

Reproductive Performances of Local Etawah Goats under Rural Condition in Different Altitudes of East Java Province, Indonesia

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Abstract: Reproductive performances of local PE goats at Lowland (<400m), Mid-land (400-700m) and Highland (>700m above sea level) were studied in East Java Province, Indonesia by evaluating the age of does at first kidding, days open period, service per conception and kidding interval. This study was conducted at three Regencies of Lumajang, Malang and Trenggalek for three different altitudes of each, with balance number of 60 animals in each location (total animal of 180). The local temperature, air relative humidity (RH) and Temperature Humidity Index (THI) were significantly different for Lowland, Mid-land and Highland areas, but no between regencies. All animals were fed with the same amount and type of forage as basal feed. The forage is collected by farmers from around home. The age of does at first kidding was significantly higher ($P < 0.05$) at lowland for the respective areas of Lumajang, Malang and Trenggalek (17.80 ± 1.99 month, 18.63 ± 2.85 month and 17.55 ± 0.64 month) than at medium areas (17.06 ± 0.86 month, 17.13 ± 1.14 month and 16.95 ± 0.98 month) and highland areas (16.70 ± 0.69 month, 16.68 ± 0.67 month and 16.88 ± 0.76 month). High significant differences ($P < 0.05$) were found for days open periods of does at different altitude at lowland (3.85 ± 0.68 month, 4.15 ± 0.70 month, and 4.08 ± 0.61 month), medium area 3.51 ± 0.50 month, 3.71 ± 0.49 month and 3.71 ± 0.53 month) for the respective regencies. Service per conception was also significantly difference ($P < 0.05$) at the lowland (1.51 ± 0.19 , 1.49 ± 0.2 and 1.50 ± 0.24) than at medium areas (1.42 ± 0.2 , 1.38 ± 0.17 and 1.38 ± 0.18) whereas high areas (1.41 ± 0.18 , 1.39 ± 0.18 and 1.35 ± 0.17). For kidding interval also significant different ($P < 0.01$) where to lowland (9.38 ± 1.1 month, 8.95 ± 0.89 month and 9.38 ± 0.71), for the medium (8.90 ± 1.13 month, 8.56 ± 0.62 month and 8.88 ± 0.80 month), whereas to high (8.56 ± 0.59 month, 8.34 ± 0.54 month and 8.58 ± 0.91). Altitude significant effect on reproductive performance ($P < 0.05$), reproductive performance at high altitude is better when compared to the low-lying and being, the results of this study concluded that altitude can affect reproduction performance goat. It is recommended to get good results in raising livestock goat should be developed plateau area (> 700m asl) or lying areas are (400-700m asl).

Keyword: Altitude, age first kidding, days open, service per conception (S/C), kidding interval

I. Introduction

Local Etawah is the result of a cross goats Etawah goat (goat superior species of India) with goat Kacang (goat native to Indonesia). Goat can adapt to climatic conditions Indonesia easily maintained and livestock constitute superior types of meat and dairy producers. Goat is very well known among farmers because it has advantages such as being able to adapt well to the environment, has a high sales value when compared to other sheep, and goat milk is relatively easier to digest than cow's milk (Devendra and McLeroy, 1982). Altitude will affect the availability of oxygen and affect the temperature of the air, resulting in a decrease in animal productivity (Jacobsen, Dean, 2007; Rasmussen et al 2011). Livestock is the overall environment of the external condition of cattle that give effect to the development, response, and the growth of livestock. Literally, the environment can be separated into several namely, physical, animal, heat. Physical factors, among others, space, pressure, and equipment (cage). Cattle among other factors, the number of animals in cages and maintained in his behavior. While hot, among others, air, humidity, air movement, and radiation (Esmay, 1982). The level of adaptation to the environment, the better the better the ability of productivity.

