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Silage Making to Improve the Nutrition of Milking Animals for Small Scale Farmers' in Benue State

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Abstract

This study examines silage making to improve the nutrition of milking animals for small-scale farmers' in Benue state. Specific objectives of the study are to determine the silage making activities; determine the reasons of non-adaptation of silage making, and to determine strategies of silage making to improve the nutrition of milking animals for small-scale farmers in Benue State. Three research questions and null hypotheses were raised and tested at 0.05 level of significance. The design for the study was survey research design. The population was 190 respondents which was used as sample size. The instrument for data collection was a structured questionnaire titled: Silage Making to Improve Nutrition of Milking Animals Questionnaire (SMINMAQ).The instrument was validated by three experts. The reliability of the instrument was done by administering 30 copies of the questionnaire to 10 lecturers and 20 agricultural extension agents; the data collected was subjected to reliability analysis using Cronbach (α) technique of estimating the internal consistency of the instrument. The reliability coefficient of 0.77 was obtained, which indicates that questionnaire items were valid for the study. The data collected analyzed using both descriptive statistics of mean and standard deviation and t-test was used for testing hypotheses. The findings revealed that all the silage makes activities, reasons for non-adaptation and strategies to manage silage making to improve the nutrition of milking animals for small-scale farmers in Benue State. The null hypotheses of no significant difference tested at 0.05 level was not rejected when the P-value was greater or equal to 0.05 while rejected when the P-value was less than 0.05 level of significance. Based on the findings, the following recommendations were made; training activities and programmes as farm visit field days and workshop/seminars for small-scale farmers' be examined to educate them on silage making; to determine reasons for adaptation silage making; research to be conducted on the strategies to manage silage making to improve the nutrition of milking animals for small-scale farmers' in Benue state, Nigeria.

Keywords: Silage-making, Silage, Smallholder farmers, livestock, Ensiling

Introduction

For smallholder farmers with limited production capacity to improve the nutrition of milking animals as finding enough feed in the winter months to maintain good milk production is always a problem. According to Nyoni, Titterton, Hamudikiwanda, and Mutisi (2000) explain that many farmers are a force to buy silage just to keep their animals alive and are unable to benefit due to the higher prices paid for animal feed in the winter months. FAO **(**2009) stated that during the cold and continental winter the major fodders available are wheat or maize straw, together with hay and concentrated feeds. It further explains that as a minimum, it is essential to provide a green fodder supplement to enhance rumen function for bovine animals. Therefore, one should develop winter fodder crops as silage in improving the nutrition of milking animals. In view of Mugweni (2000), silage is forage which has been grown while still green and nutritious can be served through a natural 'pickling' process. The author further explains that lactic acid is produced when the sugars in the forage plants are fermented by bacteria in a sealed container ('silo') with no air. Forage conserved this way is known as ensiled forage or silage and will keep for up to three years without deteriorating. In the context silage is a fermented, high-moisture stored fodder which can be fed to cattle, sheep and other such ruminants (cud-chewing animals). In

other words, Silage is pasture grass that has been pickled and it is a method used to preserve the pasture for livestock to eat later when natural pasture is not palatable in the dry season.

