Online Journal of Animal and Feed Research

An International Peer-Reviewed Journal which Publishes in Electronic Format

Volume 4, Issue 6, November 2014

ISSN 2228-7701

Online Journal of Animal and Feed Research

An international peer-reviewed journal which publishes in electronic format (online)

Online J. Anim. Feed Res., Volume 4, Issue 6: pp. 137-163; Nov 2014

Online Journal of Animal and Feed Research (OJAFR)

ISSN: 2228-7701
Frequency: Bi-monthly
Current Volume: 4 (2014)
Current Issue: 6 (25 November)
Next Issue: 25 March 2015

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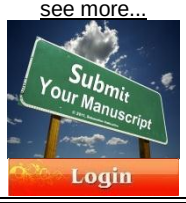

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Publisher Item Identifier (pii) / Research Title	Article Information / Abstract	Download
pii: S222877011400025-4 **On-farm evaluation of broilers for their adaptability and productivity at small holder level in Bahir Dar city, Ethiopia** 	**Original Research, D25** **Moges F, Nega M, Asefa H/M, Yetayew A, Zeleke G.** ***Online J. Anim. Feed Res.*, 4(6): 137-143, 2014.** **ABSTRACT:** Broiler introduction and adaptation trial was done at Bahir Dar city in the year 2011/2012. The major objective of the trial was to introduce broiler breeds in to the region and evaluate their performance at smallholder level. A total of 1100 day old chicks of Hubbard Classical breed were purchased from Debre Zeit Agricultural Research Center and transported to Bahir Dar. Each participant received, on average, 109 day old chicks and 400kg started and finisher feed. Brooding was done using electrical brooder. Finished broilers were sold live and in processed form after six weeks of age. The average weight old day old chicks was 45.5g. The average weight of birds at end of 1st, 2nd, 3rd, 4th, 5th and 6th weeks were 136g, 364g, 711g, 1174g, 1665g and 2092g, respectively. The average final weight was 2092g (ranged 1957g - 2216g). The average cumulative mortality was 4.8% (Ranged 1.9%-6.5%). The average daily feed intake and cumulative feed intake of each bird during the entire period was 99g and 4052g, respectively. The average FCR was 1.84. The partial budget analysis result indicated that broiler production was profitable with a net benefit of 10.75 Eth Birr/head and 19.3 Ethi0pian Birr/kg, respectively. The result showed that participants who sold processed broiler meat fetched 8.6 Eth Birr/kg more than those participants who sold live birds. The survey result indicated that all participants were highly satisfied by the breed. According to the producers; the breed has paramount merit than other chicken breeds like; very fast growth, high meat production and short rearing period. The higher final body weight, the lower mortality, higher profitability and higher market demand revealed that broilers could be reared at small holder level in big cities like Bahir Dar. The result of the trial showed that actions should be taken to solve the prevailing constraint including; lack of day old chicks and quality feed. One of the main lessons we learned from this trial was that we need to improve access of inputs to small holder producers so as to make broiler production sustainable in the region. **Keywords:** Broilers, Hubbard Classical, Small Holder Producers	PDF Watch Online
pii: S222877011400026-4 **Estrus Synchronization and Twinning Rate of Ghezel Ewes Treated with CIDR and PMSG During the Breeding Season** 	**Original Research, D26** **Najafi Gh, Cedden F, Mojtahedi S, Aliverdinasab R.** ***Online J. Anim. Feed Res.*, 4(6): 144-149, 2014.** **ABSTRACT:** The objective of this study was to investigate the efficacy of used controlled internal drug release devices (CIDR) and different doses of PMSG on estrus synchronization in Ghezel ewes. This investigation was conducted in 77 fat-tailed Ghezel ewes during the breeding season. All animals were divided randomly into four groups then a single intramuscular (IM) injection of PMSG (group 1, 350 IU, n=20; group 2, 450 IU, n=20; group 3, 550 IU, n= 20), group 4 (n=17) was made apart from 1 ml normal saline solution which was used as control group at time of CIDR removal . Estrus responses were similar in all groups (group 1, 100%; group 2, 90%; group 3, 95%; control group, 82.35%). There were no significant differences (P>0.05) between the treatment groups and the control group regarding the onset of estrus or estrus response. Pregnancy rates were 85%, 90%, 95% and 64.7% in groups 1, 2, 3 and the control group, respectively. Pregnancy rates were higher in groups 1, 2 and 3 than in control group (P<0.05). Lambing rates were obtained as 80%, 90%, 90% and 58.8% in groups 1, 2, 3 and in control group, respectively. Differences between the treated and the control animals in the Lambing rates were significant (P<0.05). Using PMSG at CIDR withdrawal increased twinning rate from 10% in control group to 33.3% in group 3, 550 IU. There were significant differences (P<0.05) between the treatment groups and the control group regarding the gestation period and the birth weight. Differences between the treated and the control animals in the Plasma P4 levels at day estrus after PMSG treatment and 30th day of pregnancy were significant (P<0.05). Plasma P4 levels at 30th day of pregnancy was 0.94ng/ml, 1.1ng/ml, 1.24ng/ml and 0.82ng/ml in groups 1, 2, 3 and the control group, respectively. **Keywords:** Estrus synchronization, Ghezel Ewe, CIDR (controlled internal drug release devices), PMSG (pregnant mare serum gonadotropin), P4 (Progesterone)	PDF Watch Online
pii: S222877011400027-4 **Livestock feeds and feeding system in Enset (Ensete ventricosum) dominated mixed farming system of southern Ethiopia**	**Original Research, D27** **Menbere Afele S.** ***Online J. Anim. Feed Res.*, 4(6): 150-158, 2014.** **ABSTRACT:** This study was conducted to identify the livestock feeds resources, feeding systems, feed related problems and the determinant factors under smallholder farmers' livestock production system in the Sidama zone of Southern Nations, Nationalities and People's Region (SNNPR) of Ethiopia. A total of 135 sample household heads which represents about 10 percent of the household heads in the two study districts (Shebedino and Dale) were included in the study. According to the order of importance, natural grazing/scavenging, crop residue and purchased feeds from market/other farmers were the major (X2=1078.103, p<0.001, n=553) feed resources used to fed different livestock species/classes in the area. Due to the economic importance difference among species/classes, the provision priorities of each particular feed resource were also significantly different. Especially the provision disparity was more (X2=302.96, p<0.001) pronounced for crop residue for which male cattle (oxen and young bulls) get top priority than natural pasture (X2=157.48, p<0.001) on which other species/classes are highly dependent and purchased feed (X2=62.29, p<0.001) by which the scavenging poultry production is subsidized. In feed	PDF Watch Online

production, conservation and treatment aspects, growing of improved forages is not common practice in the area and majority about 57.0% (n=77) of farmers have not grown improved forages (X2=4.28, p<0.001), considerable 63.7% (n=86) and limited 25.9% (n=35) of farmers have also practiced feed conservation (mainly maize Stover and elephant grass) (X2=15.96, p<0.001) and crop residue treatment (mostly add and mix salt) (X2=33.34, p<0.001), respectively. Grazing land is a scares resource in the livestock production sub-system of the area and only about 34.1% (n=46) of the farmers in the study area posses private grazing land with an average holding of 0.073±0.014 ha. Land shortage, feed shortage and population pressure were identified as major (X2=132.09, p<0.001) problems in related with feed availability in the area. The extent of land shortage (X2=10.595, p<0.01) and population pressure (X2=14.016, p<0.001) problems were different between farmers at the two study districts.

Keywords: Crop residue, Feed resource, Natural pasture, Priority, Sidama zone, SNNPRS.

pii: S222877011400028-4

The effects of supplementation rations on milk yield, body condition score and calves weight of Fuja cows

Original Research, D28
IDRIS A, Tibin I , Elbukhari H, Bakheet S, Zariba S and Hamid A.
***Online J. Anim. Feed Res*., 4(6): 159-163, 2014.**

ABSTRACT: This study was conducted in Western Sudan to evaluate the effects of supplementation on productive performance of Fuja dairy cows (local breed) and their calves. Forty lactating Fuja cows and their calves were selected on the basis of approximate similarity in age and live weight, the cows and their calves were randomly assigned into four groups (each group consisting of 10 cows). The diets were also randomly assigned to each of the four groups of the animals. The rations were fed after grazing at the rate of 2 kg per cow per day, during adaptation period of two weeks followed by the experimental period. Data collection of body condition score (BCS), milk yield and body measurements were carried out monthly for each new born calf to assess chance in body weight (BWT), body height (BH), body length (BL) and heart girth (HG). The results of the study indicated that milk yield was improved by supplementation, body condition score and parity number had significant (P≤ 0.05) effect on lactation curve. Body measurements were also affected by the sex of the calf. Strategic supplementary feeding of Fuja dairy cows increased milk yield. The treatment also reduced cows body condition loss (P<0.05) and caused no cows mortality. Therefore from the study result, it was possible to concluded that supplementation with molasses are essential for improving Fuja dairy cows and their calves' performance in range land of Western Sudan.

Keywords: Supplementation, Cows, Calves, Milk Yield, Body Measurements, Body Condition, Sudan

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Online Journal of Animal and Feed Research

Volume 4, Issue 6: 137-143 (2014) *ISSN 2228-7701*

ON-FARM EVALUATION OF BROILERS FOR THEIR ADAPTABILITY AND PRODUCTIVITY AT SMALL HOLDER LEVEL IN BAHIR DAR CITY, ETHIOPIA

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ABSTRACT*:* Broiler introduction and adaptation trial was done at Bahir Dar city in the year 2011/2012. The major objective of the trial was to introduce broiler breeds in to the region and evaluate their performance at smallholder level. A total of 1100 day old chicks of Hubbard Classical breed were purchased from Debre Zeit Agricultural Research Center and transported to Bahir Dar. Each participant received, on average, 109 day old chicks and 400kg started and finisher feed. Brooding was done using electrical brooder. Finished broilers were sold live and in processed form after six weeks of age. The average weight old day old chicks was 45.5g. The average weight of birds at end of 1st, 2nd, 3rd, 4th, 5th and 6th weeks were 136g, 364g, 711g, 1174g, 1665g and 2092g, respectively. The average final weight was 2092g (ranged 1957g - 2216g). The average cumulative mortality was 4.8% (Ranged 1.9%-6.5%). The average daily feed intake and cumulative feed intake of each bird during the entire period was 99g and 4052g, respectively. The average FCR was 1.84. The partial budget analysis result indicated that broiler production was profitable with a net benefit of 10.75 Eth Birr/head and 19.3 EthiOpian Birr/kg, respectively. The result showed that participants who sold processed broiler meat fetched 8.6 Eth Birr/kg more than those participants who sold live birds. The survey result indicated that all participants were highly satisfied by the breed. According to the producers; the breed has paramount merit than other chicken breeds like; very fast growth, high meat production and short rearing period. The higher final body weight, the lower mortality, higher profitability and higher market demand revealed that broilers could be reared at small holder level in big cities like Bahir Dar. The result of the trial showed that actions should be taken to solve the prevailing constraint including; lack of day old chicks and quality feed. One of the main lessons we learned from this trial was that we need to improve access of inputs to small holder producers so as to make broiler production sustainable in the region.

Keywords: Broilers, Hubbard Classical, Small Holder Producers

ORIGINAL ARTICLE

Received 08 Oct. 2014

Accepted 20 Nov. 2014

INTRODUCTION

The poultry sector constitutes a significant contribution to human livelihood and food security of poor households (Abdelqader, 2007). In Ethiopia chickens are the most widespread and almost every rural family owns chickens, which provide a valuable source of food and cash income (Tadelle, 2003). The total chicken population in the country is estimated to be 49.2 million; with native chicken representing 97.3% from it (CSA 2010/11). The production system is based mainly on scavenging where birds are allowed to scavenge for major parts or all of their feed (Tadelle and Ogle, 1996).

Similar to the national system, the major proportion (>95%) of chicken production in Amhara Region is a traditional sector from which almost the whole chicken meat and egg production is produced. According to CSA (2010/11); the total chicken population of the region is estimated to be 14.01 million, accounting to 27.9% of the national chicken population.

In Ethiopian, like many African countries, attempts have been made at various times to improve village chicken production systems through introduction of exotic chicken breeds (Alemu and Tadelle, 1997). Distribution layers and duals purpose breeds has been one of the livestock extension packages accomplished by the Regional Bureau of Agriculture since the last 20 years aiming at improving chicken production and productivity. Despite this huge distribution of exotic chicken breeds, the contribution (adoption rate) of improved chicken in the current production system of the region is believed to be very low mainly due to high mortality rate of chicks (Teklewold et al., 2006).

A recent study on the adoption of exotic chicken breeds in the highlands of Ethiopia indicated that adoption has been limited by a set of factors such as; lack of strong extension follow up, poor awareness of chicken producers towards improved husbandry practices, lack of complimentary inputs, seasonal disease outbreak, lack of appropriate breed, unavailability of credit services, seasonal feed shortage and marketing problems (Tekelewold et al., 2006). In addition to the above constraints; lack of alternative chicken breeds like broilers has been one of the

To cite this paper: Moges F, Nega M, Asefa H/M, Yetayew A, Zeleke G. 2014. On-farm evaluation of broilers for their adaptability and productivity at small holder level in Bahir Dar city, Ethiopia. *Online J. Anim. Feed Res.*, 4 (6): 137-143.

