Data in Brief 35 (2021) 106794

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Attitudes of food consumers at universities towards recycling human urine as crop fertiliser: A multinational survey dataset

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DOI of original article: 10.1016/j.scitotenv.2020.144438
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https://doi.org/10.1016/j.dib.2021.106794

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ARTICLE INFO

Article history:
Received 23 December 2020
Revised 14 January 2021
Accepted 21 January 2021
Available online 26 January 2021

Dataset link: Multinational survey of attitudes towards recycling urine as fertiliser (Original data)

Keywords:
Decentralized sanitation
Opinion survey
Urine source separation
New ecological paradigm
Nutrient recovery
Wastewater treatment
Environmental outlook

ABSTRACT

We present here a data set generated from a multinational survey on opinions of university community members on the prospect of consuming food grown with human urine as fertiliser and about their urine recycling perceptions in general. The data set comprises answers from 3,763 university community members (students, faculty/researchers, and staff) from 20 universities in 16 countries and includes demographic variables (age bracket, gender, type of settlement of origin, academic discipline, and role in the university). Questions were designed based on Ajzen's theory of planned behaviour to elicit information about three components of behavioural intention—attitudes, subjective norms, and perceived behavioural control. Survey questions covered perceived risks and benefits (attitudes), perceptions of colleagues (injunctive social norm) and willingness to consume food grown with cow urine/faeces (descriptive social norm), and willingness to pay a price premium for food grown with human urine as fertiliser (perceived behavioural control). We also included a question about acceptable urine recycling and disposal options and assessed general environmental outlook via the 15-item revised New Ecological Paradigm (NEP) scale. Data were collected through a standardised survey instrument translated into the relevant languages and then administered via an online form. Invitations to the survey were sent by email to university mailing lists or to a systematic sample of the university directory. Only a few studies on attitudes towards using human urine as fertiliser have been conducted previously. The data described here, which we analysed in "Willingness among food consumers at universities to recycle human urine as crop fertiliser: Evidence from a multinational survey" [1], may be used to further understand potential barriers to acceptance of new sanitation systems based on wastewater source separation and urine recycling and can help inform the design of future sociological studies.

Specifications Table

Subject	Waste Management and Disposal
Specific subject area	Social attitudes towards new sanitation systems and recycling of human urine as crop fertiliser.
Type of data	Excel file Table Text (survey instruments, codebook)
How data were acquired	GoogleForms (all countries except mainland China) Wenjuanxing market research platform (mainland China)
Data format	Raw Cleaned/processed
Parameters for data collection	Surveys were administered to university community members from 20 universities in 16 different countries. Only fully completed surveys were retained, along with a count of individuals who explicitly refused consent after reading the introduction. All respondents were anonymous and gave informed consent for their answers to be used for research. Ethics approval was obtained as required.
Description of data collection	Survey administrators sent invitations by email and followed up with reminders on days 7, 14, 21 and 28, closing each survey after 30 days; in a few cases, the survey link was kept open longer due to low initial response rates. Data were cleaned, translated into English where necessary, coded, filtered, and analysed using Excel and R software. Urine recycling perception scores and mean revised New Ecological Paradigm scores were calculated from other item responses.
Data source location	Bangladesh Agricultural University, Bangladesh Bangladesh University of Health Sciences, Bangladesh University of Santa Catarina, Brazil University of Science and Technology Beijing, China Tongji University, China Samara University, Ethiopia AgroParisTech, France University of the Aegean, Greece Tezpur University, India Oranim College, Israel University of Haifa, Israel The Hashemite University, Jordan Universiti Malaysia Terengganu, Malaysia University of Academy of Sciences of Moldova, Moldova University of Life Sciences in Lublin, Poland IADE – Universidade Europeia, Portugal National Taiwan University (Department of Bioenvironmental Systems Engineering), Taiwan National Taipei University of Technology, Taiwan Makerere University, Uganda University of South Florida, Florida, USA
Data accessibility	Repository name: Mendeley Data Data identification number: http://dx.doi.org/10.17632/kccc8m9pn9.1 Direct URL to data: http://dx.doi.org/10.17632/kccc8m9pn9.1
Related research article	Simha et al., "Willingness among food consumers at universities to recycle human urine as crop fertiliser: Evidence from a multinational survey," Sci. Tot. Environ. **765** (2021) 144,438. 10.1016/j.scitotenv.2020.144438.