According to Murdoch (2011), the making of silage was first made from Bana grass and the quality of the silage was very good and Bana grass was increased from 0.5 ha to 2 ha and the fodder-maize, Bana grass was intercropped with velvet beans. The author further explained that the intercropping of silage materials increases the protein content and so the nutritive value of the silage made out of it. Thus, the quantity of silage being made has been on the increase and the milk production during the dry season has been maintained at a good level and manure collected from the manure pit at the milking parlor was applied to the fodder as a basic fertilization. Mhere, Maasdorp and Titterton (2009) assert that to overcome periods of scarcity of green forage, in particular, the dry season, fodder can be preserved by turning it into silage. The authors' further explain that the process of silage making is based on fermentation. Bacteria, which are present in the air and on the crop, produce acid and the pH of the grass rapidly decreases to a value of approximately 4.2. This prevents decomposing and deterioration of the fresh grass and allows it to keep its quality. Garg, Bhandari, and Sherasia **(**2007) state that to enable this process sufficient soluble carbohydrates (sugars) should be available for the acid production, to provide these it is recommended to add molasses which are rich in sugar to the fodder and this enables the bacteria to produce acids immediately. The authors posit further that Leguminous fodders, which are rich in proteins and low in sugars, are therefore difficult to ensile. However, to allow the bacteria to grow, air (oxygen) should be expelled that is why the fodder is heaped and pressed. Titterton and Bareeba (2009) assert that to facilitate pressing for the process of ensiling, it is advisable to chop the green fodder and prevent air to enter at a later stage, the silage heap is covered with plastic sheets and a layer of soil, which takes about 60 days for the silage to mature. After that, it is ready for feeding. Thus, if there is no leakage of air or water occurs, the silage can remain for several years, without losing its quality. According to Murdoch (2011), enumerates four methods to produce and store the silage: in a pit, a trench, a tower and for small quantities in sacks. The author explains that silage trench preferably should be located at a place with a higher elevation to avoid rainwater to enter into the trench and the same time care should be taken that it is close to where the animals are kept to avoid much labor during feeding. FAO (2009) explain that silage making suitable materials are crops such as maize, sorghum, pearl millet, cow candy, oat, and Napier/Bana grass is very good for ensiling. Its further explain that these contain fermentable carbohydrates (sugar), which is necessary for bacteria to produce sufficient acid and thus, acid acts as a preservative. The fodder which is used for silage should not be too wet and if it contains more than 70% water is advisable to wilt it in the sun first. The dry matter of the material should preferably be in the range of 30-35%. To get an indication whether the right content has been reached, a small bundle of the fodder can be taken, wrung with 2 hands and if no moisture comes out, it is ready to ensile. Food and Agriculture Organization of the United Nations (2014) states that ensiling is of pressing the fodder to expel maximum air out of the material and the crops for silage, like maize, should be harvested at bloom stage (milk stage) to achieve an optimal feeding quality. It further explains that to ensure good ensiling process additives like molasses, common salt, formic acid or chopped sugarcane can be mixed with the fodder. Thus, an additive provides the best conditions in the fodder to enable a good fermentation process, which provides quality silage for feeding livestock.

According to Smith (2001), livestock is recognized as being an integral component of the mixed farming systems that predominate in developing countries in the tropics, of which many are in Africa. The author further states that animal manure and traction make the land more productive than it would be the case in their absence. Yet it has been recognized with equal force that livestock owned in the semi-arid regions, which predominate in most of the African countries, are forced to barely subsist on poor and sparse vegetation in the dry season, leading to severe loss of body condition, productivity and fertility and on the land, the threat of desertification. International Livestock Research Institute, (2015) asserts that in the smallholder farming system is the production of forage and fodder often a sideline activity that is integrated with other areas of agricultural production (International Livestock Centre for Africa "ILCA", 2012).Technologies aimed at achieving a balance, whereby livestock can increase productivity, so enhancing wealth for the livestock owner, while resource degradation is minimized,

must be developed (FAO, 2009). In the semi-arid regions of Africa, smallholder dairying generates a more regular income than any other rural enterprise and can lead to improved human nutrition and health, poverty alleviation and improvement of household food security (ILRI, 2015).

In view of National Sample Survey Organization(NSSO, 2007) state that during the rainy season in Nigeria, despite erratic rains lasting in general from November through March (five months) the supply and quality of forage (normally as grazing on natural pasture or veld) are usually adequate for milk production from the indigenous and cross-bred cow (Nyoni et al., 2000). The remaining seven months, however, leave a large deficit inadequate nutrient supply for the production animal. Small ruminants (goats, sheep and donkeys) are able to subsist on the poor winter grazing, crop residues (sorghum and maize straw) and browse, as are cattle herd followers such as winners and young oxen. The dairy cow, the traction animal and the finishing steer, however, which are more productive, and which represent opportunity for wealth for the livestock owner, require a much higher plane of nutrition (Kannan, Garg and Mahesh**,** 2011). NSSO (2007) posit that traditional smallholder dairy production is characterized by low levels of milk production, long calving intervals, of two years or more and short lactations. Hence the availability of milk for local markets is erratic, as is income for the farmer. There are three major reasons for this: the high cost of commercially produced stock feed, putting this source of feed beyond the reach of smallholders; the lack of adequate, good quality forage in the dry season; and the breed of cow. However, extensive research needs to carry out to find technologies which would enable the farmer to plan ahead and strategically manage the feeding of their livestock.