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major problems which limit the supply and availability of chicken meat in the Region. Currently there are few commercial poultry farms involved in production and of broilers only in and around Addis Ababa area.

Every big hotels and super markets found in Bahir Dar city also had no any opportunity to get broiler meat inside the region other than these commercial farms. Small holder chicken producers found in the Region were not aware about the breed and its productivity. Therefore introduction and evaluation of this chicken breed under small holder level in the Region were mandatory. This trial was the basic step and contributes a lot for the current broiler production in the Region.

Objectives:

- To introduce broiler chicken breeds and evaluate their performance at small holder level.
- To study the perception of small holder producers and end users on production, processing and consumption of broilers.

MATERIALS AND METHODS

Study area and participants:

This trial was done at Bahir Dar city, Amhara Region. A total of 10 participants were selected in collaboration with Bahir Dar city urban agriculture office. Practical training was prepared and given to all participants on management of birds (feeding, health care, housing, etc.), chicken house construction and data collection. After the training, each participant constructed small-scale chicken house designed for 100 day old chicks and equipped with necessary husbandry equipments like; feeders, drinkers, brooder and brooder guard. The commercial feed was purchased from Alema Feed Company, Debre-Zeit, Ethiopia. Each participant received 400kg of feed (150kg starter and 250kg finisher). Based on the feed company information, the nutritive value of the feed is presented in table 1.

Table 1 - Nutritive value of the feed used for broiler adaptation trial

No.	Feed type	Nutritive Value								
		ME (KCal/kg)	CP (%)	Lys (%)	Meth (%)	M+C (%)	EE (%)	CF (%)	Ca (%)	P (%)
1	Starter Feed	3000	22	1.2	0.5	0.9	9	5	1	0.8
2	Finisher Feed	3100	19	1	0.4	0.8	10	5	0.9	0.7

Remark: ME=Metabolizable Energy, CP=Crude Protein, Lys=Lysine, Meth=Methionine, M+C=Methionine+Cystine, EE=Ether Extract, CF=Crude Fiber, Ca=Calcium, P=Phosphorus.

Figure 1. Pictures of some participants with their birds

Experimental Birds and Management:

A total of 1100 broiler day old chicks of Hubbard Classical breed were purchased from Debre Zeit Agricultural Research Center and transported to Bahir Dar city. Deep litter housing system was used and the litter was disinfected with formalin before receiving the day old chicks. Brooding was done using infra-red lamp for four weeks of age. Data collection formats were prepared and given to each participant so as to record all relevant data.

Disease prevention and control:

Routine vaccination against Newcastle and Gumborro diseases were given as recommended by the manufacturers. On top of this, strict bio-security measures were employed during the entire rearing period. Treatments for other diseases like Coccidiosis were given as it was occurred. Feed was supplied three times a day as recommended by the management guide of the breed.

To cite this paper: Moges F, Nega M, Asefa H/M, Yetayew A, Zeleke G. 2014. On-farm evaluation of broilers for their adaptability and productivity at small holder level in Bahir Dar city, Ethiopia. *Online J. Anim. Feed Res.*, 4 (6): 137-143.
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Data management and statistical analysis

The qualitative and quantitative data-sets were analyzed using appropriate statistical analysis software (SPSS, 2002). More specifically descriptive statistics and General Linear Model (GLM) were used for this study. The following linear model was used during analysis of quantitative data:

Model statement regarding the effect of age on mortality: $Y_{ij} = \mu + m_i + \varepsilon_{ij}$;

Where Y_{ij} is the chicken performance parameter estimate for bird j in age i, μ is the overall mean, m_i is the fixed effect of age in weeks (i=6; week1, week 2, week 3, week 4, week 5, week 6) and ε_{ij} is the residual error.

Data collected

The following data were collected from the trial: weight of day old chicks (g), weekly and cumulative mortality percentages, daily and weekly feed intake, cumulative feed intake, weekly and total body weight gain/bird (g), final weight of chicks (g), weekly and total feed conversion ratio (FCR), market price per chicks (live and processed), variable cost, total revenue (ETB), total gross margin (ETB), perception of participants and end users.

RESULT AND DISCUSSION

Growth performance

The average weight old day old chicks (DOC) at arrival was 45.5g (ranged 39.7g - 49.8g). The average final weight of chicks was 2094.3g (Table 2). The final weight obtained in this trial was lower than the genetic potential of the breed under ideal management system (2592g), (table 3). However; the result obtained in this trial was very promising, which fulfills the weight requirement of our end users (1kg-1.5kg carcass weight). The survey result showed that most hotels and super markets found in Bahir Dar city do not want a broiler meat weighing more than 1.5kg for preparation of Ariosto.

The average weight gain of birds at end of each week is presented in table 3. The minimum and maximum weights gain of birds at end of the trial was 1908.7g and 2176.5g, respectively. The highest weight gain was recorded at the end of the trial period, mainly at 5th week. The weight gain recorded in some participants at the final week was below the expected due to feed shortage.

Table 2 - Average weight of birds at end of each week (g)

Participant's code number	No of DOC received	Weight of DOCs	Av. weight end of 1st week	Av. weight end of 2nd week	Av. weight end of 3rd week	Av. weight end of 4th week	Av. weight end of 5th week	Av. weight end of 6th week
1	109	49.8	150.2	376.0	656.9	1303.5	1613.7	2068.6
2	108	47.5	134.0	400.0	728.5	1267.6	1595.0	1967.9
3	108	49.8	142.1	417.4	741.8	1262.7	1722.5	2226.3
4	110	47.8	136.2	362.1	708.8	1054.6	1480.7	2098.4
5	108	48.3	145.6	372.7	735.6	1245.5	1646.9	2063.3
6	114	48.4	137.8	363.1	681.8	1151.1	1505.5	1957.1
7	108	40.5	132.2	324.9	727.7	1118.5	1871.6	2201.0
8	108	40.7	130.0	344.2	701.7	1152.2	1731.6	2142.7
9	108	42.4	138.2	331.3	711.9	1084.3	1712.9	2002.9
10	108	39.7	136.2	369.7	737.7	1122.7	1793.1	2214.5
Mean	109	45.5	138.3	366.1	713.2	1176.3	1667.4	2094.3
±SD	±2	±4.1	±6.2	±28.6	±27.2	±86.6	±123.1	±100.2

Table 3 - Average weight gain of birds at end of each week (g)

Participant's code number	Av.wt. gain end of 1st week	Av.wt. gain end of 2nd week	Av.wt. gain end of 3rd week	Av.wt. gain end of 4th week	Av.wt. gain end of 5th week	Av.wt. gain end of 6th week	Total weight gain
1	100.4	225.8	280.9	646.6	310.2	454.9	2018.8
2	86.5	266.0	328.5	539.1	327.4	372.9	1920.4
3	92.3	275.3	324.4	521.0	459.8	503.8	2176.5
4	88.5	225.9	346.7	345.8	426.1	617.7	2050.7
5	97.3	227.1	362.9	509.9	401.4	416.4	2014.8
6	89.4	225.3	318.7	469.3	354.4	451.6	1908.7
7	91.7	192.7	402.8	390.8	753.1	329.4	2160.5
8	89.3	214.2	357.5	450.5	579.4	411.1	2102.0
9	95.8	193.1	380.6	372.4	628.6	290.0	1960.5
10	96.5	233.5	368.0	385.0	670.4	421.4	2174.8
Mean	92.8	227.9	347.1	463	491.1	426.9	2048.8
±SD	±4.5	±26.6	±35.1	±93.4	±156	±91.4	±102

Mortality of Birds

The result of the current study indicated that the average number of chicks died in the entire period was five. The minimum and maximum numbers of birds died were 2 and 7, respectively (table 4). The highest mortality rate

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(3.9%) was recorded at the first week. The average cumulative mortality percentage of birds was 4.8% (ranged1.9 - 6.5). According to the results, significantly ($p<0.05$) higher mortality percentage (4%) was recorded at the first week.

Mostly mortality level below 5% is expected in poultry farms and accepted as normal. This relatively low mortality is might be the result of timely application of vaccines /medications/ and better management of birds by participants. This low mortality percentage (<5%) was a very promising result and showed that broilers could be reared at smallholder level. The observed mortality rate (4.8%) was higher than the result obtained at Zimbabwe (2%) (Chimvuramahwe et al., 2011). It was also higher than the observed mortality result (0%) at Axum University Ethiopia (Gangwar et al., 2010) and 2.2% at Jimma, Ethiopia (A. Getinet et al, 2013).

Feed intake of Birds

The average daily feed intake of birds is presented in table 5. Accordingly; the average daily feed intake of birds during the entire period was 89.2g

The average cumulative weekly feed intake is presented in table 6. The total average cumulative feed intake of each bird was 3765.7g. The daily, weekly and cumulative feed intake of birds recorded in this trial was lower than the genetic potential of the breed. This might be due to several factors including; the feed quality, the climatic condition and general management of birds. It is well known that it is difficult to create an ideal management condition under small holder chicken production system.

Feed Conversion Ratio (FCR)

The average FCR was calculated by dividing the consumed feed by the weight gain at end of each week (Table 7). Accordingly; the cumulative FCR recorded in this trial was 1.84. This means that birds consumed 1.84 kg of commercial feed to produce 1kg of meat. It was higher than the genetic potential of the breed, which was 1.74. This relatively higher FCR (low efficiency) could be related to the feed quality, feed consumption, feed wastage and water consumption.

According to the results; significantly lower FCR (high feed conversion efficiency) was recorded at the second week. The lower efficiency (higher FCR) was recorded at the 6th week of production period and this indicated that it was not economical to extend the rearing period after 42 days.

T able 4 - Average number of birds died at each week and cumulative mortality percentage

Participant's code number	Number of birds died at1st week	Number of birds died at 2ndweek	Number of birds died at 3rd week	Number of birds died at 4th week	Number of birds died at 5th week	Number of birds died at 6th week	Total number of birds died & mortality %
1	4 (3.7%)	0	1	0	0	0	5 (4.6%)
2	5 (4.6%)	0	1	1	0	0	7 (6.5%)
3	5 (4.6%)	0	0	0	0	0	5 (4.6%)
4	6 (3.5%)	0	0	0	0	0	6 (5.5%)
5	6 (5.6%)	1	0	0	0	0	6 (5.6%)
6	4 (3.5%)	2	0	0	0	0	6 (5.3%)
7	2 (1.9%)	1	0	1	0	0	4 (3.7%)
8	5 (4.6%)	1	0	0	1	0	6 (5.6%)
9	2 (1.9%)	0	0	0	0	0	2 (1.9%)
10	4 (3.7%)	0	1	0	0	0	5 (4.6%)
Mean±SD	4.3^{b}±1.4 (3.9%)	0.5^{a} ±0.7 (0.5%)	0.3^{a}±0.5 (0.3%)	0.2^{a} ±0.4 (0.2%)	0.2^{a}±0.3 (0.1%)	0^{a} ±0 (0%)	5±1.4 (4.8%)

^{a,b} Least square means with different superscript within a column are significantly different ($P < 0.05$)

Table 5 - Average daily feed intake of birds (g)

Participant's code number	Daily feed intake at 1st week	Daily feed intake at 2nd week	Daily feed intake at 3rd week	Daily feed intake at 4th week	Daily feed intake at 5th week	Daily feed intake at 6th week	Daily feed intake at entire period
1	22.5	49.7	78.3	152.4	88.2	126.1	86.2
2	21.3	58.5	85.4	132.5	91.2	105.5	82.4
3	24.3	48.4	85.3	122.1	133.3	147.5	93.5
4	23.0	49.7	86.7	91.4	113.8	175.6	90.0
5	23.3	53.5	96.4	136.2	125.6	139.8	95.8
6	19.9	49.9	85.1	128.7	104.8	139.4	88.0
7	22.4	44.6	92.6	108.9	188.3	103.1	93.3
8	22.7	49.3	82.7	117.8	158.9	126.3	93.0
9	21.9	42.2	91.3	96.3	150.9	93.2	82.6
10	23.0	46.0	85.7	96.3	149.4	125.2	87.6
Mean ±SD	22.4 ±1.2	49.18 ±4.6	87 ±5.2	118.4 ±20	130.4 ±32	128.16 ±24.2	89.2 ±4.7

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Table 6 - Average weekly feed intake of birds (g)