Value of the Data

- This data set contains respondent opinions on recycling human urine as fertiliser, as well as demographic and environmental outlook data from a multinational sample.
- These data are of use to researchers seeking to understand barriers to implementation of urine diversion and resource recovery technologies.
- These data may be further analysed to identify potential explanatory factors for attitudes towards urine recycling in different cultural contexts and to inform the development of future surveys in this area.

- This data set also offers a multinational collection of environmental outlooks (measured by the revised New Ecological Paradigm) among university communities, obtained through a standardised survey instrument that facilitates comparative study.

1. Data Description

Recycling urine collected in new source-separating sanitation systems can improve the sustainability of wastewater management while reducing the environmental impacts associated with sanitation and agriculture [2]. To complement research and development of source separation and human urine-derived fertiliser technologies, we sought to better understand the under-researched area of food consumer attitudes towards urine as fertiliser. We describe here the data collected via a survey instrument revised from that used previously in Simha et al. [3]; these data are analysed in Simha et al. [1].

The data consist of anonymous survey responses from a standardised survey instrument answered by 3763 university community members (students, faculty, and staff) at 20 universities in 16 countries. The survey assessed demographic variables (role in the university, academic discipline, settlement type, age group, and gender), as well as attitudes towards urine recycling, perceptions of the use of cow and human urine as fertiliser for food crops, perceptions of colleagues, willingness to pay for food grown with human urine, and perceptions of health risks associated with using human urine as fertiliser. We also administered a version of the revised New Ecological Paradigm scale [4], a widely used measure of environmental outlooks.

In the data deposit described here, we have provided both raw and cleaned/processed (to correct records that were erroneously split into multiple lines and to standardise language and formatting variable names to facilitate analysis) versions of the data set. Open-ended responses have not been translated from their original languages. Raw data and survey questionnaire files are labelled by country code (see Experimental Design, Materials, and Methods). The original English and the translated survey instruments, the data set files, and the codebook describing the field names/variables are available from Mendeley Data [5]. The following tables provide a descriptive overview of the survey responses.

For individual countries, sample sizes ranged from $n = 60$ (India) to $n = 716$ (China). The majority of respondents were from China, Brazil ($n = 523$), and the United States ($n = 437$). More women (56%) than men (44%) responded. More than half of the respondents were from applied science disciplines (52%), and more than half grew up in urban areas (63%). The largest share of respondents (42%) were bachelor's degree students, followed by master's degree students (25%) and faculty (16%). A summary of respondent demographics is shown in Table 1.

The majority of the questions focused on how respondents perceived urine recycling, particularly as fertiliser for food crops. Responses to these questions are further reported and analysed in our associated study [1], and a summary is presented here in Table 2. In addition to the questions focused on urine recycling and use as fertiliser, we also elicited the general environmental outlooks of respondents via the 15-item revised New Ecological Paradigm (NEP) scale [4]. The NEP scale is often used as a single index. In our data set, however, when we tested for internal consistency (with Cronbach's α) to validate its use as a unidimensional index, the results indicated that the scale has at least two dimensions in most of the country samples. Hence, we recommend caution in using the mean NEP scores reported in this data set (overall scores reported in Table 3) without further factor analysis as suggested by Dunlap et al. [4].

The data set also includes open-ended comments on several of the questions, which contain qualitative information that may be used to inform the design of future studies. These open-ended responses are included in their original languages, without translation.

Table 1
Demographics of survey participants.

