DAIRY FOOD SEQUENCE CARDS

EXPLORE LESSON 3

CROPS ARE GROWN

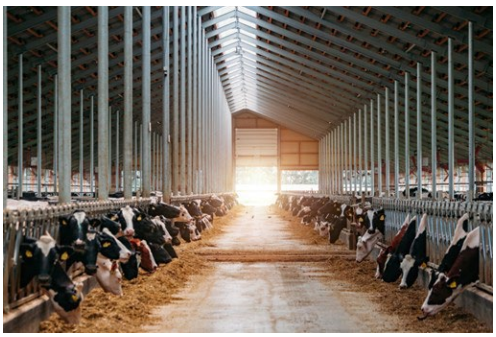
Homegrown forages or forages produced locally by neighbors and partners are ideal for use on dairy farms because they can provide a substantial nutrient base that cost-effectively uses available resources. Forage quality is dependent on field conditions, plant species and variety, fertilization, maturity at harvest or during grazing, length of cut, processing, and preservation. The production, storage and feeding of high- quality forage can reduce the need for off farm feed purchases, thus mitigating rising feed costs and improving profitability. Also, on-farm forage production influences land-use decisions and whole-farm nutrient balance, offering potential solutions to environmental management challenges faced by intensively managed dairy farms.

Three key management details for the establishment of alfalfa or other legumes are proper soil pH, properly firmed soil, accurate planting depth. Fields can be direct-seeded, but seeding forage grasses with legumes can help limit soil erosion. This keeps nutrients in place, reducing the amount of fertilizer needed and improving the farm manure management plan. Grasses: Well-managed grasses can improve overall ration fiber digestibility and nutrient management, and reduce soil erosion. Established grasses also provide a convenient place for in-season applications of manure and reduce the need for commercial fertilizer application. Grasses are much less sensitive to wheel traffic than alfalfa and will greatly benefit from the nitrogen in manure. Grass management, however, can be more difficult than alfalfa management because grasses lose quality quickly after heading. When seeded with alfalfa, it is important to select a grass variety that matures at a similar time as the alfalfa matures. Corn Silage: Most corn hybrids planted for silage harvest are conventional hybrids, which vary in yield, grain content and fiber digestibility. Corn hybrids should be selected based on hybrid maturity, traits, and their performance in replicated trials. Fiber (NDF) digestibility is important, but corn silage contains substantial amounts of energy-dense starch (30 percent on average), so starch yield is a very important factor in hybrid selection. Maturity, seed treatments, technology traits, planting population and chop height must all be the same for meaningful corn hybrid comparisons.

Check It Out: https://www.usdairy.com/news-articles/from-field-to-food-how-dairy-farmers-grow-feed-for-their-cows

From: https://www.usdairy.com/getmedia/8ce93e6c-4c85-4c93-914e-42bb155f6ed9/considerationsresourcesonfeedanimalmgt.pdf.pdf.aspx

COWS ARE FED



Water is the most important essential nutrient required by dairy cattle and is especially important in lactating cows. Consequently, drinking water quality and accessibility are very important components of successful feeding management programs. Free and easy access to plentiful sources of high-quality and clean drinking water is absolutely essential for optimum production and profits. Water intake also lowers enteric methane emissions by dairy cattle. An adequate freshwater supply also helps drive feed consumption and rumen development. Good feeding practices and a balanced diet that meets animal requirements for high levels of productivity, (i.e., growth and milk yield) health and reproduction, will improve profits and reduce enteric methane emissions per unit of fat- and protein-corrected milk. Ration formulation is truly a balancing act requiring a careful combination of various feedstuffs to ensure that nutrients are not over- or underfed to each animal class in a dairy herd. Routinely using available mathematical models to optimize rations for each animal class in the herd is highly encouraged. Ration formulation has a significant impact on profitability and enteric emissions because it directly affects feed intake, fermentable energy availability, passage rate, feed efficiency and other factors that influence ruminal digestion, enteric methane formation and nutrient supply in dairy cattle. The implementation of ration formulation practices requires consideration of rumen function, animal requirements, the net energy system and energy partitioning, metabolizable protein and concepts of feed efficiency, dilution of maintenance, and ingredient and diet nutritional analyses (i.e., composition and digestibility). Dairy nutritionists must ensure adequate nutrient supply for maximum fat- and protein corrected milk production while maintaining rumen function in the dairy cow. A healthy rumen will support extensive feed digestion and microbial protein synthesis, stimulating milk production.