Participant's code number	Cumm. feed intake at 1st week	Cumm. feed intake at 2nd week	Cumm. feed intake at 3rd week	Cumm. feed intake at 4th week	Cumm. feed Intake at 5th week	Cumm. feed Intake at 6th week	Cumulative feed intake at entire period
1	157.6	347.7	547.8	1066.8	617.4	882.5	3619.8
2	148.8	409.6	597.9	927.3	638.4	738.3	3460.3
3	169.8	338.6	596.8	854.4	933.4	1032.8	3925.8
4	161.0	347.9	606.7	639.8	796.7	1229.2	3781.4
5	163.4	374.7	675.0	953.5	879.1	978.5	4024.2
6	139.4	349.2	596.0	901.0	733.6	975.5	3694.7
7	156.8	312.2	648.5	762.1	1317.9	721.4	3918.9
8	159.0	344.9	579.2	824.4	1112.4	883.9	3903.7
9	153.2	295.5	639.4	674.0	1056.0	652.5	3470.7
10	161.2	322.2	599.8	673.8	1045.8	876.5	3679.3
Mean ±SD	157.02 ±8.4	346.7 ±31.9	611.94 ±36.5	833 ±139.8	933.6 ±224.1	902.5 ±169.4	3765.7 ±196.1

Table 7 - Average weekly FCR and cumulative FCR

Participant's code number	Average FCR at 1stweek	Average FCR at 2ndweek	Average FCR at 3rdweek	Average FCR at 4th week	Average FCR at 5th week	Average FCR at 6th week	Cumulative FCR
1	1.6	1.5	2.0	1.7	2.0	2.0	1.8
2	1.7	1.5	1.8	1.7	2.0	2.0	1.8
3	1.8	1.2	1.8	1.6	2.0	2.1	1.8
4	1.8	1.5	1.8	1.9	1.9	2.0	1.9
5	1.7	1.7	1.9	1.9	2.2	2.4	2.0
6	1.6	1.6	1.9	1.9	2.1	2.2	1.9
7	1.7	1.6	1.6	2.0	1.8	2.2	1.9
8	1.8	1.6	1.6	1.8	1.9	2.2	1.9
9	1.6	1.5	1.7	1.8	1.7	2.3	1.8
10	1.7	1.4	1.6	1.8	1.6	2.1	1.7
Mean+SD	2.0±0.1[b]	1.5±0.1[a]	1.8±0.1[b]	1.8±0.1[b]	2.0±0.2[b]	2.1±0.1[c]	1.8±0.1

[a,b] Least square means with different superscript within a column are significantly different (P < 0.05)

Economics of broiler production

Partial budget analysis: Finished broilers were sold as live weight (per head) and as processed form (per kg) after 42 days of growing period. Labor was provided by family members and the cost was not considered. The economic analysis result showed that the average selling price of finished broilers per head and per kg carcass were 60.7 and 70.9 Ethiopian Birr, respectively (table 8). Partial budget analysis result indicated that smallholder broiler production was profitable with a net benefit of 10.75 ETB per head and 19.33 ETB per kg, respectively.

Participants that sold processed meat fetched 8.56 ETB per kg more than those participants who supplied live birds. In addition, the return could also increased by 4.30 ETB/head when the day old chicks and formulated feed supplied in the locality. The result of the current study indicated that the cost of feed for broiler production covered more than 70% of the total variable cost. Opara (1996) also agreed that feed accounts for 70-85% of the production cost of modern poultry production.

Table 8 - Partial budget analysis of small scale broiler production

Description	External input source		Local input source	
	Birr/head	Birr/kg	Birr/head	Birr/kg
Selling price of broilers	60.70	70.85	60.70	70.85
Variable costs	49.95	51.55	45.65	47.15
• Day old chick cost	6.00	6.00	6.00	6.00
• Feed cost	33.25	34.15	33.25	34.15
• Vaccine/Medication/ & Service cost	1.50	1.50	1.50	1.50
• Electricity	0.50	0.90	0.50	0.90
• Water	0.33	0.40	0.35	0.40
• Straw and hay	1.25	1.40	1.25	1.40
• Transport cost	4.30	4.37	-	-
Net benefit	10.75	19.35	15.05	23.70

Sensitivity analysis

The result of the current study indicated that profitability of broiler production will result in a positive net benefit for all production situations up to 10% output price reduction and 10% input price increment (table 9).

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Table 9 - Sensitivity analysis of small scale broiler production

Description	External input source		Local input source	
	Birr/head	Birr/kg	Birr/head	Birr/kg
Average selling price of broiler	60.70	70.85	60.70	70.85
Average variable cost	47.15	48.75	42.85	44.35
Net benefit	13.55	22.15	17.90	26.50
Sensitivity analysis				
+ 5% variable cost	49.50	51.20	44.95	46.60
- 5% selling Price of broiler	57.65	67.35	57.65	67.35
Net benefit	8.15	16.15	12.70	20.75
+ 10% variable cost	51.85	53.60	47.10	48.80
- 10% selling Price of broiler	54.65	63.80	54.65	63.80
Net benefit	2.80	10.15	7.55	14.95
+ 15% variable cost	54.20	56.05	49.25	51.05
- 15% selling Price of broiler	51.60	60.25	51.60	60.25
Net benefit	-2.60	4.20	2.35	9.20

Perception of producers and end users

Producers' opinion: The survey result indicated that all participants of the trial were highly satisfied by the breed. According to the producers the breed has paramount merit than any other chicken breeds they know before. Some of the merits mentioned by the participants were; very fast growth, high final weight, able to rear many cycles per year and rear as side activity (Table 10).

All participants mentioned that they have future plan to maintain broiler production since it was profitable. The survey revealed that presence of high demands for chicken meat (80%) and low supply poultry meat (40%) were good opportunity for broiler production in the area. The result revealed that participants were afraid to sustain the work in the future due to some production constraints. The major challenge raised by all participants was lack of day old chick supply in the region (Table 11).

Table 10 - Special merits of broilers as mentioned by growers

Special characteristics of broilers mentioned by producers	Number of respondents	Response (%)
Fast growth	10	100
High product (high final body weight)	10	50
Ability to do many cycles per year	10	50
Could be done as side activity	10	50

Table 11 - Challenges to sustain broiler production

List of Constraints	Number of respondents	Response (%)
Lack of broiler day old chicks in the Region	10	100
Lack of formulated feed supply	10	70
Lack of promotion	10	50
High feed cost	10	40
Lack of appropriate health services	10	30
Lack of knowledge (poor training access)	10	30
Lack of husbandry and processing equipments	10	20

Consumers' and retailers' opinion:

Consumer's preference was assessed by interviewing hotel managers, super market owners and chefs. The result revealed that majority of the hotels was familiar with broiler meat by importing from commercial farms concentrated around Addis Ababa.

Most Hotels' chefs mentioned that broilers have many good characters as compared to other breeds like; fast cocking, keeps its flavor, used for all type of cooking except local soup (watt) and presence of good portion. Hotels managers said that most consumers preferred broiler meat as it is very soft as compared to local chicken meat. Most Hotel managers mentioned that broiler meat was highly preferred by foreigners/tourists/. The survey indicated that chicken meat demand of Bahir Dar city increased during high tourist flow seasons of the year, October to April. Some hotels managers told us that they have less demand for higher broiler weight, mainly greater than 1.5kg. Most hotels required a carcass weighing from 1kg to 1.5kg. This was highly related with the cost of the raw meat and their selling price of cooked meat (Ariosto).

CONCLUSION AND RECOMMENDATION

- The result of the current study indicated that there is high and growing demand for broiler meat in Bahir Dar city and the nearby cities.
- The lower mortality rate (<5%), the higher average final weight (2092.1g) and a relatively fair FCR (1.84) achieved in this study revealed that broilers could be produced and managed by smallholder chicken producers.

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- Feed cost and transportation cost was the major expenditures (60-70%) recorded in this study. The bulk of the feed cost arises from protein concentrates such as groundnut cake, fish meal and soybean meal. This feed cost could be reduced by providing practical trainings to producers on best-cost ration formulation using locally available feed ingredients.
- The result revealed that growers who sold semi-processed broiler meat fetched better profit than those who sold live birds and this showed that processing could be done at small holder level. This could be achieved by providing practical training on meat processing.
- Lack of day old chicks and formulated feed were the major limitations raised by most growers and end users so as to sustain broiler production in the region. Construction of broiler parent stock (BPS) and feed processing plant in the Region could be a solution to sustain the production in the area.

ACKNOWLEDGMENTS

The authors would like to thank Debre Zeit Agricultural Research centre for providing broiler day old chicks. In addition, all trial participants are duly acknowledged.

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Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Online Journal of Animal and Feed Research

Volume 4, Issue 6: 144-149 (2014) *ISSN 2228-7701*

ESTRUS SYNCHRONIZATION AND TWINNING RATE OF GHEZEL EWES TREATED WITH CIDR AND PMSG DURING THE BREEDING SEASON

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ABSTRACT: The objective of this study was to investigate the efficacy of used controlled internal drug release devices (CIDR) and different doses of PMSG on estrus synchronization in Ghezel ewes. This investigation was conducted in 77 fat-tailed Ghezel ewes during the breeding season. All animals were divided randomly into four groups then a single intramuscular (IM) injection of PMSG (group 1, 350 IU, n=20; group 2, 450 IU, n=20; group 3, 550 IU, n= 20), group 4 (n=17) was made apart from 1 ml normal saline solution which was used as control group at time of CIDR removal . Estrus responses were similar in all groups (group 1, 100%; group 2, 90%; group 3, 95%; control group, 82.35%). There were no significant differences (P>0.05) between the treatment groups and the control group regarding the onset of estrus or estrus response. Pregnancy rates were 85%, 90%, 95% and 64.7% in groups 1, 2, 3 and the control group, respectively. Pregnancy rates were higher in groups 1, 2 and 3 than in control group (P<0.05). Lambing rates were obtained as 80%, 90%, 90% and 58.8% in groups 1, 2, 3 and in control group, respectively. Differences between the treated and the control animals in the Lambing rates were significant (P<0.05). Using PMSG at CIDR withdrawal increased twinning rate from 10% in control group to 33.3% in group 3, 550 IU. There were significant differences (P<0.05) between the treatment groups and the control group regarding the gestation period and the birth weight. Differences between the treated and the control animals in the Plasma P4 levels at day estrus after PMSG treatment and 30th day of pregnancy were significant (P<0.05). Plasma P4 levels at 30th day of pregnancy was 0.94ng/ml, 1.1ng/ml, 1.24ng/ml and 0.82ng/ml in groups 1, 2, 3 and the control group, respectively.

Keywords: Estrus synchronization, Ghezel Ewe, CIDR (controlled internal drug release devices), PMSG (pregnant mare serum gonadotropin), P4 (Progesterone)

ORIGINAL ARTICLE
Received 12 Nov. 2014
Accepted 24 Nov. 2014

INTRODUCTION

Estrus synchronization or the induction of estrus is a valuable management tool for increasing the pregnancy rate in ewes. Modern sheep husbandry has improved the efficiency of extensive production and controlled the reproductive process for intensive production. The synchronization of estrus in ewes focuses on the manipulation of the estrus cycle (Zonturlu et al., 2011).

The Ghezel sheep is a high weight Iranian breed which is raised in the western north of Iran. This animal has a good compatibility in cold condition and has a good capability for grazing and walking. Meat is the main source of income for farmers (Baneh, 2009). Ghezel sheep numbering about 2 million are raised in North Western of Iran. This breed is native, fat-tailed and large-sized (38.2 to 41.7 kg at yearling in female and male respectively) (Figure 1). They are well adapted to mountainous and cold conditions (-22.8 to 38.3°C). They are raised primarily for meat, with milk and wool being of secondary importance. Ways to increase meat production in sheep, in any system, are likely to be by producing more lambs per ewe and increasing growth performance of the lambs. The first objective can be achieved by increasing ewe productivity, including lambing rate and frequency, whereas the second objective requires enhancement of the growth potential and survival of lambs (Baneh et al., 2010).

Figure 1. Ghezel sheep numbering about 2 million are raised in North Western of Iran

To have a better reproduction efficiency, it has been suggested to use new reproductive approaches such as controlling and synchronizing of estrus and using PMSG by applied AI to increase prolificacy that leads to gain practical and economical advantages. Recently, Progesterone or its analogues is generally used to synchronize estrous during the breeding and non-breeding season (Dogan et al., 2005). Administration of gonadotropins such as human menopausal gonadotropin (hMG)

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(Evans., 2003), PMSG (Lamrani et al., 2008), follicle stimulating hormones (FSH) and mixed gonadotropins preparations (Knights et al., 2003) after stopping progestogens treatment, causes in-creasing rate of ovulation.

Between all endocrine approaches to increase lambing rate, administration of PMSG is more usual than others. Ustuner et al. (2007) reported that injection of PMSG at the end of the progestogens treatment causes more precise synchronization of oestrus in small ruminants. Injecting PMSG after CIDR removal causes oestrus signs to begin earlier, become more pronounced and prolonged. A prolonged estrus probably results in elevation of circulating estrogen that causes luteinizing hormone (LH) peak (Yıldız et al., 2004). This might increase the rate of ovulation and enhances twining rate. It has been shown that an adequate dose of PMSG improves proliferation, but the use of high dose induces multiple gestations and thus, an increase in fetal or lamb mortality (Ataman *et al*., 2006). Hence, to avoid non desirable fetal or losses and large litter sizes, the dosage level of such gonadotropin has to be adjusted according to breed, season and the physiological status of the ewes (Nosrati et al., 2011).

Therefore, the objective of this study was to determine the influences of different PMSG doses on reproductive performance and twinning rate of Ghezel ewes that natural inseminated by rams.

