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RESEARCH ARTICLE

Calving disorder in Nili-Ravi Buffaloes maintained under different production systems and Agro-ecological Zones of Punjab, Pakistan

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ABSTRACT

The investigation was carried out to explore the prevalence of problems at calving in Nili-Ravi buffaloes maintained under different production systems in three zones of Punjab, Pakistan with different agro-ecology. Three representative districts namely Multan, Sialkot and Chakwal were selected from Southern, Northern and Arid Irrigated Zone of Punjab respectively. Buffaloes numbering 200 were surveyed from each zone having different agro-ecology, comprising a total number of 600 buffaloes (n=600). Information regarding prevalence of these 3 disorders at parturition i.e. prolapse of uterus, placental retention and difficult birth was collected. The overall prevalence of these three calving disorders was non-significant (P>0.05) in study zones of Punjab with different agro-ecology. However, higher prevalence of reproductive disorders (P<0.05) was observed in buffaloes in the rural subsistence small holding (60.3%) small holding with market orientation (23.3%), commercial farms in the periphery of cities (15.0%) and commercial farms (8%). Different management conditions and production objectives in different production systems appear to be significant predisposing factors involved in the prevalence of calving disorders in buffaloes. The study concluded that prevalence of calving disorders varied among production systems (P<0.05) with higher frequency in rural small holder production system as compared to other systems. It also revealed that the impact of feeding resources in these production systems can bring improvement by reducing production losses due to calving disorders.

INTRODUCTION

In South Asia, buffalo (*Bubalus bubalis*) is predominant milch specie which produce ninety-five percent in the region, and owing to its dairy potential it is called as "Black Gold" (Javaid et al., 2009). This species has a credit of being second most important milk producing mammal of the globe (Bhatti et al., 2009).

The population of buffaloes in Pakistan is estimated as 41.2 million, of which 65 percent are reported to be present in the Punjab Province (GOP, 2020). Buffaloes contribute about 68% of total milk produced in the country. Buffalo milk is thick due to its high fat percentage compared to cow and SNF (10.5%) contents, which is a major reason of its popularity among consumers. The various social and cultural factors like "lassi" from buffalo milk is preferred (Khan et al., 2019). Moreover, traditional dairy farming in Pakistan rests with buffaloes mainly due to poor production potential of local dairy cattle. The buffaloes of Pakistan are one of the best buffaloes of the world as long as productivity is concerned. Beside cultural popularity of buffaloes, these also play significant role in the GDP of Pakistan through contributing milk (37256 Thousand Tonnes), meat (Beef, 2303 Thousand Tonnes including cattle), hides (8622 Thousands) and draft power for agriculture (GOP, 2020). Pakistan is bestowed with wealth of natural resources with diverse terrine and agro-climatic conditions. The different agro-ecological zones are result of diverse

natural landscape and geographical conditions present in different regions of the country. These variable agroclimatic conditions have great impact on living standards and lifestyles of inhabitants of the area. These variations are also responsible for existing different husbandry practices and production systems of farm animals. In Pakistan, there are different production systems for the rearing of buffaloes which in turn depend upon the available resources and market targets. Mainly, there are 4 distinct production systems in Pakistan based on the location and herd size i.e. 1-Rural subsistence small holder, these turn out milk for their daily family essentials at very little cost, major inputs in these household dairy produce are generally non income sources, such as family land and work force, on an average milk produced per animal is three litres in a day, about seventy percent farmers which produce milk having smallholdings are in this category, 2-Market oriented small holder, this system is family-owned having access to market, milk marketing channels which also include sales to the retail shops in the nearby city, or sale to middleman, 3-Peri-urban semi-commercial, these are still less than 1 percent of the total dairy farms in the country, on an average milk production per animal are ten litre in a day and 4-Commercial farms, located around cities, milk delivery to the market is twice daily, main inputs in the system include labor, housing, health costs, feeding, watering, utility bills and transportation of milk (Pasha, 2013; Amrin et al., 2020). The management and feeding set up is quite different in these systems (Ali et al., 2009).

