Investigating the Relationship Between Somatic Cell Count and Milk Production
(Studied in Hartpury College Dairy Herd with Sub-Clinical Mastitis)

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Abstract: Mastitis has been recognised as a major disease affecting dairy cattle and jeopardising milk production and quality in commercial herd especially in its subclinical and clinical form. It has been recognised to use Somatic Cell Count (SCC) in the detection of Sub-clinical mastitis. This research study evaluates the relationship between Somatic Cell Count and Milk yield at Hartpury College while considering main factors such as stages of lactation, parity, and effect of herd season, sanitary conditions and the transformed Logarithm of Somatic cell Count as a covariate in this study. 3,969 data records including dairy herd with suspected cases of sub-clinical mastitis were used and healthy cows as control. All data were analysed using mixed models analysis from SPSS software. From the results obtained, stages of lactation and sanitary conditions had a significant effect on milk yield (p < 0.05). Also there was percentage reduction of 27% from animals with SCC < 100,000 cells/mL; 33% milk reduction from animal having SCC > 100,000 cells/mL and 55% from animal having SCC > 350,000 cells/mL. The effect of herd season and parity showed no significant result on milk yield. However there could have been more significant result on parity and effect of herd season if other dairy farms were considered for this retrospective study that investigates the relationship between Somatic Cell Count and milk yield on the effect of parity and effect of herd season.

Keywords: Somatic cell count, milk yield, parity, effect of herd season, lactation and sanitary conditions.

1. INTRODUCTION

Mastitis has been recognised as a major disease affecting dairy cattle and jeopardising milk production and quality in commercial herd, especially in its subclinical and clinical form (Petrovski et al., 2006). The measurement of prevalence and incidence of mastitis, especially sub-clinical mastitis in the milk of cows is known as Somatic Cell Count (SCC). The Somatic cells present in milk are mostly macrophages, which resides in the teat cisterns. These macrophages help in recognising bacteria...
invasion in the milk (Philips, 2010). Somatic cell counts of milk samples have gained wide recognition in the detection of subclinical mastitis and clinical mastitis, which mostly are the cause of milk reduction in dairy herds.

Mastitis is an infection of the mammary gland, a disease of great economic importance resulting in significant economic losses in the dairy industry (Juozaitiene et al., 2006). The symptoms of mastitis includes normal or elevated body temperature, inflammation of the udder and on milk testing, there is high somatic cell count.

According to Hagnestam-Nielsen et al. (2009), Subclinical mastitis is associated with increased somatic cell count and has several negative consequences. The risk of clinical mastitis (CM) increases with increasing somatic cell count (Beaudeau et al., 1998; Steeneveld et al., 2008). Sub-clinical mastitis is 15 to 40 times more prevalent than clinical mastitis and causes high economic losses in most dairy herds (Schultz et al., 1978).

Subclinical mastitis is associated with increased somatic cell count and has several negative consequences; also the risk of clinical mastitis increases with increasing somatic cell count, a high somatic cell count is often considered as an indicator for an infection in the udder. The herd-level economic loss brought about by subclinical mastitis is significant and has been reported to have a larger negative effect on any dairy herd than that caused by clinical mastitis (Huijps et al., 2008).

In addition, high somatic cell count is associated with reduced processing ability for milking:

a. It is reduced because of damage to the sensory tissue of the teat,
b. It also decreases the shelf-life of consumer milk (Ma et al., 2000).

Reduced animal welfare, economic losses and poor milk quality, consequently, form the incentives to reduce incidence of sub-clinical mastitis. The main component of the economic loss associated with sub clinical mastitis is reduced milk production of the affected dairy cows (Huijps et al., 2008). Thus, the cost of clinical and sub clinical mastitis will largely depend on the extent of the associated milk yield loss.

The aim of this retrospective study is to investigate the relationship between Somatic Cell Count, milk productivity and subclinical mastitis and thus to identify possible areas where average monthly milk yield could be improved in order to gain economic turn-over for the dairy unit; and also to investigate whether the occurrence of sub-clinical mastitis in the dairy herd can be reduced by measuring the somatic cell count within the milk.