MATERIALS AND METHODS

Location, animals and treatments

This experiment was carried out at breeding station of Ghezel sheep in Miandoab in West Azarbaijan province in Iran in breeding season, from September to October. The site is located at 46°6′E latitude, 36°58′N longitude and 1314m from the sea level in the center of the plain areas which ends at south front of Lake Urmia. The annual rainfall in this region ranges from 250 to 300 mm. A total of 77 Ghezel ewes 2-4 years-old and weighing 45-55 kg, were used in this study. CIDR were inserted into vagina of the ewes for 14 days. In group 1 (n=20), group 2 (n=20) and group 3 (n=20) 350 IU, 450 IU and 550 IU of PMSG was administered, respectively, at the time of sponge withdrawal. In the control group (n=17), ewes were injected with 1ml normal saline solution at sponge removal to act as untreated controls.

Mating, estrus and pregnancy detection

Three fertile Ghezel rams were introduced to each group (12 rams totally) twice a day (0800 - 1100 and 1700 - 2000 h), starting about 24 h after CIDR withdrawal, and left with them for estrus detection and natural mating. Ewes were observed continuously during the 3 h when rams were introduced to them and their mating were recorded. One months after the natural insemination by rams, conception rates of animals all groups were checked by transabdominal ultrasonography, using B-mode diagnostic ultrasound scanner (100 Falco, Pie Medical Application Manual, Equipment B.V., Maastricht, Netherland). The numbers of lambs born per ewe were recorded daily during lambing. Fertility was monitored in terms of conception rate (percentage of pregnant ewes /ewes inseminated) and mean litter size (lambs born/ ewes inseminated). For prevention of pregnancy toxicity in late pregnancy, all ewes received additional 250 g/day/doe barley grain.

The following parameters were recorded:

- Percentage of Animals in Estrus*:* Number of ewes showing estrus/Total treated ewes in each group x100
- Pregnancy Rate: Number of pregnant ewes/Number of inseminated ewes in each group x100
- Lambing Rate: Number of ewes lambing/ Number of inseminated ewes in each group x100
- Duration of pregnancy
- Birth weight.

Blood samples

After the CIDR implantation (day 0), a series of blood samples was collected at days Estrus after PMSG treatment and 30th day of pregnancy. Blood samples were obtained from a jugular vein using vacutainer vials and centrifuged immediately after collection at 3000 rpm for 10 minutes at 4°C. The blood plasma was then stored at -20°C until assayed. Concentrations of progesterone were determined by ELISA kit (Monobind®; USA) with 0.1 ng/ml sensitivity.

Statistics

Estrus response and Pregnancy rates of the groups and reproductive performance were analyzed using the chi-square test. Statistical analyses on the concentration progesterone were performed on a microcomputer using Statistical Package for Social Science (SPSS) program (version 20.0). Data were analyzed through analysis of variance (ANOVA) with significant difference level of $P<0.05$.

RESULTS

Effects of CIDR (controlled internal drug release device) which used to synchronize estrus and different doses of PMSG on fertility parameters were presented in Table 1. The rates of estrus in groups 1, 2, and 3 which received different doses of PMSG and the control group were found as 100, 90, 95, and 82.35%, respectively. There was no significant difference between groups ($P>0.05$).

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Pregnancy rates were 85, 90, 95 and 64.70% in groups 1, 2, 3 and the control group, respectively. There were significant differences between the treated groups and the control group (P<0.05).

The lambing rates for groups were 80, 90, 90 and 58.82%, respectively. The mean lambing rate in groups 3 and 2 were higher than in groups 1 and 4 (P<0.05). Using PMSG at CIDR withdrawal increased twinning rate from 10% in control group to 33.3% in group 3, 550 IU (P<0.05).

Gestation periods of the animals in groups 1, 2, 3, and 4 were found to be 153±0.21, 148±0.12, 148±0.16 and 158±0.27 d, respectively. There were significant differences between the treated groups and also between the treated groups and the control group (P<0.05). There was significant (P<0.05) effect of the hormonal treatments on the birth weight of lambs averaging 4.9±0.09, 4.0±0.10, 3.9±0.10 and 4.9±0.13 kg for groups 1, 2, 3 and 4 respectively.

Mean progesterone concentration at day estrus were 0.37±0.05, 0.40±0.12, 0.45±0.06 and 0.39±0.03 ng/ml in groups 1, 2, 3 and the control group, respectively. There was significant (P<0.05) effect of the hormonal treatments on the mean progesterone concentration at day estrus between groups.

Mean progesterone concentrations at 30th day of pregnancy were 0.94±0.21, 1.10±0.19, 1.24±0.18 and 0.82±0.27 ng/ml in groups 1, 2, 3 and 4, respectively. Mean progesterone concentration in group 4 with injection dose of 550 IU (1.24±0.18 ng/ml) was the highest value between all groups (P<0.05).

Table 1 - Some reproductive parameters in Ghezel ewes treated with CIDR with PMSG during the breeding season.

Groups	1	2	3	4
Estrus response (%)	100^{a}	90^{a}	95^{a}	82.35^{a}
Pregnancy rates (%)	85^{a}	90^{a}	95^{a}	64.7^{b}
Lambing rate (%)	80^{b}	90^{a}	90^{a}	58.8^{c}
Twinning rate (%)	12.5^{c}	22.2^{b}	33.3^{a}	10^{c}
Lamb birth weight (kg)	4.9±0.09^{a}	4.0±0.10^{b}	3.9±0.10^{b}	4.9±0.13^{a}
Gestation period (day)	153±0.21^{b}	148±0.24^{c}	148±0.16^{c}	158±0.27^{a}
P4 levels, Day of estrous (ng/mL)	0.37±0.05^{ab}	0.40±0.12^{ab}	0.45±0.06^{a}	0.39±0.03^{b}
P4 levels, 30th day of pregnancy (ng/mL)	0.94±0.21^{ab}	1.10±0.19^{ab}	1.24±0.18^{a}	0.82±0.27^{c}

^{a,b,c}: Means in the same row with different superscripts differ significantly (P< 0.05)

DISCUSSION

The breeding season of Ghezel ewes in West Azarbaijan province in Iran usually lasts from July to November. However, the majority of ewes are bred between July and early September in this zone. The present study was performed at the beginning of the breeding season, in mid-July.

In the present study Ghezel ewes have received different doses of PMSG following 13-day progesterone treatment. Progestogens and PGF 2α or their analogues were used in order to condense parturition and oestrus of the ewes in the breeding season. Hormones such as GnRH, PMSG, FSH, and LH may be used to increase pregnancy rate and numbers of lambs (Monika, 2001). Injection of 500 IU of PMSG following the treatment of ewes in the breeding season with vaginal sponges containing 30-40 mg of FGA resulted in 90% and 85% oestrus and conception rates, respectively (Miljkovic et al., 1989). Pregnancy rates in ewes receiving the same dose of PMSG and FGA were higher than in the controls (Dumitrescu et al., 1985).

Similarly, Karagiannidis et al. (2001) reported that responses to different PMSG doses varied among various breeds. The results on estrus rate for treated groups were consistent with that reported by some other researchers (Domingues et al., 1991).

The conception rate was comparable to those reported by Miljkovic et al. (1989). The different reproductive performance may be associated with animal use of different breeds, age and body condition, and also with nutritional factors, type of insemination or management systems. In this study, the percentages of estrus and pregnancy rates in group 3 received 550 IU of PMSG were determined as 95%. The rate of estrus response was similar to the previous findings of Krajinovic et al. (1985).

Moreover, there were significant differences regarding pregnancy and lambing rates between trial and control groups. Hence, Nosrati et al. (2011) observed no significant difference in pregnancy rates for different PMSG doses (300 IU, 400 IU, 500 IU and 600 IU).

Zeleke et al. (2005) recorded a pregnancy rate as 75% and a lambing rate as 94.6% in ewes treated with sponges and 300 IU of PMSG. Also, Zarkawi *et al*. (1999) reported a higher lambing rate (80%) in Awassi ewes which have received 600 IU of PMSG after 60 mg of medroxyprogesterone acetate (MAP) during out of breeding season. Al-Merestani et al. (1999) conducted a study in which Syrian Awassi sheep were treated with intravaginal sponges combined with 400 IU of PMSG. They have reported a lambing rate as 78%. It was thought that fertility parameters could be affected by different treatment seasons such as anestrus, breeding or transition season.

In the presented study, the percentages of lambing and twinning rates in group 3 given 550 IU of PMSG were determined as 90% and 33.3%, respectively. It was pointed out that administration of PMSG increased the number of follicles and therefore raised the twinning and triplet rates (Gulyuz et al., 1995).

PMSG injection increased twinning rate from 10% in CIDR-treated ewes without PMSG, to 33.3% in 550 IU PMSG-injected ewes. This increase is of great value to sheep holders, and is similar to that obtained by Zarkawi (2001) who reported that Awassi ewes in Syrian, treated with sponges plus PMSG, had a twinning rate of 50%

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compared with 20% for sponge-treated ewes without PMSG. Some papers reported that administration of 300 IU PMSG was not sufficient to stimulate additional follicular development or was weak for some breeds response (Koyuncu et al., 2008; Zonturlu et al., 2011). Twining rate in experiment of Nosrati et al. (2011) that synchronized the Kurdi ewes for 14 d with CIDR and superovulated by 500 IU of PMSG injection were 33.5% that was similar to the result of current study obtained by using 550 IU PMSG.

In the presented study, the percentages of lambing rate in groups 2 and 3,90% was higher than that in groups 1 and 4 , 80% and 58.8%, respectively (P<0.05). These results were in agreement with those reported by Zonturlu et al. (2011) and Timurkan et al. (2005). Koyuncu et al. (2001) reported that the administration of 700 IU of PMSG increased multiple-birth rates and lambing rates. Zeleke et al. (2005) recorded a lambing rate of 94.6% in ewes treated with sponges and 300 IU of PMSG. Also, Zarkawi et al. (1999) reported a higher lambing rate (80%) in Awassi ewes, outside the breeding season, which were administered 600 IU of PMSG after 60 mg of medroxyprogesterone acetate (MAP), compared to ewes in the control group. Al-Merestani et al. (1999) in a study in which Syrian Awassi sheep were treated with intravaginal sponges combined with 400 IU of PMSG, reported a lambing rate of 78%. The results obtained by Zarkawi et al. (1999) and Al-Merestani et al. (1999) for lambing rate were statistically important when PMSG injected groups were compared with animals that received no treatment. Safranski et al. (1992) reported that average gestation periods in control and trial groups received melengesterol acetate (MGA) + PG-600 (400 IU of PMSG+200 IU of HCG) were found as 163.8±4.9 and 157.2±2.8 d, respectively.

In our study, gestation period was 153±0.21, 148±0.12, 148±0.16, and 158±0.27 d in groups 1, 2, 3, and 4, respectively. It was seen that there were significant differences both within treated groups and as well as between trial and control groups (P<0.05). Because increased lambing rate related with increased PMSG dose may result in shortened gestation periods, as reported by previous researches (Safranski et al. 1992; Horoz et al. 2003).

There was significant (*P*-<0.05) effect of the hormonal treatments on the birth weight of lambs averaging 4.9 ±0.09, 4.0±0.10, 3.9.1±0.10 and 4.9±0.13 kg for groups 1,2,3 and 4 respectively. This result also can be attributed to increased twinning rate related in the increase of PMSG dose.

Mean progesterone concentration at day estrus were 0.37±0.05, 0.40±0.12, 0.45±0.06 and 0.39±0.03 ng/ml in groups 1, 2, 3 and the control group, respectively. These results were consistent with that reported by Cunningham et al. (1975). Cunningham et al. (1975) conducted a study in which Cheviot ewes were used to determine levels of progesterone in the plasma during the estrous cycle. In the study of Cunningham et al. (1975) Plasma progesterone levels increased progressively during the period 15 to 9 days before estrus to a mean level of about 2-5 ng/ml, and remained at this level for several days. By 2 days before estrus, the mean plasma progesterone concentration had fallen to 1.42 ng/ml, and on the following day it had dropped to <0.5 ng/ml. It remained at this low level until after Day 2 of the cycle, and then again showed a progressive rise.

The data presented above confirm that, in the cyclic ewe, plasma progesterone values fall to very low levels on the day before estrus, also PMSG, when injected immediately after the removal of CIDR increased the rate of ovulation hence, increasing multiple births and litter size (Akoz et al., 2006).

Mean progesterone concentration at 30th day of pregnancy was 0.94±0.21, 1.10±0.19, 1.24±0.18 and 0.82±0.27 ng/ml in groups 1, 2, 3 and 4, respectively. Mean progesterone concentration in group 4 with injection dose of 550 IU (1.24±0.18 ng/ml) was the highest value between all groups (P<0.05). This value in groups 3 (1.10±0.19 ng/ml) and 2 (0.94±0.21 ng/ml) were higher than group I (0.82±0.27 ng/ml) (P<0.05). Some papers reported that administration of 300 IU PMSG and less than was not sufficient to stimulate additional follicular development or was weak for some breeds response (Fallah et al., 2007; Nosrati et al., 2011; Oyedipe et al., 1989). In the present study we observed a PMSG-dose-dependent increase in progesterone levels between groups at 30th day of pregnancy. This result was similar to the previous findings of Oyedipe et al. (1989).