Demographic variable	All	BD	BR	CN	ET	FR	GR	IN	IL	JO	MY	MD	PL	PO	TW	UG	US
Total no. of respondents	3763	155	523	716	324	260	150	60	229	258	96	85	93	88	163	126	437
No. of universities surveyed	19	2	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1
Age bracket (yrs)																	
<20	588	7	27	142	112	31	20	2	6	58	4	7	22	1	35	0	114
21–24	1245	47	124	276	93	170	51	21	35	105	6	32	48	8	60	33	136
25–30	743	66	168	107	34	51	23	21	37	19	11	12	9	6	55	22	102
31–40	579	22	129	76	44	5	27	10	41	37	42	18	6	34	10	30	48
41–50	374	8	33	75	30	2	19	5	63	31	19	10	4	23	3	28	21
51–60	180	3	31	37	11	0	8	1	34	6	10	2	4	10	0	10	13
61–70	47	1	9	2	0	1	1	0	13	2	4	3	0	6	0	2	3
>70	7	1	2	1	0	0	1	0	0	0	0	1	0	0	0	1	0
Gender																	
Female	2093	56	305	405	97	163	103	19	175	159	39	52	70	58	79	31	282
Male	1670	99	218	311	227	97	47	41	54	99	57	33	23	30	84	95	155
Role in university																	
Admin/Staff	179	4	15	44	2	0	11	10	28	22	6	4	1	17	3	5	7
Bachelor's student	1583	47	204	256	209	51	69	16	95	169	10	21	78	5	51	46	256
Master's student	931	60	117	240	20	142	37	9	52	18	1	26	1	4	67	33	104
PhD student	388	23	108	35	5	56	12	12	1	3	2	9	10	4	37	6	65
Postdoc	71	1	10	8	1	0	8	0	0	2	2	9	0	22	4	2	2
Faculty	611	20	69	133	87	11	13	13	53	44	75	16	3	36	1	34	3
Discipline																	
Applied Sciences	1939	109	346	369	269	159	28	36	7	129	53	17	3	49	86	95	184
Arts	158	1	2	18	6	0	9	0	13	6	0	4	78	0	6	1	14
Humanities	224	5	27	14	15	1	30	1	72	16	1	3	2	2	8	5	22
Natural Sciences	974	31	114	241	21	82	61	11	72	75	25	57	1	30	54	12	87
Social Sciences	468	9	34	74	13	18	22	12	65	32	17	4	9	7	9	13	130
Settlement type																	
Periurban	628	35	41	58	34	58	37	29	41	4	40	15	14	12	39	39	132
Rural	733	26	14	184	172	62	19	9	62	43	11	31	8	22	17	11	42
Urban	2387	94	468	459	118	140	94	22	126	211	45	39	71	54	107	76	263
Invalid responses	15	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: BD, Bangladesh; BR, Brazil; CN, China; ET, Ethiopia; FR, France; GR, Greece; IL, Israel; IN, India, JO, Jordan; MY, Malaysia; MD, Moldova; PL, Poland; PT, Portugal; TW, Taiwan; UG, Uganda; US, United States.

2. Experimental Design, Materials and Methods

2.1. Survey instrument

The survey instrument was originally designed in English, modified from a previous survey we administered at VIT University in South India [3]. Note that all questions numbers here refer to those in the English master survey. The main changes for the international survey described here were as follows. First, demographic questions were adjusted to be general, rather than specific to VIT University or to an Indian context (for example, questions about caste and religion were omitted, and a question about university departments specific to VIT was replaced with one about general categories of academic disciplines [Q3]). We added additional questions about role in the university (Q2) and settlement type of origin (Q4; urban, peri-urban, or rural). Second, we combined questions about substances believed to be present in human urine into a single question with additional options (Q17) and changed a question about whether human urine should be disposed of without reuse to a more neutrally worded question about acceptable ways to reuse or dispose of human urine (Q19).

The final survey instrument was designed loosely around Ajzen's theory of planned behaviour, which posits that the intent to perform a behaviour can to a large extent be predicted by attitudes towards the behaviour, social norms, and perceived behavioural controls, and that this intent then accounts for much of the variance in actual behaviour [8]. Because the behaviour

Table 2
Descriptive overview of respondent attitudes towards urine recycling as fertiliser.