Check It Out: https://www.usdairy.com/news-articles/cow-chow-7-interesting-ingredients-part-of-a-dairy-cow-diet

From: https://www.usdairy.com/getmedia/8ce93e6c-4c85-4c93-914e-42bb155f6ed9/considerationsresourcesonfeedanimalmgt.pdf.pdf.aspx

COWS ARE CARED FOR

The health of cattle on a dairy is an essential part of good husbandry and a well-being program. One of the foundations for animal well-being is the freedom from pain, injury or disease by prevention or rapid diagnosis and treatment. A dairy maintains the health of the cattle by providing appropriate nutrition, housing and disease prevention, detection, and action programs. These programs should be developed through consultation with a qualified veterinarian. The health of all animals and animal groups should be maintained through preventive care programs augmented by rapid diagnosis and treatment when necessary.

Dairy operations should have a Valid Veterinary-Client-Patient Relationship demonstrates that the dairy uses a veterinarian for health and disease issues and allows the dairy to obtain and use appropriate drugs. The dairy should have a written Herd Health Plan(s), developed in consultation with the herd veterinarian, to prevent common diseases such as mastitis, lameness, metritis, metabolic diseases, displaced abomasum, and other infectious diseases such as pneumonia and infectious diarrhea.

The Herd Health Plan should include:
1. Vaccination protocols
2. Daily observation of all cattle for injury or signs of disease
3. Protocols for cattle that develop disease or are injured
4. Protocols for prevention, detection and action for mastitis and lameness
5. Training programs for family members and employees involved in detecting disease and injury, reporting the cases and actions to be taken.

Management protocols for painful procedures and conditions. When addressing management, it is important to describe it, do it, document it and deem it correct. Management protocols for special needs cattle – cattle with a physical or medical condition that requires additional care and/or monitoring. The operation should have a herd health plan as well as training and protocols for handling, transporting and caring, and euthanasia for cattle for all ages and health conditions. All employees should be trained in cattle handling to protect the safety of the animal and caretaker. Consequences of inhumane handling must be known and enforced. All training should be documented and signed by the employee including the date completed, content and trainer

Check It Out: https://www.usdairy.com/news-articles/5-ways-dairy-farmers-keep-their-cows-healthy

Watch This Video: https://www.youtube.com/watch?v=gy8xWH9rnk8

From: https://dairywellbeing.org/uploads/NDAWI%20Principles%20&%20Guidelines.pdf

COWS ARE BRED, HAVE CALVES, & PRODUCE MILK

During the transition period, cows experience more stress. Effective cow management during transition will not only reduce involuntary culling, replacement costs and non-productive days, but it will increase milk yield in the following lactation, allow for a lifetime of productivity and reduce enteric methane emissions per unit of fat- and -protein-corrected milk production. Both physical and metabolic stresses occur as cows transition from milking to the dry period, through calving and into the following lactation. Proper nutrition and management of cows at each transition are essential in helping them to adjust to rapid and dramatic changes in physiology and nutrient requirements. Actions taken during transition significantly influence subsequent milk yield, lactation length, incidence of disease and reproductive efficiency, therefore directly affecting herd composition and profitability, and indirectly influencing enteric methane emissions. Management goals include: 1) preparation for a successful calving and subsequent lactation by promoting cow comfort and DMI 2) meeting, but not exceeding, transition cow nutritional requirements; and 3) reducing the incidence of postpartum metabolic diseases.