Oyedipe et al. (1989) conducted a study in which Yankasa ewes were used to determine the effect of dose of pregnant mare serum gonadotrophin on estrus parameters, ovulation rate and peripheral progesterone concentrations. Ovulation rates (based on number of corpora lutea) averaged 1.0±0.0, 1.3±0.3, 2.0±0.0, 5.5±0.5 and 7.0±1.2 for ewes treated with 0, 250, 500,750 and 1000 IU PMSG, respectively.

CONCLUSION

The increased prolificacy and twinning rate in treated Ghezel ewes indicate the relevance of using both treatments (CIDR + PMSG). Therefore, it seems beneficial to use CIDR for estrus synchronization in local Ghezel ewes during the breeding season, and to use PMSG as a tool to increase twinning rate.

Acknowledgments

The author would like to thank the Head of the Iranian style of breeding small ruminants (Ismail Sadeghian), Abbas Akbari Sharif Agricultural Jihad Organization Experts for their cooperation.

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To cite this paper: Najafi Gh, Cedden F, Mojtahedi S, Aliverdinasab R. 2014. Estrus Synchronization and Twinning Rate of Ghezel Ewes Treated with CIDR and PMSG During the Breeding Season. *Online J. Anim. Feed Res.*, 4(6): 144-149.
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To cite this paper: Najafi Gh, Cedden F, Mojtahedi S, Aliverdinasab R. 2014. Estrus Synchronization and Twinning Rate of Ghezel Ewes Treated with CIDR and PMSG During the Breeding Season. *Online J. Anim. Feed Res.*, 4(6): 144-149.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Online Journal of Animal and Feed Research

Volume 4, Issue 6: 150-158 (2014) *ISSN 2228-7701*

LIVESTOCK FEEDS AND FEEDING SYSTEM IN ENSET (*Ensete ventricosum*) DOMINATED MIXED FARMING SYSTEM OF SOUTHERN ETHIOPIA

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ABSTRACT: This study was conducted to identify the livestock feeds resources, feeding systems, feed related problems and the determinant factors under smallholder farmers' livestock production system in the Sidama zone of Southern Nations, Nationalities and People's Region (SNNPR) of Ethiopia. A total of 135 sample household heads which represents about 10 percent of the household heads in the two study districts (Shebedino and Dale) were included in the study. According to the order of importance, natural grazing/scavenging, crop residue and purchased feeds from market/other farmers were the major (X^2=1078.103, p<0.001, n=553) feed resources used to fed different livestock species/classes in the area. Due to the economic importance difference among species/classes, the provision priorities of each particular feed resource were also significantly different. Especially the provision disparity was more (X^2=302.96, p<0.001) pronounced for crop residue for which male cattle (oxen and young bulls) get top priority than natural pasture (X^2=157.48, p<0.001) on which other species/classes are highly dependent and purchased feed (X^2=62.29, p<0.001) by which the scavenging poultry production is subsidized. In feed production, conservation and treatment aspects, growing of improved forages is not common practice in the area and majority about 57.0% (n=77) of farmers have not grown improved forages (X^2=4.28, p<0.001), considerable 63.7% (n=86) and limited 25.9% (n=35) of farmers have also practiced feed conservation (mainly maize Stover and elephant grass) (X^2=15.96, p<0.001) and crop residue treatment (mostly add and mix salt) (X^2=33.34, p<0.001), respectively. Grazing land is a scares resource in the livestock production sub-system of the area and only about 34.1% (n=46) of the farmers in the study area posses private grazing land with an average holding of 0.073±0.014 ha. Land shortage, feed shortage and population pressure were identified as major (X^2=132.09, p<0.001) problems in related with feed availability in the area. The extent of land shortage (X^2=10.595, p<0.01) and population pressure (X^2=14.016, p<0.001) problems were different between farmers at the two study districts.

Keywords: Crop residue, Feed resource, Natural pasture, Priority, Sidama zone, SNNPRS.

ORIGINAL ARTICLE

Received 12 Nov. 2014

Accepted 23 Nov. 2014

INTRODUCTION

Despite the large livestock population in the country, the sector's contribution is well below its potential due to various reasons such as feed shortage and disease (Berhanu et al., 2009), less efforts in introducing the appropriate package of improved livestock technologies such as cross breeds, improved feeds management practices and inadequate healthcare services which enhance the current livestock production and productivity (Getahun, 2012).

The major feed resources in the country are crop residues and natural pasture, with agro industrial by-products and manufactured feed contributing much less (Berhanu et al., 2009; Anteneh, 1984; Alemayehu, 1987). The importance of natural pasture is gradually declining because of the expansion of crop production into grazing lands, redistribution of common lands to the landless and land degradation (Berhanu et al., 2009).

In the Ethiopian highlands, natural pasture can produce 6 tons DM/ha but when continuously grazed it yields only 2.5 tons DM/ha (Jutzi et al., 1987). As frequent grass out take leads to a reduction in DM yield up to 50 percent, yield from heavily grazed pasture may not exceed 1.5 tons DM/ha (Jutzi et al., 1987). According to Lulseged (1985), native pasture land in the Ethiopian highlands have been estimated to be 73 million hectares supporting about 24 million livestock units (LU) in the same area. These figures indicate that native pastures are an important feed source. However, even when a high average dry matter production of three tons per hectare per year is assumed for this grassland, these areas could only contribute a maximum of 50 percent of the total feed required.

According to different reports, about half or more of all animal in the Ethiopian highlands obtain their feed in the form of crop residues (straws, stubble, chaff or weeds from crop plots). The dependence on this feed source is likely to continue along with increasing human population densities and corresponding extension of crop land into traditional grassland (Abate et al., 1993). Moreover, Alemu et al. (2000) have indicate that due to crop

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encroachment, the contribution of crop residue represent the largest amount of feed and regularly conserved as a sole feed of dry season for animals in the highlands of Ethiopia and it provide 10 to 15 percent of the national intake of feed by livestock, and in some areas the estimate would increase up to 50 percent (Zinash et al., 2001 and Alemayehu, 2003) and it can account up to 70% of animal feed in the highland parts of the country (Zinash and Seyoum, 1991). Moreover, the contributions of crop residues reach up to 80% during the dry seasons of the year (Tolera, 2007). In terms of biomass, crop residue, aftermath grazing and pulse residues contribute 0.5, 1.84 and 0.404 million tones out of the total dry matter feed resources of 41.66 million tonnes available annually in the highlands of Ethiopia (Alemayehu, 1987).

With the poor quality of livestock feed in the country, the feed shortage is also exaggerated by its erratic and seasonal supply. Hence, there is severing feed shortage during the dry season and at the beginning of the main rains. The most critical period is between April and the beginning of July, when all feed resources is virtually depleted (Getachew et al., 1993). In spite of this fact, seasonal feed deficiencies cause loss of weight that was gained during more favorable periods. Fodder conservation to help eliminate seasonal feed-supply fluctuations is rarely practiced.

Several studies have been conducted on fodder production and use in Ethiopia, both by national and international research organizations. However, the focus of the studies was limited to the agronomic and nutritional characteristics of feed resources, and animal responses to types of feeds and feeding practices (Bediye et al., 2001). However, characterization of available feed resources, its feeding system, and feed production and management system of the smallholder farmers in the highland parts of the country in general and the specific study area in particular are scanty.

Therefore, considering all these facts, and the severity of feed shortage in livestock production sub system of the region it would be important to characterize the feed production, management, important feed related problems and available feed resources of the area to identify research and development interventions, and to recommend path ways for the future.

MATERIAL AND METHODS

Study Area

Sidama zone, found in Southern Nations, Nationalities and People's Region (SNNPR) of Ethiopia, lies between 380 08' E to 390 10' E longitude and 60 40' N to 70 06' N latitude at an elevation ranging from 501 m to 3000 meters above sea level (SNNPRS, 2010). Currently Sidama Zone is divided in to 19 districts hosting a total population of over 3,504,049, with land mass of 6,832.85 sq. km and a population density of 512.8 Person/sq.km (CSA, 2012). Out of the total land size of Sidama zone, 26.8% is lowlands, 45.49% midlands and 27.71% highlands (SNNPRS, 2010). Farmers in the area practices crop dominated mixed crop-livestock agriculture. The zone is one of the major coffee growing areas of southern Ethiopia; cultivated and wild coffee is a main cash crop of the area.

Sidama zone is well endowed with natural resources contributing significantly to the national economy of the country. Other than coffee, maize, haricot bean, root crops ("*enset*" false banana and potato) and fruits are major crops grown in the zone. Haricot bean and Chat (Chata edulis) production are other sources of cash after coffee. Enset (*Ensete ventricosum*) is a strategic crop substantially contributing to the food security of the zone and is especially important in the highland parts of the zone (Kassu, 2009). According to SNNPRS (2010), the zone have bimodal production seasons known as "*Belg*" (short rainy season) from March to April and "*Meher*" (main rainy season) from June to September. The zone receives average annual mean rainfall ranges 801- 1600 mm with annual mean temperature of the zone ranges between 10.1-27 0C (SNNPRS, 2010).

Sampling Procedure

Reconnaissance survey was conducted to have the notion of understanding about the study area and to select the representative study sites (districts) before to get on questionnaire. Different participatory rural appraisal (PRA) tools, purposive and Probability Proportional to Size (PPS) sampling approach were used to collect data from the study. Out of the total 19 districts in Sidama zone 10% or two districts (Dale and Shebedino) and out of districts total (36 and 32) PAs four and three Pas` with total sample households of 135 (63 and 72 from Dale and Shebedino districts) were selected, respectively. Moreover, in order to capture gender effect in the study objectives, the total sample households at each district and PA's level were further stratified into female and male headed households and 15 women and 120 men household heads were included in the study.

Data Analysis

In data analysis two groups of explanatory variables i.e. socio economic characteristics (N=6) and asset related variables (N=10) having different levels of groups were used for their effect on dependent variables that were considered (Table 1). In case of dependent variables having priority data nature and depend of the priority level four (4= 1st priority, 3= 2nd priority, 2= 3rd priority, 1= 4th priority) or three (3= 1st priority, 2= 2nd priority and 1= 3rd priority) likert scales were used in the analysis process.

Friedman's tests were used to rank the priorities among dependent variables to identify their ranks and to consider high ranked variables for furthers analysis. The associations among dependent variables and with deferent explanatory variables were evaluated using Spearman's-Correlation (r_s). Kruskal Wallis test was also used to

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identify the effect of explanatory variables on dependent one. All these statistical procedures were performed using SPSS release version 22 (IBM SPSS Statistics, 2013).

Prior to the required statistical analysis, the hypothesized explanatory variables were checked for the existence of multicolinearity using Variance Inflation Factor (VIF) for association among the explanatory variables. According to Gujarati (2003), VIF can be defined as: VFI (X_i) = $1/1\text{-}R_i^2$

Where

R_i^2 is the square of multiple correlation coefficients that results when one explanatory variable (X_i) is regressed against all other explanatory variables. As a rule of thumb, if the VIF of a variable exceeds 10, it is an indication of a multicolinearity problem and removed from further analysis. The VIF values displayed below (Table 1) have shown that all the predictor variables have no serious multicolinearity problem.

Table 1 - VIF of the Explanatory variables used in the study

Explanatory Variables	Tolerance	VIF
Socioeconomic characters		
District (n=2)*	0.613	1.633
Gender (n=2)	0.771	1.296
Age group (n=3)	0.735	1.360
Educational background (n=4)	0.681	1.469
Marital Status (n=3)	0.641	1.561
Family size group (n=4)	0.744	1.345
Asset related		
Total TLU holding group (n=3)	0.284	3.518
Farm land holding group (n=3)	0.672	1.488
Sheep Ownership (n=2)	0.915	1.092
Goat Ownership (n=2)	0.881	1.135
Male cattle Ownership (n=2)	0.702	1.425
Female cattle Ownership (n=2)	0.310	3.226
Calf Ownership (n=2)	0.747	1.338
Poultry Ownership (n=2)	0.861	1.161
Donkey Ownership (n=2)	0.752	1.331
Grazing land Ownership (n=2)	0.905	1.105

*n= number of groups within variable, VIF= Variance Inflation Factor ,

RESULTS AND DISCUSSION

Feed resources and feeding priority

Available feed resources: The feed resources and types to provide for different livestock species/class would be governed by different factors. Among which economic importance of the animal and availability of feed resources and types are the most important. Accordingly, in the study area natural pasture, crop residue, market purchased feeds and grown improved forages have been identified as available feed resources that are used in livestock production activity. However, their utilization priorities were significantly (X^2=1078.103, p<0.001) different (Table 2) and natural pasture, crop residue and market purchased feeds were identified as the major feed resources with highest mean rank value >2.00 and these feed resources were considered for further analysis here onward. Maize Stover, Enset and Sugarcane leaf were the dominant feed types in crop residue resource. The importance of natural pasture and crop residue in this study is in agreement with (Bilatu et al., 2012; Tolera et al., 2012; Ahmed et al., 2010; Belay et al., 2012).

