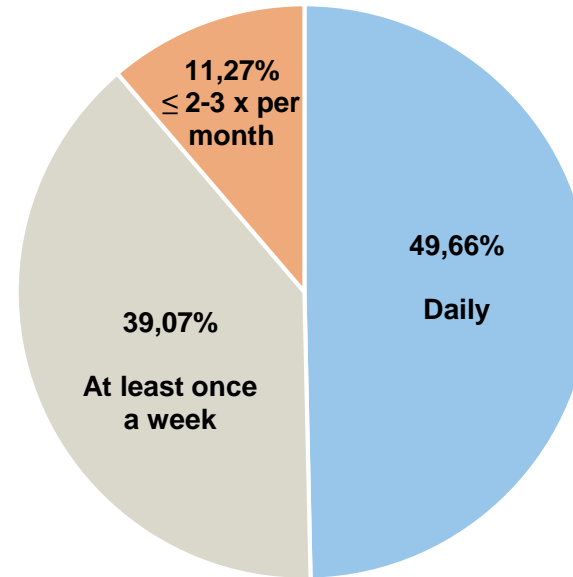
Area

Rural	27.92
Suburban	23.77
Urban	48.31

Mean

Household size	2.7
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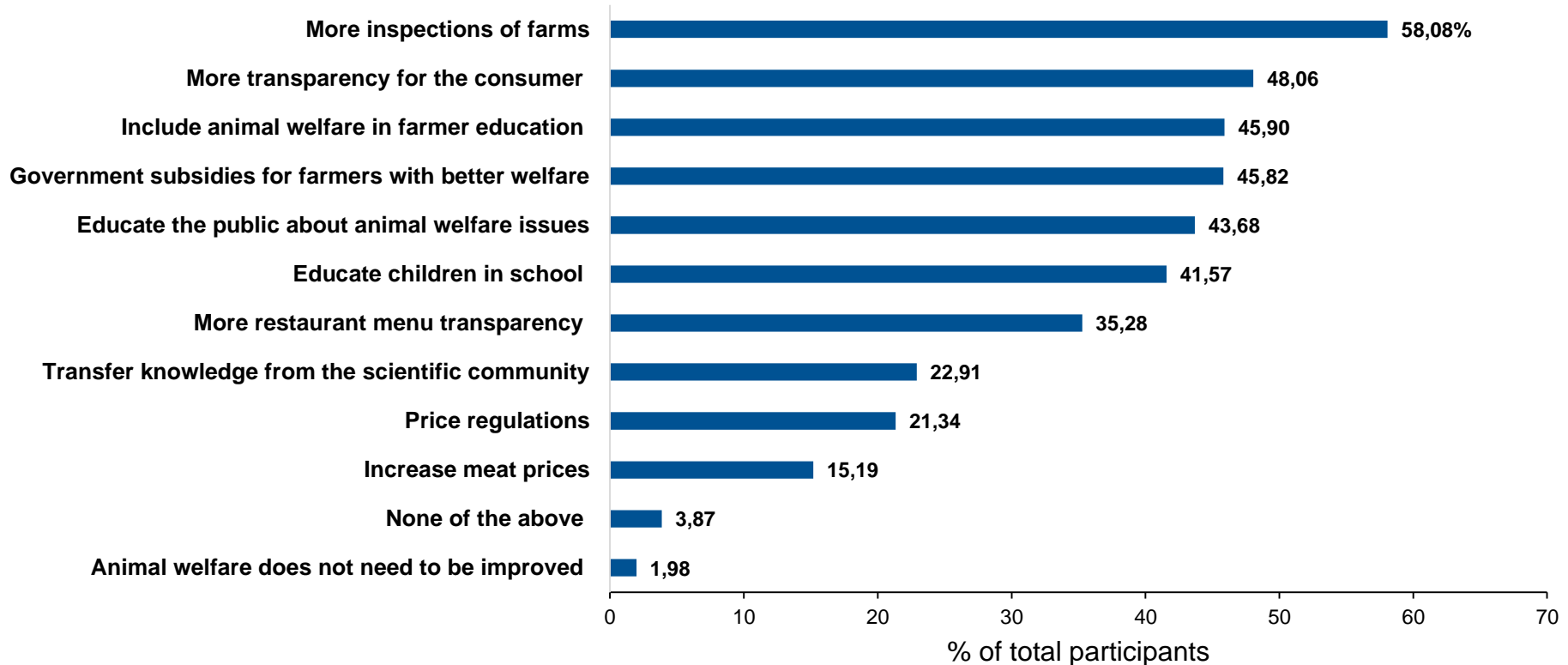
Cow Milk Consumption



- 94.5% of participants consume all animal products
- Almost all participants shop at supermarkets, 17% at farmers markets, and 11% at organic markets
- 24% exclusively or mainly consume organic dairy products
- Half felt to have average knowledge about animal systems and around a third estimated low knowledge

Quantitative Survey Results

Which of the following do you believe would be effective ways to improve animal welfare?



