

Effects on Jerseys and Holsteins, Milk Production, Intake, and Feed

Efficiency

A Senior Project

Presented to

the Faculty of the Dairy Science Department

California Polytechnic State University, San Luis Obispo

In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Science

by

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March 2013

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Abstract

The objective of this literature review was to determine if it is more efficient and cost effective to use Jerseys instead of Holsteins for milk composition and production. In respect to the animals Dry Matter Intake (DMI), and its environmental impact. To research if you can make more money per animal with less ground, less input, and less production with a certain much smaller breed, such as Jerseys. This paper reviewed important aspects of the two breeds that are relevant and practical to producers. The ideas and opinions presented in the paper are a result of a review of the current literature having to do with each breed. Information provided throughout the paper attempts to link practices that producers use with breed differences in respect to efficiency. A central theme portrayed throughout the paper is that Jerseys have the potential to be more efficient and economical compared to Holsteins. Economic losses from an insufficient breed could be detrimental to a dairy farm these days. Many crucial areas of an operation such as reproduction, milk components, milk production, diseases and regulations are sectors that cause the most losses to producers economically. Even though switching breeds may seem overwhelming and not worth it to many producers, if already milking a less sufficient breed, the economics just might show it to be worth it. This paper attempts to show that the potential for a greater income in these tough economic times, when using a more efficient breed.

Key Words: Jerseys, Holsteins, efficiency, cost effective.

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INTRODUCTION

The importance of Breed efficiency has increased in the dairy industry. It was stated in a study that was done about 33 years ago that they suggested no comparative advantage for Jersey in spite of higher ratios of milk to body weight and feed that intake was less than Holstein (Blake et al., 1986); but, this makes no sense anymore. As feed costs are higher now and with a higher production per intake weight levels, Jerseys have an advantage in being more environmentally friendly, and more efficient. Now days there is a great importance for efficiency to milk producers, feed and production efficiency in dairy cows is an important function in the dairy industry today, and has a great interest to dairy production systems globally (Prendiville et al., 2011). There are fewer margins for error, with high cost of feed, and the low price of milk, with an increase in regulations. With these recent changes, the efficiency of the breeds can no longer be overlooked. With the industry needing to be worry about the little things, how can they overlook the big things like using the most efficient animal? To find the most efficient breed, among the two most prominent dairy breeds Jerseys (J), and Holsteins (H), we need to analyze each breed. We have continued to make our animals more efficient over the years so we could be more productive but the need for efficiency has become more apparent since 2008 in the United States, because the state at which the economy is in. The main productive aspects researched were compared to determine the most efficient breed by analyzing reviewed articles to make the most intelligent choice. This review will focus on the capacity of each breed in terms of milk production, milk components, feed intake, feed efficiency, and their environmental impact. While also analyzing Milk pricing, economics and nutrient management which can be effected by

each of these breeds. This focus will determine if it is more efficient and cost effective to use Jerseys instead of Holsteins. Also to determine if you can make more money per animal with less ground, less input, and less production with a certain breed, to reach full efficiency.

MILK PRODUCTION

These two breeds display very different performance characteristics, with a notably higher milk yield in the H breed compared with a higher milk nutrient density and a lower body weight in the J breed (Capper and Candy, 2003). Although the largest reason for the breeds milk production differences, is their actual breed, the production system their involved in can also make a substantial difference in their production, components and yield.

Differences between breeds

The Jersey and Holstein breeds are different, but these two breeds account for 95.4% of the United States dairy herd, Holsteins being 90.1% and Jerseys being 3.8% of the total animals (USDA, 2007a). Jerseys and Holsteins differ in their size, weight, color, production, and population. Jerseys are smaller weighing about 1000 lbs. with Holsteins weighing much more at about 1500 lbs. (Capper and Candy, 2003). Jerseys originated on the Island of Jersey, which is a small British island in the English Channel off the coast of France. Jerseys is one of the oldest dairy breeds, being purebred. Jerseys were brought to the United States in the 1850's. The breeds been purebred since 1763 and the breed standard were formed in 1844 (Oklahoma State University, 1995-2008).Migrant European tribes settled in the Netherlands about 2,000 years ago, and they needed