Variable	All	BD	BR	CN	ET	FR	GR	IN	IL	JO	MY	MD	PL	PO	TW	UG	US
Q5: Believe cow urine/manure can be fertiliser																	
No	233	11	20	21	66	7	11	3	11	23	6	7	5	15	7	0	20
Yes	3530	144	503	695	258	253	139	57	218	235	90	78	83	78	156	126	417
Q6: Willing to eat food fertilised with cow urine/manure																	
No	421	2	26	95	75	4	18	1	15	66	8	16	11	26	15	0	43
Yes	3342	153	497	621	249	256	132	59	214	192	88	69	77	67	148	126	394
Q7: Believe human urine can be fertiliser																	
No	1426	74	189	79	136	41	82	34	88	216	41	59	32	62	70	28	195
Yes	2337	81	334	637	188	219	68	26	141	42	55	26	56	31	93	98	242
Q9: Willing to eat food fertilised with human urine																	
No	1596	97	205	155	157	52	75	37	94	223	55	61	47	66	72	29	171
Yes	2167	58	318	561	167	208	75	23	135	35	41	24	41	27	91	97	266
Q12: Believe colleagues will eat food fertilised with human urine																	
No	2071	115	347	115	127	127	105	38	143	229	64	67	55	71	111	57	300
Yes	1131	40	176	40	197	133	45	22	86	29	32	18	33	22	52	69	137
NA	561	NA	NA	561	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Q11: Willingness to pay for food fertilised with human urine																	
NA	1596	97	205	155	157	52	75	37	94	223	55	61	47	66	72	29	171
Less	479	20	57	80	86	12	12	3	31	11	13	9	11	3	37	25	69
Similar	1367	29	244	325	49	170	56	18	93	23	26	14	26	21	44	47	182
More	321	9	17	156	32	26	7	2	11	1	2	1	4	3	10	25	15
Q14: Believe fresh, untreated human urine is health risk																	
No	1317	69	190	275	97	117	54	26	58	32	40	27	30	27	61	42	172
Yes	2446	86	333	441	227	143	96	34	171	226	56	58	58	66	102	84	265
Q16: Believe human urine can be treated to remove risk																	
NA	1317	69	190	275	97	117	54	26	58	32	40	27	30	27	61	42	172
No	432	23	16	109	42	5	9	8	18	98	8	17	18	16	21	2	22
Yes	2014	63	317	332	185	138	87	26	153	128	48	41	40	50	81	82	243

Notes: BD, Bangladesh; BR, Brazil; CN, China; ET, Ethiopia; FR, France; GR, Greece; IL, Israel; IN, India; JO, Jordan; MY, Malaysia; MD, Moldova; PL, Poland; PT, Portugal; TW, Taiwan; UG, Uganda; US, United States; NA, not applicable. Note that Q12 was not required in the mainland China surveys, and only 22% ($n = 144$) of respondents chose to answer this question.

Table 3
Mean NEP scores, measures of consistency within samples, and inversely correlated items.

Country	*n*	NEP score (mean ± SD)	Cronbach's α	Cronbach's α range	Inversely correlated item numbers
All Countries	3763	3.48 ± 0.5	0.7	0.69 to 0.72	6
Bangladesh	155	3.33 ± 0.38	0.53	0.42 to 0.53	2, 4, 6, 8, 10, 14
Brazil	523	3.11 ± 0.23	−0.33	−0.5 to −0.17	5, 7, 9, 11, 13, 6, 8, 12
China	716	3.64 ± 0.47	0.8	0.77 to 0.82	None
Ethiopia	324	3 ± 0.27	−0.31	−0.52 to −0.1	2, 4, 6, 8, 10, 12, 14
France	260	3.88 ± 0.37	0.66	0.6 to 0.72	None
Greece	150	3.66 ± 0.41	0.67	0.59 to 0.75	None
India	60	3.69 ± 0.4	0.59	0.44 to 0.74	4, 6, 10, 12, 14
Israel	229	3.7 ± 0.47	0.77	0.73 to 0.82	None
Jordan	258	3.35 ± 0.37	0.53	0.45 to 0.61	2, 4, 6, 8, 10, 12, 14
Malaysia	96	3.38 ± 0.39	0.47	0.31 to 0.63	2, 4, 6, 8, 10, 12, 14
Moldova	85	3.57 ± 0.42	0.65	0.55 to 0.75	4, 6, 10, 14
Poland	88	3.61 ± 0.5	0.7	0.61 to 0.79	None
Portugal	93	3.36 ± 0.43	0.71	0.63 to 0.8	4, 6, 12, 14
Taiwan	163	3.52 ± 0.46	0.71	0.63 to 0.8	2, 4, 6, 8, 10, 14
Uganda	126	3.23 ± 0.46	0.62	0.52 to 0.72	2, 4, 6, 12, 14
USA	437	3.74 ± 0.56	0.82	0.8 to 0.85	None