Top 3 sources to find out about animal husbandry and welfare issues:



Internet 52%



43%



packaging labels/producer info 30%



15% do not seek out information

Quantitative Survey Results

What factors are participants concerned about regarding the animal welfare of dairy cows?

Top 3
<ul style="list-style-type: none"> • Antibiotic usage • Hygiene • Slaughtering conditions

Bottom 3
<ul style="list-style-type: none"> • Milking by machine • Ability of the cows to socialize • Floor type

19% are not concerned about the welfare of dairy cows

Which housing system is the best for each of the characteristics?

	Hygiene	Health	Happiness	Preventing injury	Space for the cow	Comfort
Tie-stall	12.05d	6.93c	5.69c	12c	5.96d	5.25c
Cubicle	17.14c	20.17b	17.33b	20.77b	15.52c	17.55b
Compost bedded	37.42a	52.56a	58.35a	46.79a	53.78a	57.41a
Artificial floor	33.39b	20.34b	18.63b	20.44b	24.75b	19.79b

Note: Different letters within column indicate significant differences between housing systems as evaluated by Tukey's HSD ($p < 0.05$)

Quantitative Survey Results

Percentage change of housing acceptance with grazing compared to no grazing

	Total	Austria	Germany	Italy	Netherlands	Norway	Slovakia	Slovenia	Sweden
Tie-stall	3.93***	7.95***	4.11***	-0.17	4.25***	9.47***	-0.98	3.27**	5.21***
Cubicle	15.09***	22.17***	19.91***	10.31***	12.05***	15.96***	6.35***	12.35***	20.85***
Compost bedded	-4.63***	-7.71***	-6.63***	-3.38**	-3.31**	-2.24	-5.36***	-5.79***	-2.13
Artificial floor	6.93***	7.23***	6.80***	1.36	4.96***	8.23***	17.81***	2.27	9.25***

Questions: Which system(s) do you think is acceptable to use for cows if the cows are allowed outside to graze during the day and/or during the summer months/not allowed outside to graze at any point during the year?

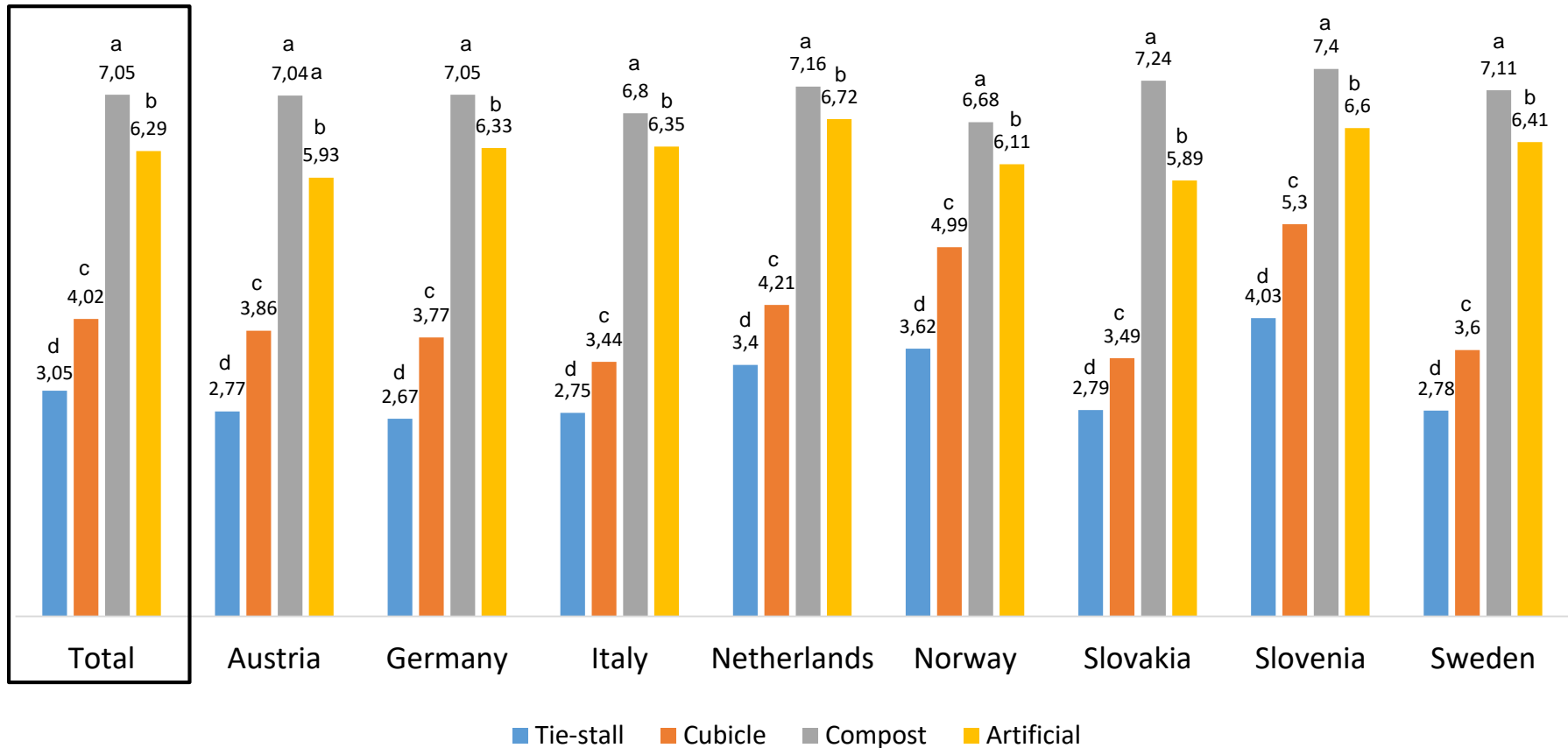
Note: ***, **, * indicates significant at the 1%, 5%, and 10% levels