The objectives of this research study are;

a. To assess the reduction in milk yield associated with increased somatic cell count in the context of the different stages of lactation, parity and effect of herd season on the dairy herd.
b. To evaluate the test day milk loss/gain at a somatic cell count ≤ 500,000 cells / mL in order to bring about an increased economic turn-over for the dairy unit
c. To quantify the impact of sanitary conditions as a factor on how it affects somatic cell count and milk productivity.
d. To measure the amount of change in 305-day milk yield associated with an increase in lactation average somatic cell count using computer based records at the college dairy farm.

Null Hypothesis;

a. There is no significant difference between somatic cell count and milk productivity.
b. There is no significant difference between stages of lactation in relation to milk productivity.
c. There is no significant difference between parity and milk productivity.
d. There is no significant difference between the effect of herd season and milk productivity.
e. There is no significant difference between the levels of sanitary conditions and milk productivity.

2. LITERATURE REVIEW

2.1 The changing epidemiology of Bovine mastitis

In the early 1940s, the average dairy herd size in the United Kingdom was about 15 cows, which would have had an estimated 23 cases of mastitis annually due mainly to *Streptococcus agalactiae* and *Streptococcus aureus* (Bradley, 2003). The mean somatic cell count was probably around 750,000 cells/mL. However, there was great optimism that penicillin was about to eradicate mastitis, but it was
not until the 1960s that real progress was made in the control of the disease. The plan called for a five pronged approach to the management of mastitis, namely rapid identification and treatment of both subclinical and clinical cases of mastitis, routine whole herd antibiotic dry cow therapy, post milking teat disinfection, culling of chronically affected cows and the routine maintenance/management of the milking machine.

It was the uptake of this plan that resulted in rapid progress in control of both clinical and subclinical mastitis in the UK (White, 2006). In addition to the initial benefit of implementation of the Five-Point Plan, a number of factors have added impetus to UK mastitis control programmes. The most notable of these were the implementation of EC Milk Hygiene Directive (92/46) that imposed an upper limit of 400,000 cells/mL in bulk milk for human consumption and the economic incentives offered to farmers, by milk purchasers, to produce milk of higher quality with a lower SCC (Andrew, 2009). The impact of the implementation of mastitis control strategies, and in particular the Five-Point Plan, has been very successful in controlling the contagious pathogens and has led to a substantial reduction in the incidence of clinical and subclinical mastitis and bulk milk somatic cell counts (BMSCC) (Booth, 1997). The historical change in both subclinical and clinical mastitis incidence and its causes is illustrated in Table 1.

Table 1: Incidence and aetiology of clinical and subclinical mastitis in UK dairy herds (Quarter cases/100 cows/year) (Green, 2001).

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<thead>
<tr>
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<tr>
<td>Staphylococcus aureus</td>
<td>76</td>
<td>7</td>
<td>2.2</td>
</tr>
<tr>
<td>Streptococcus agalactiae</td>
<td>6</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Streptococcus dysgalactiae</td>
<td>16</td>
<td>4</td>
<td>2.0</td>
</tr>
<tr>
<td>Streptococcus uberis</td>
<td>7</td>
<td>9</td>
<td>5.3</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>7</td>
<td>10</td>
<td>14.4</td>
</tr>
<tr>
<td>Other</td>
<td>50</td>
<td>9</td>
<td>17.7</td>
</tr>
<tr>
<td>Total</td>
<td>153</td>
<td>40</td>
<td>41.6</td>
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Over the years, there has been a dramatic fall of the overall incidence of mastitis especially subclinical mastitis from over 150 to 40 cases per 100 cows per year and the incidence of the contagious mastitis pathogens (Wilesmith et al., 1986). Over the same period of time, the average Bulk Milk Somatic Cell Count (BMSCC), fell from over 600,000 cells/mL to just 400,000 cells/mL (booth). This fall is reflected in the distribution of herds between different cell count bands illustrated in table 2 below (M. Blanshard, personal communication, 2001).

2.2 Subclinical mastitis

In most surveys, approximately one third to one half of cows has inflammatory infections, with the vast majority of infections being subclinical. Subclinical infections is usually accompanied by an increase in somatic cell count and reduced milk productivity (Vernooy, 2004), and the extent and duration of which it depends on the causative pathogen, and the effectiveness of host defence mechanism. Ceron-Munoz, (2002) states that mastitis occurs as a response to invasive agents can be characterised by an increase in SCC or logarithmic transformation in Somatic cell scores (SCS).