Notes: Cronbach's α is a measure of internal consistency commonly used to validate the use of the NEP scale as a unidimensional measure; a value between 0.70 and 0.90 is usually considered good, although a value of >0.50 may be acceptable for a preliminary study [4,6]. Negative α scores may indicate incorrectly coded data or, as in this case, that a large number of item scores were strongly inversely correlated with the overall score, making use of the mean NEP score as a unidimensional measure invalid because more than one axis exists [4]. In the last column, the numbers of the inversely correlated items are listed. The internal consistency check was run using RStudio version 1.2.5042 and R version 4.0.0 [7].

in question (consumption of food grown with human urine as fertiliser) was largely hypothetical to our target audience, we focused on the intentional components. We also included additional questions about general environmental outlook as measured by the revised NEP scale [4], since environmental outlooks have been previously hypothesised to be relevant to attitudes towards urine source separation and use as fertiliser [9]. We slightly modified the wording of NEP item 4 in the English master survey after Ogunbode [10] from "Human ingenuity will insure [*sic*] that we do not make the earth unlivable" to "Human intelligence will ensure that we do not make the Earth unliveable" to facilitate comprehension.

The questions and resulting variables in our survey can be divided into the following groups: (i) demographics, (ii) willingness to consume food grown with human urine, (iii) willingness to pay for food grown with human urine, (iv) social norms, (v) benefits and risks, and (vi) environmental outlook. For a table of all variables with type (categorical, continuous, etc.) and the text of the survey questions, see "IndexCodebook.pdf" in the data deposit.

2.1.1. Demographics

We included standard demographic questions concerning age bracket (Q21; <20, 21–24, 25–30, 31–40, 41–50, 51–60, 61–70, or >70), gender (Q23; male or female), role in university (Q2; bachelor's student, master's student, PhD student, postdoctoral researcher, faculty, or staff/administrator), and discipline (Q3; applied sciences, natural sciences, social sciences, arts, or humanities), as well as a question about the settlement type where the respondent grew up (Q4; urban, peri-urban, or rural), based on the hypothesis that familiarity with or proximity to agricultural practices might affect perceptions of using human urine as crop fertiliser.

2.1.2. Willingness to consume food grown with human urine

Our primary study question was a dichotomous yes/no question about whether people would be willing to consume food grown with human urine as a fertiliser (Q9). Respondents were able to comment further on their answers in an open-ended comment field (Q10).

2.1.3. Willingness to pay for food grown with human urine

Perceived behavioural control could only be assessed indirectly since food grown with urine as fertiliser is not readily available on the market. We therefore asked respondents to complete the hypothetical statement "I would eat food that was grown using human urine as a fertiliser, _____." (Q11) with "even if it costs more/similar/less than what I usually pay," in order to determine whether respondents thought such food would be worth paying a price premium, whether they viewed it as less desirable than their usual food, or whether they considered the products to be of similar value.

2.1.4. Social norms

Social norms, both descriptive and injunctive, play a major role in behaviour that is often underestimated, particularly in environmental behaviours [11]. Although we were unable to address descriptive norms directly because food grown with human urine is not yet widely available, we included questions about cow urine as fertiliser (Q5 and Q6). Similarly, we asked whether respondents believed their colleagues would be willing to consume food grown with human urine as fertiliser (Q12) to assess perceptions of the injunctive social norm.

