

2 **Perception of Agricultural Students Towards**
3 **Livestock Waste Management Education in**
4 **Libya**

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6
7 **ABSTRACT**

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Aims: The aim of this research is to define the education processes used in the management of animal wastes and the perception of Libyan agricultural students in the management of livestock wastes.

Study design: This study concentrated on the students' population. The criteria for eligibility in this study included (i) Students of agriculture (ii) the respondent's willingness to oblige to the study protocols and complete the study.

Place and Duration of Study: The study was carried out in Tripoli University between the year 2017-2018 among cross-sectional agricultural students in Tripoli district of the Libya.

Methodology: The study concentrated on students' age less than 20-50 years, 166 male 134 female students. The associations between perception and waste management education tools and methods used in Tripoli were analyzed by means of t-test, ANOVA and descriptive statistics. The data were analyzed using the statistical software SPSS 20.0 and the reliability of the construct was examined using Cronbach's alpha which ranged from 0.709 to 0.831 indicating excellent internal consistency.

Results: The study reveal that Agricultural students in Tripoli should be experts in livestock management, by involving in planning educational programs and the delivery of these programs should offer a variety of programs to meet the need of their clients and they should facilitate participants learning processes. The agricultural students have positive perception of currently used teaching method as effective. They also have positive views about the teaching tools in livestock waste management education. There is no statistically significant difference ($t(298) = -0.385, p = .700 > 0.05$) between male and female agricultural students' perception regarding the teaching tools used in education of livestock waste management. There was no statistically significant difference ($t(298) = -.356, p = .722 > 0.05$) between a male and female student regarding the teaching method used in education of livestock waste management.

Conclusion: Best management practices, good and acceptable working conditions should be defined, as a crucial and main educational activities for educators. Continuing education and training programs appropriate to the current situation should be developed and transferred to regional educators to help the agricultural students in the area get better use of communication technologies. More teaching tools should be developed and used by livestock waste management education and teaching methods used by livestock waste management educators should be improved.

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10 *Keywords: perception, agricultural student, livestock, waste management, education, teaching tools*

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13 **1. INTRODUCTION**

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15 The most important component of any agricultural development process is educational training and this includes new and particular technology or knowledge about the new technology to farmers. This can be done by communicating information [1] to help farmers have or create good decisions and have an opinion about the system they require to use for their agricultural production [2]. At first it was adult education programs that the term "extension" was used in the description of the program in England which was around half 19th Century and this was mainly because universities expanded their campuses to neighboring rural communities [1]. However, environmental concern as for the debasement of the soil nature, surface and groundwater resources as a result of surface spillover and leaching of excess nitrogen and phosphorus have been raised from its over application to crop and field lands [3-5]. The best management practices (BMPs) for livestock waste management have been made as answers for the potential issues related with livestock waste

contamination of the environment [6, 7]. Nevertheless, the amplex of such BMPs especially for nitrogen and phosphorus management has been addressed [8]. As indicated by Boesch et al. [8], standard BMPs have not altogether diminished agricultural nonpoint discharge of contamination.

Warnick et al. [9] defined the perceptions of science instructors, in regards to educational change with the coordination of science in horticultural education. Science educators perceived the combination of science in rural education to add to educational change by helping students meet state models [9]. Bruening et al. [10] contemplated the perceptions of agriculturists about the usefulness of data and organization sources and then inferred that agriculturists saw water contamination and manure management as the most genuine ecological issues. However, agriculturists were not sure if nutrient management and groundwater pollution were serious ecological issues or not. The perceptions of educators with respect to instructor preparing and changing of educational programs and direction in agrarian schools were contemplated [11]. Agricultural instructors had the observation that attempting new thoughts in their showing practice and best educator training and proficient improvement projects could upgrade educational programs and instructional changes in farming education [11]. Ikeoji et al. [12] studied the perceptions of farming science instructors with respect to issues and difficulties of vocational agriculture delivery in secondary schools. In an investigation agrarian science instructors saw poor financing of professional farming, staying informed concerning advancements in the field of agriculture and imparting such improvements to students were the most difficulties to the conveyance of professional agriculture in secondary schools. Ozor et al. [13] likewise examined the perceptions of farmers in regards to cost-sharing of agricultural technology transfer. The investigation of Ozor et al. [13] reasoned that 80.6% of agriculturists and 85.7% of professionals had positive discernment towards cost-sharing, which filled in as a pointer towards acknowledgment of the change. Farouque and Takeya [14] contemplated the view of farmers with respect to the combination of soil fertility and nutrient management for maintainable harvest generation. There is a gap in the educational direction of Livestock Waste Management that is not really expressed. It does not reveal what agricultural engineers are doing in Education in Livestock Waste Management and how they perceive the training processes in the management of livestock waste. The focus of this work is based on waste management in livestock in Libya. The aim of this research is to define the education processes used in the management of animal wastes and the perception of Libyan agricultural students in the management of livestock wastes by answering the following research questions:

