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Agriculture & Veterinary

Altitude Ranges of Simada

Sperm Sexing in Small Ruminants

Highlights

Percoll Density Centrifugation

Properties of Varieties of Kenaf

Discovering Thoughts, Inventing Future

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Mechanical Properties of Varieties of Kenaf *(Hibiscus Cannnabinus)* Stem

By Raji, Abdul Ganiy Olayinka & Aremu, David Olufemi
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Abstract- Due to the diversity in the use of kenaf, its processing and production, there is need to determine some mechanical properties of the kenaf stem so as to get a suitable database for design and mechanical features of the equipment and facilities for processing kenaf stem. This study was designed to investigate the effect of moisture content (mc) on mechanical properties of kenaf stems. Five common varieties of kenaf in Nigeria were identified and selected (Ife Ken 400, Ife ken D1 400, NHC 25 v 31, NHC 1 v 37 and Kuba 108). Samples were stored at room temperature for five weeks and moisture loss was monitored. Samples from each variety were cut into 30mm were prepared and placed horizontally between the crosshead of the Instron Testing Machine (Model 3369, 100KN, USA) to determine the mechanical properties (load at maximum tensile stress, tensile strain at maximum tensile stress, energy at maximum tensile stress and tensile stress at break) at 2mm/min.

Keywords: *kenaf, moisture content, mechanical properties.*

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Mechanical Properties of Varieties of Kenaf *(Hibiscus Cannnabinus)* Stem

Raji, Abdul Ganiy Olayinka [α] & Aremu, David Olufemi [σ]

Abstract- Due to the diversity in the use of kenaf, its processing and production, there is need to determine some mechanical properties of the kenaf stem so as to get a suitable database for design and mechanical features of the equipment and facilities for processing kenaf stem. This study was designed to investigate the effect of moisture content (mc) on mechanical properties of kenaf stems. Five common varieties of kenaf in Nigeria were identified and selected (Ife Ken 400, Ife ken D1 400, NHC 25 v 31, NHC 1 v 37 and Kuba 108). Samples were stored at room temperature for five weeks and moisture loss was monitored. Samples from each variety were cut into 30mm were prepared and placed horizontally between the crosshead of the Instron Testing Machine (Model 3369, 100KN, USA) to determine the mechanical properties (load at maximum tensile stress, tensile strain at maximum tensile stress, energy at maximum tensile stress and tensile stress at break) at 2mm/min. The data were subjected to statistical analysis. Highest load at maximum tensile stress of 714.90 at 21% mc and the least load at maximum tensile stress of 406.44 at 18% mc were obtained respectively for Ife Ken D1 400 and Ife Ken 400. Highest energy at maximum tensile stress (2.6466) was obtained for Kuba 108 while Ife Ken 400 has the least energy at maximum tensile stress (0.7865). Ife Ken D1 400 has the highest tensile stress at break (22.336) while Ife Ken 400 has the least Tensile Stress at break (8.567). Moisture content had significant effect on the mechanical properties of the kenaf stem. The study established that the kenaf stem is harder and may be difficult to crush for extraction of fibre at higher moisture content.

Keywords: kenaf, moisture content, mechanical properties.

I. General Background

Kenaf (*Hibiscus cannabinus*) is an annual crop which is high in fiber yield (Bakhtari *et* al., 2011; Mazumder *et al*., 2005). Kenaf's ability to fix CO_2 has expanded its global consciousness as a natural source of cellulose fiber (Hossain *et al*., 2011; Lam *et al*., 2003). Its carbon dioxide assimilation capability, water purification ability and fast growing characteristics have invigorated several nations to consider kenaf as an alternative source of natural fibre (Kobayashi *et al*., 2013; Dauda *et al*., 2013).

It is cultivated for its fiber in India, Bangladesh, United States of America, Indonesia, South Africa, Malaysia, Viet Nam, Thailand, parts of Africa and to a small extent in South Eastern Europe. The stems produce two types of fibers. A coarser fiber in the outer layer (bast fiber) and a finer fiber in the core. It matures in 100 to 200 days. Kenaf was grown in Egypt over 300 years ago. The kenaf leaves were consumed in human and animal diet, the bast fiber was used for bags, cordage and the sails for Egyptian boats. This crop was not introduced into southern Europe until the early 1900s. Today, principal farming areas are China, India and it is also grown in many other countries such as US, Mexico and West Africa. The main uses of kenaf fiber have been rope, twine, coarse cloth similar to that made from jute and paper (Zakiah *et al*., 2011). Uses of kenaf fiber include engineered wood, insulation, clothing-grade cloth, soil-less potting mixes, animal bedding, packing material and material that absorbs oil and liquid. It is also useful as cut bast fiber for blending with resins for plastic composites, as a drilling fluid loss preventative for oil drilling muds, for seeded hydro mulch for erosion control. It can be made into various types of environmental mats, such as seeded grass mats for instant lawns and moldable mats for manufactured parts and containers (Amel *et al*., 2013). Kenaf seed yields vegetable oil used for cosmetics, industrial lubricants, biofuel production and also important for reducing cholesterol and heart diseases (Zakiah *et al*., 2011). It can also be used for making papers. The fibers are produced mostly for textiles, gunny sacks and to a certain extent, paper. New uses for kenaf have recently been developed for different industrial applications. Products range from bio composites, paper, textiles and cattle feed and absorbing agents (Dauda *et al*., 2013).

The kenaf stem is divided into two separate parts, the bark or bast containing relatively long fibers and the stem containing short fibers, called core. The ratio of the core to bast is 65:35% of the whole stem weight. The plant grows on various types of soil but is best grown during the rainy season for good yields. Yields of kenaf range from 8 – 12 metric tons of dry stem per hectare. Mechanized operation from seeding to harvesting is required for large scale cultivation. Fiber production can be processed through mechanical and water retting (separation) where steams are soaked in ponds. Traditional growers of kenaf are China, Indonesia, Myanmar, Thailand and the United States of America. Post-harvest handling of kenaf stems requires processing machines like decorticators, driers,

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pelletizers, milling machines etc, the efficiency and design of these machines is dependent of the engineering properties of the stem which include the mechanical properties. The mechanical properties of a material describe how it will react to application of physical forces; some materials will deforms or flow, solids will deform liquid and gas will flow. Mechanical properties are determined through series of standardized mechanical tests resulting from the structure, physical state and rheology. They can be subdivided into two groups; structural and geometrical properties and strength properties. Structural and geometrical properties include mass, volume, area-related properties (density, shrinkage and porosity) and morphological properties (surface area, roundness and sphericity) (Mohsenin, 1986)

Due to the diversity in the use of kenaf, its processing and production, there is need to determine some mechanical properties of the kenaf stem so as to get a suitable database for design and mechanical features of the equipment and facilities of processing kenaf stem. Thus, this study was carried out to determine the effect of moisture content and time on some mechanical properties of kenaf stem such as tensile strength, young modulus and tensile strain.

II. Methodology

a) Sample Collection and Preparation

Five varieties of kenaf stems (Ife Ken 400, Ife ken D1 400, NHC 25 v 31, NHC 1 v 37 and Kuba 108) were obtained from kenaf farm of the Institute of Agricultural Research & Training (IAR&T), Ibadan, Nigeria and the Teaching and Research farm of the Obafemi Awolowo University, Moor Plantation, Odo-Ona, Apata, Ibadan, Nigeria. The samples were kept at room temperature for five weeks to determine the loss in weight with time on the mechanical properties of the kenaf stems. Samples were tested at every week of storage for strength properties. The moisture content at each period of testing was determined and linked with the period of test.

b) Moisture Content Determination

During each week of test, samples were taken from each variety and cut into 30mm length. The samples were weighed and placed in the oven at 103±°C to dry to a constant weight. At the end of 24 hours, the samples were removed from the oven and cooled for ten minutes and reweighed. The moisture content of the stems was then obtained using Equation 1.

$$Mc = \frac{Ww - Wd}{Ww} \times 100 \qquad (1)$$

Where: Mc is the Moisture content (%) of material, W_w is the Wet weight of the sample, and W_d is the weight of the sample after drying.

c) Determination of Mechanical Properties

The experiments were conducted at Federal College of Agriculture, Ibadan and Obafemi Awolowo University (O.A.U) laboratories. Five samples from each of the five varieties (thus making 25 samples) were cut into 30mm and were placed horizontally between the crosshead of the Instron Testing Machine (Model 3369, 100KN, USA), at 2 mm/minute (Plate 1). The machine was connected through a data logger to a computer system where the force deformation curve and data were observed as the experiment progressed. This procedure was repeated every two weeks to investigate the effect of moisture (due to loss of weight) on the mechanical properties of kenaf stems. The parameter recorded are load at maximum tensile stress, tensile strain at maximum tensile stress, energy at maximum tensile stress and tensile stress at break.

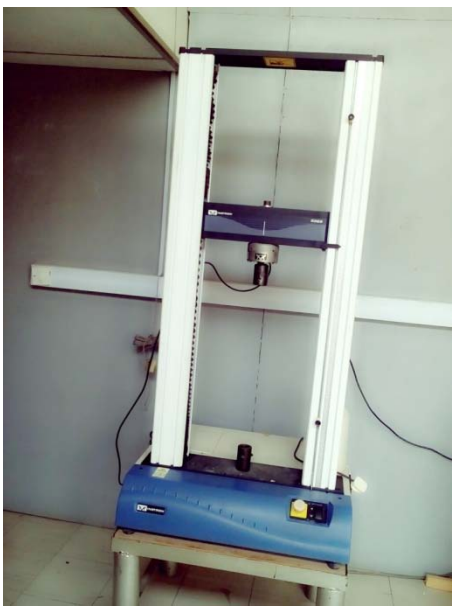

Plate 1: Instron Testing Machine

d) Statistical Analysis

Analysis of variance (ANOVA) of two factors complete randomized design (CRD) was used to evaluate the effect and significance level of moisture content on the mechanical properties of kenaf stem used for the experiment at alpha (α) = 0.05. The effect of moisture content on mechanical properties of kenaf stem were statistically analyzed using Duncan's Multiple Range Test (DMRT) at $P < 0.05$

III. Results and Discussion

The percentage moisture content of the samples at each period of storage for the five varieties is presented in Table 1.

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Table 1: Percent Moisture Content of Kenaf Samples at five weeks of Storage

Time	Moisture Content (wb %)				
	Ife Ken 400	Ife Ken D1 400	NHC 25 v 31	NHC 1 v 37	Kuba 108
Week 1	69	38	20	60	52
Week 2	43	34	18	55	45
Week 3	31	30	15	48	40
Week 4	20	23	12	40	36
Week 5	18	21	10	32	28

The mechanical strength (load at maximum tensile stress, tensile strain at maximum tensile stress, Energy at maximum tensile stress and tensile stress at break) of the kenaf stems was investigated at each week of storage is presented in Tables 2 – 3.

It was observed that variety 3 (NHC 25 v 31) has the highest value of Load at Maximum tensile stress of 895.08935N, while variety 2 (Ife Ken D1 400) has the highest Tensile Strain at Maximum Tensile Stress of 0.25667mm/mm. The Load at Maximum Tensile Stress increases every two weeks while Tensile Strain at Maximum Tensile Stress varies every two weeks, this findings are similar to report of Ghahraei *et al*. (2011). The mechanical properties of the varieties of the kenaf stem of the weeks shows that variety 5 (Kuba 108) has the highest Energy at Maximum Tensile Stress of 4.51469 J while variety 2 (Ife Ken D1 400) has the highest Tensile Stress at Break of 26. 38957MPa. Energy at Maximum Tensile Stress increases at week 4 while Tensile Stress at Break varies every two weeks (Ghahraei *et al*., 2011).

a) Load at Maximum Tensile Stress

The ANOVA table for load at maximum tensile stress for the five kenaf varieties is presented in Table 4. It was observed that there is high significant difference at 5% level of probability by Analysis of Variance (ANOVA) of each level of MC(Variety) of the mechanical properties. The result of Duncan Multiple Range Test (DMRT) as shown in Table 10 shows that Variety 2 (Ife Ken D1 400) has the highest Load at Maximum Tensile Stress of 714.90a while Variety 1 (Ife Ken 400) has the least Load at Maximum Tensile Stress of 406.44b.

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Table 2: Load and Tensile Strain at Maximum Tensile Stress of Kenaf Stems

Time	Load at Maximum Tensile Stress (N)					Tensile Strain at Maximum Tensile Stress (mm/mm)				
	Ife Ken 400	Ife Ken D1 400	NHC 25 v 31	NHC 1 v 37	Kuba 108	Ife Ken 400	Ife Ken d1 400	NHC 25 v 31	NHC 1 v 37	Kuba 108
Week 1	380.15618	609.14613	719.07828	357.07821	340.31765	0.03500	0.10973	0.04686	0.05086	0.05130
Week 2	633.50109	612.58785	618.69042	732.01834	460.40463	0.13320	0.25667	0.02300	0.03646	0.05224
Week 3	365.71051	726.28495	764.11598	512.67929	437.34626	0.12593	0.09653	0.02892	0.10213	0.05332
Week 4	430.70995	733.61161	730.58575	547.72875	472.78725	0.05813	0.11920	0.13559	0.05109	0.06262
Week 5	222.11501	892.86456	895.08935	621.29735	554.11480	0.03260	0.07547	0.03646	0.04686	0.06372

Table 3: Energy at Maximum Tensile Stress and Tensile Stress at Break of Kenaf Stems

Time	Energy at Maximum Tensile Stress (J)					Tensile Stress at Break (MPa)				
	Ife Ken 400	Ife Ken D1 400	NHC 25 v 31	NHC 1 v 37	Kuba 108	Ife Ken 400	Ife Ken D1 400	NHC 25 v 31	NHC 1 v 37	Kuba 108
Week 1	0.23025	1.27989	2.02156	1.82156	0.28145	3.37843	15.47069	13.18491	10.18491	12.87201
Week 2	1.76856	2.67480	2.01103	1.42347	2.32186	20.60159	20.80127	20.30988	16.60978	18.15281
Week 3	1.41212	1.29628	1.03497	1.54637	2.36985	12.83085	26.38957	24.31447	20.55336	10.82148
Week 4	0.41088	1.95499	1.05190	0.30732	4.51469	1.82691	23.38528	23.10068	7.216086	20.92310
Week 5	0.11081	1.05170	1.07169	3.02131	1.98634	4.19574	25.63396	25.36029	18.14472	15.88175

Table 4: Analysis of Variance (Load at Maximum Tensile Stress)

Source	Type III Sum of Squares	Df	Mean Square	F	Pr > F	Remarks
Variety	1819438.686	4	454859.672	4.39	0.0026	Significant (S)
MC (Variety)	1324304.665	20	66215.233	0.64	0.8744	Not Significant (Ns)
Error	10371946.38	100	103719.46			
Corrected Total	13515689.73	124				

MC (Variety) means moisture content nested into variety

Ns: Not significant at Pr > 0.05

S: Significant at Pr > 0.05

b) Tensile Strain at Maximum Tensile Stress

The ANOVA table for tensile strain at maximum tensile stress for the five kenaf varieties is presented in Table 5. It was observed that that there is no significant difference at 5% level of probability by Analysis of Variance (ANOVA) of each level of Variety of the mechanical properties. The result of Duncan Multiple Range Test (DMRT) as shown in table 10 shows that Variety 5 (Kuba 108) has the highest Tensile Strain at Maximum Tensile Stress of 1522.7a while Variety 1 (Ife Ken 400), Variety 2 (Ife Ken D1 400), Variety 3 (NHC 25 v 31) and Variety 4 (NHC 1 v 37) has the least Tensile Strain at Maximum Tensile Stress 0f 0.1a.

Table 5: Analysis of Variance (Tensile Strain at Maximum Tensile Stress)

Source	Type III Sum of Squares	Df	Mean Square	F	Pr > F	Remarks
Variety	46369147.1	4	11592286.8	1.00	0.4113	Not Significant (Ns)
MC (Variety)	231854236.1	20	11592711.8	1.00	0.4692	Not Significant (Ns)
Error	1159274299	100	11592743			
Corrected Total	1437497682	124				

MC (Variety) means moisture content nested into variety

Ns: Not significant at Pr > 0.05

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c) Energy at Maximum Tensile Stress

The ANOVA table for energy at maximum tensile stress for the five kenaf varieties is presented in Table 6, it was observed that there is high significant difference at 5% level of probability by Analysis of Variance (ANOVA) of each level of Variety of the mechanical properties. The result of Duncan Multiple Range Test (DMRT) as shown in table 10 shows that Variety 5 (Kuba 108) has the highest Energy at Maximum Tensile Stress of 2.6466a while Variety 1 (Ife Ken 400) has the least Energy at Maximum Tensile Stress of 0.7865b.