animals that made the best use of their land. Black cattle of the Batavians white cows of Friesians were breed and strictly culled to produce animals that were efficient, at producing milk with limited feed resources. These animals where genetically formed into efficient, high producing black-and-white dairy cows, known as the Holstein, when markets began to develop for milk in America. Some dairy breeders turned to Holland for their cattle. Winthrop Chenery, a Massachusetts breeder, purchased a Holland cow from a Dutch sailing master who had landed cargo at Boston in 1852. Chenery was so pleased with her milk production that he imported more Holsteins in 1857, 1859, and 1861. And many other breeders joined him to establish Holsteins in America (Oklahoma State University, 1995-2008). The breed with a reddish brown hair is a J and H is either black and white or red and white spotted. In respect to these animals production, the H produces a larger quantity of milk daily but the J milk has a greater fat and protein percentage over the H (Olivia, 2011). There is still a much larger population of H over J in the US, with nine in every ten dairy producers currently milking Holsteins (Oklahoma State University, 1995-2008).

Production Systems

When separating regions, the dairies within each region are managed very similarly, also needing to exclude poor managed dairies (Stigbauer et al., 2013). Dairy farms that confine their animals compared to grazing, there are a lot of incentives both ways it just comes down to what works best for the region and economically. In grazing there are lower expenses for feed, equipment, and buildings potentially leading to greater income per cow (Fontaneli et al., 2004). There are reported improvements in animal health and reproduction which amounts to less culling. With the growing pressures from regulatory

agencies and environmental interests to reduce centralized accumulation of cattle wastes this helps (Fontaneli et al., 2004). With a confined space managed in free stalls with cows being feed a TMR they produced 19% more milk than cows grazing (Fontaneli et al., 2004). Feed cost of grazing cows was about one half of a barn confined cow but milk income was 20% less, this resulting in similar milk income minus feed cost values (Fontaneli et al., 2004), and making grazing vs. confined very similar. Grazing animals in this study were also supplemented with concentrates.

In Nordic countries (which make up the Northern Europe and the North Atlantic region), dairy cows have traditionally been kept in tie-stall barns because herds have been small. With the dairy industry undergoing structural changes since small farms are no longer profitable (Hovinen et al., 2009). Farms are becoming larger, and this combined with high labor costs, and automation becoming more common, It has led to a rapid and comprehensive change in farm management. For example in Finland, warm loose-housing barns have slatted or concrete floors and stalls covered with rubber mats and bedded with wood shavings, sawdust, or different mixtures of materials which are very similar to free stalls (Hakkarainen., 2007; Hovinen et al., 2009). The Bedding is similar in both types of barns, and the feeding in both types of housing is usually silage based, supplemented with concentrates. But with production trends changing and larger dairy farms coming on line the shift is towards efficient open lots and free stalls (Hovinen et al., 2009).

There are organic dairies, non-organic dairies, and dairies that put their animals on pasture (Stigbauer et al., 2013). Even these are similar when in the same region, as most organic dairies used to be conventional dairies. The difference between conventional and

organic dairies is that, conventional farms treat more cows, produce more milk, feed more grain, have longer calving intervals, and younger cows as they push the animals more (Stigbauer et al., 2013).

In production systems relative to location and climate, aren't followed very closely in respect to how they affect the animal. It used to be that there were smaller farms because of milks perishability. Today with better refrigeration and the consumption switching from fluid milk consumption, to processed products, that have a longer shelf life (Capper and Candy, 2011). We have made larger dairies where it is warmer and feed is readily available there for cost efficiency. Like the California Valley which has the largest producing counties in the US. With this shift we have just found more ways to cool our animals for example soakers fans etc. but a dairy in this valley that reaches over a hundred degrees in the summer. It would be better to have jerseys over Holsteins. Jerseys are adaptable to a wide range of climatic and geographical conditions because they are more tolerant of heat than the larger breeds (Oklahoma State University, 1995-2008).