Postpartum dairy cows with high-yield potential cannot meet their energy demands from dietary intake alone. These cows depend on body reserves to balance the deficit between dietary intake and nutrient requirement increasing the risk for ketosis and other health problems. Grouping fresh cows separately for two to three weeks postpartum can help maximize DM and energy intake to return cows more quickly to a positive energy balance. Calf and heifer management programs must focus on numerous factors that affect the animal's ability to stay healthy, grow and reproduce as it matures. To ensure immunoglobulin absorption for passive immunity, calves must be fed an adequate amount of high-quality colostrum within the first 24 hours of life. Clean and stress-free environments — along with appropriate vaccinations administered to the calf's dam before calving and then to the calf and heifers — are best-suited for disease prevention. Providing required energy and protein for growth of the calf, young heifer and bred heifer is essential for timely growth in the form of muscle and bone. Keeping good records on growth, health and breeding helps evaluate and improve calf and heifer management program.

Check It Out: https://www.usdairy.com/news-articles/the-many-ways-farmers-care-for-their-cows

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COWS ARE MILKED 2 OR 3 TIMES A DAY

Getting the cows milked two or three times a day is a lot of work. Milkers know the longer cows are away from the barn, the less milk they will produce because of reduced time to eat or lay down. Added to that urgency is the knowledge that there are many things that need done on a dairy farm no matter the time of year. Most producers know that good milk flow and quality begins with proper teat stimulation and an efficient milking preparation procedure. However, urgency in the milking parlor can lead employees and even family members to take shortcuts. Those shortcuts, instead of shortening milking time, may actually increase it.

Dairy farmers must consistently apply good management practices to produce milk that meets or exceeds these quality requirements. Cow cleanliness and proper procedures at the milking parlor offer the greatest opportunity to improve milk quality. For example, fore stripping before teat-end disinfection stimulates oxytocin release and allows for detection of clinical mastitis by visual examination of milk appearance. Milk quality also is influenced by proper sampling, milk cooling and equipment hygiene and upkeep.

Check It Out: https://www.usdairy.com/news-articles/in-the-milking-parlor

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From: https://www.dairyherd.com/news/how-variability-your-farms-milking-procedure-affecting-milk-flow
From: https://www.usdairy.com/getmedia/8ce93e6c-4c85-4c93-914e-42bb155f6ed9/considerationsresourcesonfeedanimalmgt.pdf.pdf.aspx

MILK IS COOLED AND TESTED FOR SAFETY

The first step in the dairy supply chain starts down on the farm. Special equipment pumps milk right from the cow and into a storage tank. The tank is refrigerated and cools the milk quickly. This quick-cooling method is essential for product freshness and safety. The milk never touches human hands, which is an important safety precaution in getting your milk from the farm to the end consumer's refrigerator.

Testing is an important step in the dairy supply chain. Milk is tested for antibiotics on the farm and when it gets to the plant. Milk with antibiotics cannot reach the public. Farmers can face financial penalties if their milk tests positive for antibiotics.

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From: https://usatruckloadshipping.com/moving-milk-dairy-logistics/#:~:text=An%20unbroken%20cold%20chain%20means,and%20integrity%20of%20the%20product

MILK IS LOADED AND TRANSPORTED IN AN INSULATED TANKER TRUCK

From there, milk takes a ride on a tanker truck and goes to a processing plant. The milk travels in a sealed tanker truck. Large farm operations might need to move enough milk to fill a truckload, other times the truck picks up milk from a few farms before heading to the plant.