Table 6: Analysis of Variance (Energy at Maximum Tensile Stress)

Source	Type III Sum of Squares	Df	Mean Square	F	Pr > F	Remarks
Variety	43.38261425	4	10.84565356	3.23	0.0155	Significant (S)
MC (Variety)	72.33586725	20	3.61679336	1.08	0.3860	Not Significant (Ns)

MC (Variety) means moisture content is nested into variety

Ns: Not significant at Pr > 0.05

S: Significant at Pr > 0.05

d) Tensile Stress at Break

The ANOVA table for tensile stress at break for the five kenaf varieties is presented in Table 4, high significant difference was observed at 5% level of probability by Analysis of Variance (ANOVA) of each level of Variety of the mechanical properties. The result of Duncan Multiple Range Test (DMRT) as presented in Table 7 shows that Variety 2 (Ife Ken D1 400) has the highest Tensile Stress at break of 22.336a while Variety 1 (Ife Ken 400) has the least Tensile Stress at break of 8.567b. The mean effect of the mechanical properties of kenaf stem is presented in Table 8.

Table 7: Analysis of Variance (Tensile Stress at Break)

Source	Type III Sum of Squares	Df	Mean Square	F	Pr > F	Remarks
Variety	2938.926280	4	734.731570	5.06	0.0009	Significant (S)
MC (Variety)	3508.516857	20	175.425843	1.21	0.2633	Not Significant (Ns)
Error	14512.27943	100	145.12279			
Corrected Total	20959.72257	124				

MC (Variety) means moisture content is nested into variety

Ns: Not significant at Pr > 0.05

S: Significant at Pr > 0.05

Table 8: Mean Effect of Varieties on Mechanical Properties

Variety	Load at Maximum Tensile Stress	Tensile Strain at Maximum Tensile Stress	Energy at Maximum Tensile Stress	Tensile Stress at Break
Ife Ken 400	406.44b	0.1a	0.7865b	8.567b
Ife Ken D1 400	714.90a	0.1a	1.67060ab	22.336a
NHC 25 v 31	677.30a	0.1a	1.7371ab	20.644a
NHC 1 v 37	557.39ab	0.1a	1.6468ab	15.095ab
Kuba 108	452.98b	1522.7a	2.6466a	15.283ab

Mean with same letter in a column are not significantly different at Pr > 0.05 by Duncan Multiple Range Test (DMRT)

IV. Conclusion

The effect of moisture content on some mechanical properties of different varieties kenaf stem was investigated; it can be deduced the higher the moisture content, the higher the load at maximum tensile strength, energy at maximum tensile stress and the tensile stress at break however, there was a decrease when these properties gets to the breaking point.

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Roasting Technique Nutritional Value Improved *Brugmansia Suaveolens* Brows Leafe Supple-mentation on Performance of Yearling Bonga Sheep

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Abstract- The experiment was conducted to evaluate the effect of roasting technique nutritional value improved brugmansia suaveolens leafe, concentrate and their mixtures supplementations on intake, body weight gain and carcass parameters of yearling bonga sheep graze basal diet natural pasture grass adlibly, and to assess the economic benefit of the supplementation. The experiment was carried out at Modeyo Bonga sheep multiplication center, Decha woreda, Kafa Zone, Ethiopia using twenty eight yearling male bonga sheep with a mean (±SD) initial body weight of 31.67±1.59 kg.The animals were vaccinated against internal and external parasites, respectively, before the start of the experiment.Experimental sheep were adapted for 15 days to the treatment feeds. The experiment consisted of feeding trial of 90 days. The experiment was laid out in a randomized complete block design (RCBD) with four blocks consisting of seven animals per block based on their initial body weight.

Keywords: *Nutrition, Bonga Sheep, Carcass, Brugmansia Suaveolens, Economic Feasibility.*

GJSFR-D Classification: *FOR Code: 070799*

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Roasting Technique Nutritional Value Improved *Brugmansia Suaveolens* Brows Leafe Supplementation on Performance of Yearling Bonga Sheep

Kibreab Yosefe [α], Muluken Zeleke [σ], Metsafe Mamiru [ρ] & Hailemariam Gizaw [ω]

Abstract- The experiment was conducted to evaluate the effect of roasting technique nutritional value improved brugmansia suaveolens leafe, concentrate and their mixtures supplementations on intake, body weight gain and carcass parameters of yearling bonga sheep graze basal diet natural pasture grass adlibly, and to assess the economic benefit of the supplementation. The experiment was carried out at Modeyo Bonga sheep multiplication center, Decha woreda, Kafa Zone, Ethiopia using twenty eight yearling male bonga sheep with a mean (±SD) initial body weight of 31.67±1.59 kg.The animals were vaccinated against internal and external parasites, respectively, before the start of the experiment. Experimental sheep were adapted for 15 days to the treatment feeds. The experiment consisted of feeding trial of 90 days. The experiment was laid out in a randomized complete block design (RCBD) with four blocks consisting of seven animals per block based on their initial body weight. Dietary treatments were randomly assigned to one of the four treatment diets within a block. Treatments comprised of grazing natural pasture adlibitum-T1; grazing natural pasture adlibitum supplementation with 5 minute rosted brugmansia suaveolens leafe (RBS, 838gm)-T2; Concentrate composed of: Wheat (354 gm) , fabeaben (77 gm), barley (102 gm) -T3; RBS and concentrate-T4. The amount of supplement offered was 838 g/day on DM basis. There is free access to clean drinking water. Supplementation improved very significantly ($p<0.001$) feed intake, final body weight (FBW), average daily gain (ADG) and dressing percentage. Sheep suplemented with T2 had very significantly higher ($p<0.001$) body weight change compared to the unsuplemented and rest two treatmets.Sheep suplemented with T2 had significantly higher($p<0.001$) final body weight(41.07 kg), ADG(91g/day) as compared to the un-supplemented treatment, which had 37.67kg and 79 g/day, respectively. Similar to biological performance, economic analysis also showed that supplementation with T2 resulted in better return compared to others. Thus, it can be concluded that of 5 minute rosted brugmansia suaveolens leafe supplementation in general improved yearling bonga sheep. Among the supplements, however, T2 is biologically optimum and economically feasible.

Keywords: Nutrition, Bonga Sheep, Carcass, Brugmansia Suaveolens, Economic Feasibility.

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I. Introduction

The sheep and goats population of Ethiopia, including expert estimates of the pastoral areas, is about 55 million heads of which about 27 million are sheep (CSA,2014) and diverse genotype of sheep populations (Gizaw et al., 2007) maintained in different agro-ecological zones and ethnic groups. Most of the sheep (about 70%) are found in the highlands of the country maintained in the traditional husbandry system (Mengistu, 2006).They provide about 46% of the national meat consumption and 58% of the value of hide and skin production (Awgiww et al. 1991).

Fattening has been defined as intensive feeding of highly nutritious feed to promote fast growth and fat deposition to achieve desired carcass growth and quality (Alemu, 2007).Sheep fattening in Ethiopia has been recognized as a potential profitable activity that enhances the income of smallholder farmers (Shapiro et al., 1993; Pasha, 2006).Fattening is practice by 89.5% of the farmers in Adiyo Kaka district of kafa zone. Castration practice by 98.2% of the farmers,average age of castration is 10.8 ± 2.53 months, 63.3% primarily practice Castration to improve the fattening potential and is the means of getting higher sale prices in local markets in Ethiopia(Edea Z.*et al*., 2012).

Kafa Zone pouplation of Bonga sheep is 437,879(CSA,2014).Bonga sheep found at the Ecology of Humid mid-highland area(1200–2500).Distinguishing physical features of bonga sheep is long fat tail with straight tapering end (98.4%) (Abegaz (2004) ;Gizaw et al. (2007); Gizaw et al. (2008), Zewdu (2008); Dejen (2010); Amelmal (2011)) .Average weight of fattened bonga sheep is 50-65 kg,farmers at cooperative in kafaenter sheep for fattening at the age of 4-6 months others can enter fattening at 3 to 4.5 months of age immediately after weaning.There is no standard weight and age at which the sheep begin fatteningbut Most respondents gave preference to one year old sheep for sheep fattening (Animut, G. and J. Wamatu. 2014).

Brugmansia suaveolens, a member of solanaceae family, native to tropical South America (i.e.

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Brazil, Bolivia and Peru).It is also naturalised on other parts of the world including Ethiopia at eastern Africa. It is trees or bushes(Correa 1984,Zayed and Wink,2004).It is growing to about 3 m tall but occasionally reaching up to 4.5 m in height. The large leaves (10-30 cm long and 5-12 cm wide) are alternately arranged along the stems with entire margins and pointed tips.

It is multipourpose tree used for fence,animals feed,honey bee flora,poupulary known at study area as"*yemogn abeba*".Grows at areas with high humidity and heavy rainfall.Farmers based on their indigenous knowledge use different fattening ration practices for bonga sheep fattening regardless lack of comprehensive information and literature on sheep fattening in study area in addition to lack of appropriate feed packages to make sheep fattening an economically viable system.There is also no study on market oriented fattening from locally available B.suaveolensleaf improvingnutrient availabilityfor effective and efficiently utilization for sustainableusing experiment result at the end.

The pourpose of this present work is to investigateby roasting technique nutritional value improved brugmansia suaveolens brows leaf supplementation on performance of nutrient intake, weight change, feed conversion, carcass of yearling bonga sheep and its economic feasibility to develop sustainable fattening protocol under smallholder situations.

II. Materials and Methods

a) *Experimental Site*

Table 1: Description of the study area

Altitude	1,809 m.a.s.l
Latitude (NS):	07° 11.513
Longitude (EW):	036° 18.052

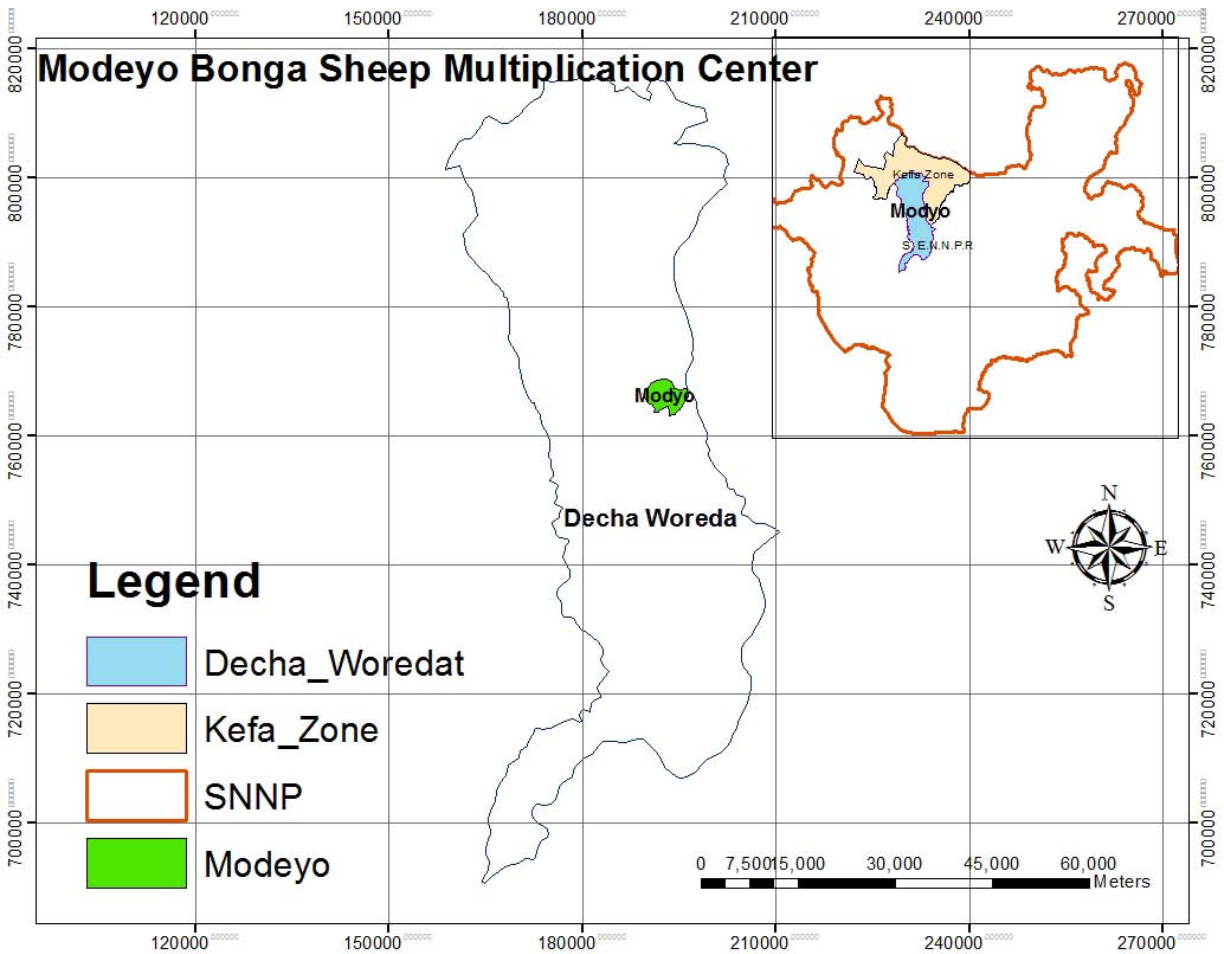

Fig. 1: Map of bonga sheep multiplication center(fig credit to:Desta y.wodebo)

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b) Sample collection and Experimental feed Preparation

Leaves of B. Suaveolenswere collected from moist ecology of 1,809 m.a.s.l from farmers around modeyo Bonga sheep multiplication center (N 07°11.513,E 036°18.052).Fresh green leaves were collected everyday throught the experiment for daily ration earlymoring at 21:00, starting from 11 september 2015 to 5 January 2016 G.C at the bases of 50 g DM/kg live weight for each sheep in adition to 15 % to be leftover.Th fresh leaf decorticate blade from petiole with excusive of midrib from base and roasted for 5 minute only stiring by droping a water in to casserole(pan) used for rosting.

A⇨ B⇨ C⇨ D⇨

Fig. 2: Brugmansia suaveolens leaf preparation procedures

c) Animals and Feed Management

Twenty eight castrated male Bonga sheep 12 months of age(31.67±1.59 kg) were used in the experiment.The sheep were from modeyo bonga sheep multiplication center where they had ear tagged and good record on their birth history to determine their age.Prior to experiment; the animals were dewarmed and vaccinated (drenched) against common diseases of small ruminants especially against gastro-intestinal parasites in the experimental cite.Pens were installed in a well ventilated shed with one side open to natural light and roofing to protect animals against sun and rain. They were randomly housed in individual holding pens (1.5 x 2.5 m^2) with concrete floors on an open-air platform. They were penned individually in a well-ventilated shed with cemented floor. During the feeding trial, animals were fed their experimental allowances according to the experimental scheme.

Pasture grazing (30%), and test diet (70%) all together estimated to 50 g DM/kg live weight feed daily in adition to 15% to be leftover (Osuji et al., 1993). Test feed was provided once daily at 8:00AM prior to the provision of basal diet up to 10:00 AM in a separate trough in an individual opened pen. The animals were free access to clean drinking water throughout the experiment. The offered and refused amounts of feeds were recorded to estimate the actual voluntary feed intake for each treatment.

In the beginning ,every two week and last day of each of the experimental period, all animals were weighed individually following overnight fasting to avoid gut content variation and data for the next period were recalculated.Body weight was measured using steelyard spring balance manual weighing which was calibrated manually. Weight of animals was taken after the balance is set correctly and once the animals stand calmly on it. In general, the daily diet (basal + supplement) were balanced to provide 8.36 MJ/kg Metabolisable energy and 70 g/kg crude protein in dry matter basis (NRC, 2007).

The total amount of feed offered and refused daily collected to determine the quality of feed the sheep consumed throughout the experimental period. Every morning the refusal collected, weighed on individual bases, and bulked for laboratory analysis. All sheep weighted fortnightly on suspended weight balance of 100gm precision.

