PREVALENCE OF RETAINED FOETAL MEMBRANES AND ASSOCIATED RISK FACTORS IN CROSS BREED HOLSTEIN FRIESIAN DAIRY COWS IN SMALL AND LARGE SCALE DAIRY FARMS OF SELECTED DISTRICTS OF SOUTH AND OROMIA REGIONAL STATES

M.SC. THESIS

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HAWASSA UNIVERSITY

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A THESIS SUBMITTED TO THE SCHOOL OF ANIMAL AND RANGE SCIENCES,

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MARCH /2020

APPROVAL SHEET I

SCHOOL OF GRADUATE STUDIES

HAWASSA UNIVERSITY

This is to certify that the thesis titled "Prevalence of Retained Foetal Membranes and Associated Risk Factors in Cross Breed Holstein Friesian Dairy Cows in Small and Large Scale Dairy Farms of Selected Districts of South and Oromia Regional States." Is submitted in partial fulfilment of the requirements for the degree of Master of Science in Animal Sciences with a specialization of Animal Production of the Graduate Program of the School of Animal and Range Sciences, College of Agriculture, and is a record of original research carried out by Tesfaye Belay Balcha ID. No. SGS/208/08 under our supervision, and no part of the thesis has been submitted for any other degree or diploma.

The assistance and the help received during the course of this investigation have been duly acknowledged. Therefore, we recommend that it will be accepted as fulfilling the thesis requirements.

_____ _____

Name of Major Advisor Signature Date

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Name of co-advisor Signature Date

APPROVAL SHEET II

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We, the undersigned, members of the board of examiners of the final open defence by TESFAYE BELAY have read and evaluated his thesis entitled "*Prevalence of Retained Foetal Membranes and Associated Risk Factors in Cross Breed Holstein Friesian Dairy Cows in Selected Small and Large Scale Dairy Farms of Selected Districts of South and Oromia Regional States.*" and examined the candidate. This is, therefore, to certify that the thesis has been accepted in partial fulfilment of the requirements for the degree of Master of Science in Animal and Range Sciences (specialization: Animal Production).

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DEDICATION

I dedicate this thesis manuscript to my mother Asiye Tullu Jiregna for nursing me with great affection and for her dedicated partnership in the success of my life.

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First of all I am very much grateful to Almighty God for He has been helping me in my life. I wish to express my profound appreciation and sincere thanks to Dr. Sintayehu Yigrem (PhD) major advisor, and Dr. Desie Shiferaw (DVM, Asso. Professor) co-adviser for their consistent guidance, valuable comments and encouragement at all stages of the research, particularly on the statistical model and the dissertation write-up.

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STATEMENT OF THE AUTHOR

I declare that this thesis is my own work and it has been submitted in partial fulfilment of the requirements for M.Sc. degree at Hawassa University and is deposited at the University library to be made available to borrowers under rules of the library. I also solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate.

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LIST OF ABBREVIATIONS AND ACRONYMS

RFM	Retained Foetal Membrane
CSA	Central statistics Authority
GDP	Gross Domestic product
M.a.s.l	Meter above Sea Level
RF	Rain Fall
HU	Hawassa University
WGCF&NR	Wondo Genet College of Forestry and Natural Resource
WG	Wondo Genet
SNNPRS	Southern Nations, Nationalities and Peoples Regional State
MMP	Matrix Metalloproteinase
MHC	Major Histocompatibility Complex
NEFA	Non- Esterified Fatty Acid
IFN-t	Interferon-Tau
PGF2	Prostaglandin F2 Alpha
IU	International Unit
CL	Corpus Luteum
IM	Intramuscular
SPSS	Software Package for Social Science
ROP	Retention of placenta
SPP.	Species
HH	Households

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Prevalence of Retained Foetal Membranes and Associated Risk Factors in Cross Breed Holstein Friesian Dairy Cows in Small and Large Scale Dairy Farms of Selected districts of south and Oromia regional states.

Tesfaye Belay

Major Advisor: Sintayehu Yigrem (PhD)

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ABSTRACT

A retrospective study was carried out to analyze the prevalence and risk factors associated with retained foetal membranes (RFM) in crossbred dairy cows managed under various farm scales and farming systems in Southern and Oromia regional states. Multi-stage sampling technique was employed to select dairy farm households. The three districts was selected purposively based on the potential of dairy production system. A total of 120 households were selected randomly, 48 from Wondo Genet, 41 from Shashemene and 31 respondents from Hawassa districts.Data on the prevalence of RFM was collected mainly by two approaches: the first by monitoring smallholder and large scale dairy farms where total of 500 calvings had occurred between September, 2016 and May, 2019. The second form of data collection was by using secondary data from large scale dairy farms. The study was complimented by household survey, where the perceptions of farmers about risk factors and possible mitigation practices followed by farmers to prevent RFM. The result shows that out of the monitored calvings, 69 calvings (13.8%) had RFM. RFM progressively and significantly increased with the advancing age of the cow which is 9.2%, 14.4%, 15.4% and 15.3% respectively for. Parity of the cow was categorized as 1-2, 3-6 and >7. It was observed that 6.9%, 13% and 74.3% respectively. The prevalence of RFM in cows with poor, medium and good body condition is recorded as 18.6%, 4.3% and 66.7% out of positive cows respectively. The sex of delivered calf has its own impact on the prevalence of RFM where the incidence of RFM for female calves born was 10.7% and for male it was 17.5%. The incidence of RFM was also affected by blood levels of crossbred cows where 50%, 75% and 87.5% crossbred had 32.1%, 12.1% and 13.3% RFM prevalence, respectively. In conclusion, the prevalence of RFM in the present study area was so high, requiring special attention to be given, by considering important predisposing factors. In this study, the impacts of other important factors (such as effect of nutritional status of cows) were not considered, which might require further studies.

Keywords: Retention of foetal membranes, prevalence, risk factors.

1. INTRODUCTION

1.1. Background and Justification

Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country. The total cattle population for the country is estimated to be about 59.5 million. Out of this total cattle population, the female cattle constitute about 55.5 percent out of these 98.20 percent of the total cattle in the country are local breeds. The remaining are hybrid and exotic breeds that accounted for about 1.62 percent and 0.18 percent, respectively (CSA, 2016/2017).

Livestock contributes to 30-35% of Ethiopian GDP and more than 85% of cash income sources for livelihoods. In this respect, milk production is playing a vital role in the livelihoods of the people of Ethiopia (Belete, 2006). Among livestock species, cattle have significant contributions to the livelihoods of farmers (Mekonnen *et al*., 2012). Dairying is an important enterprise for many countries of the world and is especially important source of income generation for rural families in the developing agricultural countries like Ethiopia. With increase in population size the demand for milk also increases (Usman *et al*., 2013).

The development of the dairy sector in Ethiopia could contribute significantly to poverty alleviation and improvement in health and nutritional status of the whole community at large (Jayne*et al*., 2010). However, the dairy industry is not as developed as that of east African countries. Consequently, national milk production remains among the lowest in the world even by African standard. However, there is a slow and gradual overall growth in milk production in Africa owing to cross breeding program that are being introduced into many tropical countries to

increase milk production (Kassa and Lema, 2005). Dairy-industry development aimed at smallholders enhances development opportunities for women and young rural people. Dairy production provides women with a regular daily income, vital to household food security and family wellbeing (Dugdill *et al*., 2013).

Despite the huge number of cattle in the country, productivity is low due to constraints of disease, nutrition, poor management and poor performance of endogenous breed. This constraint results in poor reproductive performance of dairy cattle and lower economic benefit from the sector (Bitew and Prased, 2011). Among the major problem that has direct impact on reproductive performance of dairy cows are abortion, dystocia, retained foetal membrane, repeat breeding and uterine prolapse. This could be classified as postpartum and prepartum (Forar, *et al*, 1995). Reproductive health problems cause considerable economic loss to the dairy industry due to slower uterine involution, prolonged inter conception and calving interval, negative effect on fertility, drop in milk production and early depreciation of potentially useful cows (Corea *et al*, 2001). Diseases have numerous negative impacts on productivity of herds i.e. death of animals, loss of weights, slow down growth, poor fertility performance, decrease in physical power and the likes (CSA, 2017).

Retained Foetal Membrane (RFM) or retention of afterbirth is one of the most common conditions occurring in farm animals following parturition. It is observed in the dairy cows and less commonly in other domestic species. In physiological parturition the afterbirth of the cow falls away within 3 to 8 hours following calving. Placenta is not said to be retained in cattle until 12 hours after parturition (Jackson, 2004, Raheem et al., 2016)

Retained Foetal Membrane is due to the failure of the villi of the foetal cotyledons to separate from the crypts of the maternal caruncles. The incidence of RFM appears to be varying from area to area and from year to year and from breed to breed.

Retained Foetal Membrane costs farmers in many ways, partly because of the veterinary costs, but mainly because of its effect on milk yield and, most importantly due to subsequent fertility problems. Studies have shown 5-10% prevalencies of retained placenta in intensive dairy farms. Veterinary advice should be sought if the rate goes above this figure, especially if it goes above 10% (Laven, 2002). Detachment of the placenta in the cow is initiated by a progressive collogenolysis of the maternal and foetal connective tissues of the placentome during the last month of gestation. The successive weakening of the interface between the maternal and foetal tissue includes re-molding of the connective tissue and influx of leukocytes to the site (Gunnick, 1987).

RFM is one of the great problems on the productivity of cow. That means the RFM decrease the reproductive performance of the cow and also decrease milk production. RFM is a concern because it can lead to further complications including; Septic metritis (infection of the uterus), Septicemia (infection of the blood), Endotoxemia (toxins in the blood), Laminitis and death, finally it can also need vet, support (Laven, 2002). In most of the animals affected with retention of a slight to moderate loss milk and a slight to moderate delay in the involution the uterus, and subsequent conception (Stephen, 2002).

1.2. Objective of the Study

The objective of this research was to estimate the prevalence of retained foetal membranes and associated risk factors in cross breed Holstein Friesian dairy cows in selected small and large scale dairy farm.