Efficient reproductive performance is a key element for profitable and sustainable dairy smallholdings (Thornton, 2010; Mudavadi et al., 2020). Reproductive efficiency is negatively influenced by many factors which include pubertal age, pattern of breeding being seasonal, interval of calving to conception, services per conception, number of days open, health of uterus and problems at parturition (Marai and Haeeb, 2010). Decline in reproductive efficiency results in two-fold economic waste, decreased production, and management cost (Mulligan et al., 2006; Inchaisri et al., 2010; Edwards, 2019). Poor reproductive process can badly affect fertility. These factors include long calving to conception interval resulting in prolonged dry periods, delay in puberty, abnormal births so less number of lactations in the life of an animal, which result in increase in management cost and culling cost because of being infertile (Agarwal and Tomar, 2003; Agarwal et al., 2005; Ali, 2011). Reproductive tract infections of breeding buffaloes play a crucial role in infertility which add up to decreased productivity. To maintain subsequent fertility in next calving, animals with any abnormality in previous calving need special attention (FAO, 2005; Khan et al., 2011; Lopez-Helguera et al., 2012).

There are many elements which contribute to increased prevalence of problems at parturition in buffalo i.e., hormonal imbalance, imbalanced nutrition, managemental characteristics and meteorology. Studies on epidemiology of problems at parturition in buffalo with special emphasis on aspects prevailing in different agro-ecological zones of Punjab are scanty. The information and basic data for adoption of preventive measures for the enhancement of overall reproductive efficiency of animals is the aim of such studies. Therefore, the study was planned to undermine the prevalence of calving anomalies (difficult birth, placental retention and prolapse of the uterus) in buffalo population maintained under different systems of production in zones of Punjab, Pakistan with different agro-ecology.

MATERIALS AND METHODS

Study Area

The study was carried out on Nili-Ravi buffaloes maintained at three zones of Punjab, Pakistan with different agro-ecology. The province of Punjab consists of 36 administrative districts with area of 205,346 sq. km. The province comprises of three agro-ecology zones based on climate, 1) South Irrigated, 2) North Irrigated and 3) Arid (Rain fed). One district from each agro-ecology zone was at random selected i.e. Multan district (South Irrigated Zone) southern part of Punjab, probably the geographic center of Pakistan, with very hot in summer and very cold in winter. Sialkot district (North Irrigated Zone), is located in the north-east of the Punjab, features humid subtropical atmosphere. Chakwal District (Arid Zone) is located in northern Punjab**.** Chakwal is located in the subtropical region, and its climate is relatively cooler due to its elevation from central Punjab. The data pertaining problems at parturition in buffalo was gathered from all Tehsils (subdivisions of a district) of the three districts which were included in the study. The district of Multan (South Irrigated Zone) consisted of 3 Tehsils i.e. Tehsil Multan, Tehsil Shujabad and Tehsil Jalalpur Pirwala. The district of Sialkot consisted of four Tehsils i.e.

Tehsil Sialkot, Tehsil Sambrial, Tehsil Daska and Tehsil Pasrur. The Chakwal District comprised of four Tehsils i.e. Tehsil Chakwal, Tehsil Chua Sayyeden Shah, Tehsil Kallar Kahar and Tehsil Tala Gang (Fig. 1).

Buffalo Production Systems in Study Area

The buffalo is raised in four different production systems depending on the number of animals raised by the farmers namely; rural subsistence small holding (1-3 animals), market oriented small holding (4-10 animals), peri-urban commercial farm (10-20 animals) and commercial farm (more than 20 animals).

Sampling

According to the prescribed questionnaire, survey was carried out to appraise the incidence of reproductive

disorders in buffaloes raised under different production systems in the three agro-ecological zones (Fig. 2). Buffaloes numbering 200 in each agro-ecology zone were surveyed for the study. The particulars with regard to 3 parturition related problems i.e. prolapse of uterus, placental retention and difficult birth was put on record with help of developed proforma with retrospective information pertaining to buffaloes about their age, lactation number, season of calving, milk yield, body condition score (BCS Score 1 to 5), size of calf (small<,medium35kg>large), sex of calf, animal died or recovered during calving disorder, multiple births, still birth, fetal malpresentation, if any reduction in feed intake prior to calving, if the disorder accompanied mastitis or history of mastitis, any history of disorders during previous lactations, any history of other metabolic disorders (e.g) Milk Fever, Postparturient Hemoglobinuria etc., any history of metritis, endometritis, pyometra, any history of chronic enteritis, Natural service (NS) or Artificially inseminated(AI) and Services or breedings per conception.