Table 2: List of treatment combinations used in the experiment

Treatment	Composition
T1	Tethered Grazing
T2	Roasted Brugmansia S.Leaf
T3	Concentrate
T4	Roasted B.S Leaf

Control feed(T1) is composed of 57% Poaceae, 27.7% Asteraceae, 15% Fabaceae, 0.3% Cyperaceae and Juncaceae, from test diet:T2=5 minute rosted brugmansia suaveolens leafe with salt (5.33gm), T3=Concentrate composed of: Wheat(354gm), fabeaben(77gm),barley(102gm), salt(5.33gm),T4=rosted brugmansia suaveolens and concentrate at 1:1 ratio

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The experimental animals DM intake (percent body weight) was estimated from= (DM intake/Body weight)*100.Metabolisable energy (ME) contents were predicted from the equations of Abate and Meyer (1997). Feed conversion efficiency (FCE) was measured as proportion of average daily BW gain to daily DM intake (Ball and Pethick, 2006). The daily BW gain was calculated as the difference between the final and initial BW divided by the number of feeding days

d) Chemical Analysis of Feed

Samples of feedstuffs were analyzed for dry matter (DM), crude protein (CP), crude ash (CA), crude fiber (CF) and ether extract (EE) according to AOAC (2005) and for neutral detergent fiber (NDF), Acid detergent fiber (ADF) according to Van Soest et al. (1991).Total digestible nutrients were calculated from the proximate, detergent composition and nutrient digestion data following McDonald et al. (2010)

e) Lamb slaughter and carcass data collection

Lambs were slaughtered at 465 day of age. Lambs were transported 10 km to the Bonga agricalteral reaserch center were sloughtering and carcass data taken . Feed and water were withheld from lambs for approximately 12 h before slaughter.slaughter and carcass data collection of the experiment is according to USDA(1992).

Empty body weight was calculated as the difference between slaughter and gut contents. Percentage of total edible offal components (TEOC) was calculated as the sum total of blood, lung + trachea, heart, liver empty gut and kidney. The percentage of total non-edible offal components (TNEOC) was considered as the sum of head, skin with feet, penis + testicle, omental fat from kidney and abdomen, spleen, gall bladder, and gut content. Both TEOC and TNEOC percents were calculated based on SBW. The dressing percentage was calculated on the hot carcass as proportion of the slaughter weight as well as empty body weight

All the offal's and the carcass including the cuts were weighed on a digital balance with an error margin of 1 gram.Thestored sides(both quarters) were thawed at room temperature,reweighed,deboned and miced (excluding the bone).duplicate samples of the thoroughly mixed mince were taken to determine moisture by freeze-drying and the freeze-dried samples were analyzed for fat(soxhlet) and protein(kjeldhal).

f) Data Collection, Experimental Design and Statistical analyses

Initial,every two week and final body weight of the animal and their costs (feed cost,cost of sheep at the start and at the end of experiment , medicament cost, fire wood cost) were collected.Daily feed offered and refused was collected and recorded for each animal throughout the experimental period. Body weight was taken at every fifteen days interval after overnight fasting using suspended weighing scale. At the end of the experiment, all the experimental sheep were fasted for 12 hours, weighed and slaughtered. The animals were slaughtered following the standard slaughtering procedures for sheep.

Experimental sheep were adapted for 15 days to the treatment feeds. The experiment consisted of digestibility trial of 7 days and feeding trial of 90 days. The experiment was laid out in a randomized complete block design (RCBD) with four blocks consisting of seven animals per block based on their initial body weight. Dietary treatments were randomly assigned to one of the four treatment diets within a block.

Feed intake , body weight gain and carcass parameters were subjected to analysis of variance(ANOVA) using the general linear model procedure in SAS 2013 SAS software version 9.4.Treatment means were separated using least significant difference(LSD). When the results were significant, mean comparisons were made using Tukey multiple range test procedure of the SAS package.All data were analyzed as a randomized complete block design(RCBD).

The model employed was:

$$Yij = \mu + ti + bj + eij,$$

Where; Yij = Response variable
μ = Overall mean
ti = Treatment effect
bj = Block effect (initial body weight)
eij = Random error

g) Economic Analysis

Partial budget analysis was performed by considering variable costs (sheep cost at the start of experiment and at the end of experiment cost, feed cost) and total revenue (income) from sales of sheep. Net income obtained from the experiment was calculated as the difference of total revenue (total returns) and total variable costs according to the formula developed by Upton, 1979

Where,

$NI = TR - TVC$
$\Delta NI = \Delta GR - \Delta TVC$
$MRR = \Delta NI/\Delta TVC$

Where, NI = net income, TR = Total return, TVC = Total variable cost, ΔNI = change in net income, ΔGR = change in gross return, ΔTVC = change in total variable cost, MRR = marginal rate of return.

Marginal rate of return (MRR) is another way of taking the cost factor into account. It measures the ΔNI which is generated by each additional unit of expenditure (ΔVC).

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III. Results

The chemical composition of feeds used for experiment is shown in Table 3.Crude protein containt of Roasted B. Suaveolens is 547% higher than control feed of grazing pasture grass hey and 290 % higher than concentrate feed used at the experiment.

Table 3: Chemical Composition of Experimental Feedstuffs

	Nutrient (%)							
Diet	DM%	OM%	Ash%	CP%	CF%	NDF	ADF	ADL
Grazing natural pasture grass	91.1	88.3	11.7	6.3	3.9	65	51.1	12.9
Roasted B. Suaveolens	90.57	88.82	11.18	34.51	5.93	36.33	18.97	5.21
Concentrate	91.58	96.2	2.42	11.7	1.54	18.21	3.27	1.15
Roasted B. Suaveolens and Concentrate	92.37	91.59	5.37	13	3.4	21.67	7.32	3.25

DM dry matter,OM organic matter, CP crude protein ,CF crude fatt,ND Fneutral detergent fiber, ADF acid detergent fiber, ADL acid detergent lignin,

Table 4: Feed intake, daily weight gain,feed conversion ratio of yearling bonga sheep suplemented rosted *brugmansia suaveolens* leafe, concentrate mix and their mixture

DM Intake, g/day	T1	T2	T3	T4	SEM	P
Rosted brugmansia s. leafe	-	838	-	569		
Concentrate mix	-	-	600	181		
Grazingnatural pasture	adlibly	adlibly	adlibly	adlibly		
Total	100^{d}	938^{a}	700^{c}	850^{b}	0.57	***
Initial	30.56	31.88	31.08	31.15	0.19	NS
Final	37.67^{d}	41.07^{a}	38.64^{c}	40.07^{b}	1.03	***
AverageDaily gain, g	79^{d}	91^{a}	84^{c}	88^{b}	2.1	***

*^{abc} Means in the same row with different superscript letter are significant different; NS, non significant (P>0.05);*significant at P<0.05; **significant at P<0.01,T treatment, DM dry matter, FCR feed conversion ratio*

Table 5: Carcass parameters, edible and non-edible carcass offal of yearling bonga sheep suplemented rosted *brugmansia suaveolens leafe*, concentrate mix and their mixture

	Mean, Treatments					
Traits	T1	T2	T3	T4	SE	P
(a)Edible carcasses						
liver(g)	347^{d}	456^{a}	388^{c}	450^{b}	0.39	**
heart(g)	114.67^{c}	151^{a}	115.33^{c}	138.67^{b}	1.20	**
Empty gut(kg)	1.5	2.52	2.17	2.2	0.52	NS
Kidney without fat(g)	74	86.3	79.5	81.83	2.06	NS
Heart without fat(g)	45.7^{d}	109^{a}	52^{c}	59^{b}	0.75	**
Tail fat(g)	236^{d}	395^{a}	244^{c}	267^{b}	3.16	***
Kidney fat(g)	16.7^{d}	56^{a}	28.8^{c}	39^{b}	1.02	**
Intestinal fat(g)	112	174.21^{a}	129.08^{b}	169.18^{a}	4.34	***
(b) Non-edible traits						
skin(kg)	2.8	2.8	2.9	2.7	0.04	NS
Spleen(g)	60.67^{d}	83.5^{a}	65.33^{c}	80.33^{b}	0.67	***
Testis(g)	152.67^{d}	195.67^{a}	146^{c}	187.67^{b}	5.83	***
Head(kg)	2.87^{d}	2.9^{a}	2.7^{c}	2.8^{b}	0.07	*
Blood weight(gm)	904.7	1043	1022	1041	0.03	NS
lung with trachea(g)	313	369.7	321.3	351.3	11.12	NS
Gall bladder(g)	11^{d}	39^{a}	19.17^{c}	20.3^{b}	0.32	**
Pancreas(g)	27^{d}	58^{a}	31^{c}	51^{b}	0.43	**
Four legs with hooves(kg)	1.33	1.6	1.3	1.5	0.11	NS

*^{abc} Means in the same row with different superscript letter are significant different NS, non significant (P>0.05);*significant at P<0.05; **significant at P<0.01*

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Table 6: LS Mean and SEM of carcass charechteristics of yearling Bonga sheep suplemented rosted *brugmansia suaveolens* leafe, concentrate mix and their mixture

Variable	Overall mean	Cv%	Sign.level	Feeding Regime				SEM
				T1	T2	T3	T4	
SWT(kg)	39.36±0.43	6.87	*	37.67^{d}	41.07^{a}	38.64^{c}	40.07^{b}	1.03
HCW(kg)	17.01±0.21	7.04	**	14.33^{d}	20.35^{a}	15.26^{c}	18.06^{b}	0.45
EBW(kg)	31.18±0.99	6.07	**	28.66^{d}	34.49^{a}	29.35^{c}	32.25^{b}	0.97
DPSBW(%)	42.87±0.38	4.53	***	37.33^{d}	49.56^{a}	39.49^{c}	45.08^{b}	1.34
DPEBW(%)	54.25±0.21	6.22	***	50^{d}	59^{a}	52^{c}	56^{b}	1.88

^{abc} *Means in the same row with different superscript letter are significant different; ns, non significant (P>0.05);*significant at P<0.05; **significant at P<0.01; T, treatment; LSMean, least squire mean; SEM, standard error of mean; SWT, slaughter weight; HCW, hot carcass weight; DPSW, dressing percentage on slaughter body weight base; DPEBW, dressing percentage on empty body weight base.*

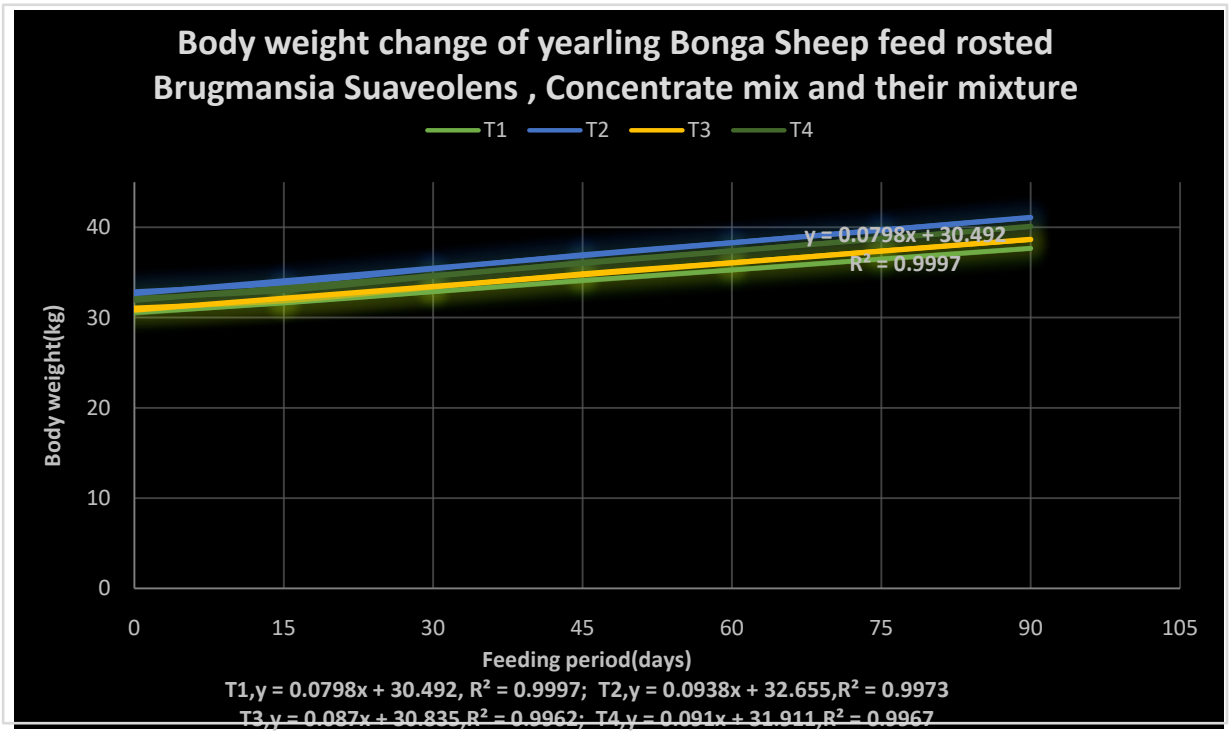

Fig. 3: Body weight change of yearling bonga sheep feed rosted *brugmansia suaveolens,*concentrate mix and their mixture

Table 7: Partial budget analysisof yearling bonga sheep feed rosted *brugmansia suaveolens,*concentrate mix and their mixture

Parameter	Experimental diet			
	T1	T2	T3	T4
Sheep initial price (EB/head)	605.7	632.8	607.2	678.6
Total feed cost (EB)		7.47	202.5	302.5
Total non-feed cost (EB)	202.5	226.5	202.5	202.5
Total variable cost(EB)	808.2	856.8	1012.2	1183.6
GR, selling price (EB/head)	1477.4	1590	1684	2086
NR (EB/head)	669.2	733.2	501.8	693.4
NROC (EB/head)		248	67.1	97.9
MRR		1.3168	0.0127	0.6212
MRR (%)		131.68	1.274	62.12

EB ethiopian birr,GR gross return,NR net return, NROC net return over control,MRR marginal rate of return

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IV. Discussion

Mean daily diets intake of rosted*brugmansia suaveolens*leafe (T2) was significantly (P<0.001) higher than the rest three treatment and given in (Table 4).Despite the differences in the magnitude of nutrient consumption, the superior nutrient intake, daily weight gain and feed conversion ratio in yearling Bonga sheep feed T2 can be a good scientific evidence for improvement of sheep nutrition under small holder farming settings where *brugmansia suaveolens browse plant dominantly growing* agroecology. This might be associated with the 5 minute rosting makes strong bond between nutrients and antinational elements to be broken and nutrients in the leaf available to be easily absorbed by small intestine

The mean values of edible and non-edible carcass characteristics of slaughtered yearling bonga sheep suplemented five minute rosted *brugmansia suaveolens leafe*, concentrate mix and their mixture are presented in Table 5. The values of the most edible carcass components such as liver, heart, heart without fat, tail fat, kidney fat, intestinal fat were increased in animals supplemented with five minute rosted *brugmansia suaveolens leafe* (T3) as compared to the rest three diet($p<0.05$). Similarly, most non-edible carcass traits such as head, testis, spleen and pancreas weights were increased in lambs supplemented with either concentratemix, mixture of five minute rosted *brugmansia suaveolens leafe* with concentratemix and grazing natural pasture grass.

Kuwet fat tailed Naeemi breed (a local strain of the Awassi breed) feed 70% concentrate and 30%lucern hay at 5 month age had carcasses dressed according to the normal commercial procedure in Kuwait, which includes removal of tail, liver, heart and kidneys was 40.7±0.68% and dresed hot carcass weight was 15.9±0.28kg, Kideny fat 0.231±0.040kg.

carcass charechteristics of yearling Bonga sheep suplemented rosted *brugmansia suaveolens* leafe, concentrate mix and their mixture are presented in Table 6.Relatively the highest dressing percentage values in T2 over T1, T3 and T4 in the present study can indicate that T3 positively improves the growth performance and weight addition of sheep. On the other hand the higher dressing percentage values in T2 over T1, T3 and T4 implies that supplementation of a sheep with 5 minute rosted *brugmansia suaveolens* leafe has a potential to improve edible carcass parameters through improved feed intake of the diet. The differences might be related to the energy protein ratio of diets supplied to animals, which might have constrained the growth of some these organs.