Table 2 - Friedman's mean rank test for utilization priorities of identified feed resources in the study area (N=553).

Feed resources	Mean	Std. Deviation	Mean Rank	Rank
Natural pasture	3.69	0.68	3.76*	1
Crop residue	1.65	1.69	2.60*	2
Market purchased feed	0.93	1.17	2.06*	3
Improved forage	0.06	0.36	1.57	4
Chi-Sq			*1078.10*	
Sig.			*0.000*	

4= 1st priority, 3= 2nd priority, 2= 3rd priority, 1= 4th priority, *high priority feed resources

Livestock feeding priorities: As the result presented in Table 3 indicates, the provision priority of the three major feeds resources for each species/class was significantly different. Except young bulls (X^2=22.45, p<0.001, N=22) and oxen (X^2=4.57, p>0.05, N=7) which have access for crop residue at highest priority and equally chance of getting those major feed, respectively which may relate with significant role in income generation of young bulls and limited ownership, the other livestock species/classes were mostly depend on natural pasture and rarely crop residue.

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Table 3 - Provision priorities of major feed resources for different livestock species and classes in the study area.

LS species	N	Crop residue	Rank[1]	Natural pasture	Rank	Purchased feed	Rank	Chi-Sq[2]	Sig[2]
Sheep	16	2.06**	5	2.75***	6	1.19*	9	19.63	0.000
Goat	23	2.02**	6	2.65***	8	1.33*	6	21.91	0.000
Oxen	7	2.57***	1	2.00**	12	1.43*	4	4.57	0.102
Y. Bull	22	2.50***	2	2.32**	11	1.18*	10	22.45	0.000
Cow	97	2.32**	4	2.52***	9	1.16*	11	103.85	0.000
Heifer	39	2.37**	3	2.51***	10	1.12*	12	46.46	0.000
F. Calves	52	1.93**	7	2.77***	5	1.30*	7	58.60	0.000
M. Calves	33	1.89**	8	2.71***	7	1.39*	5	31.11	0.000
Layer Birds	88	1.45*	11	3.00***	1	1.55**	2	157.41	0.000
Broiler Birds	88	1.45*	12	3.00***	1	1.55**	1	168.32	0.000
Dual Birds	81	1.48*	10	3.00***	1	1.52**	3	141.67	0.000
Donkey	7	1.86**	9	2.86***	4	1.29*	8	9.54	0.008
Chi-Sq[3]		302.96		157.48		62.29			
Sig. [3]		0.000		0.000		0.000			
Average		1.99		2.67		1.33			

Mean feed provision priority value of each species/class with *** = 1st priority, **= 2nd priority and *=3rd priority
Cho-sq and p-value with [3] and [2] are respectively for among species/classes for specific feed and among major feed resources for each species/class. [1] Priority/rank of specific feed resource provision among species/classes.

Due to the economic importance difference among species and classes, the provision priorities of each particular feed resource were also significantly different among species/classes. Especially the disparity were more (X^2=302.96, p<0.001) pronounced for crop residue (Table 3) than natural pasture (X^2=157.48, p<0.001) and purchased feed (X^2=62.29, p<0.001) resources. Accordingly, considering male cattle (oxen and young bull) have better chance in getting crop residue followed by females (milking cow and heifers). The dependency on natural pasture feed resource which is seasonal available and having low quality were more for poultry followed by donkey. However, the high dependency of poultry on natural may compensate with their better access for purchased feeds than other species/classes. Next to different classes of poultry, oxen have better chance in getting purchased feeds than other species/classes.

Feed production, management and conservation

Regarding feed production, management and conservation practices, growing of improved forage was not a common practice in the area and majority (57.0%, n=77) of farmers have not grow improved forages. This result is in agreement with Abate et al. (1993) who indicated the fact that no special effort is made to grow feed for farm animals in subsistence-oriented smallholder production system in the Ethiopian highlands. Admassu (2008) has also reported that forage development is a key to skip feed shortages if practiced but it is at an infant stage in terms of usage. Moreover, about (63.7%, n=86) of farmers respond as they practiced feed conservation to overcome seasonal feed shortage problem they faced (Table 4). In order to increase the palatability and nutritive value of the crop residues only (25.9%, n=35) of farmers were found to add and mix mostly salt.

Table 4 - Respondent experience status for improved forage growing, feed conservation and crop residue treatment in the study area (N=135).

Farmers status	Improved forage growing (%)	Feed conservation (%)	Crop residue treatment (%)
Not have (0)	57.0	36.3	74.1[a]
Who have (1)	43.0	63.7	25.9[b]
Chi-Sq	4.276	15.955	33.337
Sig.	0.039	0.000	0.000

a,b; % within a column with different superscripts differ significantly (P<0.001)

As the result in Table 5 shows, farmers at Dale were better experienced in crop residue treatment (X^2=33.09, r_s =0.497, p<0.001) and improved forage growing (X^2=4.244, r_s =0.178, p<0.05) than Shebedino farmers who were advanced in feed conservation experience (X^2=15.84, r_s =0.344, p<0.001). Farmers who have family size range of B/n 7-9 persons and >=10 persons have better experience of feed conservation (X^2=12.69, r_s =0.272, p<0.05) than the others (Table 5).

As the correlation and mean rank test among respondents feed management and production experiences with asset related variables indicates, the total TLU holding, goat and male cattle ownership status have positive associations with crop residue treatment (X^2=8.059, r_s=0.229, p<0.05), improved forage growing (X^2=4.513, r_s=0.184, p<0.05) and feed conservation experiences (X^2=17.108, r_s=0.357, p<0.001), respectively. Accordingly,

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farmers who hold larger (>=5.3 TLU), possessed the respective livestock species and class have better experience in feed management, conservation and production than the others (Table 5).

Table 5 - Spearman's correlation and Kruskal Wallis rank test for the effect of socio economic characteristics and asset related factors on feed treatment, conservation and production (N=135).

Variables and Groups	%	Crop residue treatment	Feed conservation	Improved forage growing
Districts				
Shebedino (1)	53.3	54.25	78.44	62.44
Dale (2)	46.7	83.71	56.07	74.36
Chi-Sq		33.090	15.836	4.244
Sig.		0.000	0.000	0.039
r_s		0.497**	-0.344**	0.178*
Family size				
<=3 persons (1)	5.2	69.79	63.57	58.29
B/n 4-6 persons (2)	48.1	72.31	58.23	68.08
B/n 7-9 persons (3)	34.1	65.17	79.29	69.82
>=10 persons (4)	12.6	58.44	76.62	66.79
Chi-Sq		3.572	12.691	0.744
Sig.		0.311	0.005	0.863
r_s		-0.152	0.272**	0.033
TLU holding group				
Small (<=0.38TLU) (1)	10.4	50.50	53.93	53.46
Medium (0.39-5.42TLU) (2)	88.9	69.63	69.44	69.38
Large (>=5.43TLU) (3)	0.7	118.00	92.50	106.50
Chi-Sq		8.059	3.411	4.149
Sig.		0.018	0.182	0.126
r_s		0.229**	0.158	0.167
Goat Ownership				
Not have (0)	82.2	69.35	66.35	65.15
Who have (1)	17.8	61.75	75.63	81.19
Chi-Sq		1.293	1.599	4.513
Sig.		0.255	0.206	0.034
r_s		-0.098	0.109	0.018*
Male cattle Ownership				
Not have (0)	78.5	68.97	61.93	67.02
Who have (1)	21.5	64.47	90.17	71.59
Chi-Sq		0.523	17.108	0.422
Sig.		0.469	0.000	0.516
r_s		-0.062	0.357**	0.056
Calf Ownership				
Not have (0)	45.9	62.48	60.93	60.77
Who have (1)	54.1	72.69	74.01	74.14
Chi-Sq		3.969	5.404	5.322
Sig.		0.046	0.020	0.021
r_s		0.172*	0.201*	0.199*

r_s = Spearman's correlation coefficient followed by ** and * are significant at the 0.01 and 0.05 p-level (2-tailed).
a,b; Mean ranks within a column with different superscripts differ significantly at specified sig. (p-level)

According to respondents' response, three feed resources namely crop residue, natural pasture and improved forages have been identified to be conserved at different priorities and the result is presented in Table 6. As the mean rank of the result prevails, crop residue and natural pasture were the priority resources (X^2=70.22, p<0.001) which mostly conserved by respondent farmers. Even if, the mean conservation rank of improved forages was below the threshold value, its role in addressing the existing feed shortage condition of the area would not be overlooked mainly due to limited farmers experience in improved forage growing and this is in line with Admassu (2008) who reported forage development is a key to skip feed shortages.

Maize Stover from crop residues and elephant and Desho grass either separately or together from improved forage were the major feed types that are mostly conserved by majority of farmers in the area. Therefore, the importance of crop residue in the study area was in agreement with Bekele (1991) who reported crop residue, stubble and roadside grazing as the major sources of feed available in the highlands area. The importance of maize Stover in the study area is also in agreement with de Leeuw et al. (1992) who reported that the residues from maize and sorghum/pearl millet growing in the mid- to low-altitude zones account for 39 and 36% of the total, respectively.

As a result of improved forages growing better status of Dale farmers their conservation priority for this feed resource was higher (X^2=4.144, r_s=0.221, p<0.05) than Shebedino farmers (X^2=10.24, r_s=-0.347, p<0.05) for whom crop residues was a priority resource for conservation. Moreover, due to year round feed demand for donkey which

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has crucial role in transportation need of respondents, crop residue conservation priority of donkey owner respondents was higher (X^2=3.984, r_s=0.217, p<0.05) than who not possessed. However, natural pasture conservation priority was different due to respondents ownership for calves (X^2=3.984, r_s=0.217, p<0.05) and respondents who possessed calves have conserved the specific feed resource at higher priority than who not possessed (Table 7).

Table 6 - Feed resources mean rank priority for conservation (N=86).

Feed resources	Mean Rank	Mean	SD	Rank
Crop residue	2.62	2.26	1.25	1
Natural pasture	1.91	1.06	1.26	2
Improved forages	1.48	0.27	0.79	3
Chi-Sq	70.22			
Sig.	0.000			

SD, Standard deviation

Table 7 - Mean rank for factors affecting conservation priority of feed resources (N=86).

Variables and groups	%	Crop residue	Natural pasture	Improved forages
Districts				
Shebedino (1)	67.9	48.39	45.35	41.32
Dale (2)	34.5	33.90	39.86	47.78
Chi-Sq		*10.24*	*1.15*	*4.14*
Sig.		*0.001*	*0.284*	*0.042*
r_s		*-0.347***	*-0.116*	*0.221**
Calf ownership				
Not have (0)	39.3	46.64	37.12	41.02
Who have (1)	63.1	41.55	47.47	45.05
Chi-Sq		*1.336*	*4.326*	*1.713*
Sig.		*0.248*	*0.038*	*0.191*
r_s		*-0.125*	*0.226**	*0.142*
Donkey ownership				
Not have (0)	91.7	42.04	43.55	44.08
Who have (1)	10.7	56.00	43.06	38.50
Chi-Sq		*3.984*	*0.004*	*1.302*
Sig.		*0.046*	*0.950*	*0.254*
r_s		*0.217**	*-0.007*	*-0.124*

r_s = Spearman's correlation coefficient followed by ** and * are significant at the 0.01 and 0.05 p-level (2-tailed).

Grazing land ownership and holding

Due of high demand of crop land resulted from increasing human population pressure; grazing land was a scarce resource in the study area. As reported by farmers, it has also been decreasing from time to time. Accordingly, only about (34.3%, n=46) of the farmers in the study area posses very small 0.073±0.014 ha size of private grazing land (Table 8) whose lands are mostly located at farm boundary and around the homestead. This average grazing land holding was far lower with individually owned pasture lands of 0.2, 0.5 and 0.1 ha at Dogollo, Ginchi and Inewari, respectively (Getachew et al., 1993) and the average private grazing land holding of 0.22±0.02 ha. at Yerer watershed of Adaa Liben district (Samuel, 2005) which are part of Ethiopian mixed farming highlands. Moreover, the grazing lands locations identified in this study are in agreement with Admassu (2008) who reported that private grazing lands in front of homestead are usually the main sources of feeds for livestock in Alaba Woreda, Southern Ethiopia.

Table 8 - Ownership and mean holding (ha.) for grazing in study area (N=135).

Grazing land ownership	%
Not have (0)	34.1[b]
Who have (1)	65.9[a]
Chi-Sq	0.038
Sig.	0.846
Overall mean holding (n=46)	0.0728

r_s = Spearman's correlation coefficient followed by ** and * are significant at the 0.01 and 0.05 p-level (2-tailed).
a,b; % within a column with different superscripts differ significantly at p<0.05.