Goat productivity is influenced by two dominant factors, namely genetic and environmental components that affect real animal adaptation is the temperature and humidity, when the temperature of the enclosure and the ambient temperature is too high, it will cause cattle life experiencing heat stress. The presence of heat stress it causes less comfortable cattle, causing stress and dehydration, decreased feed consumption (Ronchi et al 2002) decreased milk production (Valtorta et al 2002), daily body weight gain decreased, (Sakaguci and Gaughan 2002) and ultimately have an impact on decline in productivity of livestock (Mashaly, Hendrick, Kalama, Gehad and Abbas and Patterson, 2004). While the impact of cold air causes increased feed intake (Ekpe and Christopherson 2000). East Java province lies at 111.0 'to 114.4' East Longitude and 7:12 'till 8:48' South latitude. Its area covers 46712.80 km² and is divided into 38 second-level administration that 29 districts and 9 Municipalities. Each region is divided into the subdistrict and village / village consisting of 615

districts and 8413 Village/Village. The northern region bordering the Java Sea, east of the Strait of Bali, Indonesia Ocean in the south and west by the province of Central Java.

Total Population East Java as much as 38.3632 million (BPS Prop East Java in 2013) with a population density of 794 inhabitants per square kilometer. Meanwhile, the rate of population growth in East Java of 1.09% per year, topography in East Java is very varied, but in general is dominated by the presence of the mountainous topography. This is because the East Java is the path of the South mountains, the ground surface elevation maximum + 3637 m (mountain peak Mahameru) located in the area Lumajang. The diversity of goat population in East Java because of management are not the same in each region so that the impact on the different reproductive, and will affect the production process of goats, which ultimately also affect the level of efficiency of production and reproduction in each area.

II. Material and Method

The research was conducted in Lumajang, Malang and Trnggalek at different altitude lowland (<400 m asl), medium land (400-700 m asl) and highland (> 700 m asl) in East Java Indonesia. Lumajang lowland average temperature of 28.5⁰C, 65.60% humidity, THI 26.57⁰C, medium land temperature 26.93⁰C, humidity 66%, THI 26.57⁰C, and high average temperature 19.96⁰C, humidity 71.0%, THI 18.46⁰C. Malang Regency lowland average temperature 28.61⁰C, humidity 64.26⁰C, THI 26.51⁰C, medium land average temperature 27.08⁰C, humidity 65.43% THI 25.09⁰C, and highland average temperature 20.21⁰C, humidity 71.80 %, THI 18.50⁰C. Trenggalek lowland average temperature 28.75⁰C, 63.45% humidity, THI 26.48⁰C, medium land average temperature 26.98⁰C, 68.20% humidity, THI 25.20⁰C, and highland average temperature 19.58⁰C, humidity 71.80%, THI 18.41⁰C.

In this study, using 540 females goat, Lumajang, Malang and Lumajang each goat 180. All purposively based on age 3-7tahun, must be healthy, body condition score (BCS) 3-5. In the lowlands, medium and high forage fed locally, with botanical and nutritional composition of the same. Measured performance data is Age at first Kidding, Days Open (DO), Service preconceptions (S/C), And Kidding Interval observed directly. The term in the variable is:

Age at first Kidding is a good indicator of sexual maturity form one animal (Wilson, 1984) Days Open (DO) idle time is the length of time after giving birth to goats pregnant again, normally between 2-3 month after the goat weaned him (Murjito, et al 2011).

A service per Conception (S/C) is a number that indicates the ability of animal in marriage to produce pregnancy (Vandaplassche, 1982).

Kidding interval is the period between two successive litter comprising mating period (the period from birth to conception) and pregnant period until kidding back (Devendra and Burns, 1994). Data obtained from this study is set in such a way, to distinguish the reproductive performance of local goat PE at different altitudes in three districts in the province of East Java will be tested with test-statistic ANOVA using the program Statistical Package for the Social Science (SPSS).

III. Results

3.1 Age at first kidding

Table 1. The mean age first kidding local goat PE the height of different altitude and region the height

Region	Altitude		
	Lowland <400 m asl	Med-land 400 – 700 m asl	Highland >700 m asl
Regency Lumajang	17.80 ± 1.39 ^a	17.06 ± 0.86 ^b	16.70 ± 0.69 ^b
Regency Malang	18.63 ± 2.85 ^a	17.13 ± 1.14 ^b	16.68 ± 0.67 ^b
Regency Trenggalek	17.55 ± 0.74 ^a	16.95 ± 0.98 ^b	16.88 ± 0.76 ^b

Description: ab different superscript in a row indicate significant differences (P<0,05)

Age at first birth showed differences in the lowland with med-land and high, both for Lumajang, Malang and Trenggalek, where the highland early birth compared to the lowlands and med-land.