Farm Size

There is large variation in farm sizes for both breeds, there are some small dairy herds (being <200 animals) and some large dairies (with a #of animals >2000). Although, there is a shift in size difference, happening with smaller herds going out of business, and large herd operations, with 2,000 or more cows doubling between 2000 and 2006 in the US according to McDonald et al. (2007)(Khanal et al., 2010). As this change is happening because there are cost advantages of being a large farm and being more

efficient with lower production cost, you can see this in table 3 with the total operating cost under the different farm sizes. New technological innovations and the economic advantage of size have driven a structural shift from small to large concentrated animal feeding operations (CAFOs) in the United States (Bradford et al., 2008). The percentage of production during the farm size change increased from 9 to 31% (USDA-National Agricultural Statistics Service, 2000, 2009; Khanal et al., 2010). Also with average milk produced per cow doubling, and production per farm increasing, which has been happening through the years (MacDonald et al., 2007) (Khanal et al., 2010). There is another change happening with some of these new, large dairy farms being jersey herds as a another way to be efficient because of consumption shifting from fluid milk, toward manufactured products, such as cheese (McDonald et al., 2007) (Khanal et al., 2010).

MILK YIELD

Whole Lactation Studies

It is reported that J have a greater intake capacity (DMI, kg) relative to body weight (BW), than larger dairy breeds (H), but these comparisons must consider differences in milk energy yield, diet composition, and their effects on appetite. Studies that compare J with larger breeds like H observed that H intake capacity was greater (Ingvarsen and Weisbjerg, 1993; Muller and Botha, 1998) but the J produced considerably more milk energy relative to metabolic BW (West et al. 1997) agrees with Aikman et al., (2007). The Peak milk yield is achieved in their first stage of lactation (< 60 DIM) for both breeds; 25.5, and 20.4 kg/d for the H and J, respectively (Prendiville et al., 2011). It declined gradually through the end of lactation. The milk yield for the J

was consistently lower than that of the H and Milk fat and protein percent were the highest with the J. Both the fat and protein percent were the lowest during early lactation, but they increased steadily as lactation progressed (Prendiville et al., 2011). The J had a comparable yield of milk solids with the H with the exception of mid-lactation. The pattern of change across lactation was similar for yield of milk and milk solids according to Prendiville et al. (2011).

During their dry period, DMI was greater with the H, and lower with the J, 11.7, and 8.9 kg/d, respectively. Intake capacity during the dry period was similar across the breed groups; 1.95, and 2.04 kg/ 100 kg BW for the H and J, respectively (Prendiville et al. 2011).

Consuming behavior

The dry matter and Neutral detergent fiber (NDF) intake in J is two-thirds that of a H in feeding behavior measurements (Aikman et al., (2007)). Both breeds spend more time eating during lactation compared to their dry period (Aikman et al., (2007)). The H had a much faster dry matter intake (DMI) this meant that they consumed their food much faster than J did (Aikman et al., (2007)). Ruminating times per kilogram of DMI and NDF intake were greater in J though. The total time spent ruminating in the dry periods were, 8.0 h/d for H and 7.4 h/d for J, and in their lactating period H ruminated for 10.4 h/d and Jerseys for 9.0h/d (Aikman et al., (2007)). The largest time difference between the two breeds ruminating time was during their lactation cycle, but the opposite was true for time spent ruminating per kilogram of DM. When the times spent eating and ruminating were combined, as total minutes spent chewing per kilogram of BW, J spent

much longer chewing, the increase in chewing time per kilogram of BW after calving was also greater for Jerseys, these results are attributed to Aikman et al., (2007).

Jerseys were able to spend proportionally longer ruminating each unit of ingested feed, which could contribute to more effective particle size reduction, faster passage rate, and improved digestibility (Aikman et al., 2007). Finally, the greater capacity of the Jersey to utilize dietary fiber may be of increased importance in the future as fibrous by-product feedstuffs become more available (Aikman et al., 2007).

