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# Perception of Agricultural Students Towards Livestock Waste Management Education in Libya

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## ABSTRACT

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

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## 1. INTRODUCTION

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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 as quantitative method and the sampling in this study included students of agriculture with willingness to oblige to the study protocols for the study which were randomly selected. The questionnaire focused on gender, age, education for demography and a general perception regarding livestock waste management, perception about education regarding livestock management and teaching methods and tools and questionnaire consisted of 65 items, organized by the sections shown in **APPENDIX 1** with variation of five-point Likert scale used in the survey questionnaire.

### **2.3 Data Analysis**

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.

No laboratory or medical tests were conducted.

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81 **2.4 Research Ethics**

82 For the study to be reliable and legitimate, logical process inquire about morals were viewed. The general population that  
83 took an interest in the investigations were given direct questions. The analyst's really exhibited an objective attitude during  
84 the research by showing a decent work conduct not to influence the study.  
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86 **2.5 Reliability of the study**

87 **Table 1** displays the summary of the total reliability test. The reliability of the construct was examined using Cronbach's  
88 alpha. The construct reliability should exceed 0.7 to fall within an acceptable level [16]. The reliability of the construct of  
89 this study was above 0.7 which indicates excellent internal consistency for all items under perceptions regarding livestock  
90 waste management (PrIwm), perceptions of education regarding livestock management (perIm), extent of current use  
91 (ecu) and perceived effectiveness (PE) **APPENDX-1**.  
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**Table 1.** Item-Total Statistics

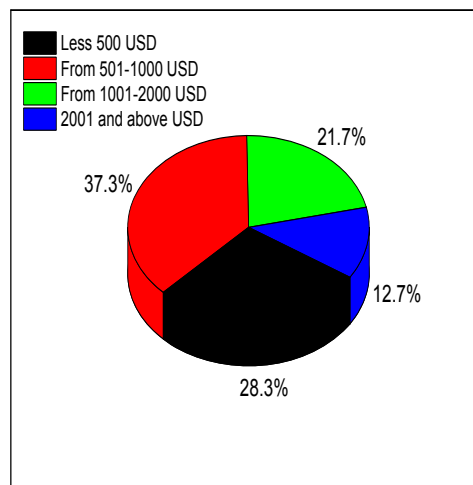
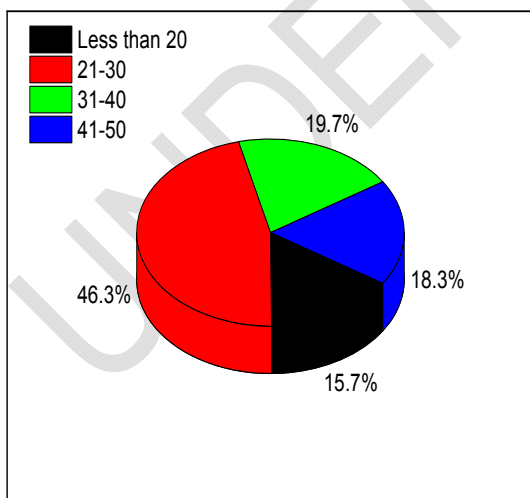
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
prlwm	12.1798	1.751	.744	.709
perIm	11.9691	1.743	.682	.731
ecu	12.3294	1.671	.620	.758
PE	12.5641	1.706	.493	.831

93 (PrIwm - perceptions regarding livestock waste management, perIm - Perceptions of education regarding livestock management, ecu - Extent of current  
94 use, PE - Perceived effectiveness)  
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97 **3. RESULTS AND DISCUSSION**

98 This detail from result of the study of the respondents' participation and the statistical interpretation answers all the  
99 research questions and the aim of the study.  
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101 **Table 2** and **Figure 1** show demographic of the students age were 47 (15.7%) of the students were < 20 years, 139  
102 (46.3%) between 21 - 30 years, 59 (19.7%) are of 31 - 40 years, and 55 (18.3%) are 41-50 years. Also **Figure 2** indicates  
103 the gender to be of 166 (51.25%) as male students while 134 (48.75%) were female students and according to Amireault  
104 et al. [17] age and experience appear to be two important factors for stable intentions in individuals. This signifies gender  
105 were fairly distributed. In addition Monthly income show that 85 (28.3%) earn less than 500 USD, 112 (37.3%) between  
106 501 – 1000 USD, 65 (21.7%) earn between 1001.0–2001.0USD while 38 (12.7%) of the students received monthly  
107 income above 2000 USD from farming (**Figure 3**).