3.2 Days Open (DO)

Table 2. The mean DO local goat PE the of different altitude and regions

Region	Altitude		
	Lowland <400 m asl	Med-land 400–700 m asl	Highland >700 m asl
Regency Lumajang	3,85 ± 0,70 ^a	3,51 ± 0,50 ^b	3,46 ± 0,56 ^b
Regency Malang	4,15 ± 0,70 ^a	3,71 ± 0,49 ^b	3,58 ± 0,56 ^b
Regency Trenggalek	4,08 ± 0,61 ^a	3,71 ± 0,53 ^b	3,50 ± 0,50 ^b

Description: ab different superscript in a row indicate significant differences (P<0,05)

Based on the results of research and observation in regency Lumajang, Malang and Trenggalek at variable pregnant after birth (Days Open) are listed in Table 2 in the Statistical tests showed that the upland areas and are not show differences ($P > 0.05$), whereas the upland areas and moderate when compared with lowland showed significant differences ($P < 0.05$).

3.3 Service per Conception (S/C)

Table 3. The mean S/C local goat PE theofdifferent altitude andregions

Region	Altitude		
	Lowland <400 m asl	Med-land 400 – 700 m asl	Highland >700 m asl
Regency Lumajang	1,81 ± 0,56 ^a	1,55 ± 0,59 ^b	1,53 ± 0,53 ^b
Regency Malang	1,76 ± 0,59 ^a	1,51 ± 0,50 ^b	1,48 ± 0,53 ^b
Regency Trenggalek	1,78 ± 0,76 ^a	1,50 ± 0,50 ^b	1,43 ± 0,49 ^b

Description: ab different superscript in a row indicate significant differences ($P < 0,05$)

Based on the results of research and observation in regency Lumajang, Malang and Trenggalek at variable service per conception (S/C) are listed in Table 3 in the statistical test showed that the upland areas and med-land are not show differences ($P > 0.05$), whereas between upland areas and moderate when compared with lowland showed significant differences ($P < 0.05$)

3.4 Kidding Interval

Table 4. The mean kidding interval local goat PE theofdifferent altitude andregions

Region	Altitude		
	Lowland <400 m asl	Med-land 400 – 700 m asl(bulan)	Highland >700 m dpl (bulan)
Regency Lumajang	9,38 ± 1,10 ^a	8,90 ± 1,13 ^b	8,56 ± 0,59 ^b
Regency Malang	8,95 ± 0,89 ^a	8,56 ± 0,62 ^b	8,34 ± 0,54 ^b
Regency Trenggalek	9,38 ± 0,71 ^a	8,88 ± 0,80 ^b	8,58 ± 0,91 ^b

Description: a.b different superscript in a row indicate significant differences ($P < 0,05$)

Kidding interval in lowland showed differences with med-land and highland, both for Lumajang, Malang and Trenggalek, where the highland early birth compared to the lowlands and med-land

IV. Discussion

Age at first birth is closely related with age ranging mated that depend on the condition of the body or the relevant fodder. Early ripe virgin goats will be faster than the first litter slows cooking. This means that the people who belong to cook goat early going faster able to donate their products for farmers. From the results of statistical tests appears in Table 1 showed no significant differences ($P < 0.05$) age of first birth goat (months) between highland areas and med-land are compared to the lowlands, but the highland and med-land were not showing the difference ($P > 0.05$) in both the regency Lumajang, Malang and Regency Trenggalek. When based the mean age at first birth order consecutive start high to low, in Lumajangat lowland areas 17.80 ± 1.39 month, med-land 17.06 ± 0.86 months, and high 16.70 ± 0.69 months. Being in Malang is the lowland areas 18.63 ± 2.85 months, the med-land were 17.13 ± 1.14 months and high 16.68 ± 0.67 months. In Trenggalekis lowland areas 17.55 ± 0.74 months, the med-landwere 16.95 ± 0.98 Months and high 16.68 ± 0.76 months. can be explained that the age of first birth goat on a high earlier when compared with medium and lowland, both in Lumajang, Malang RegencyandTrenggalek. Some nations goat tropical regions can first birth at the age of 17 months (Robinet, 1973), whereas according to Singh (1990) first birth age can after two years old. The diversity of ages birth on different plains due in part to environmental factors and partly genetic factors, but it is also a factor quality of the farmers against the current understanding of the estrous goat, goat stud willingness chill or IB seeds available, the quality of reproduction management, also depends on the condition of feed available, besides that it also depends on farmers the opportunity to marry. From the research, the highland goat give birth earlier than the goats on the plains and low, from the third plateau early age of first birth when compared with Suranindyah study (2009) of 20 months, it is also not much different from the research Anonymous (2007) that the goat age at first birth 12-18 months and within 2 years can give birth three times. First birth age differences due to marry the first time in the Highlands earlier when compared with the med-land and lowland plains and this according to research from Lebbie and Manzini (1989) that the goat in the highlands that goats in Swaziland on condition maintenance traditionally the first birth on the age range of 262-340 days when first married at age of 7.2 ± 0.4 . For medium and lowland in the prediction of first mated age was 12 months, it is not much different from the research Sodiq et al (2001) The first goat mated at the age of 12.04 months and the estimated first lamb birth between the ages of 16-18 months.