Energy Metabolism

Metabolizable energy (ME) is the Digestible Energy, the energy that is left in methane and urine is unable to be metabolized. Generally ME is the amount of energy available for metabolism by the animal. Metabolizable energy relates to the effectiveness with which dairy cattle consume it in their varies diets for growth, reproduction, and production (US Department of Agriculture,. 1980)

Digestibility and Rumen Kinetics

The fractional outflow rate of digesta from the rumen was slower in J compared with Holsteins; this effect is largely due to the differences in precalving. Overall, the outflow rate was similar for pre and postcalving in H but it was substantially higher precalving compared with postcalving in J (Aikman et al., 2007). The rate of particle breakdown within the rumen was numerically higher in J compared with H at their 14th week of lactation. The rumen retention time (the average time that digesta particles remain in the rumen) was lower in J compared with H but the rumen retention time was higher precalving compared with postcalving in H, and it increased marginally after

calving with the J (Aikman et al., 2007). Overall the rate of passage through the digesta through the posterior section of the digestive tract did not differ between breeds, and a significant reduction in the digestive tract was observed post calving in both breeds. A decline in the digestive tract continued between week 6 and 14 of lactation in J, but remained constant in H (Aikman et al., 2007). The rumen retention time was less in J compared with H, with the largest difference of 10.4hr., observed in the precalving period. A decrease in rumen retention time was observed between the dry and lactation periods in both breeds, but the magnitude of the decrease was greater in H (Aikman et al., 2007).

MILK COMPONENTS

The deterministic model used 2009 Dairy Metrics (Dairy Records Management Systems, Raleigh, NC) population data for milk yield and composition (Jersey: 20.9kg/d, 4.8% fat, 3.7% protein; Holstein: 29.1kg/d, 3.8% fat, 3.1% protein). (Capper & Candy., 2003).

Synthesis of milk solids

Management factors contribute to about 45% of the variation in milk composition, and genetics explaining 55% (Van Tassell et al., 1999). This means that the biggest factor in the animal's milk components is her genetics and breed, even though management plays a big role. Breed is a known factor that affects milk component production (Sharma et al., 1983). To quantify this statement examine table 2, for composition data provided by (Capper & Candy., 2003). The differences between Holsteins and Jerseys are clear. On test-day protein and milk fat were 0.5 and 1.0 percentage points greater for J than H.

These disparities are in the same range as previous reports of breed differences (Sharma et al., 1983; Rodriguez et al., 1997; Bailey et.al., 2004).

INTAKE

Factors that Control Intake in Dairy Cows

The DMI exhibited significant declines when maximum temperature-humidity index ((THI), which incorporates the combined effects of temperature and relative humidity) (NOAA, 1976) reached 77 (west, 2002).

Heat Stress and its effects on Intake and energy Balance

One of the greatest challenges to production dairy farmers in the United States is heat stress and the affect it has on a lactating dairy cow (west, 2002). Climatic conditions that are warm or hot for a season that is relatively long. Can cause heat stress which is chronic in nature, where there is often little relief from the heat during the evening hours, and intense bursts of combined heat and humidity further depress performance (west, 2002). Lactating dairy cows create a large quantity of metabolic heat and accumulate additional heat from radiant energy. Heat production accumulation, coupled with compromised cooling capability because of environmental conditions, causes heat load in the cow to increase to the point that body temperature increases, DMI declines and ultimately the cow's productivity declines(west, 2002). Most dairy States are subject to extended periods of hot weather for 4 plus months each year (west, 2002). Three management strategies to minimize the effects of heat stress is one the physical modification of the environment as in shading, and cooling, secondly development of heat tolerant breeds, and third improve nutritional management practices. It appears that a

combination of these practices may be needed to optimize production of dairy cows in hot and humid climates (Beede and Collier, 1986). Aspects of genetics influence the response to heat stress, and the variation among breeds, is large (west, 2002). There is evidence hair color influences the susceptibility of the cow to heat stress because the hair color is related to the amount of heat absorbed, with H being black this can affect them more (west, 2002).