RQ1: Is there a difference between genders' perceptions of agricultural students regarding the teaching tools used in education about Livestock Waste Management?

RQ2: Is there a difference between genders perceptions of agricultural students regarding the teaching methods used in education about livestock waste management?

RQ3: What is the perception of agricultural students regarding livestock waste management?

RQ4: What are the perceptions of agricultural students regarding the teaching methods used in education about livestock waste management?

RQ5: What are the perceptions of agricultural students regarding the teaching tools used in education about livestock waste management?

2. MATERIAL AND METHODS

2.1 Research Model

This study mainly aim at getting the perception of agricultural students towards livestock waste management education in Libya. This study is based on field research carried out in Libya in 2017. The quantitative method applied in this study is to make it more reliable through research questionnaire adopted from Kwaw-Mensah [15], articles, textbooks, and studies on the subject and internet source.

2.2 Participants and sample

The study was carried out in Tripoli University involving 300 cross-sectional agricultural students in Tripoli district of the Libya. This study concentrated on the students' population. The criteria for eligibility in this study will include (i) Students of agriculture (ii) the respondent's willingness to oblige to the study protocols and complete the study.

An organized questionnaire focused on gender, age, education, general perception regarding livestock waste management, perception about education regarding livestock management and teaching methods and tools. **Table 1** and **Figure 1** show demographic of the students age were 47 (15.7%) of the students were < 20 years, 139 (46.3%) between 21 - 30 years, 59 (19.7%) are of 31 - 40 years, and 55 (18.3%) and 41-50 years. Also **Figure 2** indicates the gender to be of 166 (51.25%) as male students while 134 (48.75%) were female students. This signifies gender were fairly distributed. In addition Monthly income show that 85 (28.3%) earn less than 500 USD, 112 (37.3%) between 5001 – 1000 USD, 65 (21.7%) earn between 1001.0–2001.0USD while 38 (12.7%) of the students received monthly income above 2000 USD from farming (**Figure 3**).

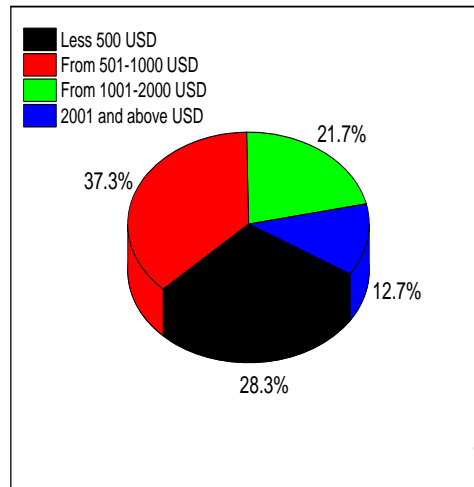
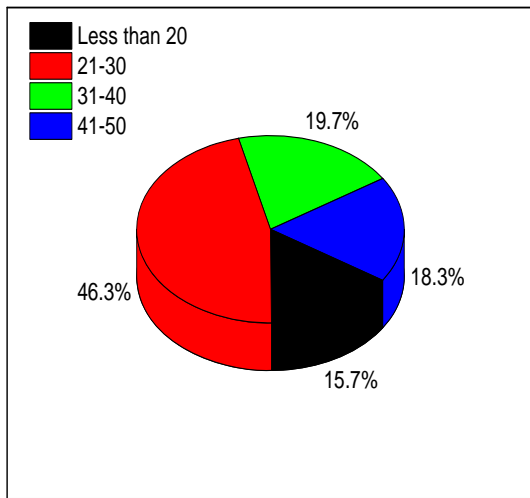