Based on the results of research and observation in Lumajang in variable pregnant after birth (Days Open) are listed in Table 2 in the Statistical tests showed that the highland areas and med-land are not show differences ($P > 0.05$), while the highland areas and moderate when compared with lowland showed significant differences ($P < 0.05$). Based on the sequence mean pregnant after birth consecutive start low to high, the lowlands 3.85 ± 0.70 months the med-land were 3.51 ± 0.50 month, and highland 3.46 ± 0.56 months. In Malang of observations as listed in Table 2 after the test statistic that pregnant after giving birth to goat highland areas and med-land compared with lowland showed significant differences ($P < 0.05$), whereas in the highlands if compared to the med-land showed no difference ($P > 0.05$). Based on the sequence of the average mating postpartum consecutive start low to high, the lowland areas 4.15 ± 0.70 months, the med-land were 3.71 ± 0.49 month), and high 3.58 ± 0.56 . So is for Trenggalek of observations as listed in Table 2 after the test statistic that pregnant after giving birth to goat highland areas and med-land are compared with lowland showed significant differences ($P < 0.05$), whereas on the high when compared to the plains showed no difference ($P > 0.05$). Based on the sequence mean pregnant after birth consecutive start lace up high, the highest in low-lying areas (4.08 ± 0.61 months), the plains were (3.71 ± 0.53 month), and plateau (3.50 ± 0.50).

Days Open is the time between parturition until bunting back. It can be said that mating occurs after birth and pregnancy goat in the area Lumajang, Malang regency in the highlands and Terri earlier when compared with medium and low plains, this is due to the distance of time from the time of delivery to the first estrus in the highlands more fast when compared with medium and low plains are in the range 3-4 months it is in accordance with the opinion of Hardjopranyoto (1985) good days Open is 90 days while Hafez (1993) days Open the good is 55-85 days. Dewendra and Burns (1994) that the interval from the time of delivery the first postpartum estrus reported varied from one to three months or even longer. The length of the Open Days will automatically affect also the distance lambing.

A service per Conception is a figure that shows the ability of cattle in marriage to produce a pregnancy. Figures mating per pregnancy low mating is a very important economic factor, both in natural mating or artificial insemination. Based on Table studies and observations obtained S/C goat in the area Lumajang in the lowlands, med-land and highlands, respectively: 1.81 ± 0.56 ; $1.55 \pm 0.59 \pm 0.53$ dan 1,53, to the area of Malang Regency respectively: 1.76 ± 0.59 ; 1.51 ± 0.50 and 1.48 ± 0.53 , while in the area Trenggalek obtained S/C in the lowlands, medium and high, respectively: 1.78 ± 0.76 ; $1, 50 \pm 0.50 \pm 0.49$ and 1,43 of test results in the area of Statistics Lumajang, Malang and Trenggalek that the highland and med-land, were compared with lowland showed differences ($P < 0.05$), but the plateau showed no difference with the middle latitudes ($P > 0.05$) in Lumajang, Malang and Trenggalek where the difference between the S/C on high and low plains due to the knowledge of farmers in the highlands is experienced by detecting estrus if be compared with lowland farmers, in addition to the intensity of the S/C is influenced by several factors: skill inseminator at the time of artificial insemination, feeding the quantity is less, because the lowlands difficult to get food even though the type of feed given almost the same as the existing the highland.