Metabolic Diseases

Zwald et al,(2004) came to the conclusion that genetic selection for health disorders can be effective. These traits can incorporate selection indices directly, or they can be combined to composite traits, such as reproductive disorder, metabolic disorders. The animals DMI declined 0.85kg for each degree (°C) increase in the mean air temperature (west, 2002). Corresponding relationships with body size and dairy form tended to be antagonistic, indicating that selection for body size and angularity may impair disease resistance. Favorable associations were also found between mastitis and both somatic cell counts and udder conformation, indicating that selection for improved udders and lower somatic cell counts will tend to improve mastitis resistance (Zwald et Al. 2004)

FEED EFFICIENCY

Dairy efficiency defined as yield of milk per unit of dietary Dry Matter (DM) consumed, which provides a measure of dairy herd productivity (Britt et al., 2003). With feed comprising the largest operating expense in the production of milk, the efficiency of converting feed DM to milk has use as a benchmark, related to profitability for the

efficacy of diet and herd management to convert purchased input to a product that can be sold. Feed efficiency is the production of milk from feed, dry matter intake, called dairy or feed efficiency, Dairy efficiency is positively correlated with milk yield (Britt et.al. 2003).

Factors affecting Feed Efficiency

Dairy efficiency was calculated with 3.5% fat-corrected milk yield. Diets fed to the herds fell within such a small range of variation (mean±standard deviation) for CP % (16.3±0.696), NDF % (33.2±2.68), and forage % (46.9±5.56) that these percentages are expected not to be useful in evaluating the effect of excessive underfeeding or overfeeding of these dietary components. (Britt et. al., 2003). The negative dairy efficiency with increasing dietary fiber and forage may reflect the effect of decreased diet digestibility. Results of this study suggest that managing herd breeding programs more efficiently reduces average days in milk. Providing a cooler environment for the cows, it also helps maximize dairy efficiency. These are some mechanisms for these effects on the dietary variables of dairy efficiency (Britt et. al., 2003).

Why are Jerseys more efficient

Previous work demonstrated that improving productivity reduces the total number of animal required to produce a set amount of milk and, in consequence, environmental impact is reduced (Capper et al., 2008, 2009).

ENVIRONMENTAL IMPACT

Environmental impact of J or H milk production sufficient to yield 500,000 t. of cheese (equivalent cheese yield) both with and without recombinant bovine somatotropin use (Capper and Candy, 2003). Both populations contained lactating and dry cows, bulls, and herd replacements for which rations were formulated according, breed-appropriate body weights (BW), with mature cows weighing 454kg (J) or 680kg (H) (Capper and Candy, 2003). Resource inputs include feedstuffs, water, land, fertilizers, and fossil fuels, waste outputs including manure and greenhouse gas emissions. Cheese yield (kg) was calculated according to the Van Slyke equation. A yield of 500,000 t of cheese required 4.94 billion kg of H milk compared with 3.99 billion kg of J milk, a direct consequence of differences in milk nutrient content (fat and protein contents) between the two populations (Capper & Candy., 2003). The reduced daily milk yield of Jersey cows increased the population size required to supply sufficient milk for the required cheese yield, but the differential in BW between the Jersey and Holstein breeds reduced the body mass of the Jersey population by 125×10^3 t. Consequently, the population energy requirement was reduced by $7,177 \times 10^6$ MJ, water use by 252×10^9 L, and cropland use by 97.5×10^3 ha per 500,000 t of cheese yield. Nitrogen and phosphorus excretion were reduced by 17,234 and 1,492 t, respectively, through the use of Jersey milk to yield 500,000 t of Cheddar cheese (Capper & Candy., 2003). The carbon footprint was reduced by $1,662 \times 10^3$ t of CO₂-equivalents per 500,000 t of cheese in Jersey cows compared with Holsteins. Use of recombinant bovine somatotropin reduced resource use and waste output in supplemented populations, with decreases in carbon footprint equivalent to 10.0% (J) and 7.5% (H) compared with non-supplemented populations

(Capper & Candy., 2003). The interaction between milk nutrient density and BW demonstrated by the Jersey population overcame the reduced daily milk yield, thus reducing resource use and environmental impact (Capper & Candy., 2003).