Statistical Analysis

The data thus obtained were treated with statistical interpretation using Statistical analysis software (SAS, 2004). The prevalence was calculated as the number of cases found positive for each disorder divided by the total number of animals examined, and further subjected to complete random design and Duncan's multiple range test to assess the statistical significance.

RESULTS

The assortment of buffaloes having parturition related problems under distinct production systems in south irrigated zone, north irrigated zone and the arid zone was determined (Table 1). In the south irrigated zone, the maximum number of buffaloes that were affected with parturition related reproductive disorders were maintained under rural subsistence small holding followed by market oriented small holding, peri-urban commercial and commercial farm; the dissimilarity among all production systems being significant (P<0.05). For the north irrigated zone, maximum buffaloes affected with parturition related problems were maintained in the rural subsistence small holding followed by peri-urban commercial, small holdings with market orientation and commercial farm in ranking order. However, the affected buffaloes were notably greater (P<0.05) in number under rural subsistence small holding juxtapose with that in market oriented small holding and commercial farm but non significantly higher than peri-urban commercial farm. For the arid zone, notably greater (P<0.05) percentage of buffaloes with problems related to parturition were reported in rural subsistence small holding compared with those in market oriented small holding, peri-urban commercial farm and commercial farm; the later three did not differ (P>0.05) among themselves. On comparison of figures in 3 zones of different agroecology in Punjab amid each other as regards to production system, it disclosed that notably greater (P<0.05) percentage of buffaloes that were affected with problems at parturition was recorded in the zone with arid agro-ecology coming behind by in the south irrigated zone and the north irrigated zone in ranking order for the rural subsistence small holding; the differentiation amid the 3 agro-ecology zones being significantly considerable (P<0.05). For the market oriented small holding, the maximum number of buffaloes which suffered was noted in south irrigated zone followed by north irrigated zone and arid zone, the differentiation amid 3 zones was significant (P<0.05). For the peri-urban commercial farm, the maximum number of buffaloes which suffered was recorded in north irrigated zone followed by those in south irrigated zone and arid zone, the differentiation amid the 3 zones was significant (P<0.05). For the commercial farm, there was not considerable dissimilarity observed in the percentage of buffaloes that suffered in 3 agro-ecology zones under study.

On pooling of figures obtained, it showed maximum percentage of buffaloes those suffered were in the rural subsistence small holding followed by market oriented small holding, peri-urban commercial farm and commercial farm in ranking order and all four were dissimilar notably compared to one another.

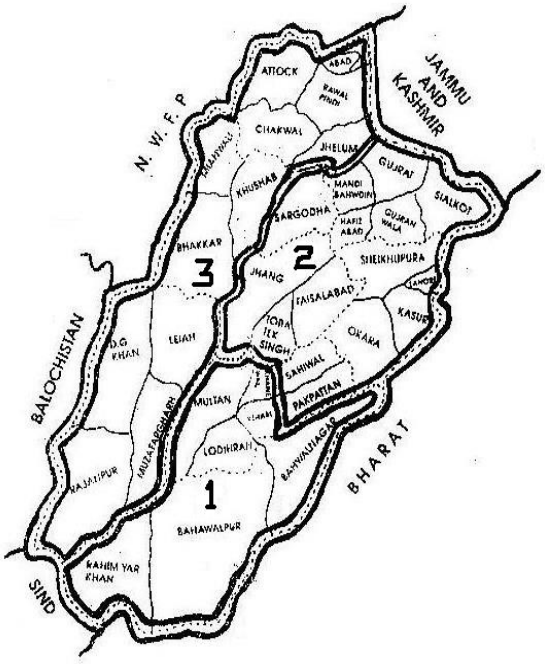

Fig. 1: Map showing Southern (1), Northern (2) and Arid Zone (3) of Punjab, Pakistan.