2. REVIEW OF LITERATURE

2.1. Placenta in dairy cows

The placenta (or the after birth) is an organ that connects the developing fetus to the uterine wall to allow nutrient uptake, provide thermo-regulation to the fetus, waste elimination, gas exchange via the mother's blood supply, and fight against internal infection and produce hormones to support pregnancy (Tolera and Wahid 2017). Placenta is the name given to the membranes that transfer nutrients from the cow to the calf (fetus) is born. These membranes and blood vessels are made by the calf and connect to the blood supply in the uterus of the cow or heifers. The cotyledons (buttons) of the placenta “hook up” to the caruncles of the uterus. It is a cross this thin connection between the membrane of the cow and the membranes the calf that essential material pass to the developing calf. (John Maas, 2008).

The placenta provides oxygen and nutrients to growing babies and removes waste products from the baby's blood. The placenta attaches to the wall of the uterus and the baby's umbilical cord develops from the placenta. Other function of placenta is it provides a reservoir of blood for the fetus, delivering blood to it in case of hypotension and vice versa, comparable to a capacitor. The umbilical cord is what connects the mother and the baby. The essential materials pass to the developing fetus. When the fetus is born, the placenta normally detaches within short time and is expelled. That is why it is referred to as the “afterbirth”. The release of foetal membranes postpartum is a physiological process and involves loss of feto-maternal adherence, combined with contraction of uterine musculature and is usually accomplished within 6 hours of calving. (Tolera and Wahid 2017).

2.2. Types of placenta in farm animals

Anatomically the placenta of animals may be divided into 4 general types based on their shape; the diffuse, the cotyledonary, the zonary and discoidal. In ruminants, including the cow, sheep and goat the placenta is the cotyledonary or multiplex type. In ruminants only a portion of the endometrial caruncles, and a portion of allantois chorion or cotyledons, which closely appose each other to form placentome, take part in the placental functions.

Formerly, the placenta was differentiated according to whether or not maternal tissue separated off with the fetal tissue at birth. Afterwards, the placenta where classified according to the way the villi are distributed on the fetalchorion. Thus, where they are uniformly dispersed, as in the mare and sow, the placenta is said to be diffuse. Where they are grouped into multiple circumscribed areas, as in the ruminant, the placental arrangement is called cotyledonary, while in the bitch and cat the villi are disposed in the form of a broad encircling belt forming a zonary placenta. More recently, embryologists have favored, division of placental types in which the degree of proximity of the maternal and fetal blood circulations is the criterion of classification. In the cow, the placenta is described as being synepithelialchorial (Noakes et al., 2009).

2.3. Mechanism of Normal Placental Separation

Maternal immunological recognition of foetal Major Histocompatibility Complex (MHC) class I proteins expressed by trophoblast cells-triggers an immune/inflammatory response that contributes to placental separation at parturition. The processes of normal separation and delivery of the placenta are multifactorial and begin before parturition (Fig 1). For example, it has been suggested that serotonin might also play a role in regulating bovine placental attachment (Fecteau and Eiler 2001).

High fetal and placental serotonin during pregnancy could help to maintain placental attachment by promoting placental cell proliferation and inhibiting matrix metalloproteinase (MMP) activity. Maturation of the fetalmonamine oxidase enzyme system close to parturition results in the mobilization and subsequent decrease in serotonin, which in turn could promote placental separation and parturition (Tolera and Wahid 2017).

2.4. Mechanism of Placental Retention

Leukocytes chemotactic factor is found in placentomes of cows with normal placental separation. Its absence in placentomes of cows with retained placenta decreases the reactivity of blood leukocytes and neutrophils to chemotactic stimuli. The cows with a greater degree of negative energy balance prepartum and higher non- esterified fatty acid (NEFA) concentrations were 80% more likely to suffer from retained placenta. Similarly, the lower circulating vitamin E concentration increased the risk for retained fetal membranes in cows. The recent data indicate that lack of uterine motility plays little or no role in the occurrence of retained placenta. Moreover, cows with retained placenta have normal or increased uterine activity in the days after calving (Frazer, 2005; Tolera and Wahid 2017).

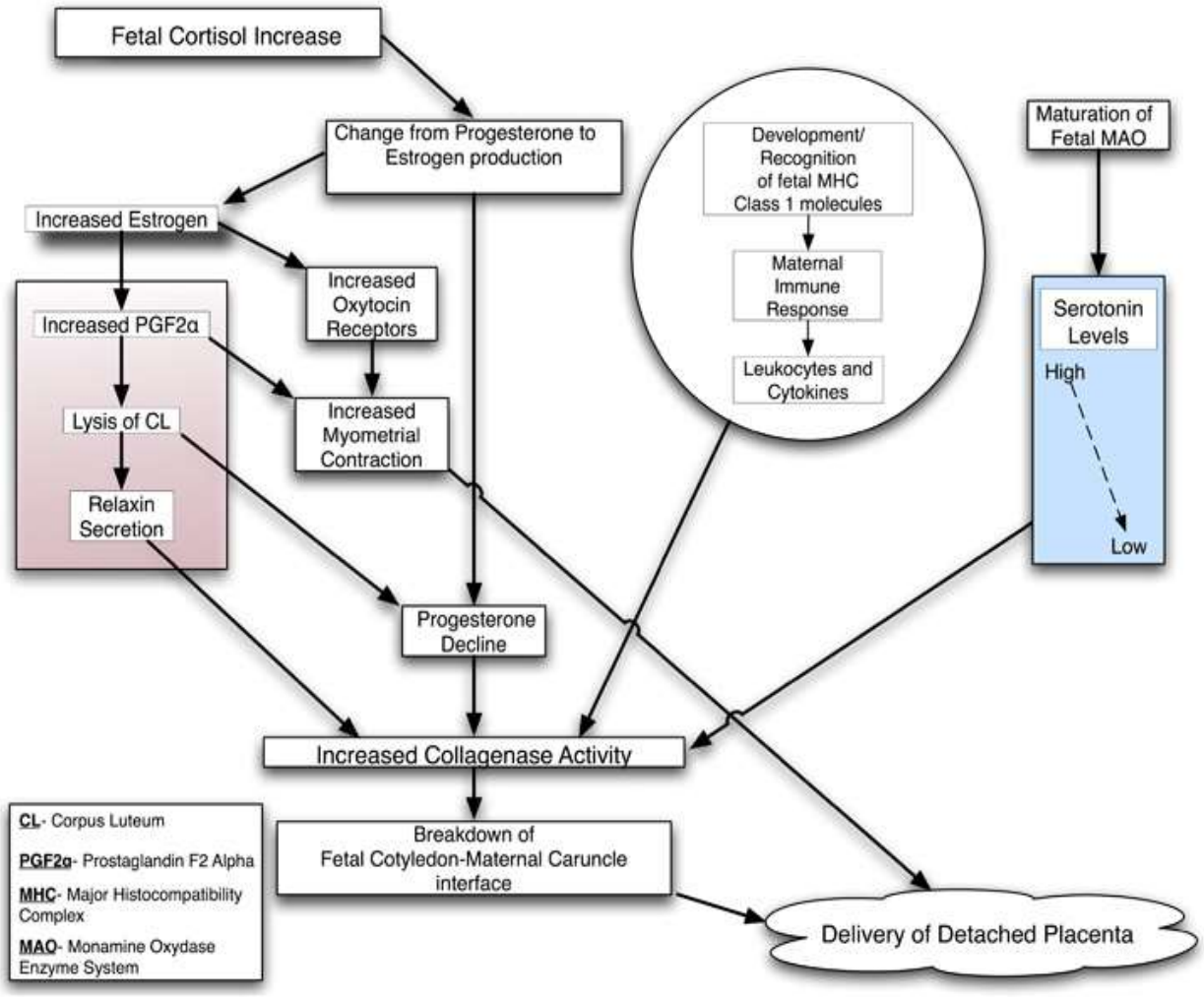

Figure 1: Physiologic processes leading to the detachment of the placenta in cattle (Frazer, 2005)

2.5. Umbilical cord

Umbilical cord connects the fetus and the placenta. The umbilical cord of the bovine uterus is 30 to 40 cm in length. The point of rupture of the umbilical cord in the calf is about 1– 2 inches from the umbilicus. After rupture the arteries retract into the body, the vein collapses and the urachus ceases to function (Noakes et al., 2009).

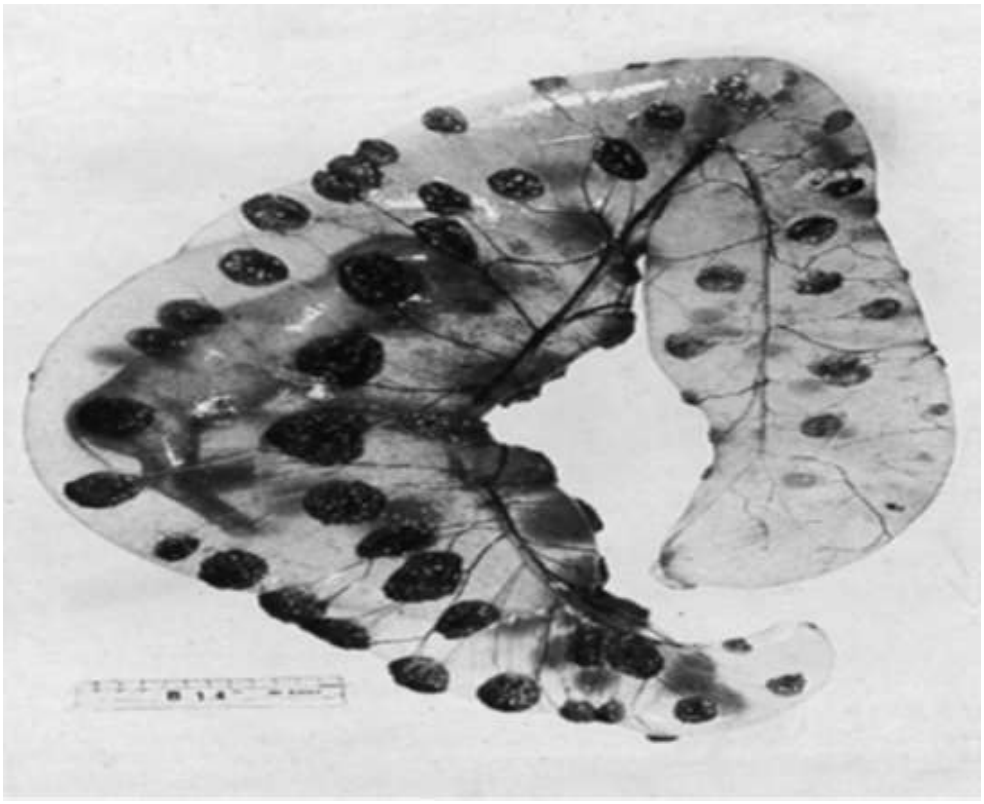

Figure 2: Bovine conceptus at 115 days. Note the blood supply to and from the developing cotyledons (Noakes et al., 2009).