Kidding interval is two successive birth of giving birth to the next birth, and the factors that determine the level of the average production of kid produced per year. The average kidding interval in the area Lumajang, Malang and Trenggalek at different heights are presented in Table 4.

The results showed that the average kidding interval in the area Lumajang in lowland 9.38 ± 1.10 months, were med-land 8.90 ± 1.13 months and highland 8.56 ± 0.59 months, for Malang to 8.95 ± 0.89 lowlands months, were med-land 8.56 ± 0.62 months and 8.34 ± 0.54 high months, whereas for the kidding interval Trenggalek obtained the average on the haighlowland 9.38 ± 0.71 months., were med-land 9.11 ± 0.82 months and the high was $8.58 \pm 0,91$ months. From the results of Anova test statistics in regency Lumajang, Malang and Trenggalek found that the kidding interval in highland and med-land when compared with lowland showed significant differences ($P < 0.05$), but in the highlands and med-land were not showed differences ($P > 0.05$). The difference between the highlands and the lowlands were caused in the lowlands due to breastfeed their kid longer when compared to the highlands and are due to the perceived lack of sufficient food that cause growth to be ugly and his fear of death in this case in accordance with the opinion Dewendra and Burn (1994) there are several factors that led to the death of the kid among others cold, food shortages, disease and dystocia, while according Utama et.al (1997) stated that the goats are very susceptible to changes in environmental conditions, both feed changes and other maintenance females pregnant, mother and kid are not yet weaned, young female kid and young male kid. With duration of breastfeeding kid in its mother it will cause lust into retreat and marriage also delayed so that kidding interval becomes longer as stated Astuti (2007) that the parent who delayed marriage affect the kidding interval.

V. Conclusion and Recommendations

4.1 Conclusions

Reproductive performance (first birth, days open, services per conception and kidding interval) on the highland and med land in regency Lumajang, Malang and Trenggalek better when compared to the lowland.

4.2 Recommendations

To get a good result from raising goats PE should be maintained at an altitude of 400-700m above sea level location and > 700m asl.