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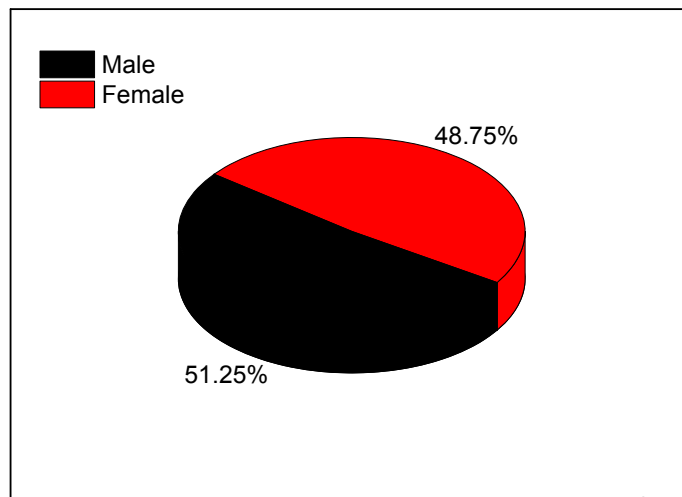


Figure 3. Gender distribution of the students

Table 2. Demographic distribution (n = 300)

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

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

Descriptive statistics were used to determine mean scores, standard deviations, frequencies and percentages which were used for the analysis. In the analysis, 'strongly disagree' and 'disagree' were categorized as 'disagree' while 'strongly agree' and 'agree' were categorized as 'agree'. The results of the analysis are presented in **Table 3**. A mean score above or below 3 was considered positive and negative perception respectively while 3 was considered as neutral. The minimum and maximum frequencies of the students' responses to the questionnaire were 5 and 293 respectively and the mean scores ranged from 3.86 (SD = 0.766) to 4.55 (SD = 0.670). Generally, the agricultural students agreed with all the items (Item 1 to Item 13). The perception of agricultural students regarding livestock waste management is that: agricultural students/engineers should be experts in livestock management, should have some knowledge about how adults learn, agricultural engineers should involve learners in planning of educational programs, should involve learners in the delivery of educational programs, should offer a variety of programs to meet the needs of their clients and should facilitate participants learning processes. According to Fukumoto, [6]; Alam et al. [7]; and Tyson, [18] the best waste management methods for livestock, has been developed as technical interventions for possible environmental pollution problems in the livestock environment.

Table 1. 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 waste management are easy to understand	7(1.7)	0(0.0)	293(97.7)	4.55	0.670
6	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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136 Furthermore in **Table 4**, the minimum and maximum frequencies of the students' responses to the questionnaire were 5  
 137 and 295 respectively and the mean scores ranged from 4.24 (SD = 0.661) to 4.52 (SD = 0.656). Generally, agricultural  
 138 students agreed that they should be experts in livestock management, have some knowledge about how adults learn,  
 139 should involve learners in planning of educational programs, should involve learners in the delivery of educational  
 140 programs, agricultural students should offer a variety of programs to meet the needs of their clients and they should  
 141 facilitate participants learning processes. The extension educators perceived themselves as the most appropriate and  
 142 relevant professionals to give educational programs regarding waste management therefore with educational  
 143 professionals waste management knowledge can be passed on to agricultural students [19].