The results observed in this study agree to Gebremeskel and Kefelegn, (2011) who reported nutritionally poor and dried roughage feeding lambs supplemented with a protein source had significantly higher hot carcass weight, and dressing percentage than the non-supplemented lambs. Moreover, by increasing the nutritional densities of the diet, it is possible to obtain heavy and fleshy carcasses (Alexandre *et al.,* 2010). The dressing percentage values calculated from the empty body weight basis were higher than on live weight at slaughter basis, implying the influence of digesta (gut fill) on dressing percentage. Expression of dressing percentage based on empty weight basis rather than live body weight at slaughter basis can be a less exaggerated and realistic. Pralomkarn *et al.,* (1995) also indicated that dressing percentage increased as feed intake increased. Gibbs and Ivings (1993) and El-Khidir *et al.,* (1998) reported that gut content constitutes a large portion of the body weight and contribute 4 - 14% of fasted live weight in sheep.

Kirton *et al.,* (1972) reported that proportion of carcass offal can be affected by the nutritional status and BW of animals, and therefore, the differences observed between the control and supplemented treatments in proportion of carcass offal could be traced to dietary origins. Wester *et al.,* (1995) also reported the effect of protein and energy nutrition in visceral organ mass in lambs. Low-energy diets (such as those provided by forage-based feeding), might lower growth of liver and kidneys compared with high-energy diets (such as those supplied by concentrate-based feeding) (A´ lvarez-Rodrı´ guez *et al.,* 2009). Because it is well documented that testis weight is correlated to spermatozoa production (Mahouachi, 1985).

The economic analysis of the experiment was computed and described for each treatment (Table 7).Selling price estimated by six different merchants at the end of the experiment but manure that can use as fertilizer was not included in total revenue calculation because sheep manure selling is not common in the study area. Fixed costs such as feeding pen were constructed previously by the southern agricultural research institute Modeyo Bonga sheep multiplication center for on-station experiment and its cost were not included in calculation. Communal grazing land was free of charge and common for all experimental sheep and was not considered for partial budget analysis.

The major cost that determined the profitability of using rosted *brugmansia suaveolens,* concentrate mix and their mixture to the non-feed cost. Solomon et al. (1991) reported that feed input is the major component of sheep production costs in agreements with the high feed costs of the current finding. Similar to the current study Aganga et al. (2005) reported that under intensive and semi-intensive livestock production a large proportion of costs are feed costs. For each Ethiopian birr invested on treatment farmers can obtain additional 1.3168, 0.0127 and 0.6212 Ethiopian birr from T2, T3 and T4, respectively.

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V. Conclusion

At this finding yearling bonga sheep Feed Rosted for five minute Brugmansia Suaveolens Brecht (*yemogn abeba*) daily at 50 g DM/kg live weight perform better ADG of 91 g/day very significantly. This particular treatment (T2) economically feasible and marginal rate of return (MRR) is higher than the rest group that within 1 birr investment there will be 1.32 birr profit .It can be concluded that five minute rosted for Brugmansia Suaveolens with crude protein (CP=34.51%)could be recommended as a supplement for fatting of yearling bonga sheep in south and south west Ethiopia.

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Conflict of Interest

All authors declare that there are no potential or actual conflicts of interest related to the research presented in this paper

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A Novel Approach to Analysis District Level Long Scale Seasonal Forecasting of Monsoon Rainfall in Andhra Pradesh and Telangana

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Abstract- India is a nation which purely relies on agriculture, so rainfall prediction is very important for agriculture to make crop management decisions. Long scale forecast of rainfall during monsoon season (southwest and northeast), at the spatial firmness of a district, could serve as a significant comment to the agricultural community to take better decisions in yield management. Such forecasts are not producing efficient results which are available now. In this paper rainfall, crops and soil data of Andhra Pradesh (AP) & Telangana (TS) states are gathered to analyze rainfall patterns based on soil for crop management. Variety of crops needs adequate rainfall based on their different categories. In this paper, we are proposing a model which relates the analysis of rainfall patterns, soil types and several crops grown in two states on seasonal wise.

Keywords: : rainfall; DBSCAN; crop; forecast; SWM; NEM; soil; clustering; AP & TS.

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A Novel Approach to Analysis District Level Long Scale Seasonal Forecasting of Monsoon Rainfall in Andhra Pradesh and Telangana

P. Chandra Shaker Reddy [α] & Dr. A. Suresh Babu [σ]

Abstract- India is a nation which purely relies on agriculture, so rainfall prediction is very important for agriculture to make crop management decisions. Long scale forecast of rainfall during monsoon season (southwest and northeast), at the spatial firmness of a district, could serve as a significant comment to the agricultural community to take better decisions in yield management. Such forecasts are not producing efficient results which are available now. In this paper rainfall, crops and soil data of Andhra Pradesh (AP) & Telangana (TS) states are gathered to analyze rainfall patterns based on soil for crop management. Variety of crops needs adequate rainfall based on their different categories. In this paper, we are proposing a model which relates the analysis of rainfall patterns, soil types and several crops grown in two states on seasonal wise. We are experimenting with last 12 years of rainfall data, a variety of crops grown in different seasons and identifying the average rainfall needed for distinct of crop types. DBSCAN clustering algorithm used to determine the rainfall patterns as low and high density. The proposed system serves as a tool to explore the rainfall patterns. The statistical results show that proposed model could enhance those effectiveness and exactness.

Keywords: rainfall; DBSCAN; crop; forecast; SWM; NEM; soil; clustering; AP & TS.

I. Introduction

Determination of climate features is most important for the success or the failure of agricultural decisions. It is a fact that production of food strongly depends on climate changes; it will show details of humidity, temperature, wind and rainfall for the current day and the forecast for the next five days [1], In addition, a farmer will also be provides with the extreme weather alerts like hailstorms or unseasonal rains. Rainfall is very significant and essential for agricultural depended countries like India because over 50% of rural households depends on agriculture as their principal means of livelihood. The factory farm sphere of India has occupied almost 43 percent of India's geographical area.

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Usually, agriculturists utilised traditional methods to anticipate the rain based on their perception of such marvels the formation of halo around the moon, wind and cloud movement, lightning, animal behavior, bird movement etc. Later on, those customary strategies joined with logical perceptions that can end up being preferable in determining climate over depending on single strategy. As existing, operational long scale forecasting of rainfall in SWM are publicize by IMD (India Meteorological Department) for an entire country and four broad regions of India [6]. Every broad consist of 8-10 meteorological subdivisions out of 36. Operational LRF of SWM rainfall is not yet available to users at the spatial resolution of a meteorological subdivision/cluster of districts/district. Using a proposed technique, LRF of SWM &NEM rainfall for subdivisions wise were being given since 1990, depended on this new method, has accomplished in delivering better forecasts for all subdivisions for the past 26 years, as well forecast for the nation as a whole.

AP&TS jointly have 23 districts, agriculture in these states principally depends on rain-fed water sources for irrigation. In AP and TS 71% of people are dependent on agriculture and its partnered segments, altogether geological zone 42 % of the land is utilized for cultivation in the two states (total 27.44 Million Hectors, 12.754 Million Hectors in agriculture)[5,4]. It is evaluated that about 65 percent of the cultivated space falls under dryland agriculture while the rest is irrigated. This area is drought prone to erratic rainfall received during crop season; this requires precise rainfall forecast framework for farmers to take decisions on crop management system.

a) Agro – Climates Zones in AP & TS

This section describes the various zones (parts), required average rainfall for cultivation, different type's soils and variety of crops grown in those zones. Combined Andhra Pradesh is the fifth largest state in India with a geographical area of 27.44 m ha. Several primary yields are grown on its soils. These States(23 districts) have been divides into seven agro-climatic zones (viz., Krishna-Godavari, North Coastal, Southern, Northern Telangana, Southern Telangana, Scarce Rainfall and High altitude and Tribal). These seve zones of AP & TS states geographically shown as in Fig. 1.

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The reach for precipitation regularly received, land sorts existing, soils happening and significant yields, cropping frameworks developed in these zones are outfitting in Table 1.

Table 1: Zone Wise Different Soils and Required Rainfall for Crops Grown in AP&TS

S. No.	Name of the Zone	Received Rainfall (mm)	Soils	Major Crops were Grown
1	Krishna- Godavari (Delta) Zone	800-1100	River valley and delta alluvial soils, mixed red and black and deep black soils in sub coastal valley	Rice, cotton, black gram/ green gram, groundnut, fodder, tobacco, sugarcane, chillies, coconut, sesamum
2	North- Coastal zone	1000- 1100	Coastal alluvium Patches below lateritic and red sandy uplands	Rice, groundnut, pearl millet, finger millet, sugarcane, sesamum, horse gram, green gram, black gram
3	Southern zone	750-1100	Coastal alluvium belt Below lateritic and red sandy hinterlands	Rice, groundnut, sorghum, pearl millet, red gram, finger millet, horse gram
4	Northern-Telangana zone	900-1200	Mixed red and black soils and medium black soils and plateau, heavy black soils in valleys and red sandy soils in uplands	Sorghum, rice, maize, cotton, groundnut, red gram, and Bengal gram
5	Southern-Telangana zone	700-900	Red sandy soils and medium black and lateritic soils	Sorghum, rice, castor, groundnut, pearl millet, red gram, horse gram, finger millet, green gram, maize, safflower
6	Scarce-rainfall zone	500-700	Red sandy soils in uplands and mixed red and black to deep black soils in lower areas	Groundnut, sorghum, setaria, rice, cotton, coriander, pearl millet
7	High-altitude tribal area zone	1000-1300	Red sandy soils in uplands	Rice, pearl millet, groundnut, finger millet, sesamum, tuber crops, forest trees and horticultural crops

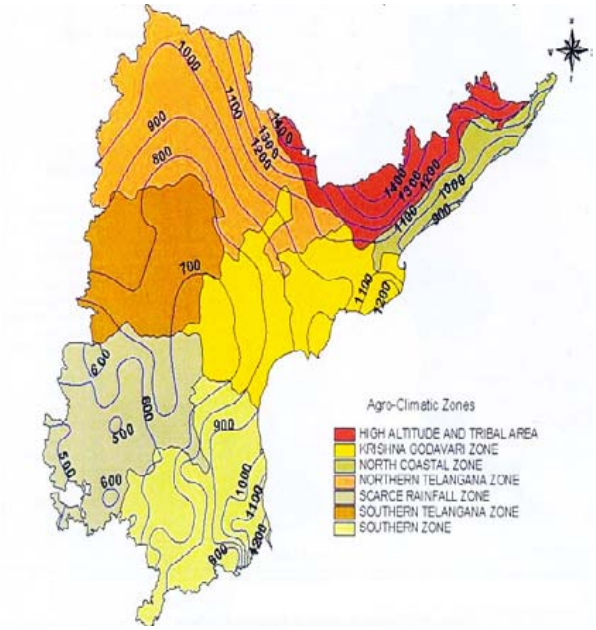

Fig. 1: Agro-Climate Zones of AP&TS states

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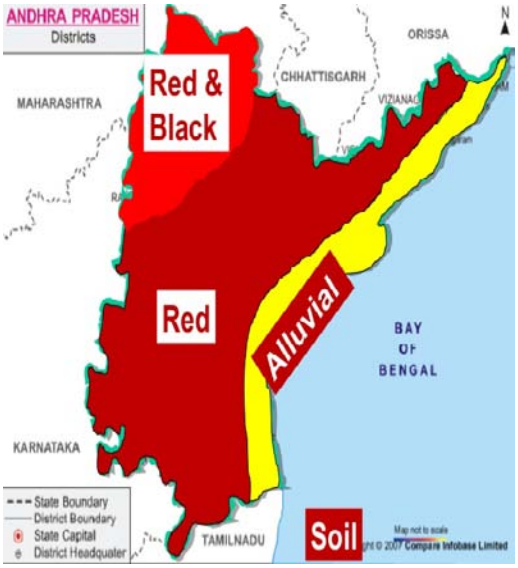

Fig. 2: Soil Map of AP & TS states

Table 2: Soil Types Exist in District Wise and Various Crops Were Grown in Different Soils

Soil Type	Places (Districts) of Occurrence	Major Crops
Red soils	Parts of Ranga Reddy, Medak, Guntur, Prakasam, Nellore and Kurnool	Groundnut, sorghum, pearl millet, foxtail millet, red gram, green gram, cowpea, castor and horse gram
Laterites	Kavali taluk of Nellore, Zaheerabad Mandal of Medak and very small pockets in Visakhapatnam, Srikakulam and West Godavari	Mango, Cashew and Tamarind trees
Black soils	Parts of Adilabad, Nizamabad, Karimnagar, Warangal, Khammam, Medak, Ranga Reddy, Mahabubnagar, Kurnool, Anantapur, Nellore and Guntur	Cotto, chillies, sunflower, Bengal gram, sorghum, safflower and coriander
Alluviums Soils	Parts of East and West Godavari, Krishna and Guntur	Rice, Sugar-cane, Plantain, Guava, Lemon and Oranges.

a) Soils Types

Due to various forms of mineral and organic compositions, there are different types of soil that undergo different environmental pressures. Mainly four types of soils exist in these two states where they are Red, Laterites, Black and Alluviums soils. Soil map of these states shown in fig. 2. Variety of soils, places of their occurrence and crops are grown soils are discussed in Table 2.

b) Crops Types

Crops can be divided into four main categories depending on their usage. There are Food Grains (Rice, Wheat, Maize, Millets and pulses), cash crops (cotton, jute Sugarcane, Tobacco and oilseeds), plantation crops (Tea, coffee, coconut and rubber) and horticulture crops (fruits and Vegetables). These are geographically represented in Fig. 3. *Rice* covers about one-third of the total cultivated area of the state; it is also cultivated in rabi season with the use of irrigation. *Jowar, Bajra and Ragi* are grown in large areas, but unfortunately area under these crops has drastically decreased over the years. Locally crop season is classified as Kharif (June/July- Sept/Oct), Rabi (Nov/Dec -April/May) and Ziad (summer)[2,3]. Different crops grown in two states seasonal wise and required weather conditions summarized in Table 3.

c) Rainfall

Agricultural production in AP&TS at most depends upon the distribution of rainfall. The high amount of rainfall in the beginning and sunny/ dry weather at the time of ripening is very helpful for a good crop. AP acquires maximum rainfall during SWM (Southwest Monsoon) (Jun-Sept) as well as NEM (Northeast Monsoon) (Oct-Dec). SWM offers 69% (925 mm) of rainfall in the total of AP and NEM offers 22% (300 mm) of rainfall in the total of AP and remaining contributed by during winter and a hot period is shows in Fig. 4. Information on probable rendering of SWM & NEM could show to be important in farming plan, agriculture activities and management of rain water [13]. This type of forecast is very useful for agriculturists as an input, like fertilizers, seeds, etc.