2.6. Retained Placenta in dairy cows

Retained Foetal Membrane or retention of afterbirth or fetal membrane is one of the most common conditions occurring in animals following parturition. It is observed chiefly in the dairy cow and less commonly in other domestic species. In physiological parturition the afterbirth of the cow falls away within 3 to 8 hours following calving. If the placenta is retained longer than 8-12 hours the condition is considered pathological (Raheem *et al.,* 2016).

The normal physiological stages of birth during parturition include dilatation of parturient canal, delivery of the fetus and expulsion of the fetal membranes (Tolera and Wahid 2017). Retained fetal membrane (RFM) is a recurrent theme in considerations of the metritis-endometritis-Pyometra complex of diseases. It is a common complication of bovine parturition and although

not of great consequence purse, its role in predisposition to infections of the uterus means that RFM is an important contributor to bovine infertility (Noakes *et al*., 2001).

Figure 3: Cow with foetal membranes stretched in the study area

2.7. Etiology of retained placenta

The third and last stage of parturition is the expulsion of fetal membranes and the involution of the uterus. Retention of the fetal membranes occurs when the normal processes of dehiscence and expulsion fail to take place. There appear to be three main factors involved in the separation and expulsion of the fetal membranes, namely: Maturation of the placenta, exsanguinations of the fetal side of the placenta; when the umbilicus ruptures, which causes collapse and shrinkage of the trophectodermal villi and their physical separation from the maternal crypts, uterine contractions, which aid the exsanguinations of the fetal side of the placenta and cause physical separation of the

placenta by distorting the shape of the placentomes (thereby causing ‘unbuttoning’ of the cotyledon from the caruncle), expulsion of the dependent and detached parts of the fetal membranes can then occur (Noakes et al., 2009). Detachment of the placenta in the cow is initiated by a progressive collogenolysis of the maternal and fetal connective tissues of the placentome during the last month of gestation. The successive weakening of the interface between the maternal and fetal tissue includes re-molding of the connective tissue and influx of leucocytes to the site (Heuweiser and Grunert, 1987).

2.8. Risk factors for retained placenta

A variety of risk factors including early or induced parturition, dystocia, hormonal imbalance and immune suppression, can interrupt these normal process and results in retention of the placenta. Most of the time the ROP is occurs due to when the cow is pregnant more than one calf or twins. And when there is major surgery for instance cesarean section and sometimes depends on the season for instance the number of cases of ROP occurs due to excess or low selenium (Laven, 2002; Noakeset al., 2009).

2.8.1. Infectious Disease

Infectious disease causes of placental retention are behind the scope. Infectious diseases like Bovine Viral Diarrhea may cause RFM in cattle. Brucellosis is a contagious bacterial disease of sexually mature animals and causing abortion and retained placenta. The disease is clinically characterized by abortion in the last trimester and retained placenta in cows (Tolera and Wahid 2017).

2.8.2. Management

Management causes of retained placenta include stress, hereditary, inbreeding and obesity. Lack of exercise and hypocalcemia are the most frequent causes of decreased myometrium contractility. Stress (Transportation, rough handling, poor feed conditions, isolation from group, lameness,) results in elevated corticosteroids and increased risk of placental retention. Dairy producers have suggested that Poor health management in herds can predispose animal to retention of placenta. In addition to this deficiency of antioxidant, vitamin E and selenium may decrease chemo-taxis and leukocyte numbers at the fetomaternal junction, thus contributes to the retention of fetal membranes. Over-condition and under condition as well as managemental defects and environmental factors can result in retention of placenta. (Tolera and Wahid 2017).

2.8.3. Nutritional

Nutritional causes of ROP are primarily due to the deficiency of feed during the last 6 to 8 weeks before calving specially when there is deficiency of content of minerals and vitamins in diet (Spears and Weiss, 2008). Heavy grain feeding may be associated with both higher milk production and increased risk of reproductive disorders such as dystocia, retained placenta, cystic ovaries and metritis (Grimard, 2006). Vitamin and mineral deficiency conditions such as selenium, vitamin E and vitamin A, B-carotene and disturbed Ca/P ratio can impair general immunity and may alter the competence of cellular self-defence mechanism and can increase the risk for placental retention and metritis (Ahmed and Zaabal, 2009).

2.8.4. Cow's Body Weight

The percentage of retained placenta increases significantly with increasing live body weight of cows due to the increment in fat adipose tissues, which may result in trapping the steroid sex hormones (Gaafar. 2010).

2.8.5. Calves' Birth Weight

A significant increment of retained placental problem is happening with increasing fetal birth weight. The reason could be due to pressure of the fetus on the placenta and foetal membrane (Frazer, G.S., 2005), so that the attachment between the cotyledons and the foetal membrane become stronger these consequent in occurrence of placental retention.

2.8.6. Hormones

Placental separation occurs when fetal cortisol induces the production of the enzymes, 1 7-hydroxylase and aromatase in the placenta which favour estrogen synthesis at the expense of progesterone synthesis. Maternal plasma levels of any remnant of fetal membranes. Therefore, a decreased level of estrogen may be indicated as a factor enhancing ROP (El-Nemer, 2000). Spontaneous myometrial contractility is augmented by autocrine and paracrine release of PGF and parturition ensues. Disturbed endocrine function high progesterone and cortisol levels and low oestradiol level was traced in the blood of cows with ROP. Increased progesterone level in RP may be due to failure of the placenta to produce specific steroidal enzymes that help in progesterone aromatization and its conversion to oestrogen Ball, P., (2004).

2.8.7. Failure of Maternal Immune Response

It is occurred due to failure of the maternal immune system to successfully degrade the placentomes at the end of pregnancy (Frazer, G.S., 2005). Maternal immunological recognition of fetal MHC class I proteins expressed by trophoblast cells triggers an immune inflammatory response that contributes to placental separation (De-Mouzon.2006). This lymphocytic activation was suppressed at the foeto maternal interface alongside the pregnancy course to avoid rejection of fetal allograft where the trophoblast secretes interferon-tau (IFN-t) and both trophoblast and endometrium secrete prostaglandin E2 and the endometrial glands secrete serpins (uterine milk

proteins), all of which inhibit lymphocyte activation to keep on the embryo not rejected by the dam Hansen, P., (1996).

2.8.8. Mechanical Causes of Retained Placenta

Difficult birth (calf too large for cow, backwards calf known as breech birth, one leg or head backwards), twins, late or premature birth, prenatal loss, induction of parturition with PGF2, cesarean section and fetal monsters or emphysematous fetus (gas-filled fetus) are direct causes of dystocia and consequently to ROP (Tolera and Wahid 2017).

2.9. Prevalence of Retained placenta

There are many factors influencing the incidence of RFM which includes; abortion, dystocia, multiple birth, concurrent diseases, age, nutrition, season of the year and gestation length. The exact cause of RFM is still not known and this hampers the search for preventive and therapeutic measures (Majeed, 2009).

Rate of incidence increased with age of the dam. Gestation length, prior to retention and birth weight were also associated with higher rates. The combination of short gestation length (< 270 days) and low birth weight (< 37 kg) was associated with the highest risk of retained placenta. High birth weights mainly caused higher rates when related to dystocia. The incidence rate in cows delivering a male calf was only slightly higher than in cows delivering a female calf. (Joosten et al.,1987). The incidence of retained placenta was higher in cows giving birth to twins or male calves, and following abortions, stillbirths or placental retention at the previous parturition.

The records of the individual animals which is starting from September 2006 to May 2019. The data were analyzed and the prevalence of RFM was calculated by the following formula.

Prevalence of RFM (%) = Number of animals with RFM after delivery X 100.

Number of animals which is delivered between 2016 –2019

2.10. Economic and reproductive impact of retained placenta

2.10.1. Metritis

Retention of placenta (ROP) and metritis are positively correlated. Cows with ROP had a significantly higher incidence of metritis than cows without ROP and also a significant difference was found between conception rates in cows with ROP and metritis (Young quist and Threfall, 2007). Retention of placenta results from the presence of decomposing placental tissues, which provide a favorable environment for bacterial colonization. Coliform bacteria and high concentrations of endotoxins present in lochia of cows with ROP are potent inducers of prostaglandins and cytokines, favoring development of uterine infections (Dohmen, 2005). Metritis result in decreased dry matter intake and hence, multiparous cows with metritis in early lactation produce less milk than the healthy cows. This difference is greatest during the first 20 weeks of lactation (Tolera and Wahid, 2017).

2.10.2. Mastitis

Although the main economic impact of ROP seems to be decreased milk production (more days open, decreased milk volume, milk from treated cows withheld), the correlation between ROP and mastitis is controversial. Milk from cows with retained placenta is unfit for human consumption and therefore cannot be sold. The fertility of dairy cows is affected when most cows in the herd suffer from retained placenta. This causes a direct loss to the farmer due to delayed calving leading to a lengthy period between births (calving intervals) and hence low milk production. It is unhygienic to milk a cow with decomposing afterbirth hanging on it

(LeBlanc *et al.*, 2008). The financial losses due to retained placenta in dairy cattle were due to increased calving interval, increased culling rate, loss of milk production and the costs of veterinary treatment and drugs.

2.10.3. Reduced Conception Rate

Varies studies reported that the conception rate of cows presenting retained placenta were significantly lower compared to normally calved cows (Shiferaw, Y. et al.., 2005). The highest proportion of normal cows was conceived during the period from 61 to 90 days after parturition, while cows with retained placenta were conceived at more than 120 days after parturition (Gaafar, 2010).