Statement of Problem

Traditional smallholder dairy production is characterized by low levels of milk production, long calving intervals, of two years or more and short lactations. Hence the availability of milk for local markets is erratic, as is income for the farmer and high cost of commercially produced stock feed, putting this source of feed beyond the reach of smallholders and lack of adequate good quality forage in the dry season and the breed of cow. Nevertheless, one such technology is the conservation of forage production during the wet season, for feeding to stall fed or partially zero-grazed livestock during the dry season. Improving the nutritional value of crop residues through physical and chemical treatment, improved management of grazing and the use of by-products by the peri-urban farmer can contribute to the forage bank. The conservation of high-quality forages, however, may be the only such technology that would satisfy the high demand for nutrients for such livestock operations as small-scale dairy farms in the semi-arid regions of the tropics and for traction which commences in the dry season. Hence, this technology has been a problem for the small-scale farmers' to adapt to complement the improve nutrition of milking animals for small-scale farmers. Thus, this necessitate the researchers to determine the process of Silage Making to improve the Nutrition of Milking Animals for Small Scale Farmers' in Benue State

Purpose of the Study

The purpose of the study was silage making to improve the nutrition of milking animals for small-scale farmers' in Benue state. Specifically, the study sought to determine:

1. silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue state;
2. reasons for non-adoption of silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue state; and
3. strategies to manage silage making to improve the nutrition of milking animals for small-scale farmers' in Benue state.

Research Questions

1. What are silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue state?

2. What are the reasons for non-adoption of silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue state?
3. What are the strategies to manage silage making to improve the nutrition of milking animals for small-scale farmers' in Benue state?

Statement of Research Hypotheses

1. There is no significant difference in the responses of extension agents and colleges of education lecturers on the of silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue state
2. There is no significant difference in the responses of extension agents and colleges of education lecturers on the methods of non-adoption to improve the nutrition of milking animals for small-scale farmers' in Benue state
3. There is no significant difference in the responses of extension agents and colleges of education lecturers on the strategies to manage silage making to improve the nutrition of milking animals for small-scale farmers' in Benue state

Methodology

Survey research design was used for the study. The research design involved the use of a questionnaire to gather large-scale data from a representative sample of the population. The study area was Benue state. The purposive technique was used to select a sample of 190 respondents for the study. The respondents comprised of 100 agricultural extension workers and 90 lecturers in Department of Vocational Agriculture of the two public colleges of education located at Katsina-ala and Oju Local Government Areas of Benue State. The whole population involved because the sample size was manageable. The instrument used for data collection was 39 items structure questionnaire title: Silage Making to Improve Nutrition of Milking Animals Questionnaire (SMINMAQ) developed from the literature review of the study. The questionnaire had four-point scale response options of strongly agree (SA), agree (A), disagree (D) and strongly disagree (SD), with a corresponding value of 4, 3, 2 and 1 (10/4=2.50) respectively. Three experts validated the instrument by looking into the content of the questionnaire items. One from the Department of Vocational Agriculture and Technology Education, University of Agriculture, Makurdi and Two from Department of Agricultural Education, Colleges of Education located at Katsina-ala and Oju Local Government Areas of Benue State. Their corrections and suggestions were effected on the initial draft to produce the final copy of the instrument. 30 copies of MINMAQ was administered to the 10 lecturers of the college of education Jalingo and 20 agricultural extension agents in Taraba state and retrieved, to trial test the internal consistency of the questionnaire items. Cronbach alpha coefficient of 0.77 was obtained indicating that internal consistency of the questionnaire was reliable and valid for use. One hundred and ninety (190) copies of the questionnaire were administered to the respondents with the help of three research assistants who were given the orientation on how to administer and retrieved back as they were familiar with study area. The questionnaire administered to the respondents were retrieved by the research assistants and handed over to the researchers and the data collected was subjected to analysis. The results were interpreted using means and standard deviation. The benchmark was 2.50 for decision-making and any item with a mean value of 2.50 or above was considered agreed while any item with a mean value less than 2.50 was considered not agreed. Testing the hypothesis of no significant difference was not rejected for any item that P-value was equal or greater than alpha value of 0.05 level significance while null hypothesis of no significant difference was rejected for any item whose P-value was less than the alpha value of 0.05 level of significance at 188 degrees of freedom. The results obtained were from the research questions answered and hypotheses tested through the collection and analyzed data as in the tables below.