It has been established that SCC higher than 283×10^3 cells mL^-1 indicates the presence of mastitis (especially in the sub-clinical stage). The reduction in milk yield associated with subclinical mastitis is usually estimated by extrapolating from crude somatic cell count (SCC) and milk yield loss is non-linear, whereas logarithmic transformation results in a linear relationship. For instance, twofold increase in crude SCC above 50,000/mL on monthly test day reports was associated with an average reduction in milk yield of 0.6kg/day for multiparous cows and 0.3kg/day for heifers (Hortet, 1999).

Each unit increase in log_{10}SCC on weekly test day reports was associated with an average reduction in milk yield of 2kg/day for multiparous cows and 1.3 kg/day for heifers (Koldeweij, 1999). In the United
Kingdom and the United States, linear score (LS), a log-based transformation of SCC that results in scores of 0-9; parameter is usually used as a measure. Each unit increase in lactation average LS above 2 results in an average milk yield reduction of 0.7kg/day or 180kg/lactation in multiparous cows, with losses for heifers being approximately half (Reneau, 1986). Such association provides a rough estimate of the magnitude of milk yield loss associated with sub- clinical mastitis in a given herd, but do not accurately account for the milk yield loss in individual cows.

Sometimes, herd milk yield loss is estimated from the SCC of the bulk tank (BTSCC). For example, a decrease in milk yield equating to a loss of at least £59/cow/year was demonstrated in herds with BTSCC greater than 200,000mL (Ott & Novak, 2001). However, one problem with using BTSCC to estimate milk yield loss is the dilutional effect of high yielding dairy cows on BTSCC.

2.3 Somatic Cell Count

Somatic cell count concentration measures can be collected from an individual quarter of the udder, from each cow or as a representative sample from the bulk milk tank. Measuring SCC in each quarter is the best method of obtaining information relating to SCC and sub-clinical mastitis. However, the short-coming of this method is that it is non-economically viable and therefore the other methods such as clinical mastitis test (CMT) are more predominantly used in UK dairy industries (Green et al., 2001)

SCC in dairy cattle is a tool for indicating infection status of individual cow. Somatic cell counts in dairy are particularly important to monitor and control as milk with higher SCC than 400,000 cells/mL is not permitted for human consumption, thereby resulting in yield and financial loss for the herd (White, 2006).

There are three main demerits of high SCC in dairy cattle.

a. Milk is reduced because of damage to the sensory tissue of the teat, by about 2.5% for each 100,000 cell/mL above 200,000 cells/mL (Blowey & Edmondson, 1995).

b. The milk has increased lipase content and the lipid breakdown products give the milk a rancid taste.

c. The milk has a low casein content leading to reduced cheese yield.

If an animal has a high SCC, then it is assumed that the cow is fighting an infection. The cells in question are white blood cells (Leucocytes), which as in any animal, are a major part of the immune system response to infection entering the body. If the SCC of an animal is high but with no signs of mastitis, then the dairy cow is said to have sub-clinical mastitis. The opposite situation can also occur; if a cow has clinical signs of mastitis, its SCC can still remain fairly low or average (White, 2006). This makes recognition and diagnosis even more difficult. It must be noted that a cow’s cell count will fluctuate daily, which is the reason why daily and monthly recording of milk yield is very important (Rhodes, 2003).

2.4 Aim of the research study

The primary aim of this research study is to investigate the relationship between Somatic Cell Count (SCC) and milk yield, in context of the effects of stages of lactation, parity, effect of herd-season and sanitary conditions on milk yield at Hartpury College Dairy herd, Gloucester, United Kingdom. The specific relationships investigated were:

a. Somatic cell count and milk yield with BLnSCC (Transformed Somatic Cell Count).

b. Stages of lactation and milk yield.

c. Parity and milk yield.

d. Sanitary conditions and milk yield.

e. Investigating the reaction between parity and stages of lactation as both factors has effect on milk yield milk and the transformed SCC.