Regulations

With an increasing impact of environmental policies and regulations on animal production (Lascano et al., 2008) it helps to have the least polluting animal (breed).

Agencies and their trends

The agency for Compliance and Enforcement is U.S. Environmental Protection Agency (EPA) and it Works in partnership with the state governments, tribal governments and other federal agencies, EPA ensures compliance with the nation's environmental laws (USEPA, 2012).

The U.S. Department of Agriculture (USDA) is the federal government's arm for setting and executing agricultural policies, regulations and programs. The (USDA) Natural Resources Conservation Service works with landowners on private land to conserve natural resources. The nation's 3,000 conservation districts, almost one in every county, are the heart of the conservation delivery system (USEPA, 2012). 7.1.2.1. US vs. Europe

United States Environmental Protection Agency (EPA) has regulations for Concentrated Animal Feeding Operations (CAFOs) which are agricultural operations that keep and raise animals in a confined area, where feed is brought to the animals instead of the animals grazing (USEPA, 2012). An operation is considered a CAFO if the animals

are confined for a minimum of 45 days during 12-month period, and there is no grass or other vegetation in the area of confinement during the normal growing season (USEPA, 2012). The USEPA requires that CAFO wastes applied to agricultural land follows an approved nutrient management plan (NMP). A NMP is a document that sets rates for waste application so they meet the water and nutrient requirements of the certain crops and soil types (Bradford et al., 2008). The assumption is that a well-designed, executed NMP ensures all lagoon water contaminants are taken up and or degraded in the root zone (Bradford et al., 2008). The European Environmental Agency (EEA) uses a Common Agricultural Policy (CAP) that is used to strengthen, competitiveness, sustainability and permanence of agriculture in the European Union (European Environmental Agency., 2011). The CAP is one of the EU's strongest sectorial interventions and has substantial implications for the environment, by shaping the European landscape and influencing its agricultural practices (European Environmental Agency., 2011).

Carbon Footprint

The United states dairy industry has made a considerable progress in reducing its environmental impact, per unit of milk production, by a 63% decrease in their carbon footprint per unit of milk, by improved productivity between 1944 and 2007 (Capper et al., 2009).

Nutrient excretions

A study done by Knowlton et al, (2010) that was done to evaluate manure excretion from J and H, evaluated feces, urine, and nitrogen excretion. Cows were moved

in pairs into open-circuit respiration chambers, (An open-circuit respiration chamber is a chamber where the environment can be changed as well as examine the digestibility of feed production of methane, see Figure1) 49, 154, and 271days in lactation, for a seven day measurement period. In this experiment, authors observed that. Total daily manure excretion was lower in J cows than in H cows, with reductions usually proportional to changes in feed intake. J cows excreted 33% less wet feces and 28% less urine than H cows, fecal, and urinary N decreased by 33, and 24%, respectively, in Jersey cows compared with Holstein cows (Knowlton et al., 2010). In a similar study that went in to more detail, there was a similar result as it was reported that to produce the same amount of product with Jerseys, compared to Holsteins, the carbon footprint between them was reduced.

MILK PRICING

The most important factor affecting Income over Feed Cost (net income after subtracting feed cost from gross income) is the total amount of milk fat and protein produced. Management factors are responsible for about 45% of the variation in milk composition, and genetics explaining 55% (Van Tassell et al., 1999). This means that the biggest factor in the animal's milk components is her genetics and breed, even though management plays a big role. Breed is a known factor that affects milk component production (Sharma et al., 1983). To quantify this statement examine table 2, for composition data provided by (Capper and Candy, 2003). The differences between H and J are clear in regards to their milk component variation. The most important factor affecting Income over Feed Cost (IOFC) is the total amount of milk fat and protein,

produced in a multiple component pricing system that pays dairy producers on the basis of milk fat, true protein, and other dairy solids. (Bailey et.al, 2004).