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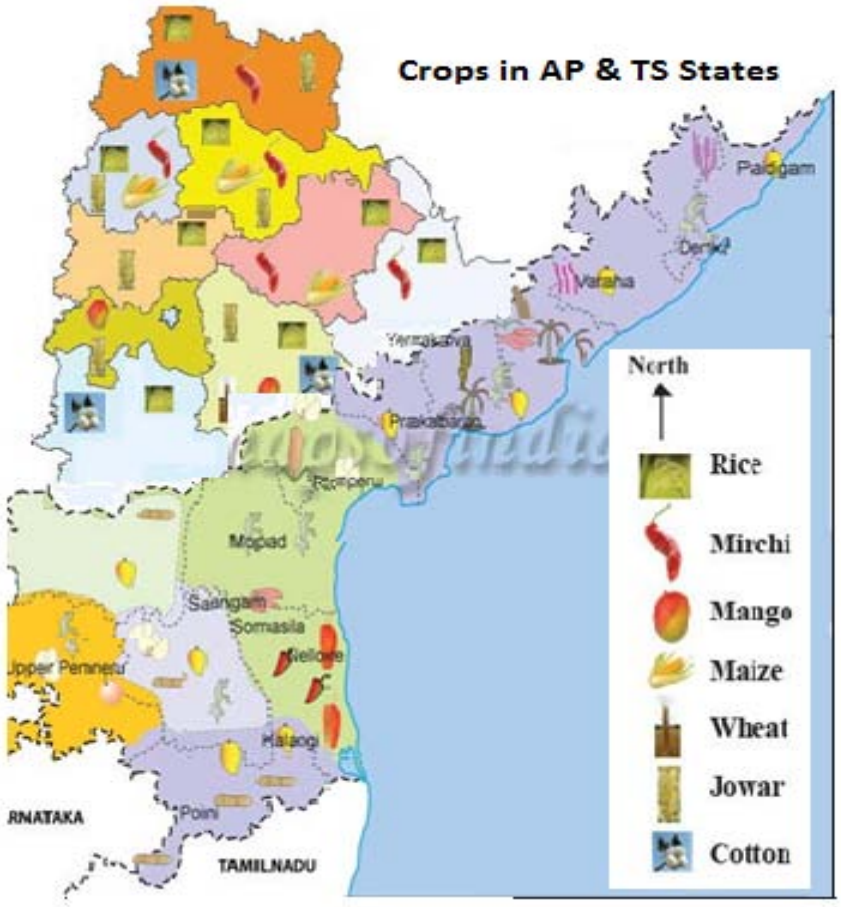

Fig. 3: District wise Crop Map of AP& TS States

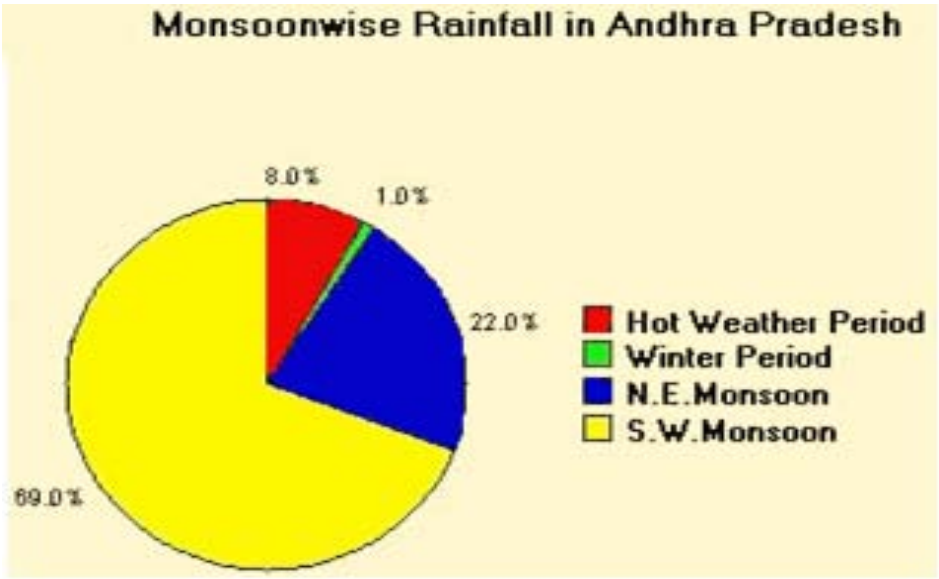

Fig. 4: Avg. rainfall percentage monsoon wise in AP&TS

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Table 3: Variety of crops and their required weather conditions to grown in AP & TS

Crop Name	Area in Hectors(Lakh)	Soil Supported	Season	Rainfall Need (mm)	Avg. Temp. Needed (^{0}C)	Remarks
Rice	40.96	deep clayey and loamy soil	Kharif	150 to 300	22 - 32	
Rice	3.19	Inferior alluvial or loamy soil.	Kharif and Rabi	50 to 100	27 -32	
Jowar	7.63					
Maize	0.56					
Bajra	0.43					
Ragi	3.19					
Wheat	0.10	fertile loamy and clayey loamy soil	Rabi	75 to 100	10-15 21-26	sowing harvesting
Redgram	5.50	loamy soils	Rabi	40-45	20 -25	
Greengram	3.42					
Blackgram	4.46					
Bengalgram	6.15					
Groundnut	14.61	Red and Black Soils	kharif	50-75	20 - 30	
Castor	1.68	Red and light alluvial soils	Khariff	50-75	20-25	
Sunflower	2.88	Black soil	kharif and rabi	52-75	55-80	
Soybean	1.42	Black soil	Kharif	50-90	57-85	
Cotton	16.21	Black soil	kharif	50 -100	21-30	
Sugarcane	1.75	deep rich loamy soil	Kharif	75-150	21-27	
Chilli	1.96	Sandy and clay loamy soil	kharif and rabi	40 -90	20-25	
Tobacco	1.51	alluvial soils, black clayey or loamy soils	kharif and rabi	50-100	15-20	
Jute	-	Light sandy or clayey soils	kharif	120 - 150	70-100	

II. Related Work

In this section, we discussed about recent related work done around the globe. Kipkorir E.C, et al. [1] proposed the model for climate analysis of Baringo District which is located in Kenya and authors discussed about how the weather is changed according to the different seasons and they summarized the season wise rainfall in that district of past 20 years from 1980 to 2000. O Prasad, et al. [2] proposed a method of long range Forecast (LRF) in seasonal level rainfall as district during the south monsoon of Vayu Mandal and them taken 12 days of rainfall data for prediction purpose.

A.Ramakrishna, et al. [3] submitted work on periodical analysis of rainfall patterns of Nira Basin and they proposed a model for forecasting of rainfall. Authors consider of 2-8 years of data after 1960's and they used a wave let analysis, it produces accuracy results compared to existing methods. P. Guhathakurta, et al. [11] analyzed extreme rainfall patterns in Andhra Pradesh where monsoon and post-monsoon seasons. For this study, they consider more than 70 years of data 1901-2000 of 155 substations in AP.

Vijaya Kumar, et al. [6] presented work on long term rainfall trends in India and they consider 135 years (1871-2005) of 30 subdivision of India. Authors concluded as monsoon months (June-Sept.) have received 80% of annual rainfall. J Nagendra Kumar, et al. [10] proposed GIS-MAP model for spatial analysis of rainfall data of Andhra Pradesh and Telangana states using R. They summarized data as district wise and compared with existing methods. O Prasad, et al. [12] reviewed the district level long scale rain forecast during southwest monsoon in Andhra Pradesh. They identified as the maximum of annual rainfall is getting in SWM, NEM.

III. Data Used And Method of Analysis

District wise rainfall data during SWM, NEM season for a period of 12 years (2004-16) have been considering for this study, this data is collected from IMD (India Metrological Department). Clustering

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equations are developed between rainfall data and different seasons using DBSCAN algorithm and Cluster Dendrogram method by using R-Studio for 12 years (2004-16) data. Long Period Average (LPA) of monthly, seasonal and annual rainfall dataset for the districts of AP & TS is shown in *Annexure A.*

IV. Results and Discussions

The dataset contains the rainfall values for past 12 years (2004-16) in district level that are representing in seasonal wise (SWM, NEM), the data file in figure 5. First, we normalized the data for easy representation then applied the clustering methods (DBSCAN and Hierarchical) to identify the rainfall patterns using R-Tool. Plot the graphs to identify the rainfall patterns of past 12 years in SWM, NEM using DBSCAN Algorithm and identify the all season's rainfall patterns by using Hierarchical clustering model. Dataset contains total 274 instances and it divided into three clusters. 241 instances fall in to cluster one, it represents regular rainfall patterns of districts in southwest monsoon season, and 31 instances fall into cluster two it represents 20-30 percent fewer rainfall patterns and four instances distributed into cluster 3 as represents extreme less rainfall patterns. These three cluster objects represented in different color codes in fig.5a for SWM, 5b for NEM.

Comparison graph of rainfall received in SWM and NEM of AP& TS states shown in Fig.6 as years wise (2004-16). The analysis shows that max of rainfall received during the period of SWM & NEM, so this is period is very important for agriculture to make their own crop decisions. Agriculture field is requires better prediction system for analysis of weather conditions during June to December months.

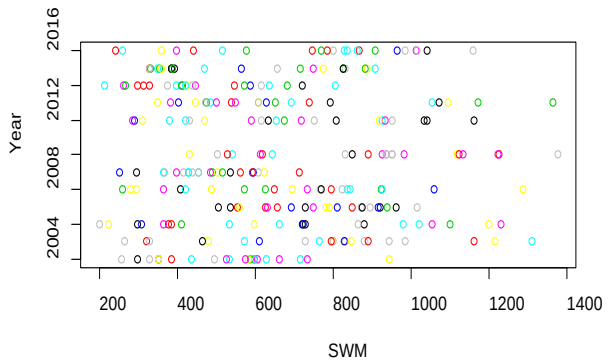

Fig. 5 a: Rainfall patterns in Southwest Monsoon

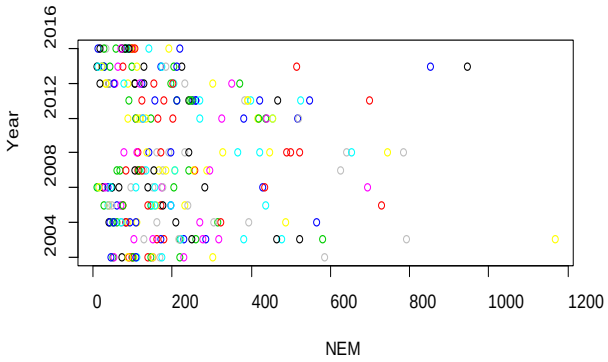

Fig. 5 b: Rainfall patterns in Northeast Monsoon

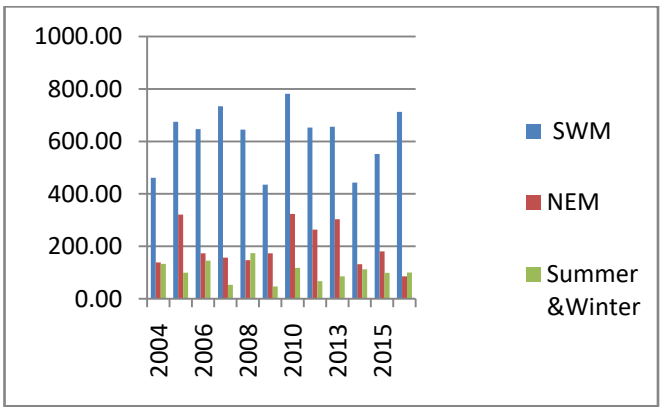

Fig. 6: Seasonal Rainfall comparison in different years

V. Conclusion

In traditional methods, rainfall forecast is challenging task and we cannot get accuracy results. In this proposed a novel approach to predict the long scale rainfall patterns of AP & TS states district level. It is efficient and accurate to compare with community models and it is producing better results. DBSCAN algorithm is used to identify the rainfall patterns as density wise (high, low) for long term forecast by using past 12 years data of AP &TS district level. These types of new technology is used for large scale rainfall forecasting data analysis has the potential to better enhancement the weather prediction too.

Acknowledgment

Maps showing the districts of Andhra Pradesh & Telangana, soil diagram and crops diagrams are downloaded from the website WWW.MAPINDIA.COM and rainfall data of district wise of two states made available by Additional Director General of Meteorology (Research), India Meteorological Department, Pune.

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Annexure A : Monsoon wise rainfall data of 23 Districts of AP&TS states (2004-2016)

Dist. Name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
	Winter		Summer			South-West monsoon				North-East monsoon			
Khammam	6.42	6.95	15.86	22.83	44.12	178.63	300.40	294.40	254.64	103.10	178.87	3.58	1409.82
Krishna	10.62	13.53	13.29	15.75	71.18	150.66	190.95	196.38	190.62	173.06	181.84	9.42	1217.30
Kurnool	1.92	2.81	14.62	20.55	50.62	98.88	109.21	115.15	159.34	89.20	124.27	2.01	788.59
Medak	7.48	7.92	32.38	18.53	28.16	96.80	200.43	159.74	192.13	69.99	131.06	0.92	945.56
Nellore	8.04	11.01	11.40	15.24	52.78	56.62	80.25	102.82	91.71	232.03	161.87	100.84	924.60
Nizamabad	8.62	8.07	27.38	20.86	20.64	133.76	254.46	210.80	198.65	66.73	132.69	0.87	1083.54
Prakasam	6.44	12.41	15.38	17.68	58.11	73.44	89.51	102.47	126.25	172.69	149.47	21.03	844.89
Ranga Reddy	4.06	5.33	23.42	34.30	38.83	102.79	156.97	176.90	175.76	77.98	126.87	0.82	924.03
Srikakulam	7.56	7.55	15.77	28.68	87.02	156.35	198.01	188.21	238.32	196.71	217.51	11.76	1353.45
Vishakhapatnam	4.87	10.66	16.53	41.61	75.31	159.15	151.28	170.14	230.10	197.82	213.96	13.99	1285.41
Vizaya Nagaram	14.34	6.86	16.81	30.74	84.38	177.86	181.82	195.72	227.94	168.24	198.09	10.78	1313.59
Warangal	5.46	6.85	24.81	19.56	31.43	158.21	268.21	238.20	228.96	83.48	156.22	1.96	1223.35
West Godavari	4.45	7.61	8.16	12.33	62.54	149.55	208.69	223.77	219.81	161.40	190.60	10.03	1258.94
Adilabad	12.59	6.31	24.34	13.94	19.79	158.43	313.32	237.47	214.49	68.90	141.70	1.22	1212.49
Ananthapur	3.86	3.28	14.68	27.63	68.87	64.66	68.13	82.06	129.02	87.66	108.34	5.68	663.89
Chittor	2.82	7.12	14.12	29.68	80.34	83.36	96.78	113.78	126.42	155.88	141.15	74.68	926.12
Cuddapah	1.99	5.70	9.30	19.08	44.24	72.72	86.01	100.16	116.59	105.72	111.16	25.27	697.94
East Godavaru	2.05	6.52	9.41	24.37	66.67	144.36	192.96	183.14	219.06	182.92	200.99	11.22	1243.68
Guntoor	7.70	12.80	10.78	13.07	56.65	113.26	148.16	157.70	183.30	143.88	163.59	10.58	1021.48
Hyderabad	6.61	8.29	25.32	32.30	35.32	102.73	177.16	175.54	195.41	84.65	140.03	1.51	984.86
Karim Nager	15.43	9.59	33.61	21.13	27.98	140.39	273.58	225.59	237.60	84.37	160.99	1.27	1231.52
Mahabub Nager	2.01	2.50	17.89	23.31	31.26	87.62	121.45	129.11	165.60	91.49	128.55	1.60	802.39
Nalgonda	7.52	9.66	2.84	17.14	40.38	110.68	118.44	157.76	175.14	124.06	149.60	0.64	913.86

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Egg Production Performance and Consumption in Households Engaged in Rearing Bovans Brown Chicken in Three Altitude Ranges of Simada and Ebinat Districts, Northwest Ethiopia

By Hailu Mazengia, Khrist Roy, Emebet Mamo, Anteneh Gelaye & Gobezie Ayalew
Bahir Dar University

Abstract- Evaluation of egg production performance and consumption were conducted in 30 days of June (from June 1 to 30) 2016 in the households of Simada and Ebinat Districts, Northwest Ethiopia. Longitudinal study on egg production performance and consumption was implemented. Bovans Brown chicken donated by Nutrition at the Center (N@C) which is a multi-sectoral and innovative program designed to improve the nutritional status of women of reproductive age (15-49) and children less than 2 years. The Bovans Brown layer chickens were purchased from Ethio-chicken Private Limited Company, Mekelle. As soon as arriving at the age of day old, the chicken were grown in the Satellite chicken brooding center at Deber Tabor town to acclimatize into local environmental conditions until the age of 3 months.