Figure 1: Age distribution of the students **Figure 2:** Monthly income of the students

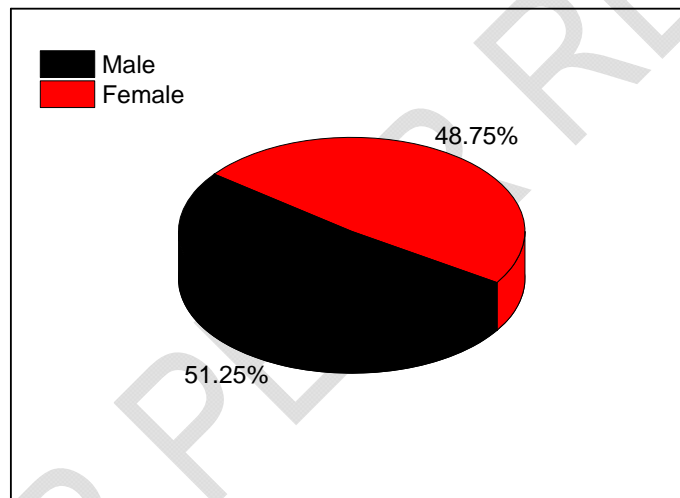


Figure 3: Gender distribution of the students

Table 1. Demographic distribution (n = 300)

Demographic category	Frequency	Percentage
Age		
<20	47	15.7
21-30	139	46.3
31-40	59	19.7
41-50	55	18.3
Total	300	100
Gender		
Male	166	51.25
Female	134	48.75
Total	300	100
Monthly income (\$)		
Less 500	85	28.3
From 501-1000	112	37.3
From 1001-2000	65	21.7
2001 and above	38	12.7
Total	300	100

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89 2.3 Data Analysis

90 The associations between perception and waste management education tools and methods used in Tripoli were analyzed
91 by means of t-test, ANOVA and descriptive statistics. The data were analyzed using the statistical software SPSS 20.0.

92 No laboratory or medical tests were conducted.

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94 2.4 Research Ethics

95 For the study to be reliable and legitimate, logical process inquire about morals were viewed. The general population that
96 took an interest in the investigations were given direct questions. The analyst's really exhibited an objective attitude during
97 the research by showing a decent work conduct not to influence the study.

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99 2.5 Reliability of the study

100 **Table 2** displays the summary of the total reliability test. The reliability of the construct was examined using Cronbach's
101 alpha. The construct reliability should exceed 0.7 to fall within an acceptable level (Fraenkel and Wallen, 2000). The
102 reliability of the construct of this study ranged from 0.709 to 0.831 which indicates excellent internal consistency.

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Table 2. Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
prlwm	12.1798	1.751	.744	.709
perlm	11.9691	1.743	.682	.731
ecu	12.3294	1.671	.620	.758
PE	12.5641	1.706	.493	.831

(Prlwm - perceptions regarding livestock waste management, perlm - Perceptions of education regarding livestock management, ecu - Extent of current use, PE - Perceived effectiveness)

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108 3. RESULTS AND DISCUSSION

109 This detail from result of the study of the respondents' participation and the statistical interpretation answers all the
110 research questions and the aim of the study.

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RQ1: What is the perception of agricultural students regarding livestock waste management?