- Consumers generally are not overly concerned about cow housing systems
 - Average of 6.35 on 10-point scale (1=not concerned at all; 10= very concerned)
 - Slovenia was significantly higher than all other countries with a mean of 7.36
- Overall ~70% were interested in a labeling system for the type of housing used
 - Netherlands had the lowest interest at 55% and Italy the highest at 79%.

Quantitative Survey Results

How much do you like each of the housing systems?

9-pt hedonic scale (1=dislike extremely; 9= like extremely)



Note: Different letters within Total and each country indicate significant differences between housing systems as evaluated by Tukey's HSD ($p < 0.05$)

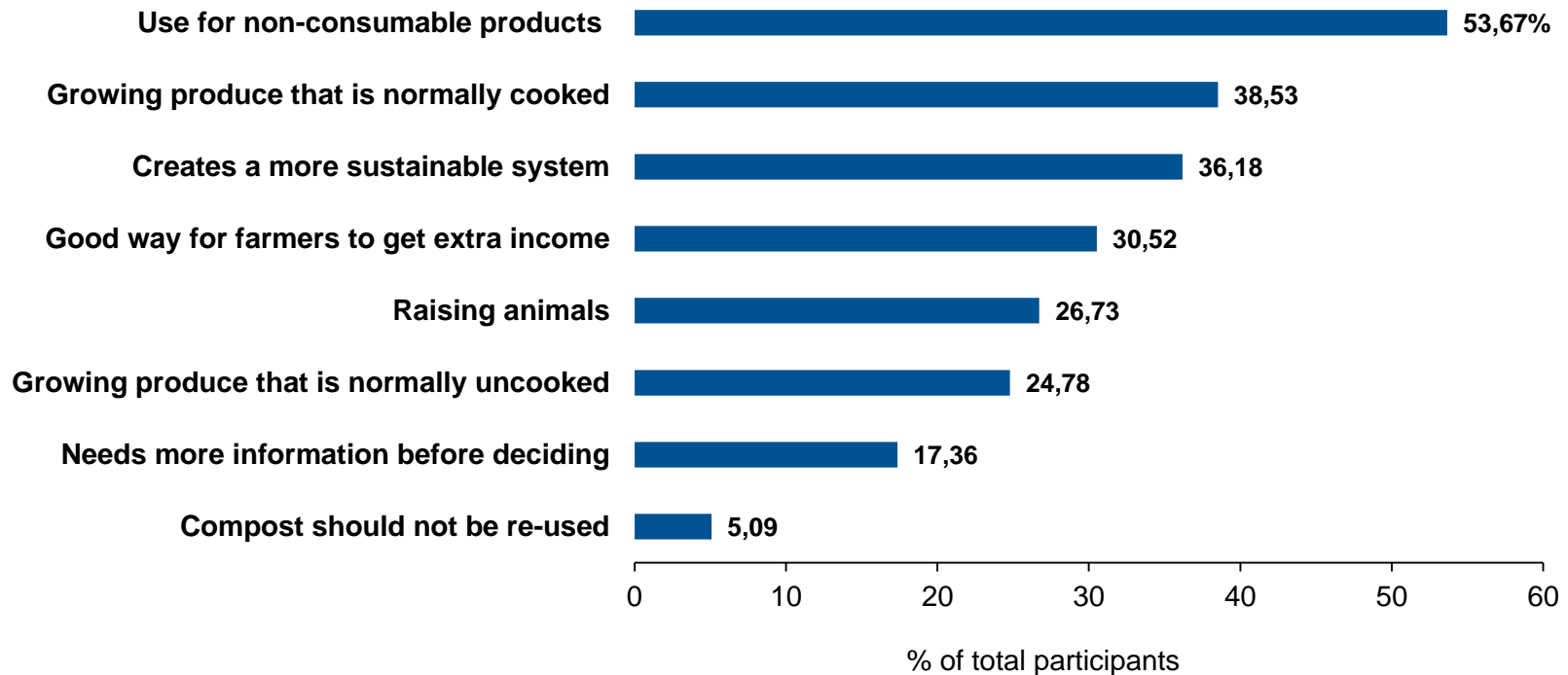
Quantitative Survey Results

How safe do participants feel about consuming food products that are grown using the compost?

(10 point scale: 1= Not safe at all; 10= Fully safe)

	Total	Austria	Germany	Italy	Netherlands	Norway	Slovakia	Slovenia	Sweden
Mean	7.06	6.98bc	6.87c	6.85c	6.79c	7.4a	6.93bc	7.63a	7.23ab
Std. Dev	1.96	1.85	1.86	1.90	1.66	1.97	2.00	2.24	2.09

What do participants think about re-using the compost?



Choice Experiment Results

	Class 1 (49.4%)	Class 2 (40.4%)	Class 3 (10.2%)
Price	-0.196***	-0.270***	-0.775***
None option	-3.029***	-0.103	1.141***
Organic	0.067***	0.087***	-0.162
Grazing	0.035	0.081***	0.222**
Tie-stall	0.066**	-0.021	-0.316**
Compost bedded	-0.022	-0.074**	-0.429***
Artificial floor	-0.047*	-0.107***	-0.427***

Notes: ***, **, * indicates significant at the 1%, 5%, and 10% levels; cubicle is reference housing system

- Increase in price decreases probability of choosing a product
- Class 1: Preference for organic
- Class 2: Preference for organic and grazing
- Class 3: Preference for grazing only