Percentage (%) reduction in milk with increased Somatic Cell Count
3. METHODOLOGY

3.1 Data

In total, 100 lactating cows suspected of being in a sub-clinical state of mastitis were chosen for the test experiment. Separately, 20 lactating cows for the control experiment were chosen from Hartpury College dairy cows with monthly records from 2007 to 2009, all resulting to an information of about 3500 points of data dairy cattle with suspected cases of sub-clinical mastitis and 700 clean/healthy dairy herd for control. All data resulting to 4200 statistical data information, but during the course of collecting the data, 231 data records were lost on milk yield and performance of both sub-clinical mastitic dairy cows and healthy cows. On each test day, SCC (x1000 cells/ml) and milk yield (from the udder quarters within 24 hour period) were recorded for all the lactating cows. All data were accessed from the computer system of Hartpury college dairy farm with the help of Alphro software programme which stores all weekly and monthly records of milk production, somatic cell count levels, milk quality and milk performance.

3.2 Definitions of data

The statistical unit will be milk yield on a test month. Milk yield on the test month will be used as the dependent variable. SCC, stages of lactation on which SCC were recorded. SCC were divided into 1000 and then converted into natural logarithm (LnSCC) (Ali and Shook, 1980), to account for skewness to the right of SCC distribution. Stages of lactation were split into a variable comprising 3 classes (day 5 – day 105 for level 1; day 106 – day 207 for class 2 and day 208 – 305 for class 3). Parities were categorised into three levels (levels 1, 2 and 3). Three seasons were defined as (April to July for level 1; August to October for level 2 and November to March for level 3) in order to determine the effect of herd-season on milk yield. Sanitary conditions bactoscan units were also categorised into three levels (1 – 25% bactoscan for level 1; 16 – 35% bactoscan for level 2 and 36 – 50% bactoscan for level 3).

All data were analysed using analysis of variance (ANOVA) to look at the significant difference on the effect stages of lactation, parity, effect of herd-season, sanitary conditions on milk yield. Analysis of co-variance (ANCOVA) was used to analyse the significant difference on the effect of the transformed natural logarithm of somatic cell count (LNSCC) on milk yield. A mixed model comprising linear regression analysis was used to model all the effects of factors (LNSCC, stages of lactation, parity, effect of herd season and sanitary conditions) on milk yield.

The linear regression is written below,

\[ Y_{ijkl} = m + B \times \text{LnSCC} + S_L + H_j + P_k + S_{Cl} + e_{ijkl} \]

Where \( Y_{ij} \) is the milk yield on each test day,
\( m \) is the overall mean, \( \text{LnSCC} \) is the fixed effect of natural logarithm of SCC (X 1000 cells/ml),
\( S_L \) is the fixed effect of class i of stages of lactation (3 levels),
\( H_j \) is the effect of herd-season j,
\( P_k \) is the effect of class k of parity (three classes),
\( S_{Cl} \) is the effect of sanitary conditions on milk yield and \( e_{ijkl} \) is the residual.

3.3 Results for mixed model analysis

Result 1 – There is a significant difference between the stages of lactation and milk yield (p < 0.05).
Result 2 – There is a significant difference between sanitary conditions and milk yield (p < 0.05).
Result 3 – There is no significant difference between parity and milk (p > 0.05).
Result 4 – There is no significant difference between the effect of herd season and milk yield (p > 0.05).
Result 5 – There is no significant difference between the naturally transformed logarithm of SCC and milk yield (p > 0.05).

4. DISCUSSION

4.1 Stages of lactation

The result for stages of lactation using the mixed model analysis showed a significant difference between stages of lactation and milk yield (p < 0.05). As the lactation advances, the milk yield...
decreases, providing sufficient information for describing the graphical representation of the milk yield and stages of lactation (Thornley & France, 2007). Using the multivariate analysis (see appendix C) to describe the relationship of stages of lactation and the transformed SCC, there was significance difference (p < 0.05) between the two parameters meaning that as the stages of lactation advances from class 1 to 2, there was an increase in the Somatic Cell Count but as the stages of lactation advances from class 2 to 3), the Somatic Cell Count had a decrease.

To further explain the result of the stages of lactation and the transformed SCC on milk yield, as stages of lactation advanced from early to mid-lactation (class 1 - 2), the SCC increased, signifying a decrease in the milk yield. However, from mid lactation to late lactation (class 2 - 3), there was a decrease in both milk yield and SCC. The latter statement does not support the results of Hagnestam-Nielson et al., (2009) which investigated the relationship between Somatic Cell Count and Milk Yield at different stages of lactation. Their findings showed that as SCC increased, the milk yield decreased towards the late lactation (Kelly et al., 2000; Rupp et al., 2000; Juozaitiene et al., 2004).