2.10.4. Delaying Post-delivery Service Interval

Placental retention is usually accompanied by delayed involution of the uterus and adversely affects reproductive performance. Cows with reproductive disorders had longer intervals from calving to first service and to conception and required more services per conception and lower pregnancy rate and conception to first service. The period from parturition to the first service was longer in cows exhibiting retained placenta compared to normal ones (Tolera *et al*.., 2017).

2.10.5. Longer Calving Interval

Retention of placenta and metritis may cause prolonged calving interval and permanent infertility. Calving interval remained longer in cows revealing retained placenta as compared to normal cows (Gaafar, 2010: Swiefy, A.S., 2003). In general, the financial losses due to retained placenta in dairy cattle existed due to increased calving interval, increased culling rate, reduced conception rate, infertility, loss of milk production, the costs of veterinary service and drugs (Tolera and Wahid, 2017).

2.11. Economic importance of ROP

ROP is one of the great problems on the production of the animal or the cow. That means the ROP decrease the reproductive performance of the cow and also decrease milk production. ROP is a concern because it can lead to further complications including; Septic metritis (infection of the uterus), Septicemia (infection of the blood), End toxemia (toxins in the blood), Laminitis and death, finally it can also need vet, support (Laven, 2002).

The effect of ROP on subsequent fertility is important to consider, as delayed involution and chronic endometritis following ROP in some cows, permanent sterility results, due to pyometra, perimetritis, salpingitis, ovaritis, sever damage to the endometrium or other causes related to the retention. In most of the animals affected with retention of a slight to moderate loss milk and a slight to moderate delay in the involution the uterus, and subsequent conception (Stephen, 2002).

2.12. Treatment for ROP

The treatment for ROP are to cause early detachment of the membranes in order to reduce the occurrence of metritis, decrease milk losses, reduce reproductive inefficiency, and decrease veterinary expenses.

2.12.1. Management aspects

As the non-infectious causes of placental retention is multi-factorial and difficult to be diagnosed, so special care should be paid for control measures rather than treatment protocols. The genetic aspect should be put in consideration to select animals having the minimal probability for the occurrence of ROP. Selection of bulls with suitable birth weight for the breed is essential to protect the herd from calving problem (RoohUl Amin et al., 2013).

2.12.2. Nutrition

Supplementation with balanced vitamin and mineral mixture in prepartum period is considered a prophylactic step to avoid fetal membrane retention. Prepartum supplementation with antioxidants, vitamin E (DL -tocopherol acetate, 1100 IU) and Se (sodium selenite, 30 mg) by single I/M injection, at 3 week prepartum, is used as a prophylactic dose to avoid placental retention in cows (Gupta *et al.,* 2005).

2.12.3. Manual removal

Manual removal of retained membranes is contraindicated because uterine infections are more frequent and more severe after this form of intervention. (Bolinder et al., 1988) found that manual removal prolonged the interval from calving to 1st functioning CL by 20 days. The removal of an attached placenta causes damage to the endometrium and suppresses uterine leukocyte phagocytosis, both of which encourage bacterial invasion (Peters and Laven, 1996). It is also not easy to properly remove a retained placenta; 62% can be removed completely, 27% partially, and 11% are non-removable. Often, attempts at removal during the first 48 hours after calving are unsuccessful because the placenta is too firmly attached and the apical part of the gravid horn is beyond the reach. It is also strictly prohibited to remove the retained placenta manually at high temperature (RoohUl Amin et al., 2013).

2.12.4. Hormones

Hormones are not effective in either detaching the placenta in primary ROP or preventing early postpartum metritis in cows with ROP. Induced labor associated with the incidence of ROP was also reduced when relaxin was administered along with dexamethasone or cloprostenol (Musah et al., 1987) presumably because of relaxin promoting collagenase activity that could counteract the inhibitory effects of dexamethasone. But some of the hormones are used for contraction of

uterus thereby, expulsion of fetal membranes. The commonly used hormones are: Prostaglandin (PGF2α) and Oxytocin.

2.12.5. Antibiotics

The use of antimicrobial therapy in the treatment of ROP has demonstrated conflicting results. Postpartum metritis is a common sequele of ROP, and the rationale behind antibiotics for ROP is to prevent or treat metritis and its subsequent negative effects on fertility. One opinion is that antibiotics should not be used to treat ROP because they may delay the release of retained membranes by inhibiting the putrefaction process. Local antimicrobials, typically given as uterine infusions or boluses, have not been shown to reduce the incidence of metritis or improve fertility (Peters and Laven, 1996).

Systemic antibiotics alone were just as effective as systemic antibiotics combined with intrauterine treatment (Drillich et al., 2006). However, because all febrile cows were treated systemically, it is unclear whether the resolution of fever was caused by the antibiotics or to the cow's own immune defence mechanisms. There are currently no known trials in which cows with ROP and fever were left untreated (LeBlanc et al., 2008).

2.13. Prevention

There are no standard preventive regimes for RP as we do not understand. Good dry cow management is the best way of preventing RP and reducing its effect. This will include supply of correct nutrients, particularly magnesium and fat soluble vitamins, maximizing dry matter intake, supplying a clean dry environment, if the cow shows selenium deficiency, supplementation of selenium is needed (Noakes et al., 2009).

3. MATERIALS AND METHODS

3.1. Description of the Study Area

The study was conducted in Wondo Genet, Shashemene and Hawassa, area dairy farms, using on-going data collection since September, 2016 which resumed until May 2019 from smallholder and state farms used as research and teaching dairy farms.

Hawassa, capital city of the Southern Nations Nationalities and Peoples Regional State (SNNPRS), which is one of the high potential areas for milk production in Southern Ethiopia. It is located 275 km south of Addis Ababa along the Addis Ababa – Moyale highway. Hawassa is situated at an altitude of 1750 m above sea level and receives an average annual rainfall of 955 mm with mean annual temperature of 20°C. Both smallholder dairy farmers as well as the Hawassa University, main campus dairy farm used to generate the relevant data.

Shashemene is located 253 km, south east of Addis Ababa and it serves as the capital town of West Arsi Zone of the Oromia National Regional State. The town has altitude of 1800 above sea level. Smallholder dairy farms in Shashemene town were used to generate the appropriate data.

Wondo Genet located southeast of Shashemene in the Sidama Zone of the Southern Nations, Nationalities and Peoples' Region. The altitude ranges from 1800- 2400 m above sea level. The mean annual rain fall is 1200 mm. Wondo Genet is located at about 265 kms from the capital city, Addis Ababa, and about 14 kms from the Shashemene town and It is also located near to Hawassa, the SNNP State's capital by 32 km. Both smallholder dairy farmers as well as the Hawassa University dairy farm at Wondo Genet College of Forestry and Natural Resources were used to generate the appropriate data.

3.2. Study design

The longitudinal type of study was undertaken from September 2016 - May 2019 to identify prevalence of retained foetal membranes and related reproductive problems of dairy cattle in small and large scale dairy farms. The study also employed questionnaire survey to which was conducted in dairy farm households from Wondo Genet districts 48, Shashemene 41 and from Hawassa 31 households are interviewed. A regular follow up was also held on purposively selected large scale dairy farm at Wondo Genet (College of Forestry and natural resource dairy farm), Hawassa University main campus dairy farms and Ayele Korosso dairy farms which is located in Shashemene districts. And small scale dairy farms from both South and Oromia region who have been engaged in dairy farm practice were selected and regularly monitored and interviewed.

3.3. Sample size and Study Animals for monitoring RFM

The study animals were crossbred dairy cows managed under various scales of production systems. Pregnant dairy cows were identified from purposively selected dairy farms. Prior to monitoring of pregnancies and parturitions, the crossbred cows history have been recorded. The breed, blood level, age of the dam, body condition score during parturition, and also their parity. At the time of partition, the sex of claves born as well as the time period elapsed between calving and release of placenta were recorded. If it takes over 12 hrs until placenta is released, it is recorded as retained placenta. Any associated reproductive failures are also recorded. Based on these, records of 500 dairy cows were fully captured from small and large scale dairy farms (notably the dairy farm at Wondo Genet College and Hawassa University).

A regular visit was carried out once a weeks on 35 dairy farms, 16dairy farms in Wondo Genet area and 12 farms in Shashemene town and 7 farms in Hawassa which was purposively selected according to their herd size and dairy production capacity.

All pregnant cows selected purposively depending on their cross breed blood level and their pregnancy status and followed up from the start to the end of this study period. These cows were identified on the basis of their breed blood level, age, body condition score during parturition, parity number, according to their local name and or ear tag numbers to identify time of foetal membrane dropped, the major reproductive health problems, and then the findings recorded in prepared observational format**.**

3.3.1. **Body condition scoring (BCS)**

For all of the animals under study body condition was scored in order to assess the nutritional status of the animal and the prevalence of post parturient reproductive health problems. Therefore, animals were grouped in to 1, 2, 3, 4 and 5 body condition scores according to Richard (1993) and later on classified as poor (score 1 to 2), medium (score 3) and good (score 4 to 5) Benti and Zewdie (2014). The measurement was done through palpation and visualization of the transverse and spines processes for the lumbar vertebrae (loin) and tail head respectively (Ambaw et al., 2017).

3.3.2. **Breed**

RFM in dairy cows of different blood level of the same HF crosses used to assess its effect on the prevalence of the RFM. 500 cows have a parturition during study time were categorized to be between HF cross 87.5%, 75%, and 50%.

3.3.3. **Parity**

The study was undertaken on the basis of number of calving's, animals with RFM to categorize as either primiparous (animals exhibiting RFM after 1st calving) or pluriparous (animals exhibiting RFM after subsequent calvings). Therefore, the data was collected by focusing on the total number of calf born or parity numbers of the cows. Parity is one of the major sources of variation in milk yield (Mulindwa*et al.,* 2006). Cows in 4th and more lactations were no longer better producers compared to those in their 3rd lactation. The older age may contribute to reduced milk production through turnover rate of secretory cells, with higher numbers dying compared to the newly produced active secretory cells. Fat tissue cells usually replace dead secretory cells.