Table 1: Mean and t-test Analyzes of Silage Making Activities to Improve the Nutrition of Milking Animals for Small Scale Farmers' in Benue state (N=190)

S/N	Item statement	$\ddot{X}_1$	S_1	$\ddot{X}_2$	S_2	t-cal	Remarks	Ho
1	Silage making as a form of fodder conservation	3.83	.46	3.90	.30	.22	Agreed	NS
2	Silage crops include grasses, maize, and forage sorghum varieties	3.81	.43	3.85	.36	.45	Agreed	NS
3	Horizontal ground silos like wooden, concrete bunkers, earthen trenches, and surface stacks	3.78	.41	3.83	.38	.43	Agreed	NS
4	Plastic bags and drums are also used receptacles for silage making	3.74	.44	3.73	.45	.89	Agreed	NS
5	High-quality silage which provides good nutrition for milking animals was first made from Bana grass	3.80	.43	3.79	.41	.93	Agreed	NS
6	Horizontal silos have been used for grass, maize and forage sorghum ensilage activities	3.77	.56	3.74	.56	.69	Agreed	NS
7	Bunker silos range in size fromthe small-scale, 4-m square, to large-scale	3.83	.57	3.76	.47	.36	Agreed	NS
8	Permanent twin-walled concrete bunkers measuring 13 m × 5 m, with walls 125 to 175 cm high.	3.68	.67	3.63	.49	.54	Agreed	NS
9	Mechanized film wrapping of small round grass bales to produce silo-wrapped grass silage is also carried out	3.85	.69	3.81	.39	.66	Agreed	NS
10	Silage making activities with the larger, twin-walled bunkers are highly mechanized	3.91	.75	3.82	.39	.30	Agreed	NS
11	Packing and compaction is achieved by the pressure of the wheels of a heavy-duty tractor, driven systematically over the heap	3.95	.83	3.85	.36	.26	Agreed	NS

Key: $\ddot{X}_=$ Mean, *S*=Standard Deviation, t-cal=t-calculated, NS=Not Significant

Data presented in Table 1 revealed that all the 11 items had their mean values ranged from 3.63to 3.95, which were above the benchmark of 2.50. This indicates that the respondents agreed with the 11 items are to improve the nutrition of milking animals for small-scale farmers' in Benue state. Thus, small-scale farmers require silage making activities in the study area. The standard deviation of the responses of the respondents on items ranged from 0.30 to 0.85, indicating that respondents were not far from the mean and the option of their responses. The data on the hypothesis in Table 1 revealed that all the 11 items had the P-values ranged from 0.22 to 0.93 which were greater than the P-value of 0.05. This indicates that there was no statistically significant difference in the mean ratings of Lecturers of colleges and agricultural extension agents on silage making activities for small-scale farmers in Benue State Nigeria. Therefore, the null hypothesis of no significant difference between two groups was not rejected on the 11 items.