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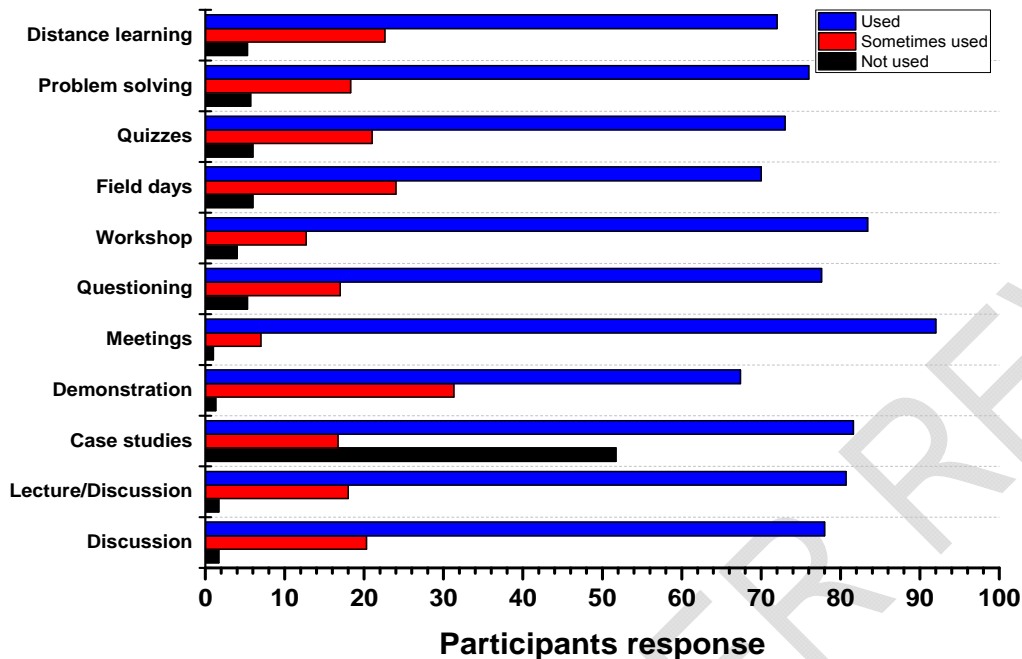
145 **Table 2.** Perception of education regarding livestock management

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

This research question sought to determine the perceptions of agricultural students regarding the teaching methods used in education about livestock waste management. Descriptive statistics were used to determine mean scores, standard deviations, frequencies and percentages were used for the analysis. In the analysis, 'not used' and 'rarely used' were categorized as 'not used' while 'frequently used' and 'Always used' were categorized as 'used'. The results of the analysis are presented in **Table 5 and Figure 4**.



**Figure 4.** Teaching methods for livestock waste management education

A mean score above or below 3 was considered positive and negative perception respectively. The minimum and maximum frequencies of the students' responses to the questionnaire were 3 and 250 respectively and the mean scores ranged from 3.767 (SD = 0.717) to 4.413 (SD = 0.717). Generally, the agricultural students have positive perceptions of currently used teaching method.

**Table 3:** 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

Note: NU = not used, sometimes used = S and U = Used

The results of the analysis as presented in **Table 6** shows the minimum and maximum frequencies of the students' responses to the questionnaire were 35 and 239 respectively and the mean scores ranged from 3.637 (SD = 1.411) to 4.107 (SD = 1.116). Generally, the agricultural students perceived the teaching method in education of livestock waste management as effective (Item 31 to Item 41). Generally, the agricultural students have positive perceptions of currently used teaching method and perceived the teaching method in education of livestock waste management as effective. As



suggested by Chizari et al. [20] there is a perceived demonstration that formal group meetings and informal discussions the most appropriate teaching methods, though there is a need for training in identifying and organizing training content and various teaching methods.

**Table 4:** 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(21.7)	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 5.** 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
50	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. Agriculture students have positive perceptions of the currently used teaching tools in education of livestock waste management. They perceived teaching tools in education of livestock waste management as effective. This shows that extension educators can successfully use field demonstrations to educate farmers in agricultural waste management [21] and also Park, Cho, and Lee, [22] states that perceptions of extension educators regarding the usefulness and effectiveness of those methods and tools are significant while Martin and Omer, [23] suggested the use of media outlets

such as radio programs, television broadcasts and satellite programming to be very effective in educating community members for waste management.