3.3.4. **Age**

The study also focuses on the age of the cows exhibiting RFM were obtained from the records of animals with RFM and the age is also used to assess its effect on the prevalence of the RFM. That means she is heifer or advanced age during parturition. The data was analysed to assess the influence of the age on the prevalence of RFM.

3.3.5. **Calf Sex**

The sex of delivered calf exhibiting RFM were obtained from the records of animals with RFM and the basis of their sex was analyzed to identify the effect of the calf sex on the incidence or prevalence of RFM.

3.3.6. Questionnaire survey method

From the total of 120 households good dairy producing farmers were taken from each of the three districts which is Wondo Genet, Shashemene and Hawassa were n=48, n=41 and n=31 respectively according to their milk producing capacity.

Structured questionnaire was prepared and used to collect information from 120 households of dairy farm owners by questionnaires. Before the interview, respondents were informed to the objective of the study. Following that, the actual questions and questionnaires were presented. Accordingly, information about the HF-cross breed, age, parity, BCS and calf sex, and major health challenges such as abortion, repeat breeding, still birth, prolapse, milk fever were collected on individual cattle level.

Accordingly, information about the age, parity, sex of delivered calf, breed, body condition score during parturition feeding system, housing system, production system, and type of feed, health care and major reproductive problems such as abortion, dystocia, retained foetal membrane, repeat breeder, stillbirth and uterine prolapse cases were collected and defined on individual cattle level. In order to identify dairy farms considered in the current study, an initial list of dairy farms in the study area was obtained from Wondo Genet area, Shashemene and Hawassa City Administration Agricultural and Rural Development Office and as well as Hawassa University main campus dairy farm, Wondo Genet college of forestry and natural resource dairy farm and Wondo Genet research center dairy farms are used.

3.4. Data management and analysis

The data obtained from questionnaire and regular follow up were entered on a Microsoft Excel spread sheet and Descriptive statistics, chi-square test were employed to describe and compare the various variables of the differences or association between in different risk factors such as age, breed, parity, calf sex and body condition with overall prevalence of reproductive health problems such as abortion, repeat breeding, still birth, dystocia, uterine prolapse and hypocalcaemia was analysed by using value of $p<0.05$ considered as significant

Data on different risk factors for RFM were analysed by use of SPSS version 20 software.

4. RESULTS AND DISCUSSION

4.1. Socio-economic characteristics of dairy farms in the study Areas

One hundred twenty dairy-producing households, who produce milk in different production system, were included in the study.

The proportion of the households with the age range between 24-34 years were 31.7%; and those within the age range of 35- 44 years were 33.3%, 45-54 years were 19.2% whereas those >54 years were 15.8%. This shows most of the dairy cow husbandry, were headed by adult age group of the society. And shows that most farmers were at the productive age and can actively manage their dairy cows.

Out of 120 households, the majority of dairy farm operation mainly covered by males 74.2% and females which is 25.8%.

Both men and women take part in livestock management. Generally, women contribute more labor input in feeding, cleaning of barns, milking, butter and cheese making and sale of milk and other milk products (Somano, 2008). In these study and study area most of the milking process is done by male.

Table 1: Sex and Age of household head category in the study areas

Variables	Categories	Wondo Genet	Shashemene	Hawassa	Over all	Percent
Sex	Female	14	11	6	31	25.8%
	Male	34	30	25	89	74.2%
Age	24-34	17	15	6	38	31.7%
	35-44	24	16	0	40	33.3%
	45-54	4	10	9	23	19.2%
	>55	3	0	16	19	15.8%

Source: survey result (2019).

This reflected the facts that, male mainly heads on dairy production. This result is in line with the Azage *et al.(*2003) finding reporting that, most of the households sampled for the study were male headed households (77.5–97.4%) and Assefa *et al,.(*2013), reported that, the majority (85%) of the respondents were male household heads. Also in agreement with the Ethiopian Society Animal production (2009) among the farmers, 21.43% were female-headed households while the rest 78.57 % were male-headed households.

The educational status of households in the study area (Wondo Genet, Shashemene and Hawassa) was shown in table 2. Majority of the farm owners from the overall result shows that n=53 (40.8%) were educated elementary school, n=34 (30%) educated high school, n=13 (12.5%) educated diploma and more, and n=20 (16.7%) were non educated (illiterates).

As observed from the educational level of farm owners or attendants, education is an important entry point for the empowerment of communities and an instrument to sustainable development. In this context, the educational level of the farming households may have significant importance in identifying and determining the type of development and extension service approaches. The

role of education is obvious in affecting household income, adopting technologies, demography, health, and as a whole the socio-economic status of the family as well (Adebabay Kebede, 2009). This shows that the growing educational coverage provided better opportunities to implement improved agricultural practices and wise use of scarce agricultural resources in the study area are shown on the following table 2.

Table 2: Educational status of respondents in the study areas.

		District				
Variables	Categories	Wondo Genet	Shashemene	Hawassa	Over all	Percent
Education	Illiterate	10	6	4	20	16.7%
	Elementary	25	20	8	53	44.2%
	High school	9	10	15	34	28.3%
	Diploma and above	4	5	4	13	10.8%
Total N		48	41	31	120	100%

Source: Survey result (2019), Where, N = Number of respondents

4.2. Cattle herd size and composition

Table 3 shows the livestock herd size and composition in the study areas. The cattle herds are dominated by dairy cows and also comprised a significant proportion of cows and almost all of them were cross breed cows. Most of dairy producers upgraded their crossbred and indigenous stock to continue dairying. The mean livestock holdings per household (TLU) in study areas were 12.8 ± 6.8 heads.

Table 3: Livestock herd size and composition per household in the study areas.

Livestock Type	Study area	N	Mean ±SD	Std. Error	95% CI for Mean	
					Lower Bound	Upper Bound
Cows >75%	Wondo Genet	52	3.83 ± 5.353	.742	2.34	5.32
	Shashmene	37	3.54 ± 1.169	.192	3.15	3.93
	Hawassa	31	3.13 ± 1.522	.273	2.57	3.69
Cows <75%	Wondo Genet	52	1.58 ± 2.052	.285	1.01	2.15
	Shashmene	37	1.22 ± 1.584	.260	.69	1.74
	Hawassa	31	2.10 ± 1.758	.316	1.45	2.74
Local Cows	Wondo Genet	52	.23 ± .546	.076	.08	.38
	Shashmene	37	.16 ± .501	.082	.00	.33
	Hawassa	31	.32 ± .702	.126	.07	.58
dry cows	Wondo Genet	52	1.63 ± .793	.110	1.41	1.86
	Shashmene	37	1.57 ± .728	.120	1.32	1.81
	Hawassa	31	1.65 ± .755	.136	1.37	1.92

Livestock Type	Study area	N	Mean ±SD	Std. Error	95% CI for Mean	
					Lower Bound	Upper Bound
male calves	Wondo Genet	52	.88 ± .878	.122	.64	1.13
	Shashmene	37	1.08 ± .795	.131	.82	1.35
	Hawassa	31	1.03 ± .605	.109	.81	1.25
female calves	Wondo Genet	52	1.75 ± .883	.122	1.50	2.00
	Shashmene	37	1.59 ± .798	.131	1.33	1.86
	Hawassa	31	1.74 ± .815	.146	1.44	2.04
Heifer	Wondo Genet	52	1.31 ± .829	.115	1.08	1.54
	Shashmene	37	1.30 ± .661	.109	1.08	1.52
	Hawassa	31	1.0 .683	.123	.75	1.25
Bulls	Wondo Genet	52	.08 ± .269	.037	.00	.15
	Shashmene	37	.08 ± .277	.045	-.01	.17
	Hawassa	31	.06 ± .250	.045	-.03	.16
TLU	Wondo Genet	52	13.3 ± 9.5	1.3	10.7	15.9
	Shashmene	37	12.1 ± 3.2	.53	11.0	13.2
	Hawassa	31	12.9 ±4.2	.75	11.4	14.4

Source: Survey results (2019), Where, N = Number of respondents; SD= Standard deviations; TLU= Tropical livestock unit;Std. Error= Standard error.

4.3. **Prevalence of RFM observed by regular follow up**

Out of 500 calvings, 69 calvings (13.80%) had RFM problems observed on the following table.

Table 4: Prevalence of RFM in general in the three study areas.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Positive	69	13.8	13.8	13.8
	Negative	431	86.2	86.2	100.0
	Total N	500	100.0	100.0	

Source: Survey result (2019), Where, N = Number of respondents.

The present study on prevalence rate of RFM (13.8%) is lower than 14.2 % reported by Mamo, (2004) and 19.2% by Gashaw et al, (2011). And higher than 10% the report of (Nigussu et al. 2016), 8.6%reported by (Molalegn and Shiv, 2011) and the variation in the incidence of RFM attributes to variation in predisposing factors to which the animals are subjected to nutritional status and management problems such as lack of exercise.

4.4. **Prevalence and Risk factors for RFM**

The analyzed risk factors which were associated with the RFM in 69 cases out of 500 dairy cows which is recorded during the study period. The risk factors analyzed were the influence of Breed, Age, Parity, Body condition score, and Calf sex on the prevalence were observed according to their categorization of level of risk factors of RFM shows on the following table 12.

Table 5: Prevalence and association with its Risk factors for RFM in the study area

Risk Factors	Categories	No. of cow examined	Cow affected (No. of +ve)	Prevalence (%)
Breed	HF-Cross- 87.5%	248	33	13.31%
	HF-Cross- 75%	224	27	12.1%
	HF-Cross- 50%	28	9	32.1%
Age	2-4	109	10	9.2%
	4-6	111	16	14.4%
	6-8	136	21	15.4%
	>8	144	22	15.3%
Parity	1-2	288	20	6.9%
	3-6	177	23	13%
	>7	35	26	74.3%
BCS	Poor	161	30	18.6%
	Medium	300	13	4.3%
	Good	39	26	66.7%
Calf sex	Female	272	29	10.7
	Male	228	40	17.5

Source: Survey result (2019).
Where, No. of +ve= Number of positive.

The analysis result show that the influences of breed, age, parity, body condition score and calf sex in the occurrence of retained foetal membranes.