Table 2: Mean and t-test Analyzes of Reasons for Non-Adoption of Silage Making Activities to Improve the Nutrition of Milking Animals for Small Scale Farmers' in Benue state (N=190)

S/N	Item statement	$\ddot{X}_1$	S_1	$\ddot{X}_2$	S_2	t-cal	Remarks	Ho
1	Most of the farmers felt that benefits were not commensurate with effort and time involved.	3.86	1.04	3.73	.66	.25	Agreed	NS
2	Farmers realized that the lack of good quality roughage in the dry season was their main constraint	3.51	1.27	3.38	.80	.38	Agreed	NS
3	The cost involved and trouble of silage making did not provide sufficient return	3.45	1.37	3.35	.81	.51	Agreed	NS
4	There was no surplus fodder in rain fed areas for ensiling.	2.82	1.81	2.74	1.20	.73	Agreed	NS
5	Fodder production was mainly carried out in winter where legumes are grown in small plots and these did no tensile well.	3.84	1.39	3.65	.48	.21	Agreed	NS
6	Inadequate irrigation facilities by farmers to grow 2-3 crops of fodder and feed these fresh.	3.95	1.51	3.79	.54	.32	Agreed	NS
7	Surplus grasses were available in some rain fed areas but its ensiling was too labor intensive	3.65	1.63	3.49	.50	.37	Agreed	NS
8	Most farmers preferred traditional practice by drying and storing good quality fodder	3.98	1.71	3.79	.54	.31	Agreed	NS
9	Most farmers report that due to the flavor of silage it took time for some animals to adapt the feed.	3.97	1.79	3.85	.36	.54	Agreed	NS
10	farmers considered the recommended process of silage making to be cumbersome	3.85	1.96	3.77	.47	.69	Agreed	NS
11	Farmers have insufficient materials available locally to be ensiled	3.10	2.20	3.62	.62	.03	Agreed	S

Key: $\ddot{X}$= Mean, *S*=Standard Deviation, t-cal=t-calculated, NS=Not Significant, S=Significant

Data presented in Table 2 has shown that all the 11 items had their mean values ranged from 3.10 to 3.98, which were above the benchmark of 2.50. This indicates that the respondents agreed with the 11 items are to improve the nutrition of milking animals for small-scale farmers' in Benue state. Thus, small-scale farmers reasons of non-adoption of silage making activities were due to cost and cumbersome process involved silage making in the study area. The standard deviation of the responses of the respondents on 11items ranged from 0.36 to 2.20, indicating that respondents were not far from the mean and the option of their responses. The hypothesis in Table 2 revealed that 10 items had the P-values ranged from 0.21 to 0.73 which were greater than the P-value of 0.05, while eleventh (11) item of P-value of 0.03 is less than P-value of 0.05. This indicates that there was no significant difference in the mean ratings of lecturers of colleges and agricultural extension agents for 10items on the reasons of non-adaptation of the silage making activities for small-scale farmers in Benue State Nigeria while was a significant difference on the eleventh(11) item. Therefore, the null hypothesis of no significant difference between two groups was not rejected on the 10 items, while it was rejected on the eleventh (11) items in Table 2.

Key: $\ddot{X}_=$ Mean, SD=Standard Deviation, t-cal=t-calculated, NS=Not Significant, S=Significant

Table 3: Mean and t-test Analyzes of Strategies to Manage Silage Making to Improve the Nutrition of Milking Animals for Small Scale Farmers' in Benue state (N=190)