Case No._____ Date_____
Agro-ecological zone: **Irrigated** 1-District Multan **(Southern)** 2-District Sialkot, **(Northern)** 3-District Chakwal **(Arid)**
Tehsil _____ Village/Area_____
Name and address of the owner: _____
Production System:
1) Rural subsistence-small holding
2) Rural market oriented-Small holding
3) Peri-urban commercial farm
4) Commercial farm
Feeding System:
Any Concentrate/Amount (Y/N)_____
Any mineral supplement/Amount(Y/N)_____
Housing System:
1) Kaccha / Uneven floor 2) bricked floor 3) slopping
Flooring
1) Stall fed 2) Semi-stall fed
Reproductive problems(Current Calving):
Prepartum vaginal prolapse Uterine prolapse
Torsion RFM(Retention more than 12 hours)
Dystocia(only with assisted calving) Uterine infection
Still Birth (Calf born dead or dead within 24 hours of delivery)

Fig. 2: Survey proforma for the calving related disorders in the water buffalo.

Table 1: Incidence of calving disorders in buffaloes maintained in different production systems in three agro-ecological zones of Punjab, Pakistan

Production System	Southern Irrigated Zone Buffaloes with calving disorders n (%)	Northern Irrigated Zone Buffaloes with calving disorders n (%)	Arid Zone calving Buffaloes with calving disorders n (%)	Total n (%)
Rural subsistence small holdings	98 (49.0)^{Ab}	75 (37.5)^{Ac}	189 (94.5)^{Aa}	362 (60.3)^{A}
Market oriented small holdings	77 (38.5) ^{Ba}	56 (28)^{Bb}	7 (3.5)^{Bc}	140 (23.3)^{B}
Peri- urban commercial farms	22 (11.0)^{Cb}	66 (33) ^{ABa}	2 (1.0)^{Bc}	90 (15.0)^{C}
Commercial farms	3 (1.5)^{Da}	3 (1.5)^{Ca}	2 (1.0)^{Ba}	8 (1.3)^{D}

The values with different superscripts in the same row (small letters) except for totals, and in the same column (capital letters) differ significantly (P<0.05).

Table 2: Distribution of buffaloes affected with calving disorders in three agro-ecological zones of Punjab, Pakistan

Calving Disorders	Southern Irrigated Zone	Northern Irrigated Zone	Arid Zone	Total
	Buffaloes with calving disorders n (%)	Buffaloes with calving disorders n (%)	Buffaloes with calving disorders n (%)	Buffaloes with calving disorders n (%)
Dystocia	46 (23)^{B}	51 (25.5)^{B}	54 (27.0)^{B}	151 (25.2)^{B}
Retention of Fetal Membranes (RFM)	50 (25)^{B}	56 (28.0)^{B}	59 (29.5)^{B}	165 (27.5)^{B}
Uterine prolapse	104 (52)^{A}	93 (46.5)^{A}	87 (43.5)^{A}	284 (47.3)^{A}

The values with different superscripts in the same column (capital letters) differ significantly (P<0.05).

Overall incidence of three calving disorders in buffaloes is presented in Fig. 3. Regarding frequency of distribution of problems at parturition (Uterine prolpase, placental retention and dystocia), when figures obtained from the 3 zones of Punjab with different agro-ecology was correlated amid each other, no notable dissimilarity was recorded in all the 3 zones (Table 2). On pooling of figures obtained, it was shown that notably greater (P<0.05) number of buffaloes those suffered were observed with prolapse of the uterus followed by placental retention and difficult birth in ranking order; the variation among later 2 was no significant (P>0.05).

DISCUSSION

The management practices including the nutritional management vary from one production system to the other due to availability of financial resources available to the farmers. The farmers with small holdings usually tend to have limited resources, limited inputs, limited space and not very high production objectives. Particularly the farmers in rural subsistence small holdings raise the animals to substantiate their income and use the livestock as a source of supplementing their resources in the hour of need (Ali, 2009). The overall incidence of calving disorders did not differ notably among 3 zones of province. The frequency of buffaloes with uterine prolapse was higher as compared to other disorders (fetal membranes and dystocia in ranking order). Similar findings about incidence of calving disorders were also reported earlier (Rabbani et al., 2010; Shiferaw et al., 2005).