4.4.1. Breed

Table 5 indicates the prevalence of RFM in dairy cows of different blood level of the same HF cross cows. 500 hundreds cows have a parturition during study time were categorized to be between HF cross 87.5%, 75%, and 50% it was observed that the prevalence of RFM in different blood levels are 33 cows (13.3%), 27 cows (12.05%) and 9 cows (32.1%)out of positive animals

respectively. Therefore HF- cross breeds of different percentage was statistically significant ($p<0.05$), which is ($\chi^2=6.77$; P= 0.011) table 6.

It was observed that the prevalence of RFM highest in 50%, moderately highest in 87.5% and lowest in 75% HF blood level, The incidence of retained membranes is higher in genetically high-yielding dairy cows and cows on high plane of nutrition at parturition are more prone to retention as are cows with disorders of carbohydrate metabolism (fat cow syndrome, ketosis, displaced abomasums) around the time of calving (Noakes et al 2009). This may be due to the fact that less adaptive behaviour of the cross- breed cows to tropical conditions of high temperature, humidity and various diseases and low feed quality making them more susceptible (Mukasa, 1989). Another reason may also be due to the fact that, cross breeds require more improved management, feeding and better health care to get better reproductive performance and productivity in the tropics (Teklye et al.,1991). The influences of breed in the current study was statistically significant and associated with ($P<0.05$) to the occurrence and prevalence of retained foetal membranes.

4.4.2. Age

Table 6 presents the prevalence of RFM in dairy cows of different age groups. Sixty nine cows in which the calvings were followed by RFM were categorized to be between 2-4, 4-6, 6-8, and over 8 years of age. It was observed that the prevalence of RFM were not significantly increased with the advancing age. The prevalence of RFM in cows aged 2-4, 4-6, 6-8, and over 8 years were recorded as n=10 cows (9.2%), n=16 cows (14.4%), n=21 cows (15.4%) and n=22 cows (15.3%) respectively. In this study age of delivered cows shows not statistically significant ($\chi^2=2.77$; P=0.15) association with RFM. The association in relation to prevalence is given with table 6 below.The present study (9.2%), (14.4%), (15.4%) and (15.3%) indicated that the highest

prevalence of retained placenta were not increased along increasing of age which was lower than to the findings of (32.03%), (44.06%)and (49.62%) by (Dawit and Ahimed 2013) North eastern Ethiopia and (Ambaw et al.,2017).

Table 6: Linear logistic regression (LLR)- (analysis) on the prevalence of RFM in the study areas.

Risk factors	Categories (level of risk factors)	No. of cow examined	Cow affected (No. of +ve)	Standard error	X^2	P.value	95% CI
Breed	HF-Cross- 87.5%	248	33	0.022	-	-	9.6-18.2
	HF-Cross- 75%	224	27	0.022	-	0.683	8.4-17.0
	HF-Cross- 50%	28	9	0.090	6.77	0.011	17.4-51.6
Age	2-4	109	10	0.030	-	-	5-16.3
	4-6	111	16	0.033	-	0.232	9-22.3
	6-8	136	21	0.031	-	0.15	10.3-22.6
	>8	144	11	0.030	2.77	0.15	10.3-22.2
Parity	1-2	288	20	0.02	-	-	4.5-10.5
	3-6	177	23	0.03	-	0.031	8.8-18.8
	>7	35	26	0.75	79.40	0.000	57.2-86.2
BCS	Poor	161	30	0.031	-	-	13.3-25.4
	Medium	300	13	0.012	-	0.000	2.5-7.3
	Good	39	26	0.76	89.79	0.000	50.4-79.7
Calf sex	Female	272	29	0.19	-	-	7.5-14.9
	Male	228	40	0.25	4.92	0.030	13.1-23.1

Source: Survey result (2019).Where, X^2= Chi-Square, CI=Confidence Interval. BCS= body condition score

4.4.3. Parity

The analysis of clinical records of 69 cows with RFM revealed that from parity number 1-2, 3-6 and >7 cows were recorded as n=20 cows (6.9%), n=23 cows (13%) and n=26 cows (74.3%) respectively which is out of all positive animals. Therefore Parity was statistically highly significant at ($p<0.05$), which is (χ^2=79.40; P= 0.000).

This finding is related with the report which is 0.8%, 9.4% and 29.6% respectively (Ambaw et al., 2017).

4.4.4. Body Condition Score (BCS)

The effect of body condition on the prevalence of retained foetal membranes were more highest in poor body conditioned animals, highest in good body conditioned animal and lower in Medium body conditioned animals from out of all observed animals in each categories n=26 cows having good body condition which is (66.7%), poor body condition cows n=30 in numbers (18.6%) and medium conditioned n=13 cows (4.3%) out of positive animals respectively. It was therefore Body Condition Score was statistically significant ($p<0.05$), which is ($\chi^2=6.77$; $P= 0.011$) table 6.

The current finding indicated higher prevalence of RFM problems in cattle with relatively good and poor body condition (66.7%) and (18.6%) and less in medium body condition(4.3%) this finding related to the report of (Benti and Zewdie, 2014), with being High prevalence of RFM problems in good (57.1%) and poor (48.3%) body condition and less in medium condition(42.4%), who reported a low prevalence of the problems in poor body condition as compared to good body condition cows.

BUT these finding realized the fact that cows in good body condition were the most susceptible to RFM problems due to over conditioning and good management system makes narrow of birth canal of the cows, as well a fat cow was more susceptible to metabolic problems and infections and is more likely to have difficult at calving and retained foetal membrane (Isahket al., 1983). The poor body conditioned animals also more susceptible to RFM this is due to the weak expulsive force to expel out the foetal membranes leading to secondary complications (Robert,

1986) and the poor body defence mechanism that increases the rate of infection (Isahket al., 1983)

Therefore, thinness or fatness could be an evidence to underlying nutritional imbalance, health problems or improper herd management. If done on a regular basis, body condition scoring can be used to trouble shoot problems and improved the health and productivity of the dairy herd; whereas, medium body condition animal was in perfect condition to meet performance needs.

Management system or BCS was statistically highly significant ($p<0.05$) on the prevalence rate of the RFM and This might be related to poor sanitation of the barn, resulting in contamination during calving and improper feeding. There is evidence of a high incidence of retained foetal membrane when cows' diets are deficient in selenium and/or vitamin E. correction of dietary deficiencies or supplementary feeding of these substances is commonly associated with a reduction of the incidence of retention. The incidence of retained membranes is higher in genetically high-yielding dairy cows and cows on high nutritive planes at parturition are more prone to retention as are cows with disorders of carbohydrate metabolism (fat cow syndrome, ketosis, displaced abomasums) around the time of caving (Noakes et al 2009).

4.4.5. Calf sex

A total of 500 cows were studied and of this 69 animals were observed for RFM problems and Out of 69 delivered calves the RFM are seen in 40 male calf (17.5%) and female calves 29 (10.7%) in this study sex show statistically significant (χ^2=4.92; P= 0.030) which have association with occurrence of RFM. The relative prevalence in relation to sex of delivered calf using chi square analysis was summarized on table 6.

The high prevalence rate of RFM observed with male calving (17.5%) could be related to shorter gestation period in cows having male calf and the large size and heavy weight of male calving

causing circulatory disturbances and/ or over stretching or inertia of the uterus (Roberts, 1986) causing RFM problems.

4.5. Prevalence of Retained Foetal Membranes at the level of Farm scale

According to the Farm scale from all study area which is small farm scale and large scale dairy farms. And from those farm scale the large scale dairy farm have high prevalence rate (15.4%) than small scale dairy farms which is 12.4%. this is indicated on the following table 7.

Table 7: Prevalence of RFM at the level of Farm scales in the study area

Categories	Farm scale			
	Total Observed	Negative	Positive	Prevalence
Small scale	253	222	31	13.9%
Large scale	247	209	38	15.4%
Average				13.9%

Source: Survey result (2019),

4.6. Prevalence of Retained Foetal Membranes at the level of study area

From the three study areas the effect and prevalence of retained foetal membranes were highly observed around Wondo Genet area which is n=42 (19%), then n=15 (10%) in Shashemene and least in Hawassa n=12 (9.3%) out of observed animals in each district observed in table 8.

Table 8: Prevalence of RFM at the level of study areas(three districts).

Study area	No. of observed	No. of Positive	Prevalence (%)
Wondo Genet	221	42	19.0%
Shashemene	150	15	10%
Hawassa	129	12	9.3%
Average			12.8%

Source: Survey result (2019),

4.7. Reproductive disease identified in the study area

From the three districts which is Wondo Genet, Shashemene and Hawassa the major cattle reproductive diseases prevailing in the study area, were uterine prolapse, repeat breeding, abortion, milk fever (hypocalcaemia), still birth, retained foetal membranes and dystocia. The problem of dystocia is observed on 12 households (HH), still birth on 11 HH, uterine prolapse also on 11 HH, abortion 38 HH, RFM on 97 HH and milk fever (hypocalcaemia) on 27 HH which is out of total interviewed people.

Even though the prevalence and severity of diseases vary from dairy farm to the other dairy farm, dairy farmers or producers reported that hypocalcaemia, repeat breeding, abortion and RFM were the most important identified reproductive health problems which is 22.5%, 24.2%, 31.7%, and 80.8% respectively and dystocia, stillbirth and uterine prolapse were less frequently observed problems (10%, 9.2% and 10%) respectively.

Table 9: Reproductive Disease Identified in the Study Area

		District				
Reproductive Health Problems	**Categories**	Wondo Genet	Shashemene	Hawassa	N	Percent
Dystocia	Yes	5	5	2	12	10%
	No	47	32	29	108	90%
Stillbirth	Yes	5	3	3	11	9.2%
	No	47	34	28	109	90.8%
Uterine prolapse	Yes	6	4	1	11	9.2%
	No	46	33	30	109	90.8%
Milk fever	Yes	11	8	8	27	22.5%
	No	41	29	23	93	77.5%
Abortion	Yes	19	8	11	38	31.7%
	No	33	31	20	82	68.3%
RFM	Yes	42	32	23	97	80.8%
	No	10	5	8	23	19.2
Repeat breeding	Yes	15	8	6	29	24.2%
	No	37	29	25	91	75.8%
Total N						

Source: Survey result (2019),
Where, N = Number of respondents

This result is in line with the (Ambaw*et al.*. 2017) finding reporting that, the major reproductive problems identified were repeat breeding (9.9%), retained placenta (7.6%), dystocia (4.5%), abortion (3.1%), and uterine prolapsed (2.1%) and The higher prevalence rate of reproductive

problems in crossbreed animals than local breed may be due to the fact that less adaptive behaviour of the cross- breed cows to tropical conditions of high temperature, humidity and various diseases and low feed quality than local breed cattle making them more susceptible than indigenous breed (Mukasa, 1989). Another reason may also be due to the fact that, cross breeds require more elaborated management, feeding and better health care than the indigenous zebu to get better reproductive performance and productivity in the tropics (Teklye *et al*.,1991).