S/N	Item statement	$\ddot{X}_1$	S_1	$\ddot{X}_2$	S_2	t-cal	Remarks	Ho
1	Short and longer-term planning strategies can help manage that expense of silage making	3.27	.28	3.64	.48	.13	Agreed	NS
2	Farmer should be knowledgeable providing at least 30% of the total dry matter that a dairy farm is going to use in one year	3.59	.37	3.69	.58	.70	Agreed	NS
3	Producing enough good-quality corn silage is critical for the profitability of dairy farms.	1.90	.64	3.19	1.16	.00	Agreed	S
4	Perfect time to start planning for this season and next season is when materials available	4.08	.39	3.82	.41	.30	Agreed	NS
5	Farmer should know the current stocks of all your forages	3.89	.60	3.67	.47	.42	Agreed	NS
6	Create a forage budget that outlines your short-term needs from now to six months out	3.92	.67	3.76	.43	.57	Agreed	NS
7	Create a forage budget that outlines your longer term for the next 12-18 months	3.91	.82	3.77	.55	.64	Agreed	NS
8	Farmer should know forages in stock to be harvested	2.66	.29	3.61	.90	.16	Agreed	NS
9	Farmer should plan his cropping strategy	2.50	.37	3.45	1.00	.48	Agreed	NS
10	Farmers should understand how important it is to plant corn at the right time, in the best conditions possible	2.55	.45	3.15	.99	.11	Agreed	NS
11	Discuss the best planting density with your agronomist	2.53	.53	3.08	1.02	.91	Agreed	NS
12	Silage yields and quality at different plant densities can be tested	4.07	.26	2.83	1.21	.01	Agreed	S
13	Higher yields are obtained without sacrificing nutritional quality by putting a little more seed into the field	4.06	.37	3.71	.46	.32	Agreed	NS
14	Strategy to consider your best field is to replenish your forage reserves	2.61	.86	3.49	1.02	.35	Agreed	NS
15	Strategically plan your hybrid selection and planting date	3.90	.60	3.82	.37	.84	Agreed	NS
16	Plan the seeding time so the early kernel development of the crop does not occur during times of maximum daily temperatures	4.25	.67	3.60	.49	.12	Agreed	NS
17	A substantial kernel abortion rate of the crop can occur at high temperature 95°F.	3.91	.82	3.77	.55	.33	Agreed	NS

Data presented in Table 3 has shown that all the 17 items had their mean values ranged from 2.53 to 4.25, which was above the benchmark of 2.50. This indicates that the respondents agreed with the 17items are strategies to manage silage making to improve the nutrition of milking animals for small-scale farmers' in Benue state. Thus, small-scale farmers require strategies to manage silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue state. The standard deviation of the responses of the respondents on 17items ranged from 0.26 to 1.16**,** indicating that respondents were not far-fetched from the mean and options of their responses. The hypothesis in Table 3 revealed that 15items had the P-value ranged from 0.12 to 0.91 which was greater than the P-

value of 0.05, while third and twelfth (3rd and 12th) items of P-value of 0.00 and 0.01 are less than P-value of 0.05. This indicates that there was no significant difference in the mean ratings of lecturers of colleges and agricultural extension agents for 15th items on the strategies to manage silage making to improve the nutrition of milking animals for small-scale farmers while there was a statically significant difference between the third and twelfth (3rd and 12th) items. Therefore, the null hypothesis of no significant difference between two groups was not rejected on the 15th items, while it was rejected on the third and twelfth (3rd and 12th) items in Table 3.

Discussion of Results

The result in Table 1 showed that all the 11items of the silage making activities are required to improve the nutrition of milking animals of small-scale farmers in the Benue state of Nigeria. Since the responses of respondents agreed with all 11items, this indicates mean values are above the benchmark of 2.50. The result also indicates that there was no statistically significant difference between the mean responses. Thus, the respondents agreed that the silage making activities to improve the nutrition of milking animals for small-scale farmers. These statements are in agreement with views of FAO **(**2009) that during the cold and continental winter the major fodders available are wheat or maize straw, together with hay and concentrated feeds. Its further explains that as a minimum, it is essential to provide a green fodder supplement to enhance rumen function for bovine animals. Therefore, one should develop winter fodder crops as silage in improving the nutrition of milking animals. FAO (2014) also submits that for smallholder farmers with limited production capacity, finding enough feed in the winter months to maintain good milk production is always a problem. Many are forced to buy hay, concentrates or silage just to keep their animals alive and are unable to benefit due to the higher prices paid for animal feeding the winter months.