Keywords: *egg production performance/utilization/ simada/ebinat /ethiopia.*

GJSFR-D Classification: *FOR Code: 070799*

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Egg Production Performance and Consumption in Households Engaged in Rearing Bovans Brown Chicken in Three Altitude Ranges of Simada and Ebinat Districts, Northwest Ethiopia

Hailu Mazengia [α], Khrist Roy [σ], Emebet Mamo [ρ], Anteneh Gelaye [ω] & Gobezie Ayalew [¥]

Abstract- Evaluation of egg production performance and consumption were conducted in 30 days of June (from June 1 to 30) 2016 in the households of Simada and Ebinat Districts, Northwest Ethiopia. Longitudinal study on egg production performance and consumption was implemented. Bovans Brown chicken donated by Nutrition at the Center (N@C) which is a multi-sectoral and innovative program designed to improve the nutritional status of women of reproductive age (15-49) and children less than 2 years. The Bovans Brown layer chickens were purchased from Ethio-chicken Private Limited Company, Mekelle. As soon as arriving at the age of day old, the chicken were grown in the Satellite chicken brooding center at Deber Tabor town to acclimatize into local environmental conditions until the age of 3 months. The chickens were distributed for a total of 1000 farmers in Ebinat and Simada districts (500 for each). Farmers received five pullets and managed the pullets in semi-intensive chicken production system with provision of simple houses made up of local materials, supplemental feeds formulated from locally available grains and disease control and health programs through supervision of agricultural extension service experts in the study areas. For evaluation of the program 100 farmers engaged in rearing laying chickens (30 from each district) farmers were selected randomly. The records were monitored weekly by agriculture extension service experts. The overall mean family size included in this study from both districts was 4.92± 1.37. Higher family size (4.94±1.43) was found in low than medium (4.91±1.38) and high (4.91±1.35) altitude areas. However, there was no any statistically significant difference ($p>0.05$) mean number family size among the three altitude areas. The mean number of laying hens in medium altitude areas (4.29±0.52) was higher than low (3.76±1.07 and high (4.28±0.63) altitude areas. There was statistically significant difference ($p<0.05$) in mean number of laying hens among altitude areas. Higher number of eggs per hens was found in low altitude areas (27.22±6.43) than medium (24.82±1.37) and high (26.89±1.07) altitude areas. The mean number of eggs laid per hen in Simada district (was significantly ($p<0.05$) higher than Ebinat district. With respect to egg consumption by family members in under-two children, two to five, and lactating women were 57% , 47 % and 72% found consuming weekly egg consumptions > 4 eggs whereas 94 % of the pregnant women had <1 egg per week .In this study, it was found that district, altitude and interaction of district and altitude have significant effects on egg production performance and number of laying hens.

Keywords: *egg production performance/utilization/ simada/ebinat /ethiopia.*

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I. Introduction

The global hen egg production has shown a major dynamic during the past two decades (period 1990 – 2009) (FAOSTAT database, 2014). The rapid global increase in egg production has been very unbalanced. Whereas production has shown a rapid increase in Asian countries (+ 8.6 % per year), the increase in volume of egg production in Africa has been restricted to 3.5 % per year, with countries in Eastern Africa showing an annual increase of 1.2 % annually. Corresponding value for Southern Africa was at 6.1 % per year. Data available for 2009 indicate that Asia is the centre for egg production, contributing about 63 % of global egg volume. In contrast, the contribution of African countries to global egg production is about 3.7 %.

Eggs are an inexpensive source of high-quality protein, essential vitamins, and minerals that are needed for a healthy diet and a healthy life. Annual consumption of eggs determined largely by the country's wealth, ranges from 300 g/person in African countries to 19.1 kg in Japan. Only 9 of 43 sub-Saharan African countries have an average consumption higher than 2 kg while most Asian and American people eat at least twice 2 kg (FAO,2012) .Consumption of eggs in Canada went from 22.0 dozens/capita in 1980 to 17.1 dozens/capita in 1995. But a slow gradual increase in consumption started in 1996 due to a variety of factors including the introduction of designer eggs with omega-3 fatty acids and reached 20.5 dozens/capita in 2012 (Food and Agriculture Canada (FAC), 2013). With under nutrition remaining a significant problem in many parts of the developing world, eggs may be regarded as part of the solution to make up malnutrition (Iannotti *et.al,* 2014). According to report by ((IEC, 2011), the per capita consumption of eggs in most countries varied between 2 to 4 eggs per week.

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In African countries the majority of poultry are kept by smallholders in less intensive systems (FAO, 2004; 2006). The advantages of these systems are the low levels of market inputs required and the unique products that they produce. Moreover, poultry and poultry products play an important social and cultural role in the lives of rural communities in Africa (FAO, 2010; Ojwang *et al*., 2010; Thornton *et al*., 2013) with a significant impact on development. The role played by the smallholder poultry production include security of supply of animal-based protein sources coming from poultry meat and hen eggs, and nutrition for health cannot be overemphasized (Alders & Pym, 2009).

Ethiopia is one of the few African countries with a significantly large population of chicken, which is estimated at 56 million (CSA, 2014). In Ethiopia, chickens play a significant role in human nutrition; serve as an income source; and are raised by almost all society, from the landless rural poor to the well off in the urban setting (Nigussie Dana *et al.,* 2010). Village chickens have been reared for a long time for similar purposes. They have contributed to the country's economy. This is not because they are productive but are huge in number. Constraints which restrict the potential of village chickens in Ethiopia include; low inputs of feeding, poor management, the presence of diseases of various natures and lack of appropriate selection and breeding practices (Alemu, 1995; Ashenafi, 2000; Tadelle and Ogle, 2001; Mazengia *et.al.,* 2010).

In recent years attempts are underway to enhance poultry productivity and optimize the contribution of chickens to the national economy. Greater efforts have been made to transform the production system into a more commercialized and intensive large-scale system (Ashenafi, 2000). In addition, exotic breeds and cross-breeds are multiplied in government and private owned poultry farms and distributed to individual farmers via the extension division of the Bureau of Agriculture and Rural Development and non-governmental organizations to be maintained and produced under the backyard management system. This is thought to improve the livelihood and nutrition of poor farmers and further to contribute to the national economy at large (Tadelle and Ogle, 2001).

In this study, nutrition at the center (N@C), which is a multi-sectoral and innovative program designed to improve the nutritional status of women of reproductive age (15-49) and children less than 2 years. N@C recognizes the impact of animal food source and is promoting poultry production to improve the nutritional status of a subgroup of participating households (HHs) in its operational areas. N@C is aiming to address the challenges of poultry production by smallholder farmers through a research based pilot intervention in two phases. The first phase pilot poultry interventions were intended to be implemented in 6 Kebeles with different agro-ecology. Therefore, this study focuses on evaluation of egg production performances of Bovans Brown layer chicken and status of egg consumption in the households in different altitudes of Simada and Ebinat districts of Amhara Regional State, North west Ethiopia.

II. Materials and Methods

a) Descriptions of the study area

South Gondar Zone is one of the ten zones in Amhara Regional State located 600 km from Addis Ababa to the northwest of Ethiopia. The zone is bordered by north Gondar zone and Lake Tana in the west and north, North Wollo zone to east and west and east Gojam zones in south. The altitude variation in the zone ranges from 1800 to 4120 meter above sea level (masl). Similarly, the mean annual temperature ranges from 9 to 32ºc. The rain fall is bimodal that relying on the *Belg* (short rain season) from mid-January to March, and the *Kiremt* (rainy season) rains from mid-June to mid-September and the highest rain fall occurs during rainy season. The annual mean rain fall ranges from 1200 to 1500 mm. The main crops grown in the area are maize, barely, wheat and peas. Similarly, barley, wheat, teff, peas, lentils and fababeans are the main crops cultivated during summer. Wheat and barley are the main food crops while pulses are the main cash crops in the area (CSA, 2014).

The study was conducted in two districts in the N@C program area where chicken development is schemed and implemented through distribution of improved high egg laying breeds. These are: Ebinat and Simada districts (Figure 1).

b) Ebinat

Ebinat district is located 660 kms Northwest of Addis Ababa at an altitude range of 1730-2500 masl. The area is classified as mid-altitude or "Woyna Dega" climatic zone, with an annual rainfall ranging from 800-1000 mm. The mean annual minimum and maximum temperature is about 10-32°C, respectively. Majority of the land is black soil (CSA, 2014).

c) Simada

Simada is located 720 kms Northwest of Ethiopia at an altitude range of 1920-3135 masl. The area is classified as highland or "Woyna Dega" climatic zone, with annual rainfall ranging from 1250-1599 mm. The mean annual minimum and maximum temperature is 9.9-21°C, respectively (CSA, 2014).

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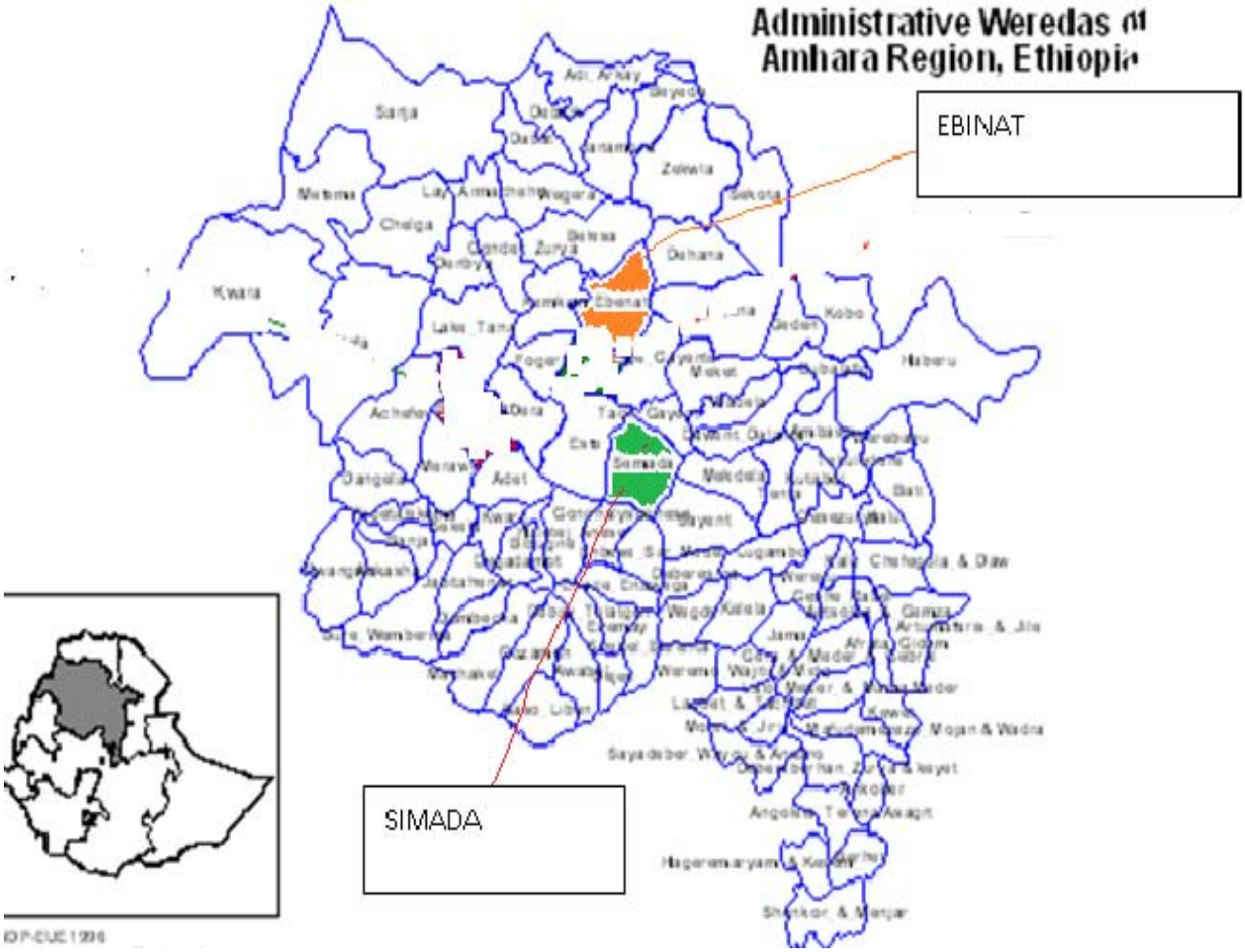

Figure 1: Map of study districts of Amhara region

d) Sample size and sampling methods

From two districts of the zone three kebeles representing each altitude were chosen using purposive sampling techniques.Accordingly, Wonberoch, Selamya and Gelamatebia from Ebinat district, Sergawit, Mindik Hana and Ashera arga were selected and included in Simada district in this study.A multi-stage sampling procedure was employed for this study districts. First the study areas were stratified into three altitude ranges based on altitude as: high altitude (>2200 masl), mid altitude (1700-2200 masl) and low altitude (<1700 masl). This classification was found to be relevant to investigate the variation in egg performance of Bovans Brown to each altitude On-farm monitoring works were taken using randomly selected exotic chicken owners for the purpose of egg production performance and utilization of eggs in the household members in low, medium and high altitude areas of Simada and Ebinat districts. For this purpose 100 household owners (34=Low,34=medium and 32=high altitude ranges) were included for yield and utilization record formats were designed in local language were distributed to be filled by household members.

e) Method of data collection

The record formats were regularly monitored by agriculture extension service experts and local CARE program coordinators and livestock experts. During monitoring/home visits number of eggs laid, no of eggs consumed by under two children, two to five year children, egg consumed by lactating and pregnant women, eggs consumed by other family members were recorded.

f) Data management and statistical analysis

Data were managed both in hard and softcopies. All collected data were entered into Microsoft Excel computer program. SPSS (2011) version 20 was used for analysis. Mean comparisons using Analysis of Variance was used to evaluate egg productivity and utilization among the three altitude ranges. The effects of class variables were expressed as Means ± SD. Tests were considered significant at $p \leq 0.05$.

Considering the average egg size of 50 grams, the FAO database (FAO, 2010b) was used to group countries in terms of weekly egg consumption (≥4

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eggs, 2-4< eggs, 1 - 2< eggs and < 1 egg) (FAO,2010b; IEC, 2011).

The following linear models were used during data analysis:

Model statement (1) regarding the effect of altitude areas and district differences on egg production performance and number of laying hens:

$$Yij = \mu + Ai + Bj + Eij$$

Where,

Yij= Chicken egg production performance for in i^{th} altitude areas

μ = The overall mean

Ai = Fixed effect of i^{th} altitude areas (i=3; low altitude, mid altitude and high altitude)

Bj = Districts (j=Ebinat; Simada)

Eij = the residual error.

III. Result

a) Socio-demographic characteristics

The overall mean family size of farmers engaged in chicken raising activity in this study was 4.92± 1.37. Higher family size (4.94±1.43) was found in low altitude areas than medium (4.91±1.38) and high (4.91±1.35) altitude areas. However, there was no any statistically significant difference ($p>0.05$) in mean family size was observed among the three altitude areas. The average family size in Ebinat district (5.18±1.70) was higher than Simada (5.08±1.31) district but no any statistically significant difference ($p>0.05$) in family size was observed between the study districts (Table 1).

The mean number of under-two children (UTC) in study districts was 0.98±0.38. Higher number of UTC was found in low (1.00±0.49) and high (1.00±0.36) altitude areas than medium (0.94±0.24) altitude. The average number of UTC in Ebinat district (1.00±0.07) was higher than Simada district (0.96±0.19).Similarly the mean number of children between two to five years of age in both districts is 0.85±0.78 while it was higher in low altitude areas (1.00±0.78) than medium (0.74±0.79) and high (0.81±0.78) altitude areas. On the other hand, the mean number of lactating women (LW) in the study areas was 0.91±0.29. Higher number of LW were found in medium (1.00±0.00) altitude areas than low (0.85±0.36) and high (0.88±0.34) altitude areas.

The mean number of lactating women (LW) was higher in medium (1.00±0.00) altitude areas than low (0.85±0.36) and high (0.88±0.34) altitude areas. There was statistically significant difference ($p<0.05$) in average number of LW between Simada (0.86±0.35) and Ebinat(0.96±0.19) districts. Similarly, the average number of pregnant women (PW) in study areas was below one. The average PW in both study districts was 0.08±0.27. It was higher in high altitude areas than medium and high altitude areas. The average number of other family members (excluding under two children, between two and five year children, lactating and pregnant women) was 1.6±1.37. Higher number of OFM was found in medium (1.94±1.49) altitude areas than low (1.62±1.30) and high (1.47±1.29) altitude area (Table 1).

b) Egg production performance

The mean number of laying hens in the study districts was 4.11±0.81 whereas mean number of laying hens in medium altitude areas (4.29±0.52) was higher than low (3.76±1.07 and high (4.28±0.63) altitude areas. Moreover, there was significant difference ($p<0.05$) in mean number of laying hens among the three altitude areas. Despite relatively higher mean number of laying hens found in Simada district (4.13±0.34) than Ebinat (4.04±1.03), no statistically significant difference ($p>0.05$) in average number of laying hens was found among the two districts. The mean number of laying hens across study districts was not found uniform, lower than 5 laying hens/ household.