Feed related problems

Farmers' perception for feed shortage related problems were also assessed and they have also identified the problems based on their priority of importance and the result is presented in Table 9. According to 124 respondents' responses and the mean ranks, the importance of identified problems were significantly (X^2=132.09, p<0.001) different and the first three ranked problems i.e. land shortage; feed shortage and increasing population pressure were identified as major problems and used for further investigation. Feed shortage as priority problem in

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the study area has similarity with similar constraint reported by Dawit et al. (2013) in Adami Tullu Jiddo Kombolcha district, Admassu (2008) in Alaba district and Belay et al. (2012) in Dandi district of Ethiopia.

The extent of land shortage (X^2=10.595, p<0.01) and population pressure (X^2=14.016, p<0.001) as an important problem were different between farmers at the two study districts. Accordingly, land shortage (r_s=0.293) was more critical for Dale farmers than Shebedino's who were more concerned (r_s=-0.338) about increasing population pressure (Table 10).

Moreover, due to long period of land allocation and less ownership for grazing and crop lands which are the main livestock feed sources in the form of grazing and crop residue, the overall feed shortage condition was more critical (X^2=8.348, p<0.05, r_s=-0.236) for younger (<=30Yrs) farmers than those belongs to other age groups (Table 10). Moreover, due to economic importance of male cattle in general and young bull in particular in income generation, farmers limited feed access for this operation was justified by their high priority concern (X^2=6.845, p<0.01, r_s=0.236) of male cattle owners' regarding existing feed shortage problem in the study area.

Increasing population pressure as feed related problem was a priority concern for farmers who possessed sheep (X^2=4.011, p<0.05) and not possessed poultry (X^2=4.935, p<0.02) which may limit those farmers to not expand their flock size and production scope (Table 10).

Table 9 - Friedman's mean rank test for priorities of identified feed related problems in the study area (N=124).

Identified feed related problems	Mean	Std. Deviation	Mean Rank	Rank
Land shortage	1.16	1.35	4.97*	1
Feed shortage problem	1.03	1.43	4.69*	2
Population pressure	0.39	0.99	3.90*	3
Expensiveness of feed cost	0.35	0.87	3.88*	4
Lack of forage materials	0.13	0.58	3.59	5
Lack of income	0.06	0.37	3.50	6
Lack of advice	0.03	0.25	3.47	7
Chi-Sq			*132.09*	
Sig.			*0.000*	

3= 1st priority, 2= 2nd priority, 1= 3rd priority, *high priority problems,

Table 10 - Spearman's correlation and Kruskal Wallis rank test for the effect of socio economic characteristics and asset related factors on priority of major feed related problems (N=124).

Variables and groups	%	Land shortage	Feed shortage problem	Population pressure
Districts				
Shebedino (1)	52.42	53.54	61.19	69.37
Dale (2)	47.58	72.37	63.94	54.93
Chi-Sq		*10.595*	*0.265*	*14.016*
Sig.		*0.001*	*0.607*	*0.000*
r_s		*0.293***	*0.046*	*-0.338***
Age group				
Young (<=30Yrs) (1)	20.16	57.68	77.64	64.16
Middle (31-55Yrs) (2)	66.13	62.43	59.29	63.09
Old (>=56yrs) (3)	13.71	69.94	55.71	57.24
Chi-Sq		*1.470*	*8.348*	*1.235*
Sig.		*0.479*	*0.015*	*0.539*
r_s		*0.107*	*-0.236***	*-0.084*
Crop land holding group				
Small (<=0.5ha) (1)	67.74	61.13	63.81	62.97
Medium (0.6-1.5ha) (2)	30.65	65.08	60.74	61.91
Large (>=2 ha) (3)	1.61	71.00	41.00	54.00
Chi-Sq		*0.536*	*1.346*	*0.384*
Sig.		*0.765*	*0.510*	*0.825*
r_s		*0.064*	*-0.071*	*-0.036*
Sheep Ownership				
Not have (0)	86.29	61.40	64.16	60.96
Who have (1)	13.71	69.41	52.03	72.18
Chi-Sq		*0.909*	*2.450*	*4.011*
Sig.		*0.340*	*0.118*	*0.045*
r_s		*0.086*	*-0.141*	*0.181**
Male cattle Ownership				
Not have (0)	78.23	65.61	58.82	61.03
Who have (1)	21.77	51.33	75.72	67.80
Chi-Sq		*4.156*	*6.845*	*2.105*
Sig.		*0.041*	*0.009*	*0.147*
r_s		*-0.184**	*0.236***	*0.131*
Poultry Ownership				
Not have (0)	34.68	59.47	58.44	68.37
Who have (1)	65.32	64.11	64.65	59.38
Chi-Sq		*0.586*	*1.230*	*4.935*
Sig.		*0.444*	*0.267*	*0.026*
r_s		*0.069*	*0.100*	*-0.200**

r_s = Spearman's correlation coefficient followed by ** and * are significant at the 0.01 and 0.05 p-level (2-tailed).

To cite this paper: Menbere Afele S. 2014. Livestock feeds and feeding system in Enset (Ensete ventricosum) dominated mixed farming system of southern Ethiopia. *Online J. Anim. Feed Res.*, 4(6): 150-158.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

CONCLUSION AND RECOMMENDATIONS

Natural pasture in the form of grazing/scavenging, crop residue and purchased feeds from market/other farmers were the major feed resources in the area. Except young bulls which have significant role in income generation and provided crop residue at highest priority and oxen which have equally chance of getting those major feed resources due to limited ownership of the farmers and economic importance, the other livestock species/classes were mostly depend on natural pasture and rarely crop residue.

In feed production, conservation and treatment aspects, majority of farmers have not grown improved forages. However, considerable and limited of farmers, respectively practiced feed conservation (mainly maize Stover and elephant grass) and crop residue treatment (mostly add and mix salt). Grazing land is a scares resource in the livestock production sub-system of the area and only about 34.1% (n=46) of the farmers posses private grazing land with a very small an average holding of 0.073±0.014 ha which are mostly located at backyard and farm land boundaries.

According to respondents' responses and the mean ranks, land shortage; feed shortage and increasing population pressure were identified as major problems, and land shortage was more critical for farmers at Dale than Shebedino farmers who were more concerned about increasing population pressure.

ACKNOWLEDGEMENTS

The author is grateful to respondent farmers at Shebedino and Dale districts who spent their valuable time to provide information during the Participatory Rural Appraisal and formal data collection periods. Thanks also due to the local authorities, districts agriculture and rural development office staffs for their help during whole study period and in provision of secondary information.

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Online Journal of Animal and Feed Research

Volume 4, Issue 6: 159-163 (2014) *ISSN 2228-7701*

THE EFFECTS OF SUPPLEMENTATION RATIONS ON MILK YIELD, BODY CONDITION SCORE AND CALVES WEIGHT OF FUJA COWS

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ABSTRACT: This study was conducted in Western Sudan to evaluate the effects of supplementation on productive performance of Fuja dairy cows (local breed) and their calves. Forty lactating Fuja cows and their calves were selected on the basis of approximate similarity in age and live weight, the cows and their calves were randomly assigned into four groups (each group consisting of 10 cows). The diets were also randomly assigned to each of the four groups of the animals. The rations were fed after grazing at the rate of 2 kg per cow per day, during adaptation period of two weeks followed by the experimental period. Data collection of body condition score (BCS), milk yield and body measurements were carried out monthly for each new born calf to assess chance in body weight (BWT), body height (BH), body length (BL) and heart girth (HG). The results of the study indicated that milk yield was improved by supplementation, body condition score and parity number had significant (P< 0.05) effect on lactation curve. Body measurements were also affected by the sex of the calf. Strategic supplementary feeding of Fuja dairy cows increased milk yield. The treatment also reduced cows body condition loss (P<0.05) and caused no cows mortality. Therefore from the study result, it was possible to concluded that supplementation with molasses are essential for improving Fuja dairy cows and their calves' performance in range land of Western Sudan.

ORIGINAL ARTICLE
Received 12 Nov. 2014
Accepted 23 Nov. 2014

Keywords: Supplementation, Cows, Calves, Milk Yield, Body Measurements, Body Condition, Sudan

INTRODUCTION

The Sudan is a large country of livestock population that estimated 133 million heads (FAO, 1999). This stock is raised under traditional pastoralist nomadic system involving extensive seasonal migratory movements for search of water and pasture (Elmansoury, et al 2000).

Nutritional limitation constitutes one of the most important productivity constraints for nomadic herd, where the natural pasture becomes more deficient in energy, protein and essential minerals during a long period of the year (Idris, et al 2014). Consequently the grazing dairy cows are apt to suffer from nutritional deficiency, loss of body weight and body condition during the dry season, when the pasture is scarce and low in it is nutritive value, this generally reflected in slower growth rate of heifers, reduced maturity and low productive and reproductive performance, also the milk yield is reduced (Idris et al 2011). Therefore, this research programme has been under taken in the rangeland of western Kordofan to develop feed supplementation strategies for improving milk production of Fuja herds. Also one of the objectives of this study is intended to assess the utilization of some of the commonly available feed concentrates for supplementary feeding of grazing milking herds.

MATERIAL AND METHODS

General

The experimental work of this study was consisted of feeding trials with milking herds of Fuja cattle (local name) in western Kordofan, Sudan. The trials were in the form of the supplementary feeding of concentrate mixtures (local ingredients) to the grazing milking herds during the dry season, shortly after the end of rainy season and during the dry winter season. The trails were conducted at the times when the experimental cows were in the early lactation mid-lactation and late lactation. Experimental rations were formulated, based on the local commonly available concentrate feeding stuffs, to contain varying levels of energy and crude protein, and were fed to the experimental animals in supplementation to grazing on the natural grasses and crop residue in the surrounding areas (table1).

Study area

The study was conducted at the farm of Peace University Western Kordofan State, that lies between longitudes 28° -30° east and latitudes 10° -12° north.

To cite this paper: IDRIS A, Tibin I, Elbukhari H, Bakheet S, Zariba S and Hamid A. 2014. The effects of supplementation rations on milk yield, body condition score and calves weight of Fuja cows. *Online J. Anim. Feed Res*., 4(6): 159-163.
Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Herd and management

The common system of herd management is traditional pastoralist. The animals were raised under traditional grazing. The herds are taken during the day light to natural grazing in the vicinity of the farm, and in the evening they are returned to the farm and kept in cattle enclosures.

Experimental animals

Forty lactating cows and their calves were selected on the basis of approximate similarity in age and live weight. Dairy cows and their calves were divided at random into four groups, and each group consisting of 10 cows with their calves, each group of animals was assigned for the experimental rations at random.

Experimental procedure

The diets were assigned at random to each of the four groups of the animals in a completely randomized block design arrangement. The rations were fed after grazing at the rate of 2 kg per cow per day, for adaptation period of two weeks followed by the experimental period (10 months), the supplementary ration was divided in two equal portions of one kilogram each, and each portion was fed immediately before the evening or morning milking.

The cows were taken each morning to the natural pasture, and allowed to graze on the available dry grasses and crop residues. They were then returned in the evening to the camp, and each group of animals were housed overnight in it is respective enclosure, each cow within each group was fed it is experimental rations and hand-milked in the evening and in the morning.

Data was collected for body condition score (BCS), milk production per milking was estimated for each cow. Body measurements were carried out for each new born calf to assess the body weight (BWT), body height (BH), body length (BL) and heart girth (HG). The body measurements were done by using a weight–band (tape). The body score measurements were determined according to 1-9 scale (Nicholson and Butterworth, 1986), The BCS was estimated at birth, 30, 60, 90, 120, 150, 180, 210, 240, 270 and 300 days post-calving, BH , BL and HG were taken at the calving and then at 30, 60, 90, 120, 150, and 180 days after calving. Milk yield was recorded at 30, 60, 90, 120, 150, 180, 210, 240 and 270 days post-calving.

Statistical analysis

Analysis of variance (ANOVA) for completely block randomized design according to Gomez and Gomez (1984) was applied to determine significances of difference among different treatments. LSD test was used to separate among means.

RESULTS

The study showed that, milk production was significantly improved by supplementation cows with concentrate mixtures, cows supplemented with ration D recorded higher milk yield after mid-lactation on 180, 210, 240 and 270 days post-partum (table 2).

The study indicated that, cow parity number had significant ($P<0.05$) effect on BCS in the period from 30 to 300 days post-calving (Table 3). The BCS decreased for all groups as lactation curve increased, the cows in fourth and fifth age lost more BCS than the cows in sixth age. Cows of age 7 years were recorded better BCS than the other age groups.

There were positive correlation Coefficients between body condition score and milk yield (Table 4). The Correlation coefficients between the two traits tended to be higher at birth were (r) = 0.94 and 0.90 for milk yield in peak lactation. The study also indicated that there were higher significant ($P<0.01$) correlations between BCS and milk yield in mid-lactation.

The sex of calve significantly ($P< 0.05$) effects on heart girth (cm) at birth and over all age period, male calves recorded higher heart girth (HG) than female calves at birth, 60, 150 and 180 days post-partum. Female calves recorded longer ($P< 0.05$) HG on 30, 90 and 120 days after calving (Table 5). Also table 5 showed that, male calve recorded better ($P< 0.05$) body height (BH) at birth, 60, 90, 150 and 180 days post-partum and the female calves recorded longer BH ($P< 0.05$) on 30 days and 120 days after calving. Calve body length (BL) also affected by the sex, male calve recorded longer ($P< 0.05$) body length than female calves.