The finding in Table 2 has shown that there are 11items, indicating the reasons for non-adoption of silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue state. Hence the respondents agreed with all the 11items in above table, with their mean values of 2.50 as the benchmark. The results also revealed that there was a significant difference in the mean rating of the responses of the two groups on the 10items, which P-values were greater than alpha value of 0.05 level of probability while the P-value of the eleventh (11th) item 0.03 is less than an alpha of 0.05 level of significance. For the null hypotheses was not rejected for the ten (10) items while that of the eleventh (11th) item was rejected. This indicates that there are reasons for non-adoption of silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue state. This is an obvious indication that small-scale farmers require having adequate competencies in other to adopt or explore silage making activities to improve the nutrition of milking animals for small-scale farmers in the study area. The findings agree with the view of FAO (2014). The dairy industry was facing viability problems when the smallholder dairy sector was introduced. Due to pre-independence government policies of separate development, improved technologies on dairy production were targeted for the large-scale commercial dairy sector. The essential skills for dairying were lacking among the smallholder farmers when the market-oriented smallholder dairy programme was set up. Therefore, the thorough orientation and training to adopt silage making for nutrition of milking animals for small-scale farmers are required in the study area.

The finding in Table 3 has revealed that there are 17items, indicating the strategies to manage silage making to improve the nutrition of milking animals for small-scale farmers' in Benue state. Thus, the respondents agreed with all the 15items in the table are strategies to manage silage making. The results also show that there was no significant difference in the mean rating of the responses of the two groups on the 15items, which their P-values were greater than alpha value of 0.05 level of probability while the P-value of the two items (item 3rd and 12th) 0.00 and 0.01 are less than alpha of 0.05 level of significance. For the null hypotheses was not rejected for the fifteen (15) items while that of item third and twelfth (3rd and 12th) was rejected. This confirmed strategies to manage silage making to improve

the nutrition of milking animals for small-scale farmers' in Benue state. This is obvious that small-scale farmers require mastering adequate strategies to manage silage making activities to improve the nutrition of milking animals for small-scale farmers in the study area. The findings agree with the view of International Livestock Research Institute (2015) feed is the biggest expense for a dairy producer, but short- and longer-term planning strategies can help manage that expense. The dry matter corn silage that a dairy farm will use in one year accounts for about 30% of the total feeding cost. Its further states that dairy management specialist produce enough good-quality corn silage which is critical for the profitability of dairy farms. Bah **(**2010) supports that planning for the seasons for silage making for nutrition of milking animals require essential skills, which were inadequate among the smallholder farmers when the market-oriented smallholder dairy programme was set up. Therefore, the thorough orientation and training to adopt silage making for nutrition of milking animals for small-scale farmers are required in the study area.

Conclusion and Recommendation

It was established that silage making to improve the nutrition of milking animals for small-scale farmers' in Benue State is required and therefore, of importance that regular workshops/seminars for farmers' development program be provided for small-scale farmers' to ensure that they are relevant and up-to-date with contemporary issues of silage making activities and awareness to adopt silage making strategies, planning, and management of available resources to improve the nutrition of milking animals for small-scale farmers' in the study area Benue state.

This would adequately empower small-scale farmers for quality service delivery for sustainable silage making activities to improve the nutrition of milking animals for earning income and protein need as market demand increases in the study area. The study revealed that 11items on silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue state, 11items on the reasons for non-adoption of silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue state and 17items strategies to manage silage making to improve the nutrition of milking animals for small-scale farmers' in Benue state, Nigeria.

Based on the findings of the study, it was recommended that:

1. Extension agents should organize training activities and programmes as farm visit field days and workshop/seminars for small-scale farmers to educate them on silage making to improve the nutrition of milking animals for small-scale farmers' in Benue State, Nigeria;
2. Extension agents should convince farmers on the reasons for adapting silage making activities to improve the nutrition of milking animals for small-scale farmers' in Benue State, Nigeria**;** and
3. researchers should identify more strategies to manage silage making to improve the nutrition of milking animals for small-scale farmers' in Benue state, Nigeria.

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