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Table 3. Students' perception regarding livestock waste management

Item	Statement	Response			Mean	SD
		D	N	A		
1	Livestock waste management means different things to different people	5(1.7)	45(15.0)	250(83.3)	4.19	0.810
2	Livestock waste management is a controversial issue	5(1.7)	33(11.0)	262(83.3)	4.37	0.769
3	Livestock waste management is a complex environmental issue	8(2.7)	23(7.7)	269(89.6)	4.16	0.728
4	Livestock waste management is essential to human health	5(1.7)	70(23.3)	225(75.0)	3.87	0.725
5	Best management practices for Livestock	7(1.7)	0(0.0)	293(97.7)	4.55	0.670

6	waste management are easy to understand Best management practices for Livestock waste management include riparian buffers	6(1.7)	34(11.3)	260(86.7)	4.24	0.783
7	Best management practices for Livestock waste management do not improve the value of livestock waste as fertilizer.	5(1.7)	84(28.0)	211(70.3)	3.86	0.766
8	Best management practices for Livestock waste management protect water quality	8(2.7)	31(10.3)	261(87.0)	4.31	0.789
9	Best management practices for Livestock waste management protect air quality	5(1.7)	56(18.7)	239(79.3)	4.12	0.802
10	Best management practices for Livestock waste management do not protect soil quality	10(3.3)	54(18.0)	236(78.7)	4.19	0.785
11	Not all best management practices are accepted agricultural practices	5(1.7)	83(27.7)	212(70.6)	3.85	0.747
12	Efficient Livestock waste management practices require regular waste analysis	12(4)	45(15.0)	243(81.0)	4.23	0.840
13	The highest risk with livestock waste management is not from point source pollution.	5(1.7)	50(16.7)	245(81.6)	4.24	0.848

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125 Furthermore in **Table 4**, the minimum and maximum frequencies of the students' responses to the questionnaire were 5
 126 and 295 respectively and the mean scores ranged from 4.24 (SD = 0.661) to 4.52 (SD = 0.656). Generally, agricultural
 127 students agreed that they should be experts in livestock management, have some knowledge about how adults learn,
 128 should involve learners in planning of educational programs, should involve learners in the delivery of educational
 129 programs, agricultural students should offer a variety of programs to meet the needs of their clients and they should
 130 facilitate participants learning processes

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132 **Table 4.** Perception of education regarding livestock management

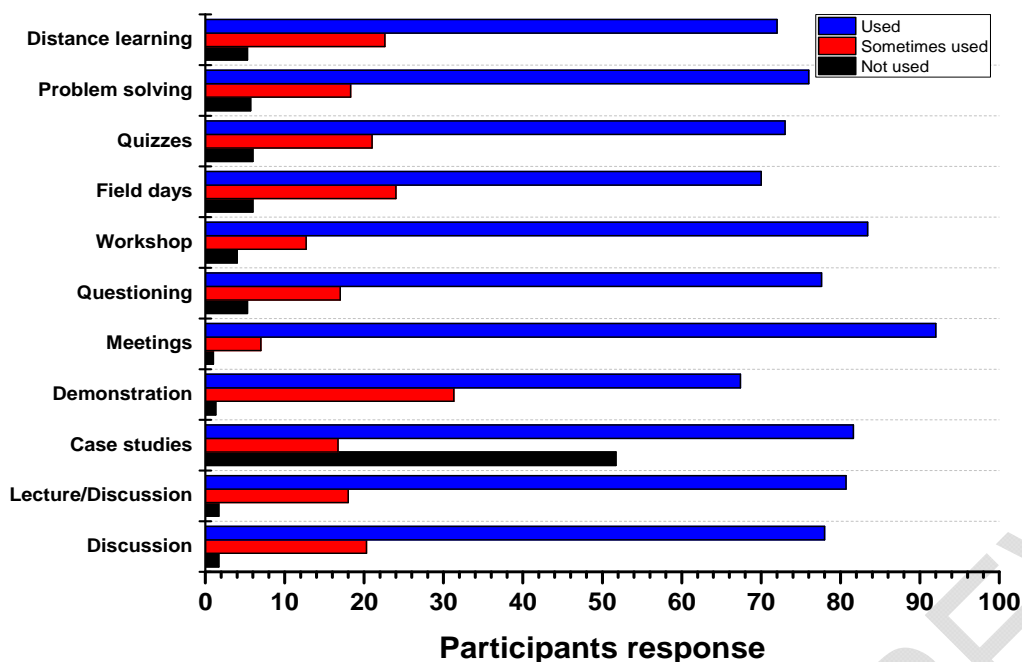
Item	Statement	Response			Mean	SD
		D	N	A		
14	Agricultural students should be experts in livestock management	5(1.7)	0(0.0)	295(83.3)	4.52	0.656
15	Agricultural students should have some knowledge about how adults learn	9(3.0)	14(4.7)	277(92.3)	4.25	0.685
16	Agricultural students should involve learners in planning educational programs	5(1.7)	6(2.0)	289(96.3)	4.45	0.685
17	Agricultural students should involve learners in the delivery of educational programs	6(2.0)	7(2.3)	287(95.7)	4.40	0.689
18	Agricultural students should offer a variety of programs to meet the need of their clients	10(3.3)	5(1.7)	285(85.0)	4.40	0.684
19	Agricultural students should facilitate participants learning processes	12(4.0)	10(3.3)	278(92.7)	4.24	0.661