2.1.5. Benefits and risks

The main components of attitude addressed in our survey were those of perceived risks and benefits. Since food grown with human urine as fertiliser is not widely available, we addressed the perception of benefits obliquely. First, we asked if respondents believed human urine can be used as fertiliser (Q7 and open-ended comment field Q8). Second, we asked which of the following seven choices for handling human urine respondents thought were acceptable: crop fertiliser, watering lawns/gardens, electricity generation, processing at a wastewater treatment plant, dilution and disposal in surface water, landfilling, and incineration. Respondents were asked to check one or more options, but not to rank them from most to least acceptable.

Risk perception can also affect consumer attitudes. We asked if respondents believed fresh, untreated human urine used as crop fertiliser posed a health risk to them as food consumers (Q14); respondents who answered "yes" were then asked if they believed that risk could be mitigated with treatment (Q16). In Q15, respondents could provide additional open-ended comments about perceived risks.

As possible explanatory factors for perceived health risk from using untreated human urine as fertiliser, we asked respondents to indicate what substances they believed urine normally contained from a list of 7 items (Q17; vitamins, salts, radioactive substances, pharmaceutical residues/medicines, hormones, heavy metals, and pathogens) previously reported in literature [12]. In Q18, respondents could provide additional comments.

2.1.6. Environmental outlook

Since we posited that a generally pro-environmental outlook might be associated with acceptance of urine recycling and food grown with human urine as fertiliser, we evaluated environmental outlooks using Dunlap's revised New Environmental Paradigm (NEP) scale [4]. This scale has been widely used in the environmental literature and, although it was originally developed and validated in Western contexts as a unidimensional scale, it is often more appropriate to split it into multiple axes [4]. The NEP scale consists of 15 Likert-type items ranked from "strongly disagree" to "strongly agree," which are coded for analysis from 1 to 5, respectively. The odd-numbered items were considered by Dunlap to be "pro-ecological," and the even-numbered items to be "pro-dominant social paradigm" (anthropocentric). When treated as a unidimensional scale, the even-numbered items are reverse-coded from 5 to 1. We presented these items at the end of our survey in blocks of 5 (Q20, Q22, and Q24), with each block randomised and separated by demographic questions (age and gender).

NEP data were initially validated using Cronbach's α, determined using RStudio version 1.2.5042, R version 4.0.0, and the *psych* package. Based on internal consistency measures for the overall scale (Table 3), we then decided to split the data into two scales in our associated

study [1]. However, we have provided calculated overall mean scores in the cleaned data sheet (AllData.xlsx).

2.2. Translation and ethics approval

Survey instruments were translated into the appropriate languages where necessary (Table 4). For the United States, ethics approval was obtained from the University of South Florida Institutional Review Board, which determined that the research met criteria for exemption from the federal regulations as outlined by Office for Human Research Protections regulation 45 CFR 46.101(b). For other countries, ethics approval was not required due to the anonymous nature of the survey. All respondents gave informed consent for their answers to be used for research.*Data collection and demographics*.

We surveyed community members at 20 universities in 16 countries, selected by convenience based on our professional networks and the ability to gain permission from university administration. These universities are based in countries with various income levels, comprising low-, lower-middle-, upper-middle-, and high-income World Bank economic categories, with at least one country included from each World Bank region.

The survey was administered through the online GoogleForms platform (https://www.google.com/forms/about/) in most countries, and in mainland China through Wenjuanxing (https://www.wjx.cn/), a market research platform widely used in China. At each university, researchers sent invitations to participate by email to university mailing lists, resulting in a convenience sample, or, in the case of the University of South Florida, an initially systematic sample consisting of every fourth full-time domestic student [13]. The responsible researcher at each university then followed up with emailed reminders after days 7, 14, 21, and 28, closing the survey at 4 weeks. In the cases of Israel and Jordan, the survey link was left open for 3 months due to low initial response rates. In total, 3763 respondents gave consent and completed the survey, and 57 refused consent and exited without completing the survey. Data on respondents who exited the survey after giving consent but before completion or who clicked on the link but did not answer any questions are not available.