Components Price

Producers are paid a separate price for milk fat, true protein, and other dairy solids. These prices reflect the value of milk components manufactured for dairy products. In addition to this value, producers in federal orders also receive a producer price differential (PPD) each month. The PPD reflects the value of the federal order pool in a particular month above the manufacturing value. And The PPD is usually positive each month because Class I and II prices in federal orders are usually higher than Class III and IV prices due to mandated formulas that use differentials (Bailey et.al, 2004). Seven of the 11 federal milk marketing orders that were created use a multiple component pricing system that pays dairy producers on the basis of milk fat, true protein, and other dairy solids. (Bailey et.al, 2004). 8.4. Customer Preference

When changing the composition of milk, under protein and milk fatty acids it alters nutritional and physical properties of dairy products and their consumer appeal (Bobe et.al, 2007). The Composition of milk protein and of milk fatty acids have recently gained interest from manufacturers and consumers, this is because it influences nutritional, physical, and flavor properties of dairy products and the consumers acceptance of dairy products (Renner and Kosmack, 1975).

Product Preference

For the past 65 years the per capita consumption of fluid milk has been declined, and cheese consumption has increased (National Milk Producers Federation, 2009).

Given that over 40% of milk produced in the United States is used for cheese production, isn't it appropriate to assess the animal that's most efficient in producing this product (Capper and Candy, 2011).

Breed Preference

The Productivity of a cow is usually referring to the milk yield per cow, but within current study's, it may also be defined as cheese yield per cow. The average J cow yields 2.6kg of Cheddar cheese/d, compared with 2.9kg of Cheddar cheese/d from an average H (Capper and Candy, 2011).

NUTRIENT MANAGEMENT

The effect the breeds have on manure and nutrient excretion has significant nutrient management implications (Knowlton et al, 2009). Data suggest that differences in manure and nutrient excretion of Jersey and Holstein cows may be large enough for different consideration in nutrient management planning and Concentrated Animal Feeding Operation (CAFO) permitting. In the late 1970s it was reported that J excreted about 70% of the fecal N and 90% of the urinary N of H while J had 70% of the BW and 79% of the DMI of H (Blake et al., 1986). Similarly, Kauffman and St-Pierre (2001) found that J excreted 71% of feces and 73% of N that's excreted by H. The authors concluded that differences in feces and N excretion were caused by differences in BW and DMI rather than by any difference in digestibility or post absorptive nutrient utilization (Knowlton et al, 2009).

Breed Comparison

Manure excretion is lower in J than in H, with reductions generally proportional to the differences in feed intake. J cows excrete 33% less wet feces and 2% less urine than H this was observed by these three articles Blake et al, (1986); Kauffman and St-Pierre, (2001) Knowlton et al, (2009). Fecal DM excretion was also lower in J than in H, but their DM digestibility and total wet manure production per their unit of BW was unaffected by breed differences.

Excretion of N is lower in J than in H, primarily because of lower N intake. Intake, fecal, and urinary N is reduced by 29, 33, and 24%, respectively, in J compared with H (Knowlton et al, 2009). Digestibility of N and the total N excretion as a proportion of N intake were unaffected by breed. Total manure N excretion averaged 323 g/d for J compared with 456 g/d for the H. Milk N secretion was also lower in the J than in H, but was similar as a proportion to N intake. But the N retention was unaffected by breed (Knowlton et al, 2009).

ECONOMICS

The Breeds are a known factor in affecting milk component production (Sharma et al., 1983). To measure these differences, the test day milk production and composition was summarized and data was provided by a Dairy Records Systems by breed.