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134 *RQ2: What are the perceptions of agricultural students regarding the teaching methods used for education of livestock*
 135 *waste management?*

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137 This research question sought to determine the perceptions of agricultural students regarding the teaching methods used
 138 in education about livestock waste management. Descriptive statistics were used to determine mean scores, standard
 139 deviations, frequencies and percentages were used for the analysis. In the analysis, 'not used' and 'rarely used' were
 140 categorized as 'not used' while 'frequently used' and 'Always used' were categorized as 'used'. The results of the analysis
 141 are presented in **Table 5 and Figure 4**. A mean score above or below 3 was considered positive and negative perception
 142 respectively. The minimum and maximum frequencies of the students' responses' to the questionnaire were 3 and 250
 143 respectively and the mean scores ranged from 3.767 (SD = 0.717) to 4.413 (SD = 0.717). Generally, the agricultural
 144 students have positive perceptions of currently used teaching method.



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146 **Figure 4.** Teaching methods for livestock waste management education
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Table 5: Current use teaching methods for livestock waste management education

Item	Statement	Response			Mean	SD
		NU	S	U		
20	Discussion	5(1.7)	61(20.3)	134(78.0)	4.103	0.8133
21	Lecture-Discussion	5(1.7)	53(18.0)	142(80.7)	4.217	0.8400
22	Case studies	5(1.7)	50(16.7)	245(81.6)	4.037	0.755
23	Demonstration	4(1.3)	94(31.3)	202(67.4)	3.767	0.717
24	Meetings	3 (1.0)	21 (7.0)	276(92.0)	4.413	0.717
25	Questioning	16(5.3)	51(17)	233(77.6)	3.973	1.129
26	Workshop	12(4.0)	38(12.7)	250(83.4)	4.193	1.058
27	Field days	18(6.0)	72(24)	210(70.0)	3.853	1.204
28	Quizzes	18(6.0)	63(21)	219(73)	3.870	1.171
29	Problem solving	17(5.7)	55(18.3)	228(76)	3.920	1.157
30	Distance learning	16(5.3)	68(22.6)	216(72)	3.850	1.191

150 Note: NU = not used, sometimes used = S and U = Used
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153 The results of the analysis as presented in **Table 6** shows the minimum and maximum frequencies of the students'
154 responses to the questionnaire were 35 and 239 respectively and the mean scores ranged from 3.637 (SD = 1.411) to
155 4.107 (SD = 1.116). Generally, the agricultural students perceived the teaching method in education of livestock waste
156 management as effective (Item 31 to Item 41)
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Table 6: Students perceived effectiveness of teaching method for livestock waste management education

Item	Statement	Response			Mean	SD
		Disagree	Neutral	Agree		
31	Discussion	44(14.6)	26(8.7)	230(76.7)	3.963	1.158
32	Lecture-Discussion	36(12)	25(8.3)	239(79.6)	4.107	1.116
33	Case studies	72(24)	27(9.0)	201(67)	3.637	1.411
34	Demonstration	69(23)	30(10.0)	201(67.0)	3.670	1.352

35	Meetings	65(217)	30(10)	205(68.3)	3.680	1.320
36	Questioning	51(17)	20(6.7)	229(76.3)	3.943	1.256
37	Workshop	36(12)	26(8.7)	238(79.3)	4.880	1.702
38	Field days	56(18.7)	43(14.3)	201(67.0)	3.728	1.218
39	Quizzes	59(19.7)	26(8.7)	215(71.6)	3.767	1.261
40	Problem solving	44(14.6)	35(11.7)	221(73.7)	3.918	1.187
41	Distance learning	49(16.3)	29(9.7)	222(74.)	3.938	1.237

RQ3: What are the perceptions of agricultural students regarding the teaching tools used in education of livestock waste management?