2.3. Data cleaning

We have deposited these data with Mendeley Data. The cleaning process for the combined data file (AllData.xlsx) was as follows:

a. Field names and styling differences in options (e.g., hyphens vs. en dashes) were standardised for consistency against the original English survey to facilitate filtering of data.
b. Responses erroneously split by the survey platform into two lines of the raw CSV file were manually combined into single records.
c. In the Greek survey, the willingness to pay question (Q11) was erroneously required, even for respondents unwilling to consume food grown with human urine who would not be expected to be willing to pay at all for such products. For consistency in the cleaned data sheet (AllData.xlsx), we removed the answers to Q11 from those who should not have received this question. These answers remain in the raw data file (GR_raw.xlsx).
d. NEP items (randomised in blocks of five in the survey) were reordered to the original order. For calculation of mean NEP scores, odd-numbered items were coded from 1 (strongly disagree) to 5 (strongly agree), whereas even-numbered items were coded in the reverse order, following Dunlap et al. [4], and the mean scores were added as an additional column to the cleaned data sheet (AllData.xlsx in the data deposit).

This cleaned data sheet can be filtered by field in Excel or other programs to select subsets of the data as needed, but we also deposited raw data files for transparency and data verification purposes.

Table 4
List of survey instruments and associated metadata and data.

Country	University	Survey language(s)	Survey platform	Survey period		No. of completed responses (no. of refusals)	File name(s) for	
				Start date	End date		Survey instrument(s)	Raw data
Bangladesh	Bangladesh Agricultural University	English	GoogleForms	19-Sep-17	19-Oct-17	51 (1)	EN.pdf	BN_BAU_raw.xlsx
	Bangladesh University of Health Sciences	English	GoogleForms	14-Sep-17	14-Oct-17	104 (1)	EN.pdf	BN_BUHS_raw.xlsx
	Both universities					155		N/A
Brazil	University of Santa Catarina	Brazilian Portuguese	GoogleForms	10-Oct-17	09-Nov-17	523	PT_BR.pdf	BR_raw.xlsx
	University of Science and Technology Beijing	Simplified Chinese	Wenjuanxing	26-Oct-17	25-Nov-17	532	SIM_CN.pdf	CN_USTB_raw.xlsx
China	Tongji University	Simplified Chinese	Wenjuanxing	23-Nov-17	22-Dec-17	184	SIM_CN.pdf	CN_Tongji_raw.xlsx
	Both universities					716		N/A
Ethiopia	Samara University	English	GoogleForms	14-Oct-17	13-Nov-17	324	EN.pdf	ET_raw.xlsx
France	AgroParisTech	French	GoogleForms	13-Feb-18	16 Mar-18	260	FR.pdf	FR_raw.xlsx
Greece	University of the Aegean	Greek	GoogleForms	20-Oct-17	19-Nov-17	150	GR.pdf	GR_raw.xlsx
India	Tezpur University	English	GoogleForms	03-Oct-17	02-Nov-17	60	EN.pdf	IN_raw.xlsx
Israel	University of Haifa and Oranim College	Arabic, Hebrew	GoogleForms	10-Feb-18	08-May-18	229	AR.pdf, IL_HB.pdf	IS_AR_raw.xlsx, IS_HB_raw.xlsx
Jordan	The Hashemite University	Arabic	GoogleForms	18-Dec-17	14-Mar-18	258 (11)	AR.pdf	JO_raw.xlsx
Malaysia	Universiti Malaysia Terengganu	English	GoogleForms	26-Sep-17	26-Oct-17	96	EN.pdf	MY_raw.xlsx
Moldova	University of Academy of Sciences of Moldova	Moldovan (Romanian)	GoogleForms	02-Nov-17	02-Dec-17	85	MD.pdf	MD_raw.xlsx
Poland	University of Life Sciences in Lublin	English	GoogleForms	05-Oct-17	04-Nov-17	93	EN.pdf	PO_raw.xlsx
Portugal	IADE – Universidade Europeia	European Portuguese, English	GoogleForms	14-Mar-18	15-Apr-18	88	PT_PT.pdf, EN.pdf	PT_PT_raw.xlsx, PT_EN_raw.xlsx
Taiwan, ROC	National Taiwan University (Department of Bioenvironmental Systems Engineering)	Traditional Chinese	GoogleForms	21-Sep-17	21-Oct-17	39	TR_CN.pdf	TW_NTU_raw.xlsx
	National Taipei University of Technology	Traditional Chinese, English	GoogleForms	17-Oct-17	16-Nov-17	124	TR_CN.pdf, EN.pdf	TW_CN_NTUT_raw.xslx, TW_EN_NTUT_raw.xslx
	Both universities					163		N/A
Uganda	Makerere University	English	GoogleForms	10-Nov-17	11-Dec-17	126	EN.pdf	UG_raw.xlsx
USA	University of South Florida, Florida	English	GoogleForms	28-Jan-18	26-Feb-18	437 (13)	EN.pdf	USA_raw.xlsx