Milk must be produced in a hygienic environment to maintain superior quality. Hygiene is based on three groups: physical, chemical, and microbiological. Physical hygiene is determined according to density, freezing point and acidity of the milk or dairy product. Chemical hygiene stems from the product's transportation and storage. Microbiological hygiene is based on temperature which prevents microbiological reproduction. The milk's packaging plays an important role in keeping the product fresh for an extended period. The packaging material should be easy to wash, clean, antiseptic, rustproof and no substance should get into the milk. This decreases the likelihood of microbiological reproduction. The temperature of the dairy food must be controlled and kept cool or risk reproduction of bacteria. Bacterial spoilage can be safeguarded using cooling systems to control the ongoing temperature. Moist or dry air can create a conducive environment for bacteria and other germs to reproduce. Proper air circulation within the transportation vehicle is needed to allow airflow and impede humid air. Excess time of the dairy product can cause non-freshness or bacterial spoilage. Batch numbers and best before dates are used to prevent both issues. The batch numbers and best before dates should be cautiously scrutinized in order to avoid a poor product reaching the consumer. This component is supplemental to time, as the product has to be transported over the given distance within the desired time frame, or risk exceeding the best before date. The ability to cover the distance can affect cost if the product isn't delivered on time and spoilage occurs. The vehicle should have the appropriate equipment to keep dairy products fresh and safe for consumption. Any vehicle moving the goods must accommodate the short shelf life and delicate conditions in which dairy products must be kept. Lastly, according to the critical issues listed above, transportation vehicles should be designed or chosen according to those properties' availabilities. The trucks should be able to provide needed equipment for making the existing properties remain from collection to retailing time, but those changes are expensive, and the most cost-effective ones are always best for dairy firms.

Check It Out: https://www.usdairy.com/news-articles/in-the-milking-parlor

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MILK IS FURTHER TESTED FOR SAFETY & QUALITY AT PROCESSING FACILITY

At the processing plant, milk is homogenized, pasteurized, and packaged in cartons. After these processes occur, milk is ready to be transported to retailers and the end consumer. In most countries where milk is processed into various products, certain requirements are determined by law to protect consumers against infection by pathogenic microorganisms. The wording and recommendations may vary, but the combination below covers the most stated requirements: The milk must be heat treated in such a way that all pathogenic microorganisms are killed. A minimum temperature/holding time of 72 °C for 15 seconds must be achieved. The heating temperature must be automatically recorded, and the transcript saved for a prescribed period of time. As milk often contains solid matter such as dirt particles, leucocytes (white blood corpuscles) and somatic cells (of udder tissue), it must be clarified. Since pasteurization is less likely to be effective if bacteria are hidden in lumps and particles in the milk, clarification must take place before heating. Milk can be clarified in a filter or, more effectively, in a centrifugal clarifier. Heat exchangers are calculated so that a higher pressure should be maintained in the pasteurized milk flow compared to the unpasteurized milk and service media. If a leakage should occur in the heat exchanger, pasteurized milk must flow into the unpasteurized milk or cooling medium, and not in the opposite direction. To ensure this, a booster pump to create a pressure differential is often required and in certain countries it is mandatory. In the event of temperature drop in the pasteurized product due to a temporary shortage of heating medium, the plant must be provided with a flow diversion valve to divert the insufficiently heated milk back to the balance tank.

PASTEURIZATION – THE HEAT TREATMENT

Along with correct cooling, the heat treatment is one of the most important processes in the treatment of milk. If carried out correctly, these processes will give milk a longer shelf life.

Temperature and pasteurization time are very important factors which must be specified precisely in relation to the quality of the milk and its shelf-life requirements. The pasteurization temperature for homogenized, HTST pasteurized milk is usually 72 – 75 °C for 15 – 20 seconds.

The pasteurization process may vary from one country to another, according to national legislation. A common requirement in all countries is that the heat treatment must guarantee significant reduction of spoiling microorganisms and destruction of all pathogenic bacteria, without the product being damaged.

HOMOGENIZATION

Homogenization has already been discussed in Chapter 6.3. The purpose of homogenization is to reduce the size of the fat globules in the milk, in order to reduce or prevent creaming. Homogenization may be total or partial. Partial homogenization is a more economical solution because a smaller homogenizer can be used.