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References

- [1]. Anonymous 2007. Department of Animal Husbandry and Fishery Regency Wonosobo. Agricultural Information Sheet Goat Farming Regency Wonosobo Agricultural Offices Indonesia
- [2]. Astuti, M., A. Agus, I.G.S. Budisatria, L.M. Yusiati, and M.U.M. Anggriani. 2007. Potential, Plasma Nutfah National Livestock, Issue 1, Mould 1, Ardana Media, Yogyakarta
- [3]. Devendra, C. and M. Burns. 1994. Goat Production in the Region Translated By IDK Putra Publisher ITB and etc., Udayana
- [4]. Geovendra, K. and McLeroy, G.B. 1982. Goat and Sheep Production in the Tropics
- [5]. Ekpe E.D. & Christopherson R.J., 2000. Metabolic and Endocrine Responses to Cold and Feed Restriction in Ruminants. *Can. J. Anim. Sci.* 69: 3610-3616
- [6]. Esmay ML. 1982. Principles of Animal Environment, the AVI Publishing Company, NC Westport Connecticut
- [7]. Geogory, K. E. 1961. Improvement of Beef Cattle through at Breeding Method, Regional Publication 120. USDA
- [8]. Hafez, E.S. E. 1993. Reproduction in Farm Animal Lea and Febiger, Philadelphia
- [9]. Hardjopranyoto, 1985. Artificial Insemination Sciences Faculty of Veterinary Medicine, University of Airlangga Surabaya
- [10]. Jacobsen, Dean (24 September 2007). "Low Oxygen Pressure as a Driving Factor for the Altitudinal Decline in Taxon Richness of Stream Macro invertebrates". *Oecologia* 154 (4):795–07. Doi: 10.1007/s00442-007-0877-x. PMID 17960424.
- [11]. Kartasapoetra. 1993. Introduction to Climate, Fifth edition. GadjahMadaUniversity Press. Yogyakarta
- [12]. Lebbie, S.H.B. and A.T. Manzini., 1989. The Productivity of Indigenous Goats Under traditional Management in Swaziland, In: Wilson R.T. and Azeb M. (eds). African small ruminant
- [13]. Mashaly, M. M., G. L. Hendricks, M. A. Kalama, A. E. Gehad., A. O. Abbas, and P. H. Patterson. 2004, Effect of Heat Stress on Production Parameters and Immune Responses of Commercial Laying Hens Poults. *Sci.* 83:889-894
- [14]. Medeiros, L.F.D. et al. Physiological reactions of goat breeds Anglo-Nubian and Saanen kept in the shade, the sun and partially shaded environment, *Bulletin of Animal Industry*, V.65, n.1 p.7- 14, 2008.
- [15]. Murdjito, G, Budisatria, Panjono, Ngadiyono, N, and Endang B.2011. Goat Performance Bligon the
- [16]. Maintained Farmers in the Village of GiriSekar, Bake, GunungKidul, and Livestock Bulletin Volume 5 (2): 86-5
- [17]. Niewolt S. 2005. Tropical Climatology, an Introduction to the Climate Low Latitude, New York: J. Willey
- [18]. Payne, W.J.A. 1970. Cattle Production in Tropic, Vol 1. Longhman London
- [19]. Rasmussen, Joseph B.; Robinson, Michael D.; Hontela, Alice; Heath, Daniel D. (8 July 2011). "Metabolic Traits of Westslope Cutthroat Trout, Introduced Rainbow Trout and their Hybrids in an Eco tonal Hybrid Zone Along an Elevation Gradient". *Biological Journal of the Linnean Society* 105: 56–72. doi:10.1111/j.1095-8312.2011.01768.x.
- [20]. Robinet, A.H 1973. The Maradi Goat and Goat breeding Nigeria. In Conference Internationale de ElevageCaprin Tours, 17-19 Juliet 1971.Paris, France Institute Technique de ElevageOvin et Caprin.127-140 (ABA 42-1646)
- [21]. Ronchi B., Bernabucci U., Lacetera N. & Nardone A., 2002. Influence of Different Term Of exposure To Hot Environment on Diet Digestibility by Sheep, In Proc. 53rd Annual Meeting EAAP 117.
- [22]. Sakaguchi Y. & Ganghan J.B., 2002. The Effect of Heat Stress on Carcass Characteristic of Animal. Reproductive Loss in Farm Animal during Heat Stress. In Proc. 15th Conf. BiometeorolAerobial 114-115
- [23]. Singh D K, Mishra H R and Singh C S P. 1990. Genetic and Non-Genetic Factors Affecting Pre-Weaning Survivability in Kids. *Animal Production* 51:504-559.
- [24]. SILVA, E.M.N. et al. Evaluation of the Adaptability Of Exotic And Native Semiarid In Paraiba Goats, *Science and Agro technology*, v.30, n.3, p.516 -521, 2006, available
- [25]. SILANIKOVE, N. Effects of heat stress on the welfare of extensively managed domestic ruminants. *Livestock Production Science*, v.67, p.1- 18, 2000
- [26]. Suranindyah, y., T.S.M. Widi, Sumadi, N. H. Tarmawati and U. Dwisepto. 2009, Production performance of EtawahCrosbreed Goat in TuriSlemanJogyakarta. The 1st International Seminar on Animal Industry Bogor: 314-318
- [27]. Smith. J.B. and S. Mangkuwidjojo. 1988. Maintenance, Breeding and Use of Experimental Animals in the Tropics, First mold. UI Press. Jakarta
- [28]. Sodik, A.; Priyono, A.; Soedjadi, M.; Sugiatno, A.; and Marmono, E.A., 2001. Small Ruminant's Production System Under Rural Area And Improving Weaning Weight. Scientific Publication, University of JenderalSoedirman, Purwokerto. 27, 41-52.
- [29]. Utama, I-K., & I.G.M Budiarsana. 1997. PeranakanEtawah Goats Producing Milk As New Sources Of Growth In The Livestock Sub-Sector Of Indonesia, Proceedings of the National Seminar and Veterinary. Bogor, 18-19 November, 1: 158
- [30]. Valtorta.S.E., 2002, Animal Production in Changing Climate: Impact and Mitigation, In: Proc. 15th Conf: Biometeorol. Aerobial. 98-101
- [31]. Vandeplassche M., 1982, Reproductive efficiency in cattle FAO Animal Production and Health Paper, FAO, Rome.
- [32]. Wilson R.T. (1984). Indigenous Goats: Productivity in Traditional Livestock Systems of Semi-Arid Africa. *Int. Goat Sheep Res.* 2(3), 243-251.