In this study mean number of eggs laid /month/hen was 26.33±0.69. Higher number of eggs per hen was found in low altitude areas (27.22±6.43) than medium (24.82±1.37) and high (26.89±1.07) altitude areas during 30 days. The mean number of eggs laid per hen in Simada district was significantly ($p<0.05$) higher than Ebinat district. Similarly, the mean number of eggs laid in the study period in both districts was 106.79±33.74. Moreover, there was statistically significant difference ($p<0.05$) in average number of eggs collected in high (112.81±27.37), medium (105.26±32.98) and low (102.65±12.64) altitude areas. The mean number of eggs collected per household in Simada district (125.60±12.64) was found higher than that of Ebinat district (87.98±37.66). Moreover, there was high significant difference ($p<0.05$) in mean number of egg collected per household between study districts (Table1).

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Table 1: Egg production performance and socio-demographics characteristics of the households in the three attitude areas of Simada and Ebinat districts

Parameter	Ebinat (Mean±SD)				Simada (Mean±SD)				Overall (Mean±SD)			
	Low (n=17)	Medium (n=17)	High (n=16)	Sub-total (n=50)	Low (n=17)	Medium (n=17)	High (n=16)	Sub-total (n=50)	Low (n=34)	Medium (n=34)	High (n=32)	Total (n=100)
Av. family size	4.71(1.10)	4.94(1.75)	4.63(1.45)	4.76(1.44)	5.18(1.70)	4.88(0.93)	5.19(1.22)	5.08(1.31)	4.94(1.43)	4.91(1.38)	4.91(1.35)	4.92(1.37)
Av. no. of laying hens	3.24(1.15)	4.47(0.51)	4.44(0.81)	4.04(1.03)	4.29(0.68)	4.12(0.48)	4.13(0.34)	4.18(0.52)	3.76(1.07)	4.29(0.52)	4.28(0.63)	4.11(0.81)
Av. no. egg laid/household/month	75.12(37.24)	86.71(36.99)	103.00(35.49)	87.98(37.66)	130.18(15.42)	123.83(11.94)	122.63(8.89)	125.60(12.64)	102.65(39.60)	105.26(32.98)	112.81(27.37)	106.79(33.74)
Av. no. of eggs laid / hen/month	23.84(7.34)	19.44±(8.14)	24.21(7.71)	22.46(7.89)	27.61(2.67)	29.21(2.11)	28.42(0.51)	28.41(1.99)	27.22(6.43)	24.82±1.37	26.02±1.07	25.45.33±0.69
Av. no. of UTC	1.12(0.60)	0.88(0.33)	1.00(0.49)	1.00±0.07	0.88(0.33)	1.00(0.00)	1.00(0.00)	0.96(0.19)	1.00(0.49)	0.94(0.24)	1.00(0.36)	0.98(0.38)
Aver.no.2 to 5 yr children	1.35(0.78)	0.82(0,95)	1.25(0.77)	1.14(0.86)	0.65(0.61)	0.65(0.61)	0.38(0.50)	0.56(0.58)	1.00(0.78)	0.74(0.79)	0.81(0.78)	0.85(0.78)
Aver. no. of LW	0.82(0.39)	1.00(0.00)	0.75(0.45)	0.86(0.35)	0.88(0.33)	1.00(0.00)	1.00(0.00)	0.96(0.190	0.85(0.36)	1.00(0.00)	0.88(0.34)	0.91(0.29)
Aver. no. of PW	0.00(0.00)	0.12(0.33)	0.25(0.45)	0.12(0.33)	0.12±0.08	0.00(0.00)	0.00(0.00)	0.04(0.19)	0.06(0.24)	0.06(0.24)	0.13(0.34)	0.08(0.27)
Aver. no. of OFM	1.41(1.37)	2.53(1.46)	1.19(1.33)	1.72(1.48)	1.82(1.24)	1.35(1.32)	1.75(1.24)	1.64(1.26)	1.62(1.30)	1.94(1.49)	1.47(1.29)	1.6(1.37)

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c) Egg Consumption

The mean monthly egg consumption by UTC in the study area was 25.93±19.89 However, there was no any statistically significant difference ($p>0.05$) among low (26.79±19.88) medium (27.59±19.04) and high (23.29±20.64) altitude areas. However, there was statistically significant difference ($p<0.05$) in egg consumption of UTC between Simada (39.76±17.91) and Ebinat (12.11±8.43) districts. Similarly, mean monthly egg consumption by children between two and five years old was 17.41±17.42 .However, no any statistically significant difference ($p>0.05$) in egg consumption by UTC among the three altitude areas was observed. The mean monthly egg consumption between two and five year old children in Ebinat (15.33±11.57) was lower than Simada (19.30±21.73) district. On the other hand, the mean monthly egg consumption by LW and PW in the study areas were 19.39±10.13 and 1.84±7.80 respectively. There was statistically significant difference ($p<0.05$) in egg consumption of both for LW and PW among the three altitude areas. Similarly, the mean monthly egg consumption by OFM and AFM were 10.06±9.58 and 21.10±9.74 respectively. However, there was no any statistically significant difference ($p>0.05$) among the three altitude areas on mean number of eggs consumed both OFM and AFM. However, the mean number of egg consumed by OFM and AFM showed statistically significant difference ($p<0.05$) between study districts. The mean monthly eggs sold for generating income by household members in the three altitude areas was 21.11±19 and it was higher in high (23.06±16.21) altitude areas than that of low (18.85±22.89) and medium (21.53±10.08) altitude areas. The mean monthly eggs sold were higher in Simada district (26.44±8.16) than Ebinat district ±18.86 (22.08). Multivariate analysis showed that district, altitude and interaction of district and altitude have significant effects on egg production performance and consumption (Table 2).

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Table 2: Monthly egg consumption among family members in the three altitudes areas of Simada and Ebinat districts

Parameter	Ebinat (Mean±SD)				Simada (Mean±SD)				Overall (Mean±SD)			
	Low (n=17)	Medium (n=17)	High (n=16)	Sub-total (n=50)	Low (n=17)	Medium (n=17)	High (n=16)	Sub-total (n=50)	Low (n=34)	Medium (n=34)	High (n=32)	Total (n=100)
Average no. of eggs consumed/UT C /month	11.76(8.50)	13.53(11.06)	10.97(8.89)	12.11(8.43)[a]	41.76(17.48)	41.65(14.32)	35.63(21.84)	39.76(17.91)[b]	26.79(19.88)[c]	27.59(19.04)[c]	23.29(20.64)[c]	25.93(19.89)
Av no. of eggs consumed / 2-5 yr/month	14.91(10.04)	9.88(9.11)	22.18(12.56)	15.53(11.57)[a]	28.59(19.82)	22.17(22.18)	14.88(23.79)	19.30(21.73)[a]	17.75(15.74)[c]	16.03(17.82)[c]	18.53(19.08)[c]	17.41(17.42)
Avr. no. of eggs consumed /LW/month	16.88(13.09)	14.41(8.39)	23.31(16.25)	18.10(13.19)[a]	18.41(8.23)	20.76(2.19)	21.94(4.11)	20.68(5.47)[a]	18.15(10.84)[c]	17.59(6.85)[c]	22.62(11.68)[c]	19.39(10.13)
Avr. no. of eggs consumed per PW /month	0.00(0.00)	0.00(0.00)	7.38(14.31)	2.36(8.69)[a]	3.88(11.63)	0.00(0.00)	0.00(0.00)	1.32(6.90)[a]	1.94(8.33)[c]	0.00(0.00)[c]	3.69(10.64)[c]	1.84(7.80)
Av. no. of eggs consumed/ OFM/month	8.54(8.40)	9.34(5.83)	14.47(17.42)	10.71(11.57)[a]	9.70(6.77)	8.29(7.88)	10.25(6.89)	9.40(7.10)[b]	9.12(7.53)[c]	8.82(6.85)[c]	12.36(13.20)[c]	10.06(9.58)
Av. no. of eggs consumed/ AFM/month	14.20(6.35)	12.07(4.81)	21.36(9.95)	15.76(8.17)[a]	26.44(8.30)	27.70(8.53)	25.08(7.94)	26.44(8.16)[b]	20.32(9.57)[c]	19.88(10.46)[c]	23.22(9.06)[c]	21.10(9.74)
Aver no. of eggs sold/month	13.29(21.92)	23.12(23.65)	20.25(20.64)	18.86(22.08)a	24.41±5.61	19.94(23.12)	25.88(9.990	23.36(15.72)[b]	18.85(22.89)[c]	21.53(10.08)[c]	23.06(16.21)[c]	21.11(19.20)

[a, b, c] *means with different superscript letters across a raw are significantly different at $p<0.05$*

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The weekly egg consumption results presented in Table 3 show more family members had consumption of at least 2 eggs per week than for lactating women who consumed below 1 egg per week in the study period. The highest weekly egg consumption per week was found in under two children (UTC) 6.48±4.97) followed by all family member (1.33±0.55), two to five children (4.35±4.35), lactating women (4.85±2.53), other family members (2.51±2.39). In this study altitude range was found to have any statically significant difference ($p>0.05$) on weekly egg consumption. However, district has statically significant difference ($p<0.05$) on weekly egg consumption for UTC and all family members weekly egg consumption.

Table 3 : Comparison of Weekly Egg Consumption in the Three Altitudes Areas of Simada and Ebinat Districts

Parameter	Ebinat Mean (SD)				Simada Mean (SD)				Overall Mean (SD)			
	Low (n=17)	Medium (n=17)	High (n=16)	Sub-total (n=50)	Low (n=17)	Medium (n=17)	High (n=16)	Sub-total (n=50)	Low (n=34)	Medium (n=34)	High (n=32)	Total (n=100)
Avr. no. of eggs consumed/ UT C /week	2.94(2.12)	3.38(2.76)	2.74(2.22)	3.03(2.36)[a]	10.44(4.37)	10.41(3.58)	8.91±5.46	9.94(4.48)[b]	6.69(5.09)[c]	6.90(4.76)[c]	5.82(5.16)[c]	6.48(4.97)
Av no. of eggs consumed / two to five children /week	3.73(2.51)	2.47(2.28)	5.55(3.14)	3.88(2.89)[a]	515(4.96)	5.54(5.55)	3.72(5.95)	4.83(5.43)[a]	4.44(.93)[c]	4.01(4.46)[c]	4.63(4.77)[c]	4.35(4.35)
Avr. no. of eggs consumed /Lactating women/week	4.22(3.27)	3.60(2.10)	5.83(4.06)	4.52(3.30)[a]	4.85(2.06)	5.19(0.55)	5.48(1.03)	5.17(1.37)[a]	4.54(2.71)[c]	4.40(1.71)[c]	5.66(2.92)[c]	4.85(2.53)
Avr. no. of eggs consumed per pregnant women /week	0.00(0.00)	0.00(0.00)	1.84(3.58)	0.59(2.16)[a]	0.97(2.91)	0.00(0.00)	0.00(0.00)	0.33(1.72)[a]	0.49(2.08)[c]	0.00(0.00)[c]	0.92(2.66)[c]	0.46(1.95)
Av. no. of eggs consumed/ OFM/month	2.14(2.10)	2.34(1.46)	3.62(4.36)	2.68(2.89)[a]	2.43(1.69)	2.07(1.97)	2.56(1.72)	2.35(1.78)[a]	2.28(1.88)[c]	2.21(1.71)[c]	3.09(3.340)[c]	2.51(2.39)
Av. no. of eggs consumed/ AFM/month	1.71(0.59)	1.76(0.56)	1.44(0.73)	1.64(0.63)[a]	1.06(0.24)	1.00(0.00)	1.00(0.00)	1.02(0.41)[b]	1.38(0.55)[c]	1.38(0.55)[c]	1.22(0.55)[c]	1.33(0.55)

[a, b, c] means with different superscript letters across a raw are significantly different at $p<0.05$,
** Calculation of egg consumption based on a 50 gram egg, adapted from FAO (2010b).*

The results presented in Table 4 show the proportion of family members on the bases of weekly egg consumption categories (> 4 eggs, 2-4< eggs, 1 - 2< eggs and < 1 egg). In this study, 57% of under-two children in the categories of were found consuming weekly egg consumptions > 4 eggs . However, greater percentage of UTC in the categories of 1-2 eggs and <1 egg weekly were 28% and 72% respectively. There were statistically significant difference ($p>0.05$) in weekly egg consumption categories of 1-2 eggs and <1 eggs between districts. However, there was no any statistically significant differences ($p>0.05$) in weekly egg consumptions by UTC among altitude ranges. On the other hand, 47 % of children between two and five years were found to consume > 4 eggs weekly and 35% and 14% of them were found to less than 1 egg per week and 1-2 egg per week respectively.. Similarly, 72 % of LW was found to consume > 4 eggs weekly and 11% and 13% of them were found to less than 1 egg per week and 1-2 egg per week respectively. In this study 94% of pregnant women were found to consume <1 egg per week whereas 38% of other family members were found consumed 2-4 egg per week. Similarly, the 71% of the total family members were found consumed >4 eggs per week. In this study district and altitude were found have statistically significant ($p<0.05$) effects on weekly egg consumption for under two children, lactating women and total family members.

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Table 4: Percentage of family members based on weekly egg consumption categories in the three altitudes areas of Simada and Ebinat districts

Category weekly egg consumption	Ebinat				Simada				Overall			
	Low	Medium	High	Sub-total	Low	Medium	High	Sub-total	Low	Medium	High	Total
Under Two Children	17	17	16	50	17	17	16	50	29	31	25	100
>4 eggs	4	6	3	13	15	16	13	44	19	22	16	57
2-4 eggs	7	4	7	18	0	0	0	0	7	4	7	18
1-2 eggs	3	5	2	10[a]	0	0	0	0[b]	3	5	2	10
< 1 egg	3	2	4	9[a]	2	1	3	6[b]	5[b]	3[b]	7[b]	15
Two to five children	17	17	16	50	17	17	16	50	25	20	20	100
>4 eggs	8	5	9	22	10	10	5	25	18	15	14	47
2-4 eggs	5	4	5	14	0	0	0	0	5	4	5	14
1-2 eggs	2	1	1	4	0	0	0	0	2	1	1	4
< 1 egg	2	7	1	10[a]	7	7	11	25[a]	9[c]	14[c]	12[c]	35
Lactating women	17	17	16	50	17	17	16	50	11	13	4	100
>4 eggs	8	4	12	24[a]	15	17	16	48[b]	23[c]	21[c]	28[c]	72
2-4 eggs	4	9	0	13	0	0	0	0	4	9	0	13
1-2 eggs	2	2	0	4	0	0	0	0	2	2	0	4
< 1 egg	3	2	4	9	2	0	0	2	5	2	4	11
Pregnant women	17	17	16	4	17	17	16	2	2	0	4	100
>4 eggs	0	0	3	3	2	0	0	2	2	0	3	5
2-4 eggs	0	0	1	1	0	0	0	0	0	0	1	1
1-2 eggs	0	0	0	0	0	0	0	0	0	0	0	0
< 1 egg	17	17	12	46[a]	15	17	16	48[a]	32[c]	34[c]	28[c]	94
Subtotal												
Other family members	17	17	16	34	17	17	16	36	25	24	21	100
>4 eggs	3	2	6	11	3	2	2	7	6	4	8	18
2-4 eggs	6	5	3	14	7	8	9	24	13	13	12	38
1-2 eggs	2	7	0	9	4	0	1	5	6	7	1	14
< 1 egg	6	3	7	16[a]	3	7	4	14[a]	9[c]	10[c]	11[c]	30
Total family members	17	17	16	28	17	17	16	1	12	12	5	100
>4 eggs	6	5	11	22[a]	16	17	16	49[a]	22[c]	22[c]	27[c]	71
2-4 eggs	10	11	3	24	1	0	0	1	11	11	3	25
1-2 eggs	1	1	2	4	0	0	0	0	1	1	2	4
< 1 egg	0	0	0	0	0	0	0	0	0	0	0	0

(Calculation of egg consumption based on a 50-gram egg, adapted from FAO (2010b)

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IV. Discussion

This study discloses some of the most important aspects of egg production performance and egg consumption in selected districts the Amhara region, particularly in Simada and Ebinat districts. The overall mean flock size of exotic chickens was 4.92 per household, is lower than the reports of Brihane Gebremariam *et al.* (2015) in southern Tigray, who also reported a mean flock size of exotic chicken about 13.86 per household. Similarly, Gueye (1997) also reported that a flock size per African village household generally ranges from 5 to 20. Moreover, an average flock size of 16 birds per household was also reported in some villages in Ethiopia and Kenya (Tadelle *et al*., 2003; Njenga, 2005).