Hagnestam-Nielson et al., (2009) further explained that bias is created if lactation mean values are calculated based on monthly Test Day (TD), because infections with a short duration may be missed. The data from this dissertation study was based on milk yield with monthly TD result and monthly SCC. Also, milk loss caused by environmental pathogens might therefore go undetected if estimates of lactational yield loss are based on monthly SCC records (De Haas et al., 2002). The decrease in monthly (TD) milk yield and Monthly SCC from the mid lactation to late lactation in the results of this study might be as a result of the undetected environmental pathogens.

4.2 Parity

Results from the mixed model analysis showed no significant difference between parity and milk yield (p > 0.05). However, from figures 10 and 11 produced by multivariate analysis respectively, the results showed a reduction of SCC due to an increase in milk yield. But the non-significant differences between parity and milk yield can be explained by insufficient cow-records with no extreme characteristics (that is Test-Days with low SCC and very low milk yield and/or high SCC and very high milk yield) occurring in very early lactation in all the classes of parities. This non-significant effect could only be due to sampling fluctuations of the dairy herd (Hortet et al., 1999). Besides, the data from this study showed a monthly Test Day of milk yield and Monthly SCC.

4.3 The effect of herd season

Results from the mixed model analysis showed no significant difference in the effect of herd season and milk yield (p > 0.05). The reason for the non-significance difference might due to the fact of that about 250 data information were lost from some dairy records in the College dairy farm including the loss of milk record and performance of dairy herd on December, 2009 data. If these data were found, there could have probably be a significant effect of herd season on milk yield. For the data analysis using multi-variate function, there was a significant difference. Even from the graphical representation of the effect of herd season on milk yield, there was an increase in milk in class 3 which is from the month of November to March. These months are the peak period of milk production in dairy herds (Bartlet et al., 1990). For the relationship between the transformed SCC and the effect of herd season at class 3, there is a reduction in SCC, which signifies that there increase in milk yield at class 3 for the effect of herd, will indicate a reduction in milk yield. Several researches have confirmed this scientific statement (Bartlett, 1990).

4.4 Sanitary conditions

From the result using mixed model analysis, there is a significant difference between sanitary conditions and milk yield (p < 0.05). As discussed in the literature review, sanitary conditions have to do with the number of bacterial count in the milk. So as the sanitary conditions increase numerically, the milk yield drops subsequently.

Berry et al., (2006) did a study on the temporal trends in bulk tank Somatic Cell Count and Total Bacterial Count. Their research findings indicated similar results as this research project, that as the sanitary conditions of bulk milk increase, this also causes an increase in SCC and as a result, the milk
yield is reduced. As said earlier on in the literature review, a Total Bacterial Count exceeding 50% indicates an infection in the dairy herd (Berry et al., 2006).

Another reason for the significant effect of sanitary conditions on milk yield is the use of dry materials to clean udder before milking. Similar result was obtained by Fadlelmoula et al., (2008). Their findings revealed that udder cleaning before milking found to have a significant (p < 0.05) effect on milk yield and SCC respectively. Their result also pointed out that the use of dry means of udder cleaning was approved well than moist cleaning methods because moist cleaning methods has the tendency of increasing SCC (Kiiman, 2001). Similar results from this study coupled with Fadlelouma et al., (2008) on the significant effect of sanitary conditions on milk yield and SCC were supported by Malinowski, (2000), Vorst et al., (2003) and Tangorra et al., (2004).

Inter-milking and teat dipping done by Hartpury College Dairy Farm might have added to the significant effect of sanitary conditions on milk yield and SCC. Results from Saloiemi and Kulkas, (2001) showed that inter-milking sanitation and teat dipping is aimed at reducing infection caused by contagious and environmental pathogen. This management practice of sanitary conditions is an important factor for the prevention of high bulk SCC and increase in milk yield (Malinowski, 2000).

4.5 The predicted values of milk yield to Somatic cell count

For the general milk reduction of cows without subclinical mastitis (Control), there was 27% milk reduction when their Somatic Cell Count is less than 100,000 cells/mL. Cows with sub-clinical mastitis have milk reduction of about 33% when their Somatic Cell Count was above 100,000 cells/mL. Cows with somatic cell Count of above of 350,000 cells had a milk reduction of about 55%. Table 8 shows the % milk reduction with the Somatic cell Count.