The higher frequency of affected buffaloes was recorded in the rural subsistence small holding followed by other production systems (market oriented small holding, peri-urban commercial farm and commercial farm

respectively). Similar results are documented by Swai et al. (2005), however Shiferaw et al. (2005) indicated same frequencies of postpartum disorders in all production systems. Egenolf (1990) reported that about 70% of livestock farmers in Punjab province are smallholders and with subsistence smallholding; they are unable to feed their animals a balanced diet resulting in nutritional imbalances and consequently a higher occurrence of calving disorders in rural subsistence smallholding. Fourichon et al. (2001) also substantiated the relation of the frequency and level of risk for health disorders with different farming or production systems indicating the feeding strategies to be important predisposing factor for the existence of these disorders. The significant differences among the agro-ecological zones were observed during the survey wherein the frequency of occurrence of these disorders varied from one zone to the other within the same production system except for commercial farms. This revealed the influence of imbalanced feeding and management practices being the reason for increased frequency of calving disorders in three production systems (small holder, market oriented peri-urban and semi-commercial). Commercial buffalo faming is characterized by high input intensive system with abundant feed resources and better management practices which reduces the chances of calving/reproductive disorders. Stall feeding is generally practiced on these farms with abundant supply of fodder and concentrates sources to ensure higher milk yield to sustain the profitability of the system. Similar findings were documented by Habib et al. (2007) on dairy buffaloes in Pakistan.

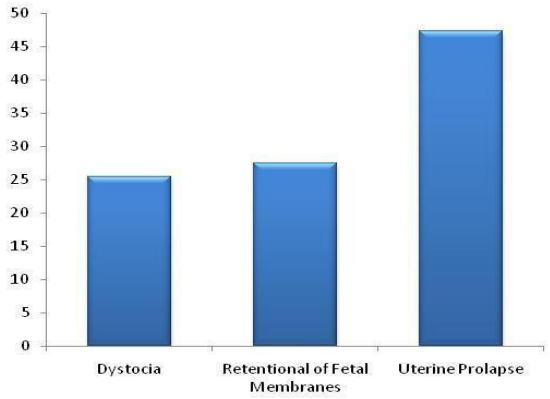

Fig. 3: Overall frequency (% age) of prevalence of calving disorders in Buffalo population of Punjab, Pakistan.

Conclusion

The frequency of distribution of calving disorders in three ecological zones was same. The study concludes that incidence of problems at or around parturition varied among different production systems in the 3 zones of Punjab with different agro-ecology. Higher frequency of problems at parturition are found in rural small holder system in comparison to other systems revealed that availability of feeding resources and management practices are major predisposing factors which affect incidence of these disorders in buffaloes and improvement in these can reduce productivity losses caused by calving disorders.

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Authors' Contribution

MAA and FH developed the study design, MNM and HJ and WA participated in data collection and analyzed the data. NI and AF drafted the manuscript. MMA helped in write up and revision of the manuscript. All the authors read and agreed with the information provided in the final version of the manuscript for publication.

REFERENCES

Agarwal SK and OS Tomer, 2003. Reproductive Technologies in Buffalo. 2nd Edition. A monograph published by the Communication Centre, Indian Veterinary Research Institute, Izatnagar, India.

Agarwal SK, SK Singh and R Rajkumar, 2005. Reproductive disorders and their management in cattle and buffaloes: A review. Indian Journal of. Animal. Science, 75: 858-873.

Ali S, 2011. Economic losses due to delayed conception in dairy animals of small farmers in district Gujranwala. M. Sc (Hons) Thesis, Department of Agriculture Economics, University of Agriculture, Faisalabad, Pakistan.

Ali MA, LA Lodhi, I Ahmad and M Younas, 2009. Serum progesterone and estradiol-17-alpha profiles in Nili Ravi buffaloes (*Bubalus bubalis*) with and without retention of fetal membranes. Pakistan Veterinary Journal, 29: 64-66.

Ali S, N Ahmad, N Akhtar, DE Noakes, 2008. Metabolite contents of blood serum and fluid from small and large sized follicles in dromedary camels during the peak and the low breeding seasons. Animal reproduction science, 108: 446-456.

Amrin A, MR Islam, MN Sultana, ME Haque, MH Uddin and MM Uddin, 2020. Impact of dairy cooperatives model farm (MF) on milk production, cost competitiveness and rural livelihood improvement in selected regions of Bangladesh. Journal of the Bangladesh Agricultural University, 18: 708-716.