**Table 6.** Students' perception regarding teaching tools in education of livestock waste management

Item	Statement	Response			Mean 4	SD 5
		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

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

The independent sample t-test was used to test the hypothesis at  $\alpha = .05$ . The results are provided in **Table 9**. The t-test results, however, showed that there was no statistically significant difference ( $t(298) = -.385, P = .700 > .05$ ) between a male and female agricultural student's perception the teaching tools used in education of livestock waste management. Therefore, gender difference between male and female perception of agricultural students regarding the teaching tools used in education of livestock waste management.

**Table 7.** 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
PE	Equal variances assumed	.008	.927	-.385	298	.700	-.02742	.07115	-.16744	.11259
	Equal variances not assumed			-.385	283.097	.701	-.02742	.07126	-.16768	.11284

RQ 5: Is there a difference between gender's perceptions of agricultural students regarding the teaching methods used in education of livestock waste management?

The results of t-test in **Table 10**, however, revealed that there was no statistically significant difference ( $t(298) = -.356, P = .722 > .05$ ) between male and female regarding the teaching method used in education of livestock waste management. Therefore, there is no difference between male and female perception of agricultural students regarding the teaching methods used in education for livestock waste management.

**Table 8.** 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
ecu	Equal variances assumed	.046	.831	-.356	298	.722	-.02297	.06451	-.14992	.10399



Equal variances not assumed

-.352 270.224 .725 -.02297 .06525 -.15144 .10551

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

#### 4. CONCLUSION

The results on perception of agricultural students regarding livestock waste management suggest that experts in waste management should have some knowledge about how agricultural educators should involve students/learners in planning of educational programs and should also involve learners in the delivery of educational programs, agricultural educators should offer a variety of programs to meet the needs of their clients and should facilitate participants learning processes. The extension educators perceived themselves as the most appropriate and relevant professionals to give educational programs regarding waste management. The result reveal that the agricultural students have positive perceptions of currently used teaching method and perceived the teaching methods and tools used in education of livestock waste management as effective and also the students have positive and effective perceptions of the currently used teaching tools in education of livestock waste management. The outcome of this study shows that there is no statistically significant difference between a male and female agricultural students' perception regarding the teaching tools and methods used in education of livestock waste management. The study reveal that best waste management practices, good and acceptable working conditions should be defined as a crucial and main educational activities for educators. There should be an identification of risks of non-existent pollution sources and the best methods of managing animal wastes developed and delivered to teachers and used when necessary. 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 in order to get a better use of communication technologies. More teaching tools and methods should be developed and used by livestock waste management education.

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309 **APPENDIX 1 – Research reliability for each Items of the questionnaire**

Items	Perceptions regarding livestock waste management	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	Livestock waste management means different things to different people	49.9900	30.900	.466	.838
2	Livestock waste management is a controversial issue	49.8233	30.521	.546	.833
3	Livestock waste management is a complex environmental issue	50.0200	30.822	.545	.833
4	Livestock waste management is essential to human health	50.3067	30.347	.611	.829
5	Best management practices for Livestock waste management are easy to understand	49.6300	30.903	.591	.831
6	Best management practices for Livestock waste management include riparian buffers	49.9367	30.521	.534	.833
7	Best management practices for Livestock waste management do not improve the value of livestock waste as fertilizer.	50.3167	30.351	.571	.831
8	Best management practices for Livestock waste management protects water quality	49.8700	29.879	.609	.828
9	Best management practices for Livestock waste management protects air quality	50.0567	30.709	.495	.836
10	Best management practices for Livestock waste management does not protect soil quality	49.9900	32.063	.346	.846

11	Not all best management practices are accepted agricultural practices	50.3333	31.507	.440	.840
12	Efficient Livestock waste management practices require regular waste analysis	49.9500	32.349	.282	.851
13	The highest risk with livestock waste management is not point source pollution.	49.9367	30.233	.514	.835