Check It Out: https://www.usdairy.com/news-articles/farm-to-table-an-insiders-look-into-the-process

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From: https://dairyprocessinghandbook.tetrapak.com/chapter/pasteurized-milk-products

MILK IS PROCESSED INTO DAIRY PRODUCTS

Milk processors produce a wide range of milk products:

- Liquid milk is the most consumed, processed and marketed dairy product. Liquid milk includes products such as pasteurized milk, skimmed milk, standardized milk, reconstituted milk, ultra-high-temperature (UHT) milk and fortified milk. Worldwide, less, and less liquid milk is consumed in its raw form.
- Cheeses are produced through the coagulation of milk protein (casein), which is separated from the milk's whey. Hundreds of varieties of cheese are produced, many of them being characteristic to a particular region of the globe. However, most cheese is produced in developed countries. Cheese can be soft, hard, semi-hard, hard ripened or unripened. Cheese's diverse characteristics derive from differences in the compositions and types of milk, processes applied, and microorganisms used.
- Butter and ghee are fatty milk products. Butter is produced by churning milk or cream; in many developing countries, traditional butter is obtained by churning sour whole milk. Ghee is obtained by removing the water from butter. Ghee has a very long shelf-life of up to two years.
- Cream is the part of milk that is comparatively rich in milk fat; it is extracted by skimming or centrifuging the milk. Cream products include recombined cream, reconstituted cream, prepared creams, pre-packaged liquid cream, whipping cream, cream packed under pressure, whipped cream, fermented cream, and acidified cream.
- Whey products: According to FAOSTAT, whey is "the liquid part of the milk that remains after the separation of curd in cheese making. Its main food use is in the preparation of whey cheese, whey drinks and fermented whey drinks. The main industrial uses are in the manufacture of lactose, whey paste and dried whey." Whey can be sweet (from the production of rennet-coagulated cheeses) or acid (from the production of acid-coagulated cheeses).
- Casein is the principal protein in milk and is used as an ingredient in several products, including cheese, bakery products, paints and glues. It is extracted from skimmed milk by precipitation with rennet or by harmless lactic acid-producing bacteria.

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From: https://www.fao.org/dairy-production-products/products/types-and-characteristics/en/

DAIRY PRODUCTS ARE SHIPPED TO RETAILERS & CONSUMERS

The dairy industry is one of many that employs refrigerated units. The type of container and the refrigeration method used as well as additional factors like the duration of transit, size of the shipment and outside temperature can influence the shipment.
A reefer truck is versatile and able to transport around 20-25 tons of refrigerated or temperature-sensitive goods. The supply chain of the milk industry requires strict processing and handling requirements to guarantee that consumers receive the freshest and safest milk possible.

The FDA granted the Food Safety and Modernization Act in 2010 that allows them to right to mandate product recalls and established stricter requirements on sanitary transportation. This means that dairy transport logistics must place a heavy emphasis on the quality and safety of their product when it goes from the farm to the store.

Dairy Logistics and the Cold Chain
Dairy logistics is a kind of cold chain logistics that works with supply chain management. Cold chain logistics refers to a supply chain that relies on the ability to keep cargo temperature controlled. An unbroken cold chain means the product never warms above a certain temperature. Raw milk needs to be stored and moved at 38 degrees and the cold chain makes this possible. This ensures the safety and integrity of the product. Cold storage provides facilities for storing goods over a length of time while the goods are waiting to be sent to a further location for sale or an intermediary location for processing and distribution. Cold transport is the ability to move goods while protecting the integrity of the product by maintaining a stable temperature and proper humidity conditions. Systems are required to keep products at their proper temperature for processing, storage, and transportation. Dairy products are highly sensitive and even a short encounter in an extreme outside temperature can cause damage to the product. It is critical that the milk is always moving because milk has a high risk of expiring and spoiling. Therefore, many problems in the dairy supply chain can be combated with cool and cold temperatures when transporting goods from location to location. The best way to ensure a high-quality product arrives at the retail store is to utilize cold chain logistics. This stops any issues caused by unwanted or extreme weather conditions, thereby reducing potential wasted product and loss of profit.

Check It Out: https://www.fao.org/dairy-production-products/products/types-and-characteristics/en/

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