- FreeWalk systems do not increase milk product choice for any of the classes compared to cubicle
- Although tie-stall least liked, those who had a higher acceptance are in Class 1 which could be partially explain positive tie-stall compared to cubicle
- Generally countries are more or less divided along class percentages except for Norway, Slovakia, and Slovenia which have a higher percentage in Class 1

Choice Experiment Results

Mean WTP for Milk Attributes (in Euro)

	Class 1 (49.4%)	Class 2 (40.4%)	Class 3 (10.2%)
Organic	0.34***	0.32***	-0.21
Grazing	0.18	0.30***	0.29**
Tie-stall	0.34**	-0.08	-0.41**
Compost bedded	-0.11	-0.28**	-0.55***
Artificial floor	-0.24*	-0.40***	-0.55***

Notes: ***, **, * indicates significant at the 1%, 5%, and 10% levels; cubicle is reference housing system

- Majority have a higher WTP for organic (which includes grazing)
- Class 2 has WTP for grazing in addition to organic
- Class 3 only has WTP for grazing
- No positive WTP for FreeWalk systems compared to cubicle housing
- Organic and grazing may be seen as strong enough signals of welfare or other factors than individual housing systems

Concluding Remarks

- Majority indicate welfare can be improved
- Tie-stall was the least liked system and compost bedded the most liked system across all countries
- Whether cows can graze can impact how consumers view the housing systems
- Overall positive attitude towards re-using compost
- Although consumers like the FreeWalk systems and are interested in a housing label, it does not translate to a higher WTP
- Individual housing types are not “stronger” than having organic signal, possibly because organic is viewed as a sufficient level of welfare or other factors
- Next steps include a more in-depth profile of the classes and a deeper look into consumer attitudes

Thank you!!!