<table>
<thead>
<tr>
<th>Somatic Cell Count</th>
<th>% reduction in milk yield</th>
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<tr>
<td>&lt; 100,000 cells/mL</td>
<td>27</td>
</tr>
<tr>
<td>&gt; 100,000 cells/mL</td>
<td>33</td>
</tr>
<tr>
<td>&gt; 350,000 cells/mL</td>
<td>55</td>
</tr>
</tbody>
</table>

The increased reduction in milk in the above table indicating higher somatic cell count can be explained by a poorer udder health status in multiparous cows of parity 3 and/ or at the end of lactation 3. This is due to an increased exposure to possible infections of sub-clinical mastitis and permanent glandular damage from previous infections. These results also support the research been done by Bartlett et al., (1990).

4.6 Linear regression between Milk Yield and Somatic cell count

This study has shown that the linear regression is not sufficient to describe the relationship between milk production and the transformed SCC. Results from [manipulated on data from SPSS] showed a negative correlation between milk yield and transformed SCC but no significant difference. The reason for this insufficiency of the result might be interpretation of raw data from the milking records and performance by the technicians at the dairy unit of the college. Another main reason for the insufficiency of relationship might be the skewed nature of the transformed Somatic Cell Count distribution (Hortet et al., 1999).

4.7 Limitations in this research study

During the course of data collection at Hartpury College dairy farm, about 200 data on milk yield and other performance record on the dairy herd were lost on the computer database. The insufficiency of these data information might be the reason for obtaining a non-significant result especially for factors such as parity and the effect of herd season on milk yield. This may have affected the completeness and validity for this retrospective study on investigating the relationship between Somatic Cell Count and milk yield in Hartpury College Dairy Farm with sub-clinical mastitis.

However, it would probably be impossible to obtain the same result if this retrospective study on investigating the relationship between Somatic Cell Count and Milk yield in Dairy herd with sub-
clinical mastitis were done in another regional of the United Kingdom. The reason for this impossibility might be difference in prevalence and incidence of sub-clinical mastitis in that region; environmental pathogens and difference in data that would be collected. Data on parity, stages of lactation, effect of herd, sanitary conditions and Somatic Cell Count will be different.

4.8 Further Research

Subclinical mastitis is a very difficult disease to detect easily without the application of Somatic Cell Count Technique. It would be very interesting to develop a further research study to examine dairy herds where very specific udder pathogens are prevalent in order to reduce the incidence and prevalence of sub-clinical mastitis not at Hartpury College only but the across entire United Kingdom. Also the undetected environmental pathogens from the results of this study needs to be studied furthermore to enhance total pathogen free environmental at Hartpury College and across the whole United Kingdom.

Considering the UK dairy industry in its current state, profits from milk production are shrinking despite the improvement of health issues management. Selecting cows based on genetic traits i.e. udder conformation and less susceptibility to sub-clinical mastitis must be researched further so that farmers can be confident to have a dairy herd which produce more milk and good quality.

5. CONCLUSION

The main aim of this retrospective study was to investigate the relationship between the Somatic Cell Count and milk yield in Hartpury College dairy with sub-clinical mastitis while considering factors such as the stages of lactation, parity, effect of herd season and sanitary conditions. The result of both animals with cases of subclinical mastitis and for the control proved a significant difference in the stages of lactation and sanitary conditions in relation to milk yield using mixed model analysis, but not for parity and effect of parity on milk yield.

However, general milk reduction of cows without subclinical mastitis (Control), there was 27% milk reduction when their Somatic Cell Count is less than 100,000 cells/mL. Cows with sub-clinical mastitis had a milk reduction of about 33% when their Somatic Cell Count was above 100,000 cells/mL. Cows with somatic cell Count of above of 350,000 cells had a milk reduction of about 55%. This indicates that part of the original aim and objectives for this dissertation study was achieved which was looking at the relationship between somatic cell count and milk in the college dairy herd.

Although if Hartpury College only was not considered for this retrospectively study, there would have possibly been a significant difference in the results of the factors which gave non-significance result in this research study for parity and the effect of herd season. This would then be investigating the relationship between Somatic Cell Count and milk yield in Diary Herd with the incidence and prevalence of sub-clinical mastitis.

In conclusion, the findings in this research project can be used as a basic calculation inputs in simulation models aiming to assess the technical and economic impact of the different health udder health statues.

6. REFERENCES


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