This research question was to find out perceptions of agricultural students regarding the teaching tools used in education of livestock waste management. The results of the analysis are presented in **Table 7**. The minimum and maximum frequencies of the students' responses to the questionnaire were 20 and 238 respectively and the mean scores ranged from 3.637 (SD = 1.411) to 4.880 (SD = 1.702). Therefore, agriculture students' positive perception of the current use of teaching tools in education of livestock waste management (Item 42 to Item 52)

Table 7. Students' perception regarding teaching tools in education of livestock waste management

Item	Statement	Response			Mean	SD
		Disagree	Neutral	Agree		
42	Posters	41(13.7)	29(9.7)	230(76.6)	3.963	1.158
43	Video-tape	36(12)	25(8.3)	239(76.7)	4.107	1.116
44	Websites	72(24)	27(9.0)	201(67.0)	3.637	1.411
45	Computer	69(23)	30(10.0)	201(67.0)	3.670	1.352
46	Internet	65(21.7)	30(10.0)	205(68.3)	3.680	1.320
47	Compact disc	51(17)	20(6.7)	229(76.3)	3.943	1.256
48	Pamphlets	36(12)	26(8.7)	238(79.3)	4.880	1.702
49	Satellites	56(18.7)	43(14.3)	201(67.0)	3.727	1.218
59	Newsletter	59(19.7)	26(8.7)	215(71.7)	3.767	1.261
51	Textbook	44(14.7)	35(11.7)	221(73.7)	3.917	1.186
52	Research publication	49(16.3)	29(9.7)	222(74.0)	3.937	1.237

The results of the analysis are presented in **Table 8**. The minimum and maximum frequencies of the students' responses to the questionnaire were 30 and 229 respectively and the mean scores ranged from 3.013 (SD = 1.346) to 3.943 (SD = 1.248). Therefore, the agricultural students perceived teaching tools in education of livestock waste management as effective.

Table 8. Students' perception regarding teaching tools in education of livestock waste management

Item	Statement	Response			Mean	SD
		Disagree	Neutral	Agree		
53	Posters	47(15.7)	29(9.7)	224(74.4)	3.943	1.248
54	Video-tape	57(19)	59(19.7)	184(61.3)	3.600	1.240
55	Websites	65(21.7)	47(15.7)	188(62.7)	3.587	1.279
56	Computer	51(17)	37(12.3)	212(70.7)	3.760	1.206
57	Internet	50(16.7)	36(12.0)	214(71.3)	3.803	1.135
58	Compact disc	44(14.7)	47(15.7)	209(69.7)	3.757	1.144
59	Pamphlets	40(13.3)	31(10.3)	229(76.3)	3.013	1.346
60	Satellites	82(27.3)	47(15.7)	171(57.0)	3.433	1.285
61	Newsletter	62(20.7)	35(11.7)	203(67.7)	3.730	1.418
62	Textbook	65(21.7)	30(10.0)	205(68.3)	3.537	1.211
63	Research publication	63(21)	37(12.3)	200(66.7)	3.683	1.271

187 *RQ4: Is there a difference between genders' perceptions of agricultural students regarding the teaching tools used in*
 188 *education of livestock waste management?*

189 The independent sample t-test was used to test the hypothesis at a $P = .05$. The results are provided in **Table 9**. The t-
 190 test results, however, showed that there was no statistically significant difference ($t (298) = -0.385, P = .700 > .05$)
 191 between a male and female agricultural student's perception the teaching tools used in education of livestock waste
 192 management. Therefore, gender difference between male and female perception of agricultural students regarding the
 193 teaching tools used in education of livestock waste management.
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195 **Table 9. Independent Samples Test for teaching tools**