The mean number of laying hens across study districts was not found to be uniform, lower than five laying hens/ household. This is attributed to failure in sex identification of pullets during distribution by livestock promotion and marketing experts.

The mean number of eggs/month/hen (26.33±0.69) reported in this study was higher than those reported by Lemlem and Tesfaye (2010) for White Leghorn, Rhode Island Red and Fayoumi chicken under village household condition; the reason for higher egg yield in this study might be attributed to the differences in genotype of the bird and feeding management used and the period lapsed for data collection. The higher egg production performance in this study was significantly higher than local chickens, which lay 55 to 80 eggs/year (Dessie and Ogle, 2001). On the other hand, the average number of eggs laid per hen/month in this study (25.45.33±0.69) clearly showed that Bovan brown layers kept under rural household conditions were superior in egg production to local layers kept under similar conditions. This result is in agreement with the reports of Desalew *et.al* (2013), Majaro (2001) and Yakubu *et al.* (2007).

The overall weekly egg consumption per week (6.48±4.97) in under-two children in this study is in agreement with the report of (FAO, 2007) which indicated egg consumption in period's between 2003 to 2005 in 31 out of 65 countries. On the other hand, the percentage of family members consumed >4 eggs per week from UTC, two to five children, lactating women were 57%,47% and 72% respectively. This finding is also similar with the report of Guyonnet (2013). On the other hand, 94% of pregnant women in the study areas were found consuming <1 egg per week. This finding is lower than the per capita consumption of eggs in most countries which varied between 2 to 4 eggs per week (IEC, 2011). The low consumption of egg per week in pregnant women might be attributed to lack of awareness on the nutritional value of egg for health of the pregnant women and growth of the fetus.

V. Conclusions and Recommendations

The first phase pilot poultry development interventions which was implemented in 6 *kebeles* with three altitude ranges of south Gonada, aprticulaly of Simada and Ebinat districts showed promising output. The result of this study clearly showed that Bovan Brown hens performed better than local hens, under semi-intensive production systems, in terms of egg production. There seems an economic and nutritional justification for keeping high egg yielding Bovans brown layer chickens in the rural households of South Gondar Zone of Amhara Regional State with close supervision of livestock production and animal health experts. Moreover this study reveals altitude ranged do not have any significant effects on the egg production performance as well as egg consumption as far as the chickens are distributed after grown in satellite brooding centers and distributed at the age of above 3 months. This study results show that egg consumption increases in the households excepting for pregnant women in the study communities.

The results of this study are inciting and accordingly the following points are strongly recommended.

- Awareness creation and changing the attitudes of pregnant women towards egg consumption should be implemented by local GOs and NGOs.
- Further studies should be conducted on the attitudes, perceptions and behaviors of household members towards egg consumption and egg sale.
- It would be timely to explore how to sustain and scale up this effort.
- Any endeavor towards poultry development and research in the study area should include the consumption and nutritional aspects of poultry products at household level.

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Use of Percoll Density Centrifugation for Sperm Sexing in Small Ruminants

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Abstract- Sperm sexing represents the most promising approach for production of gender-specific livestock under commercial settings. Flow cytometry is currently the method of choice for sexing sperm cells, but remains costly, has low throughput and lowers fertility in vivo. Thus, the study was aimed to test Percoll density centrifugation for sexing sperm cells in small ruminants. Semen from both rams (n = 4) and bucks (n = 4) was collected by electro-ejaculation, cryopreserved and further used for Percoll density centrifugation (PDC). Sperm sexing was confirmed by conventional PCR by determining the ratio of X and Y-bearing sperm cells. The semen before and after PDC in goats did not alter proportion of X-bearing (30%A vs 28%A; 34%A vs 41%A; 55%A vs 56%A; 42%A vs 40%A) or Y-bearing (70%A vs 72%A; 66%A vs 59%A; 45%A vs 44%A; 58%A vs 60%A).

Keywords: *capra hircus, ovis aries, IVF, gender section,sexed semen.*

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Use of Percoll Density Centrifugation for Sperm Sexing in Small Ruminants

José Carlos Ferreira-Silva [α], Marcelo Tigre Moura [σ], Sarah Romine Lima Basto [ρ], Luis Rennan Sampaio Oliveira [ω], Eduardo Luiz Cavalcanti Caldas [¥], Manoel Lopes Silva Filho [§] & Marcos Antonio Lemos Oliveira [χ]

Abstract- Sperm sexing represents the most promising approach for production of gender-specific livestock under commercial settings. Flow cytometry is currently the method of choice for sexing sperm cells, but remains costly, has low throughput and lowers fertility in vivo. Thus, the study was aimed to test Percoll density centrifugation for sexing sperm cells in small ruminants. Semen from both rams (n = 4) and bucks (n = 4) was collected by electro-ejaculation, cryopreserved and further used for Percoll density centrifugation (PDC). Sperm sexing was confirmed by conventional PCR by determining the ratio of X and Y-bearing sperm cells. The semen before and after PDC in goats did not alter proportion of X-bearing (30%[A] vs 28%A; 34%A vs 41%A; 55%A vs 56%A; 42%A vs 40%A) or Y-bearing (70%A vs 72%A; 66%A vs 59%A; 45%A vs 44%A; 58%A vs 60%A). However, semen from one ram was efficiently sexed by PDC for both X-bearing (46%A vs 62%B; 37%A vs 34%A; 52%A vs 54%A; 60%A vs 70%A) or Y-bearing (54%A vs 38%B; 63%A vs 66%A; 48%A vs 46%A; 40%A vs 30%A). In conclusion, Percoll density centrifugation was effective for sexing sheep sperm cells but requires further improvements for its usage for small ruminants.

Keywords: capra hircus, ovis aries, IVF, gender section, sexed semen.

I. Introduction

Sheep production is an economic activity performed on almost all continents under diverse edaphoclimatic conditions for production of meat, skin, wool, and milk for a wide array of applications (Ferreira-Silva et al 2016). Reproduction plays a major role in productivity in most, if not all, sheep and goat production schemes (Oliveira et al 2016; Ferreira-Silva et al 2017abc). Thus, gender selection may contribute to enhance small ruminant production by meeting the demand of each production system.

Gender selection has a great economic impact upon livestock production systems since females are more profitable for dairy farms, males are more attractive for beef farms or other applications with gender-specific demands (Taylor et al 1985; Ruvuna et al 1992; Hohenboken 1999; Rath and Johnson 2008). Endangered species could also benefit from gender selection during programs for reestablishing their populations (Seidel 2003/2007).

The discovery of sex chromosomes in 1910, demonstrated the genetic basis of gender choice in mammals. Sex pre-selection has been pursued more than 70 years now, where multiple methods have been developed to separate sperm cells into two X-specific and Y-specific populations (Johnson 1994). Despite numerous attempts, methods based on differences in DNA content between X and Y sperm cells are the sole option for efficient sexing sperm cells (Johnson 1994; Rath and Johnson 2008).

The difference in DNA content between X and Y bovine sperm cells is of approximately 4% and allows accuracy of 90% in sexing sperm cells (Windsor et al 1993; Chandler et al 1999). The usage of flow cytometry to sexing sperm cells has detrimental drawbacks, since it remains expensive, has low throughput and damages sperm cells, that ultimately leads to lower fertility (Rath and Johnson 2008). Due to the limited availability of this technology, sexing sperm cells has been mostly applied to cattle and much later in sheep (Rath and Johnson 2008). Thus, alternative methods for sexing sperm cells with high accuracy and lower detrimental effects are still on demand (Espinosa-Cervantes and Córdova-Izquierdo 2013).

Percoll density centrifugation (PDC) was described as an alternative to sexing sperm cells (Blottner et al 1993; Resende et al 2009; Malik et al 2011). The difference in density due to DNA content between X and Y in bovine sperm cells is 0,06% and can be captured by this approach (Windsor et al 1993; Chandler et al 1999). In cattle, PDC allows sperm cell sexing with the accuracy of around 70% and high viability for in vitro fertilization (Resende et al 2009).

Small ruminants should benefit from sperm cell sexing both for in vivo or in vitro fertilization schemes. However, few reports have described the usage of sexed semen for these purposes, primarily in sheep (Rath and Johnson 2008). The development of an efficient PDC approach would circumvent most of the limitations found using sexed semen by flow cytometry. The work was aimed to test the accuracy and

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reproducibility of a discontinuous Percoll density gradient for sexing sperm cells of small ruminants.

II. Material and Methods

a) Semen Collection and Evaluation

Semen was collected by rectal electroejaculation from four Anglo-Nubian bucks and four Santa Inês rams and used after cryopreservation as previously described by Arruda et al. (2014). All animals were of proven fertility and subject to andrology exam. Only ejaculates carrying 80% motility, vigor >3, >80% of normal sperm cells, and <10% abnormal morphology after collection were used for cryopreservation, as suggested by CBRA (2013). Only frozen-thawed semen was further used for sperm sexing. Frozen-Thawed semen that had >30% motility, vigor >3, >80% of normal sperm cells, and <10% abnormal morphology were used for sperm sexing using Percoll density gradient.

b) Preparation of Percoll density gradient

Percoll working solution was prepared by serial dilutions using a stock solution (Percoll 90%, pH 7.4 and 280-290 mOsm/kg H2O), em DMEM medium containing 0.3% BSA pH 7.4, to obtain a density of 1.123g mL-1. A continuos Percoll density gradient was prepared by layering each working solution in polystyrene conic tubes and freezing and thawing to make continuous layers in the gradient.

c) Density gradient centrifugation and recovery of sperm cells

Pools of 100 to 200 x 106 sperm cells mL-1 were layered on each Percoll density gradient (one sample for each male was prepared by mixing frozen-thawed semen from three different ejaculates). Both rams and bucks were considered independent replicates (n = 4 for each species). Gradients were centrifuged from 550 to 1,500g in horizontal rotors, for 10-30 minutes at 4 to 25 oC. The supernatant of each tube was discarded. Sperm pellets were recovered and used for sexing efficiency and cell viability assays.

d) DNA Extraction

Fresh semen samples or after cryopreservation of each species were subjected to DNA extraction using a protocol with 10% Cetyl Trimethyl Ammonium Bromide (CTAB), as previously described by Solléro et al. (2004). Samples were treated with 500µL of 10% CTAB at 65 oC for one hour. Samples were further centrifuged at 15,800g for two minutes, and the supernatant was transferred to a conical tube containing a 24:1 chloroform of alcohol isoamyl alcohol solution. Moreover, samples were centrifuged at 15,800g for 15 minutes, supernatant was transferred to a conical tube containing cold isopropyl alcohol and kept at -20 oC for 30 minutes. Finally, samples were further centrifuged at 15,800g for 30 minutes, but supernatant was discarded and pellet was washed in 75% ethanol and followed by 100% ethanol. The pellet was stored in ultra-pure water at -20 oC.

e) Real Time PCR

Genomic DNA was used for PCR reactions in order to detect SRY and Aml-X genes, as described by Phua et al (2003). Multiplex PCR reactions were performed containing 100ng of DNA from each sample, 1.5mM MgCl2, 10pmoles of each primer, 200µM dNTP, 1IU Taq polymerase, 1X PCR buffer (20mM Tris-HCl pH 8.4, 50mM KCl, 2mM MgCl2), and final volume of 25µL. The PCR reaction had an initial denaturation step at 94 oC for 5 minutes, followed by 34 cycles of 94 oC for 45 seconds, 58 oC for 45 seconds, 72 oC for one minute and a final extension at 72 oC for 7 minutes. Amplicons were detected by electrophoresis in 2% agarose gels stained with ethidium bromite, visualized with UV transilluminator and compared with a 50pb DNA ladder (Invitrogen, USA).Primers used in the experiment are described in Table 1.

Table 1: Primers used in the Experiment

Gene	Primers	Amplicon (bp)	Access Number (Genbank)
Aml-X	F - CAGTAGCTCCAGCTCCAGC R - TGTGCATCCCTTCATTGGC	300	AF215887.1 (Capra hircus)
SRY	F - ATGAATAGAACGGTGCAATC R - GGAAGAGGTTTTCCCAAAGGC	116	Z30646 (Capra hircus)

f) Statistical Analysis

The data obtained from sperm sexing conventional PCR was analyzed by the chi-square test. To determine if sex ratio was skewed after PDC, percentages were compared with their standard means and the non-sexed control. Differences with a probability of 5% were considered significant.

III. Results

Semen from both ram and bucks displayed acceptable seminal parameters for cryopreservation (Table 2). Semen was further cryopreserved and subject to the PDC.

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Table 2: Sperm parameters (mean+SD)after collection for Anglo-Nubian bucks and Santa Inês rams

Species	Animals (n)	Ejaculate Volume (mL)	Progressive Motility (%)	Sperm Vigor (1-5 scale)	Sperm Stirring (1-5 scale)	Sperm Concentration (10^6 x mL^{-1})
Caprine	4	0.70+0.08	85.0+3.5	3.5+0.3	4.5+0.4	4,023+931
Ovine	4	0.71+0.14	82.5+7.5	3.6+0.4	4.1+0.2	4,136+841

SD: standard deviation.

The ratio of X and Y-bearing sperm cells in non-sexed samples demonstrated that there is substantial variation among males of both species (Table 3). The PDC did not allow sexing of goat sperm cells since it did not skew ratios of X and Y sperm cells. However, the semen of a single ram was successfully sexed, with a significant ($P < 0.05$) increase in X-bearing sperm cells (Table 3). Despite this latter result, the semen subject to the PDC displayed detrimental effects, where motile sperm cells could not be recovered.

Table 3: Sperm sexing efficiency after Percoll density centrifugation determined by Real Time PCR (RT-qPCR)

Species	Animal (Sample)	X-bearing Sperm cells (%)		Y-bearing Sperm cells (%)	
		Control	Sexed	Control	Sexed
Caprine	1	30^A	28^A	70^A	72^A
	2	34^A	41^A	66^A	59^A
	3	55^A	56^A	45^A	44^A
	4	42^A	40^A	58^A	60^A
Ovine	1	46^A	62^B	54^A	38^B
	2	37^A	34^A	63^A	66^A
	3	52^A	54^A	48^A	46^A
	4	60^A	70^A	40^A	30^A

Different letters on same line for two consecutive columns (e.g. X or Y-bearing sperm cells) indicate statistical significance by the chi-square test ($P<0.05$).

IV. Discussion

Gender selection remains attractive due to its potential for economic impact upon livestock production systems, since skewed gender ratios may yield different probabilities for both meat and production systems (Taylor et al 1985; Ruvuna et al 1992; Hohenboken 1999; Rath and Johnson 2008). Endangered species could also benefit from sperm sexing technologies for gender selection, to meet specific demands in preservation programs (Seidel 2003/2007).

The sperm sexing by the Percoll density centrifugation was efficient for only one sheep semen sample. Sperm sexing for commercial purposes is currently performed by flow cytometry, which is based on DNA content variation between X and Y-bearing cells, but remains expensive and reduces both fertility in vitro and in vivo (Rath and Johnson 2008), possibly due to DNA damage during the process. The PDC is an alternative approach that distinguishes X and Y cells by their difference in density, since X-bearing sperm cells

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hold a small but yet reproducible difference in sex chromosome size (Resende et al 2009). Moreover, Percoll density centrifugation may be particularly attractive to small ruminant species which have less access to flow cytometry-based sperm cell sexing (Rath and Johnson 2008). Despite the more recent potential for bovine sperm cells (Resende et al 2009), previous reports using Percoll density centrifugation for sperm sexing did not achieve such results (Lisuka et al 1987; Iwasaki et al 1988). Thus, Percoll density centrifugation needs further improvement and may require additional adaptations for small ruminants. Factors such as usage of fresh semen for sexing, variations in gradient preparation, sperm cell density variation and their interaction in sperm sexing are currently under investigation.

The factors that have caused impairment of sperm cell motility after Percoll density centrifugation are currently unknown. Percoll density centrifugation was initially described as a method for sperm selection in sheep and goats before in vitro fertilization (Palomo et al 1999; Morris et al 2003), ruling out possible species-specific factors as the source for this impairment. The effect of different batches of Percoll is under current investigation. Further research is needed to identify these negative factors on sperm motility or to describe approaches to circumvent them.

V. Conclusion

Sperm sexing by Percoll gradient density centrifugation was effective for sexing sheep sperm cells but requires further improvements for its usage in small ruminants.

Conflict of Interest

The authors declare they have no conflicts of interest with regard to the work presented in this report.

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Note :

"

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2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

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Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

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Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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