The prevalence rate of hypocalcaemia (27%) recorded in this study is lower than the result (30.2%) reported by (Anteneh et al., 2012) this deference may be management, type of breed and study population. Most of the literatures suggest that when the incidence of milk fevers increases above (10%) in their third or latter lactation, considerations should be given to a specific control program (Horst, 1986). Therefore, these results indicated that control methods are required to avoid loss due to milk fever. Milk fever is caused by a severe deficiency of metabolizable calcium ion in the circulation. This could be attributed to several risk factors (Brandly and Cornelius 1969).

The prevalence rate of abortion (31.7%) recorded in this study was higher than the result (5.2) reported by Nigussu. et al., (2016), 9.0% by Tesfaye and Shamble, (2013), 13.9% by Molalegn and Shiv, (2011) and 14.6% by (Dinka, 2013). The higher prevalence rate of abortion may be attributed to the increasing practice of bull service by the most households in the study area may be these exposed the cows for brucellosis, in addition to management system specially feeding and sanitation.

The exact cause of prolapsed uterus is not clear although high estrogen has been proposed to cause prolapsed vagina (Noekes et al., 2001). Delayed intervention in cases of uterine prolapse may cause fatal septicaemia (Bhattacharyya et al., 2007).

The higher prevalence of repeated breeding (24.2%) found in the present study is higher than reported by Micheal. (2003) which is 13% in and around Hawassa, 13.08% by Adane et al., (2014) in Hosanna area, (11.4%) reported by Hadush et al., (2013) from central Ethiopia. Repeated breeding can be caused by a number of factors, including sub-fertile bulls, endocrine imbalance, malnutrition, reproductive tract infections and poor management practices such as wrong time of insemination or faulty heat detection, inappropriate semen handling and insemination techniques (Arthuret al., 2016). In addition to these, communal use of bull for natural services also considered as contributing factor. Hence the difference between the findings of the current study and previous reports may be attributed to the above-mentioned factors.

Dystocia that accounted (10%) of the problems is an important predisposing factor for occurrence of RFM. However, the current finding is higher than the prevalence of 5.9% Previous report by (Nigussu et al., 2016), (5.79%) on the prevalence of dystocia by Mamo, (2004), (7.7%) reported by Tesfaye et al., (2013), and (3.8%) of Gashaw et al. (2011). this variation in the occurrence of dystocia due to the fact that it is influenced by the factors such as, age and parity of the dam as well as breed of the sire. Inseminating cows with semen collected from large sized bulls without taking into account the size and age of cows is an important factor in precipitating dystocia (Noekes 1986).

4.8. Dairy cattle feed resources and feeding practices

The major sources of feed for cattle in the study area (Wondo Genet, Shashemene and Hawassa) are shown in Table 10. Natural grazing, crop residues, enset leaves, sugar cane leaves, hay, improved forage, agro industrial by products and non-conventional feedstuffs form the major feed resources. Most of the respondents feed their cattle in addition to natural grazing they fed by purchased concentrate dairy feeds, cutting and carry grasses, industrial by-products (wheat bran),

and crop residue such as wheat, teff straw and maize, enset leaves and sugarcane leaves. They also practice supplementation like amole salt (block salt). The major animal feed resource were use grass (42.5 %,) and crop residue and concentrates (29.2%).In addition with enset and sugar cane leaves, the other group which is 13.3% use grass, wheat bran, enset leaves and the rest 15% of the respondents use different types of grass species (elephant grass, Desho Grass and others) and crop residue, were more common animal feeds in these study areas.

Table 10: The feed sources of dairy cattle in study areas.

	District				
Feed Source	Wondo Genet	Shashemene	Hawassa	**N**	**percent**
Grass, crop residue, concentrate	19	20	12	51	42.5
Grass, crop residue, enset and sugar cane leaves	20	8	7	35	29.2
Grass, wheat bran, enset leaves	5	3	8	16	13.3
Different Grass spp. , crop residue,	4	10	4	18	15
Total N	48	41	31	120	100%

Source: Survey result (2019),
Where, N = Number of respondents

Livestock feeds are the major inputs in any milk production activity (Sintayehu *et al*., 2008). Natural pasture, crop residues, enset leaves, sugar cane leaves, hay, improved forage, agro industrial by products and non-conventional feedstuffs are form the major feed resources.

Generally, crop residues from cereals such as sugarcane tops, wheat, teff straw, and maize stover form the basal diets of the animals. This finding is in line with the report of (Kassahun Gurmessa et al. 2015) who reported the major basal feed resources for cattle in the Horro and Guduru district of Oromiya region western Ethiopia. Most of the respondents feed their cattle in addition to natural grazing they fed by purchased concentrate dairy feeds, cutting and carry grasses, industrial by-products (wheat bran), and crop residue such as wheat, teff straw and maize. In general, crop residues and natural pasture are the major feed resources of the area which agree with the report of Tolera *et al.,(*2012), and in line with the findings of Seyoum *et al*., (2001) who reported that the major basal feed resources for cattle in the highlands of Ethiopia are natural pasture,

crop residues and stubble grazing.

Nutrition has the major limiting impact on productive and reproductive performance in all animals. It also plays a major role on enhancing reproductive efficiency of dairy cows. Energy and protein are the major nutrients required in the greatest amounts and should be in the top most priority to optimize reproduction in dairy cattle; but also minerals and vitamins cannot be neglected and must be optimum in the diet (Bindari-Raj *et al*., 2013). The same author stated that nutrient should not be over-fed as this may also impairs the reproduction. Environmental factors, especially nutrition, determine prepubertal growth rates, reproductive organ development, and onset of puberty and subsequent fertility may advance or delay Age at First Service and Age at First Calving (Emebet. 2006).

Energy deficiency, particularly in postpartum cows, is most likely the major feeding factor involved in poor reproductive performance of dairy herd (Ben Salem *et al*., 2006). It results from the feeding of poor quality forages, which is most cases is coupled with inadequate

supplementation. The end result is that follicular growth and developments leading to first ovulation are affected and that cows in most negative energy balance are more likely to remain anoestrus.

Concentrates are rarely used with the exception of those milk producers who keep crossbred cows. This finding is in line with the report of (Asaminew. 2007) and (Seyoum et al.,2007) who indicated that the major basal feed resources for cattle in Bahir Dar and Mecha districts and the highlands of Ethiopia, respectively, are natural pasture, crop residue and stubble grazing. Currently with the rapid increase in human population and increasing demand for food, grazing lands are steadily shrinking due to the conversion of grazing lands to crop lands, and are restricted to the areas that have little value of farming potential.

4.9. Housing system

About 35% of the dairy cattle shed were modern (Tie stall), 42.5% of the dairy cows shed were improved (free stall) and the 22.5% of housing system were traditional (loose house). The dairy cows managed by Tie stall (modern housing system) means the dairy farm have good drainage, concrete floor and good ventilation. 42.5% of the dairy farm managed by free stall (improved housing system) having simple wooden materials, fairly constructed floor and drainage system and 22.5% of the dairy farm are managed by loose house (traditional (poor) housing system) means that poor housing, flooring (hardened soil floors), drainage and walling as well as poor ventilation system.

Table 11: Dairy housing system practiced in study area.

Housing System	District			Over all	percent
	Wondo Genet	Shashemene	Hawassa		
Modern	15	14	13	42	35%
Improved	17	18	16	51	42.5%
Traditional	16	9	2	27	22.5%
Total N	48	41	31	120	100%

Source: Survey result (2019),
Where, N = Number of respondents

The purposes of housing in the study areas are to protect cattle from theft and from extreme weather conditions. With regard to housing of crossbred cattle most of the milk producers keep their cattle in separate house. This finding is in line with the finding of Asaminew, (2007) at Mecha and Bahir Dar zuria district.

In this study areas were difference management system. This observation is in line with the study which was done by Bekele Aysheshim *et al*. (2015), All the dairy households (100%) in urban area keep their cattle in loose barn which is semi-intensive while 73.33% of the farmers in the peri-urban areas keep their cattle in separate houses (intensive system), of Dangila Town.

4.10. Perception of Dairy Farmers on RFM

When dairy producers were asked about RFM, 80.8% of them said it was the problem of their dairy farm operation. Even though, there are a number of different size dairy farms available in study area Framers believe that RFM causes considerable economic loss to the dairy farm due to slower uterine involution, prolonged inter conception and calving interval, negative effect on

fertility, drop in milk production and early depreciation of potentially useful cows and sometimes even death of the cows are occurs.

Most of the households (65.83%) use veterinary services for their sick or positive animals for correction of RFM problems, while 18.33% used cultural medicine to solve RFM cases. About 15.8% farmers used both cultural medicine & call veterinarians to correct cows with RFM problems.

The most common traditional methods of correcting the case included is drenching the cows with much amount of water after parturition and smoking the cow with wood, feeding red enset leaf and drenching of sick cows with selected herbal extracts. The goal of an ideal therapy of retained foetal membranes would be to hasten the separation of the placenta and its expulsion from the uterine cavity as well as eliminate the bacterial contamination of the uterus.

In general, farmers or dairy producer's idea on prevention of RFM were no consistent to prevent RFM in the study area. But good dry cow management, supplementation of dairy cows with concentrates, a clean dry environment and bedding and red inset leaf is the way of preventing RFM and reducing its effect as the owner opinion.

Table 12: Methods of solution for RFM removal in study area.