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.008	.927	-.385	298	.700	-.02742	.07115	-.16744	.11259
Equal variances not assumed			-.385	283.097	.701	-.02742	.07126	-.16768	.11284

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 198 *RQ 5: Is there a difference between gender's perceptions of agricultural students regarding the teaching methods used in*
 199 *education of livestock waste management?*
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201 The independent sample t-test was employed to investigate the hypothesis at $P = .05$. The results are provided in **Table**
 202 **10**. The t-test results, however, revealed that there was no statistically significant difference ($t (298) = -.356, P = .722 >$
 203 $.05$) between a male and female regarding the teaching method used in education o livestock waste management.
 204 Therefore, there is no difference between male and female perception of agricultural students regarding the teaching
 205 methods used in education for livestock waste management.
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211 **Table 10. Independent Samples Test for teaching methods**

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.046	.831	-.356	298	.722	-.02297	.06451	-.14992	.10399
Equal variances not assumed			-.352	270.224	.725	-.02297	.06525	-.15144	.10551

212
 213 The independent sample t-test was employed to investigate the hypothesis at $p = 0.05$. The results are provided in Table
 214 10. The t-test results, however, revealed that there was no statistically significant difference ($t (298) = -.356, p = .722 >$
 215 0.05) between a male and female regarding the teaching method used in education o livestock waste management.
 216 Therefore, there is no difference between male and female perception of agricultural students regarding the teaching
 217 methods used in education for livestock waste management.

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4. CONCLUSION

221 The demography of the agricultural students in this region shows that the students are between 21-30 years, 41-50 years
222 dominated by male college certificate holders with a monthly income of about 501 to 1000 TY. According to Amireault et
223 al. [17] age and experience appear to be two important factors for stable intentions in individuals. The perception of
224 agricultural students regarding livestock waste management is that: agricultural students/engineers should be experts in
225 livestock management, should have some knowledge about how adults learn, agricultural engineers should involve
226 learners in planning of educational programs, should involve learners in the delivery of educational programs, should offer
227 a variety of programs to meet the needs of their clients and should facilitate participants learning processes. According to
228 Fukumoto [6]; Alam et al. [7]; Tyson, 1995, the best waste management methods for livestock, has been developed as
229 technical interventions for possible environmental pollution problems in the livestock environment. The extension
230 educators perceived themselves as the most appropriate and relevant professionals to give educational programs
231 regarding waste management therefore with educational professionals waste management knowledge can be passed on
232 to agricultural students. Generally, the agricultural students have positive perceptions of currently used teaching method
233 and perceived the teaching method in education of livestock waste management as effective. As suggested by Chizari et
234 al. [18] there is a perceived demonstration that formal group meetings and informal discussions the most appropriate
235 teaching methods, though there is a need for training in identifying and organizing training content and various teaching
236 methods. Agriculture students have positive perceptions of the currently used teaching tools in education of livestock
237 waste management. They perceived teaching tools in education of livestock waste management as effective. This shows
238 that extension educators can successfully use field demonstrations to educate farmers in manure calibration [19]. There is
239 no statistically significant difference ($t(298) = -0.385, p = .700 > .05$) between a male and female agricultural students'
240 perception regarding the teaching tools used in education of livestock waste management. There was no statistically
241 significant difference ($t(298) = -.356, p = .722 > .05$) between a male and female regarding the teaching method used in
242 education of livestock waste management. Therefore, there is no difference between male and female perception of
243 agricultural students regarding the teaching methods used in education of livestock waste management. Best
244 management practices, good and acceptable working conditions should be defined, as a crucial and main educational
245 activities for educators. Identification of risks of non-existent pollution sources and the best methods of managing animal
246 wastes that have been developed and delivered to teachers and used when necessary. Continuing education and training
247 programs appropriate to the current situation should be developed and transferred to regional educators to help the
248 agricultural students in the area get better use of communication technologies. More teaching tools should be developed
249 and used by livestock waste management education and teaching methods used by livestock waste management
250 educators should be improved. Results should be clearly described in a concise manner.

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