Notes: Refusals represent individuals who declined consent after reading the introduction to the survey. Only fully completed surveys were retained, and the exact number of individuals originally approached with an invitation is unknown. Survey instrument and raw data files have been deposited in Mendeley Data [5]. N/A, not applicable.

2.4. Data limitations

First, most of the samples in our study are non-probabilistic convenience samples that are not necessarily representative of the larger university populations and should not be extrapolated to national populations; in particular, the samples are biased towards those in applied and natural science disciplines, and arts and humanities disciplines are underrepresented. It is possible that respondents therefore had a higher degree of interest in and/or knowledge about the topic than might be expected in the general population. Second, our question about gender only provided two options, male and female, and was required, which may have resulted in some respondents exiting the survey at that point. Finally, despite our goal of administering a relatively standardised survey, the process of translation inevitably changes meaning in subtle ways. Some options were also erroneously combined in some surveys, requiring recoding for comparison across countries.

For our associated study [1], we further processed the data for comparison purposes. In the Simplified Chinese surveys administered in both mainland China and Taiwan, the "landfill" and "incinerate" options were combined in the recycling/disposal question (Q19 in the master survey). We coded selection of this option for both landfill and incineration, although this may overstate the acceptability of one or both options. However, these options were among the most infrequently selected overall, so this did not significantly alter our overall interpretation of the question. In the Hebrew-language survey, "pharmaceuticals" and "hormones" were similarly combined into a single option in Q17 and we handled them the same way in our analysis. In both the raw and cleaned data described here, however, we have left these responses combined as originally given.

A few other inconsistencies in survey administration may also affect the comparison of the data between countries. In particular, in the mainland China surveys administered by mobile app, the question about colleagues' perceptions (Q12) was not forced, and only 22% of the Chinese respondents ($n = 155$) chose to answer this question. Some open-ended comment fields were also combined in the mobile app surveys, resulting in a slightly different order of questions. Finally, 2% ($n = 15$) of the answers for the settlement type question (Q4) in mainland China were invalid, likely due to a glitch in the mobile application.

CRediT Author Statement

Prithvi Simha and Björn Vinnerås with the help of all authors: Conceptualisation; **Prithvi Simha and Melissa A. Barton:** Data curation; **Björn Vinnerås:** Funding acquisition; **All authors:** Investigation; **Prithvi Simha and Björn Vinnerås:** Methodology; **Prithvi Simha and Björn Vinnerås:** Project administration; **Prithvi Simha and Björn Vinnerås:** Supervision; **Melissa A. Barton and Prithvi Simha:** Validation; **Melissa A. Barton:** Writing—original draft; **All authors:** Writing—review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

Data Availability

Multinational survey of attitudes towards recycling urine as fertiliser (Original data) (Mendeley Data)

Acknowledgements

We thank Evgheni Ermolaev for assistance with the survey performed in Moldova and Jennifer R. McConville and Cecilia Lalander for feedback on the survey instrument. Data collection was funded by grants from the Swedish Research Council (Vetenskapsrådet) – "Productive on-site sanitation system: new value chain for urine based fertiliser" (grant number 2015-03072) and "UDT 2.0 – Urine Dehydration Technology for Sanitation 2.0" (grant number 2018-05023).

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