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	<b>Perceptions of education regarding livestock management</b>	<b>Scale Mean if Item Deleted</b>	<b>Scale Variance if Item Deleted</b>	<b>Corrected Item-Total Correlation</b>	<b>Cronbach's Alpha if Item Deleted</b>
14	Agricultural engineers should be experts in livestock management	21.7433	6.218	.622	.784
15	Agricultural engineers should have some knowledge about how adults learn	22.0200	6.541	.478	.814
16	Agricultural engineers should involve learners in planning of educational programs	21.8167	5.943	.681	.770
17	Agricultural engineers should involve learners in the delivery of educational programs	21.8700	5.993	.657	.776
18	Agricultural engineers should offer a variety of programs to meet the need of their clients	21.8700	6.314	.554	.798
19	Agricultural engineers should facilitate participants learning processes	22.0300	6.484	.524	.804

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	<b>Extent of current use methods/tools</b>	<b>Scale Mean if Item Deleted</b>	<b>Scale Variance if Item Deleted</b>	<b>Corrected Item-Total Correlation</b>	<b>Cronbach's Alpha if Item Deleted</b>
20	Learning	88.1467	158.667	.173	.871
21	Discussion	88.3133	156.524	.274	.869
22	Lecture-Discussion	88.2000	155.946	.291	.868
23	Case studies	88.3800	155.159	.374	.867
24	Demonstration	88.6500	158.623	.201	.870
25	Meetings	88.0033	155.642	.362	.867
26	Questioning	88.4433	153.987	.267	.870
27	Workshop	88.2233	152.943	.332	.868
28	Field days	88.5633	146.073	.523	.862
29	Quizzes	88.5467	145.091	.578	.860
30	Problem solving	88.4967	144.980	.590	.859
31	Distance learning	88.5667	145.343	.557	.860
32	Posters	88.4600	144.363	.588	.859
33	Video tapes	88.5533	143.392	.601	.859
34	Websites	88.3033	145.470	.565	.860
35	Computers	88.3667	143.002	.656	.857
36	Internet	88.4600	142.891	.598	.859
37	Compact disc	88.5467	145.928	.519	.862
38	Pamphlets	88.4667	147.200	.529	.862

39	Satelites	88.2700	147.395	.541	.861
40	Newsletters	88.3233	152.908	.285	.870
41	Textbooks	88.3700	152.073	.316	.869
42	Research publications	88.5133	151.722	.291	.870

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	<b>Perceived effectiveness of currently use methods/tools</b>	<b>Scale Mean if Item Deleted</b>	<b>Scale Variance if Item Deleted</b>	<b>Corrected Item-Total Correlation</b>	<b>Cronbach's Alpha if Item Deleted</b>
43	Learning	83.0733	180.717	.491	.839
44	Discussion	83.0533	182.559	.450	.841
45	Lecture-Discussion	82.9100	182.196	.483	.840
46	Case studies	83.3800	183.634	.323	.846
47	Demonstration	83.3467	180.562	.429	.841
48	Meetings	83.3367	178.853	.493	.839
49	Questioning	83.0733	181.446	.442	.841
50	Workshop	82.1367	176.834	.404	.843
51	Field days	83.2900	184.574	.361	.844
52	Quizzes	83.2500	184.315	.353	.844
53	Problem solving	83.1000	182.151	.451	.841
54	Distance learning	83.0800	181.866	.437	.841
55	Posters	83.0733	185.239	.329	.845
56	Video tapes	83.4167	182.545	.415	.842
57	Websites	83.4300	181.497	.431	.841
58	Computers	83.2567	180.359	.499	.839
59	Internet	83.2133	182.857	.451	.841
60	Compact disc	83.2600	186.808	.316	.845
61	Pamphlets	84.0033	182.264	.383	.843
62	Satelites	83.5833	183.769	.361	.844
63	Newsletters	83.2867	179.356	.438	.841
64	Textbooks	83.4800	181.535	.459	.840
65	Research publications	83.3333	189.260	.203	.849

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