Differences between Holsteins and Jerseys were clearly demonstrated, Holsteins produced about 20 lb/d more milk than Jerseys. In addition, test-day protein and milk fat were 0.5 and 1.0 percentage points greater for Jerseys than Holsteins (Bailey et.al, 2004).

ELBEHRI et al., (1994) did an overall analysis that suggested that Jersey farms would

benefit substantially from the component pricing system, but most of Pennsylvania dairy farms, which have Holstein herds, would expect a marginal negative impact.

Conclusions

In researching these two breeds, across every aspect of their functionality we come to realize that that the J breed is the clear choice for efficiency over the H, and is the easiest to work with these days, with the state the market is in. In comparison of J and H milk for cheese production, J come out on top as they test higher in fat % and protein % which amounts to less input for a greater output (Capper and Cady., 2011). With consumption of the cheese market being on the rise while replacing other dairy products, cheese is in demand, and is what needs to be produced. So we should use the J breed to make this great product most efficiently. Cheese production is a major reason why we should use J but it's not the only reason as there are many other factors that that make J a positive over H today. With more environmental regulations than ever Jersey are also better because they are smaller and they pollute less than H which means you can have more animals to the acre to become the most profitable. Also with J having less Metabolic problems, and being a little more efficient with their feed consumption that's another positive. So although we will always need the H, I don't see a better choice or way than J right now, to maximize profits.

Table 1. Breed-specific performance data inputs to the model

Performance characteristic	Holstein	Jersey
Daily milk yield,1 kg	29.1	20.9
Milkfat,1%	3.8	4.8
Milk protein,1%	3.1	3.7
Cheese yield,2 kg/kg of milk	0.101	0.125
Calving interval,1 mo	14.1	13.7
Dry period length,2 d	60	60
Annual turnover,1%	34.5	30
Expected number of lactations ²	2.54	3
Age at first calving,1 mo	26.1	25.3
Heifer:cow ratio ¹	0.86	0.83
Heifers aged 0–12 mo,3%	46.2	48
Heifers aged >12 mo,3%	53.8	52
Prorated rbST response,6 kg/d	3.4	3.4

(Capper & Candy., 2003).

Table 2. Developed by updating data from the 2005 Agricultural Resource Management Survey of dairy operations using 2009 prices and milk production.

Item	100- 199 cows	1,000 cows or more
dollars per cwt. sold		
Gross value of production:		
Milk sold	12.98	12.44
Cattle	1.19	1.19
Other income	0.86	0.78
Total, gross value of production	15.03	14.41
Operating costs:		
Feed--		
Purchased feed	6.01	8.91
Homegrown harvested feed	4.74	1.57
Grazed feed	0.12	0.01
Total, feed costs	10.87	10.49

Other--		
Veterinary and medicine	0.97	0.79
Bedding and litter	0.33	0.12
Marketing	0.28	0.32
Custom services	0.44	0.43
Fuel, lube, and electricity	0.63	0.42
Repairs	0.89	0.44
Other operating costs	0	0
Interest on operating capital	0.02	0.02
Total, operating cost	14.43	13.03
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Allocated overhead:		
Hired labor	1.54	1.87
Opportunity cost of unpaid labor	3.4	0.19
Capital recovery of machinery and equipment	4.72	2.04
Opportunity cost of land (rental rate)	0.05	0.01
Taxes and insurance	0.28	0.15
General farm overhead	0.75	0.3
Total, allocated overhead	10.74	4.56
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Total costs listed	25.17	17.59
<hr/>		
Value of production less total costs listed	-10.14	-3.18
Value of production less operating costs	0.6	1.38
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Supporting information:		
Milk cows (head per farm)	133	2,078
Output per cow (pounds)	18,296	20,226
Milking frequency more than twice per day (percent of farms)	6.49	44.63
Milk cows injected with bST (head per farm)	17	427
Organic milk sold (percent of sales)	0.42	0.26

(USDA-National Agricultural Statistics Service, 2000, 2009; Khanal et al., 2010).

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