Bhatti JA, M Younas, M Abdullah, ME Babar and H Nawaz, 2009. Feed intake, weight gain and haematology in Nili-Ravi buffalo heifers fed on mott grass and Berseem fodder substituted with saltbush (*Atriplex amnicola*). Pakistan Veterinary Journal, 29: 133-137.

Edwards JP, 2019. Comparison of milk production and herd characteristics in New Zealand herds milked once or twice a day. Animal Production Science, 59: 570-580.

Egenolf P, 1990. Health and production problems of smallholder ruminants in the Punjab, Pakistan. Animal Research Development, 32: 105-111.

Fourichon C, F Beaudeau, N Barielle and H Seegers, 2001. Prevalence of health disorders in dairy farming systems in western France. Livestock Production Science, 68: 157-170.

GOP, 2019. Economic Survey of Pakistan. Ministry of Finance, Govt. of Pakistan, Islamabad.

Habib G, A Hameed and M Akmal, 2007. Current feeding management of peri-urban dairy buffaloes and scope for improvement. Pakistan Veterinary Journal, 27: 35-41.

FAO, 2005. Improving artificial breeding of cattle and buffalo in Asia; Guidelines and recommendations. Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, Rome, Italy.

Inchaisri C, R Jorritsma, PL Vos, AM Van der Weijden and GCH Hogeveen, 2010. Economic consequences of reproductive performance in dairy cattle. Theriogenology, 74: 835-846.

Javaid SB, JA Gadahi, M Khaskeli, MB Bhutto, S Kumbher and AH Panhwar, 2009. Physical and chemical quality of market milk sold at Tandojam, Pakistan. Pakistan Veterinary Journal, 29: 27-31.

Khan IT, M Nadeem, M Imran, R Ullah, M Ajmal and MH Jaspal, 2019. Antioxidant properties of Milk and dairy products: A comprehensive review of the current knowledge. Lipids in Health and Disease, 18: 41.

Khan HM, HK Mohanty, M Bhakat, VS Raina and AK Gupta, 2011. Relationship of blood metabolites with reproductive parameters during various seasons in Murrah buffaloes. Asian-Australian Journal of Animal Science, 24: 1192-1198.

Lopez-Helguera, F, Lopez-Gatius and I Garcia-Ispierto, 2012. The influence of genital tract status in postpartum period on the subsequent reproductive performance in high producing dairy cows. Theriogenology, 77: 1334-1342.

Marai IFM and AAM Haeeb, 2010. Buffaloes reproductive and productive traits as affected by heat stress. Tropical and Subtropical Agroecosystems, 12: 193-217.

Mulligan FJ, LO Grady, DA Rice and MA Doherty, 2006. A herd health approach to dairy cow nutrition and production diseases of the transition cow. Animal Reproduction Science, 96: 331–353.

Mudavadi OP, MA Emmanuel, G Charles, MF Namasake and LA Bernard, 2020. Effects of season variation on water, feed, milk yield and reproductive performance of dairy cows in smallholder farms in eastern Africa. Journal of Agriculture and Ecology Research International, 21: 1-15.

Pasha TN, 2013. Buffalo production systems in Pakistan. Asian Buffalo Magazine, January-June, pp: 16-23.

Rabbani RA, I Ahmad, LA Lodhi, N Ahmad and G Muhammad, 2010. Prevalence of various reproductive disorders and economic losses caused by genital prolapse in buffaloes. Pakistan Veterinary Journal, 30: 44-48.

SAS, 2004. SAS/STAT User's Guide, version 8. SAS Institute Inc., Cary, NC, USA.

Shiferaw Y, BA Tenhagen, M Bekana and T Kassa, 2005. Reproductive disorders of crossbred dairy cows in central highlands of Ethiopia and their effect on reproductive performance. Tropical Animal Health and Production, 37: 427-441.

Swai ES, MJ Bryant, ED Karimuribo, NP French, NH Ogden, JL Fitzpatrick and DM Kambarage, 2005. A cross-sectional study of reproductive performance of smallholder dairy cows in coastal Tanzania. Tropical Animal Health and Production, 37: 513-525.

Thornton PK, 2010. Livestock production: Recent trends, future prospects. Philosophical Transactions of the Royal Society B: Biological Sciences, 365: 2853-2867.