Table 1 - Ingredient composition of dairy concentrate (%)

Ingredients %	Ration A	Ration B	Ration C	Ration D
Sorghum	20	20	15	15
Ground nut cake	20	20	15	15
Wheat bran	20	20	20	20
Molasses	10	15	20	20
Corn residue	18	0	8	4
Ground nut cake Hulls	10	23	20	24
Salt +minerals	2	2	2	2
Energy density (Mcal DE/kg DM)	16.6	16.2	13.3	13.4
CP %	9.7	10	9.5	9.5

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Scienceline/Journal homepages: http://www.science-line.com/index/; http://www.ojafr.ir

Table 2 - The effect of supplementation on daily milk yield (Kg/cow)

	Daily milk yield (mean ±SE)								
Rations	**30 day**	**60 day**	**90 day**	**120 day**	**150 day**	**180 day**	**210 day**	**240 day**	**270 day**
Ration A	7.60 ± 0.54	9.80 ± 0.62	9.40 ± 0.83	9.10 ± 0.59	8.70 ± 0.55	7.40 ± 0.58 b	5.20 ± 0.59 c	7.30 ± 0.65 b	6.90 ± 0.26 c
Ration B	7.40 ±0 .06	9.70 ± 0.69	9.60 ± 0.92	9.90 ± 0.77	9.30 ± 0.71	7.70 ±0.60 b	7.90 ± 0.66 ab	7.60 ± 0.65 b	7.00 ± 0.29 b
Ration C	8.30 ± 0.45	10.7 ± 0.52	10.2 ± 0.70	9.20 ± 0.47	8.20 ± 0.44	7.10 ± 0.42 b	6.50 ± 0.50 bc	6.70 ± 0.49 b	7.00 ± 0.21 b
Ration D	7.30 ± 0.69	8.40 ± 0.80	8.70 ± 1.07	9.50 ± 0.77	9.90 ± 0.71	9.90 ± 0.70 a	8.30 ± 0.76 a	8.30 ± 0.75 a	7.70 ± 0.34 a

[abc]: means in the same column for each parameter with different superscripts are significantly different (p <0.05); NS Not: significant different (P >0.05)

Table 3 - The effect of cow's age on body condition score (BCS)

	BCS (mean ±SE)										
Age	**Birth**	**30 day**	**60 day**	**90 day**	**120 day**	**150 day**	**180 day**	**210 day**	**240 day**	**270 day**	**300 day**
4 th	6.0 ± 1.24	4.0±1 .04b	1.4±0.54c	1.2±0.61c	1.6±0.67c	1.6±0.78c	1.8±0.76c	2.2±0.75b	2.0±0.55c	1.5±0.80b	2.0±1.71b
5 th	6.0±0.88	6.5±0.52ab	4.5±0.60b	4.5±0.59b	4.3±0.75ab	3.8±0.87b	3.3±0.86bc	3.3±0.69b	3.0±0.62bc	3.3±0.80ab	3.3±0.98b
6 th	6.8±0.56	7.0±0. 50a	6.0±0.49ab	6.6±0.51a	6.4±0.57a	5.9±0.66ab	5.4±0.65ab	6.1±0.64a	5.1±0.47a	4.3±0.60a	4.8±0.69a
7 th	7.0±0.72	7.3±0.60a	7.0±0.69a	7.0±0.78a	7.0±0.86a	6.7±0.99a	6.7±0.99a	6.3±0.85a	5.0±0.71ab	5.3±0.93a	5.7±0.98a

Table 4 - Prediction equations for milk yield (Kg) using body condition score

Quadratic equation	**a**	**b**	**c**	**Correlation Coefficient (r)**	**S.E**
Milk yield at birth Y1= a+bX1+ CX1 2	- 0.149	2.357	- 0.177	0.94	1.15
Milk yield at lactation peak Y2= a+bX2+ CX2 2	0.344	2.646	- 0.127	0.90	1.90

Y1 = daily milk yield at birth (Kg/cow); X1 = BCS at birth; Y2 = daily milk yield at Lactation peak (Kg/cow); X2 = BCS at Lactation peak

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Table 5 - The effect of sex on calve body measurements (Cm) (mean ±SE)

Items	Birth	30 days	60 days	90 days	120 days	150 days	180 days
Heart girth							
Male	67.8±1.15 [a]	69.0± 2.19 [b]	83.3±3.67 [a]	91.3±3.28 [b]	95.3±4.94 [b]	101.0±6.35 [a]	110.53±3.34 [a]
Female	61.8±1.07 [b]	76.0±2.53 [a]	81.3±4.24 [b]	92.5±2.84 [a]	98.0±4.94 [a]	93.2±4.01 [b]	107.3±2.36 [b]
Body Height							
Male	53.2±3.24 [a]	68.5±1.70 [b]	66.3±3.36 [a]	65.0± 2.14 [a]	65.7±2.05 [b]	69.5±3.76 [a]	72.0±2.20 [a]
Female	51.0±2.97 [b]	71.3± 1.96 [a]	60.5±2.91 [b]	62.3±1.85 [b]	67.3±2.05 [a]	66.4±2.38 [b]	70.3±1.56 [b]
Body length							
Male	49.8±1.70 [a]	53.3±1.59 [b]	61.3±2.60 [a]	67.3±1.87 [a]	69.3±2.69 [a]	73.0±5.65 [a]	77.0±4.22 [a]
Female	47.6±1.57 [b]	58.0±1.84 [a]	57.8±2.25 [b]	66.0±1.62 [b]	66.7±2.69 [b]	66.4±3.57 [b]	74.8± 2.99 [b]

DISCUSSION

Under the condition of the present study, it was evident that post-partum supplementary feeding resulted in a certain degree of improvement in milk yield and BCS of grazing nomadic milking herd, also supplementation of dairy cows improved the body measurement and their calves.

Milk production was significantly improved by supplementation cows with concentrated mixtures during their early or mid-lactation, the cows offered with 20% molasses and higher ground nut cake mixtures (Ration D) produced higher milk yield compared with cows of other groups, these findings are in line with Hoogendroon, and Griever (1970), Ali, (1991) and Eltaher (2002). Also Tag Elsir et al (1988) reported that, supplementation of grazing cows with concentrate increased milk yield.

The body condition of the cows at calving was generally low and it was further reduced as the milk was increased, for all the experimental cows. The BCS declined sharply from calving to 300 days post-calving for all experimental cows, was follows the lactation cure of milk yield. The cows of 6 and 7 years of age lost less BCS than the cows on young ages. These results were in line with a number of other studies (Jones and Garnsworthly, 1988 and Oldman and Kyrisasis 1993).

The positive correlation Coefficients between BCS and milk yield is higher at birth and in peak of lactation. This is due to the loss in BCS of the cows during early lactation that an indication of the mobilization of the body reserve for milk production. The nutrients supplied by both grazed forage and concentrated mixtures seemed to be satisfy the increasing total nutrient requirements for milk production during the first two months of lactation.

The correlation between BCS and milk yield are shown in table4. The correlation regression (r) values are highly related to milk yield at birth and lactation peak although (r) is above 0.9 .Body condition could be used to predict milk yield accurately.

Calf sex all strongly influenced ($p<005$) heart girth (HG), body height and body length (BL). This finding is in agreement with Essien and Adesope, (2003), Orheruata (1988) and Alade (1990). Male calves were longer than female calves, the differences in the measurements obtained between the sexes can most probably be attributed to the fact that the gestation period of the male foetus is often a little longer than that of the female. It can also be explained by the findings of Essien and Adesope (2003).

CONCLUSION

The study indicated that, post-partum supplementation of nomadic milking cows with energy and concentrated mixtures during the dry season effectively improved milk yield during early and mid-lactation periods. Concentrate supplementation that, containing local ingredients were also found to improve milk production, and also molasses can be used to replace sorghum grain or sorghum brewery residue in the concentrate mixtures. These results of the present study indicated the importance of the nutritional status of the nomadic cows at calving and early post-partum on the production and reproduction performance of the animals.

ACKNOWLEDGEMENT

My thanks are due to peace University and to Scientific Research (Ministry of Higher Education and Scientific Research. Finally, I, am thankful to Dr. Idris Ahmed, the director of El-Obied Research Veterinary Laboratory.

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To cite this paper: IDRIS A, Tibin I, Elbukhari H, Bakheet S, Zariba S and Hamid A. 2014. The effects of supplementation rations on milk yield, body condition score and calves weight of Fuja cows. *Online J. Anim. Feed Res*., 4(6): 159-163
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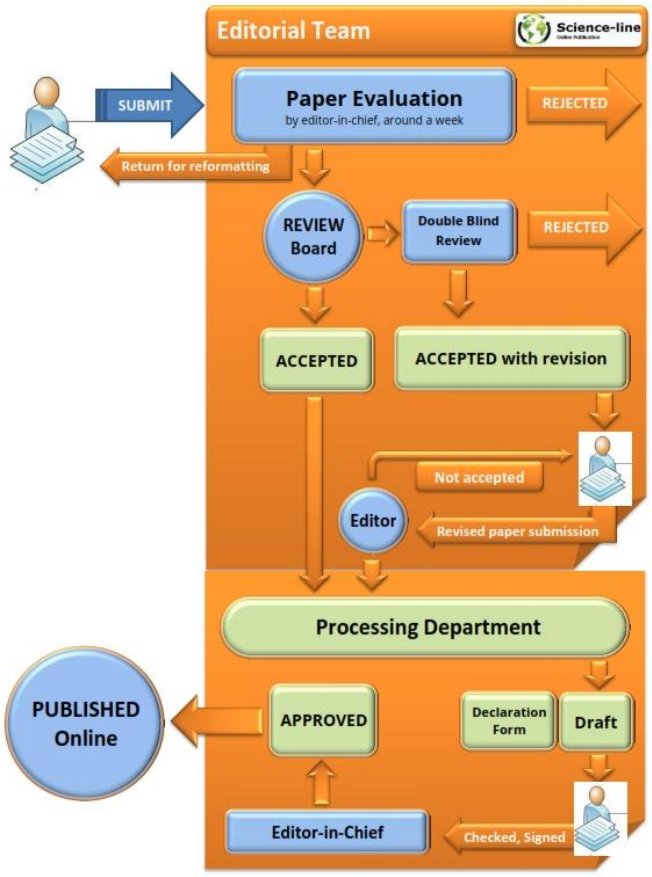

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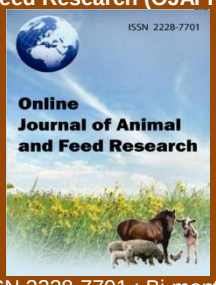

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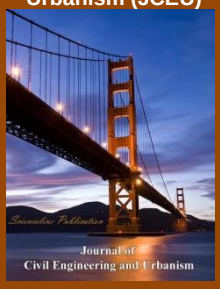

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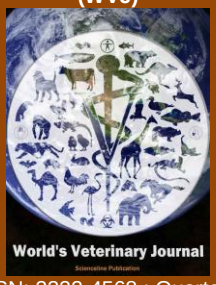

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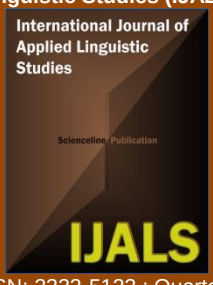

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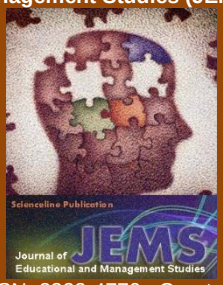

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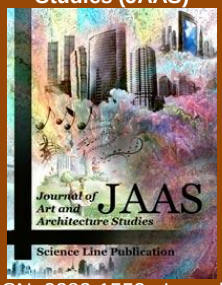

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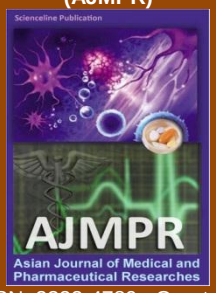

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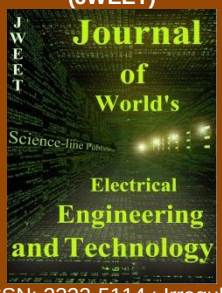

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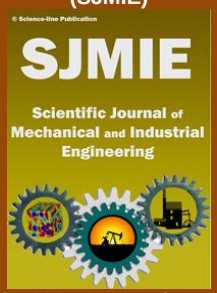

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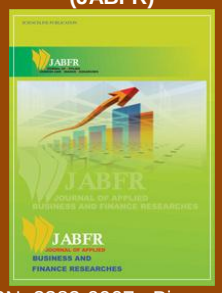

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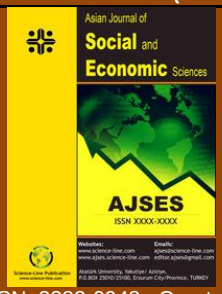

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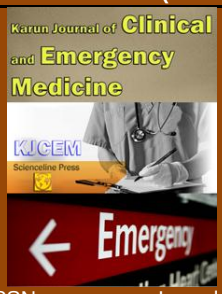

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