Methods of solving the problem	**District**				
	Wondo Genet	Shashemene	Hawassa	Over all	**percent**
Call veterinarian	32	27	20	79	65.83%
Cultural medicine	11	7	4	22	18.33%
Both veterinarian and cultural	5	7	7	19	15.84%
Total N	48	41	31	120	100%

Source: Survey result (2019),
Where, N = Number of respondents

5. SUMMERY, CONCLUSIONS AND RECOMMENDATIONS

Placental detachment and expulsion are complex processes that begin with prepartum hormonal and biochemical changes. Disturbances in any of these normal processes may result in placental retention. Retained Foetal Membrane or retention of afterbirth is one of the most common conditions occurring in animals following parturition. It is observed chiefly in the dairy cow an understanding of the physiology of placental retention allows discussions about the link of risk factors to specific causes that will aid in the critical appraisal of treatment protocols and prevention of bovine RFM.

The study was conducted to determine and identify the prevalence of RFM and its associated risk factors. Despite the huge number of cattle in Ethiopia, economic importance and productivity is low due to different constraints results in poor reproductive performance of dairy cattle and lower economic benefit from the sector. The major feed resources that are used for dairy cow feeding in the study area were grazing land, sugar cane leaf, crop residues, wheat straw, teff straw and hay are the most common that are consistently present across the study area. Poor nutrition results in poor body condition, again this enhance the susceptibility of dairy cows to health problems.

Among the major problem that has direct impact on reproductive performance of dairy cows are abortion, dystocia, retained foetal membrane, still birth, milk fever, repeat breeding and uterine prolapse. These reproductive diseases were the most varied and the most vulnerable problems that incidentally coincides with the reduction of milk production, prolonged uterine involution, resumption of ovarian activity and conception. Therefore, these reviews stand to write the most common problem of reproductive system and its impact in dairy animals.

A list of types of housing for cattle in the study area. dairy barn cattle shed were modern means that the dairy house having good drainage, ventilation and construction system, the other dairy cows shed were improved having simple wooden materials, fairly constructed floor and drainage system and the rest housing system were traditional that means poor housing, flooring and ventilation system.

The most common traditional methods of curing the case of cattle retained placenta included drinking the cows with much amount of water and smoking, and drenching of sick cows with selected herbal extracts and used both Cultural medicine & call veterinarian to cure RFM problems.

So, this study tried to point out the magnitude of prevalence of RFM and their relative importance, the association of risk factors and the problems with sex, breed, body condition, age, and parity.

Therefore, by considering such problems, the following recommendations are forwarded.

- The people and government should give emphasis to correct the RFM problems and to increase the production and productivity of the cow.
- Management practices at the farm need to be improved for better reproductive and productive performance of the cow.
- Awareness should be created among the farmers, about the importance of nutritious feed to correct the deficiencies with a view to prevent RFM problem in cows.
- The farmers have to get awareness on how to use and process locally available feeds for improving the performance of dairy cows and at the same time to decrease the prevalence of RFM;

- Technical interventions to support smallholder cattle production need targeting improving technical and institutional constraints via adequate delivery of veterinary services to correct the problem of retention of RFM rather than using traditional type cultural medicine, improved fodder cultivation, and improvement of crop residues, adequate extension service and improved availability of water.
- Fodder conservation practices, particularly hay, silage and use of concentrate and urea supplementation with crop straw, mineral, protein and vitamin rich feeds for their animals. And finally Smallholder dairy farmer should be trained with the concept of feeding interventions.

In conclusion, the prevalence of RFM in the present study area was so high, requiring special attention to be given, by considering important predisposing factors. In this study, the impacts of other important factors such as effect of nutritional status of cows were not considered, which might require further studies.

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7. APPENDICES

Appendix 1.Table 1: Conversion for livestock number to Tropical Livestock Unit

Livestock species	TLU conversion factor
Local oxen/bulls	1.1
Crossbred oxen/bulls	1.9
Local cows	0.8
Crossbred cows	1.8
Local heifers	0.5
Crossbred heifers	0.7
Local calves	0.2
Crossbred calves	0.4
Chicken	0.02
Sheep	0.1
Goats	0.1
Horses	0.8
Mules	0.7
Donkeys	0.5

Source: Gryseels (1988) and Bekele (1991), TLU=Total Livestock Unit

Appendix 1.Table 2: ANOVA tables for productive performance and breed type in the study area for mean comparisons

ANOVA						
		SS	df	Mean Square	F	Sig.
milking cows >75%	Between Groups	9.476	2	4.738	.351	.705
	Within Groups	1580.115	117	13.505		
	Total	1589.592	119			
milking cows <75%	Between Groups	13.128	2	6.564	1.931	.150
	Within Groups	397.672	117	3.399		
	Total	410.800	119			
Local	Between Groups	.435	2	.217	.651	.523
	Within Groups	39.032	117	.334		
	Total	39.467	119			
dry cows	Between Groups	.131	2	.066	.112	.894
	Within Groups	68.236	117	.583		
	Total	68.367	119			
male calves	Between Groups	.934	2	.467	.749	.475
	Within Groups	73.032	117	.624		
	Total	73.967	119			
female calves	Between Groups	.596	2	.298	.422	.657

	Within Groups	82.604	117	.706		
	Total	83.200	119			
Heifer	Between Groups	2.118	2	1.059	1.912	.152
	Within Groups	64.807	117	.554		
	Total	66.925	119			
Bulls	Between Groups	.005	2	.002	.035	.966
	Within Groups	8.320	117	.071		
	Total	8.325	119			
TLU	Between Groups	34.348	2	17.174	.364	.696
	Within Groups	5517.255	117	47.156		
	Total	5551.604	119			

Appendix 1 Table 3: Prevalence of Retained Foetal Membranes

Retained Placenta

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Positive	69	13.8	13.8	13.8
	Negative	431	86.2	86.2	100.0
	Total	500	100.0	100.0	

Appendix Figure 1: Cross Breed Holstein Fresian Dairy Cows

Appendix Figure 2: Cross Breed Holstein Fresian Dairy Cow after parturition

Appendix Figure 3: Cross Breed Holstein Fresian Dairy Cow with foetal membranes.

Appendix Figure 5: Dairy cattle house in the study area

Appendix Figure 6: elephant grass by cut and carry system in the study area

Appendix Figure 7: elephant grass by cut and carry system in the study area

QUESTIONNAIRE USED

This questionnaire is to be completed by dairy farm owners; the respondents are kindly requested to complete this questionnaire. The information gathered will be used for partial fulfilment of Master degree in animal production from Hawassa University.

Dairy cow rearing and management practices for <u>RETAINED FOETAL MEMBRANE STUDY</u>

Date of start _____

I. **FARM HOUSEHOLD CHARACTERISTICS**

Owner name_____

Age _____

Sex _____

Education _____

District _____

Type of farm _____

Herd size _____

Source of Cows _____

Do you have access to grazing land _____

1. **Cattle herd structures**

No.	Type of animals	Quantity			
		HF crosses (>75%)	**HF crosses (<75%)**	**Local breed**	**Other breed (mention)**
1.	Milking Cows				
2.	Dry Cows				
3.	Male Calves				
4.	Female Calves				
5.	Heifers				
6.	Bulls				

2. Cow ID. No. _____
3. Breed HF%
   A. HF >75% _____
   B. HF<75% _____
   C. Local cows _____
   D. Dry cows _____
4. Age of the cow_____
5. Parity Number of the cow _____
6. Date of conceived _____
7. Body condition score during parturition _____
   A. Good _____ C. Poor _____
   B. Medium _____

8. Calf sex _____

9. Foetal membranes dropped hours after birth _____

II. **FEEDS AND FEEDING**

10. Do you supplement your cows with

    A. Minerals _____

    B. Protein _____

    C. Vitamins _____

1. Do you have access to grazing land?

    a. Yes____

    b. No ____

2. Do you supplement your cows with Vitamins source feeds?

    a. Yes _____

    b. No _____

3. Do you supplement your cows with mineral supplement?

    a. Yes _____

    b. No _____

4. Do you supplement your cows with protein supplement?

    a. Yes _____

    b. No _____

III. REPRODUCTIVE DISEASE IDENTIFICATION

11. Any reproductive failures

    A. Abortion _____

    B. Dystocia _____

C. Still birth _____

D. Uterine parturition _____

E. Others _____

5. Were any of your cattle encountered reproductive disease or problems in the past?

No.	Type of problems	Quantity by breeds					
		Local	Cross			Jersey	Others
			50%	75%	>87.5%		
1.	Abortion						
2.	Dystocia						
3.	Still Birth						
4.	Retained Foetal Membranes						
5.	Prolapse						
6.	Milk fever/hypocalciamia						
	Others						

6. Is a retained foetal membranes a problem in your farm?(Retained if more than 12 hrs after delivery)

   a. Yes _____

   b. No _____

7. How many cows in your farm have retained placenta problems last year? _____Last five years? _____

8. What do you think is the consequences of retained foetal membranes?

   _____

9. What traditional methods do you follow to control retained placenta?

   _____

10. How did you solve the problem?

    a. Call veterinarian _____

    b. Take to a nearby Vet. Clinic ____

    c. Have employed veterinarian _____

    d. If Other traditional techniques applied in your local area

       _____

11. Time of foetal membrane dropped

    a. <12 hrs. _____

    b. >12 hrs. _____

12. Where do you dispose foetal membranes?

    a. In the burrow _____

    b. Waste yard _____

    c. Any where _____

BIOGRAPHICAL SKETCH

The author was born in Oromia regional state, at Guji Zone Bore Woreda 1985 G.C. He attended his primary education at Bore primary school and from 1993-2000 G.C. He had also attended his secondary School from 2001-2004 G.C. at Guji Zone Shakiso Secondary and preparatory School.

After completion of secondary school education he joined Gondar University of Veterinary Medicine department in 2008 G.C and graduated with BVSc degree in Veterinary Science in 2012 G.C. After graduation he was employed by Girja woreda pastoralist woreda for 6 years as animal disease prevention and control expert. Finally, after six years of working experience he joined Hawassa University in 2015 G.C to pursue his graduate studies in Animal Production through the few financial support obtained from Hawassa University Wondo Genet College of Forestry and Natural Resource.