



A - Review on Innovative Approach in Dairy Farming

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Abstract:

Innovative Approach and data-driven techniques are creating greater opportunities for dairy farming. Dairy farming is becoming more possible because of data-driven approaches used in Dairy sector. Demand of milk is continuously increasing due to increasing population of the world. The consumption of the dairy products is more in developed countries as compared to developing countries. To meet this increased demand for milk and milk products of developed and developing countries, better innovative techniques for improvement in milk yield are required. It is expected that the use Cattle Monitoring Drone, Health tracking device, Robotic Milking, Rumination collars, Automatic Feed Flusher and different New techniques can assist a farmer to overcome different traditional farming challenges and increase the milk production. The usage of Data driven technology and Artificial Intelligence is predicted to aid a farmer in overcoming many conventional agricultural and livestock farming problems, which will be made easier for them by employing this approach. In this paper the author address different challenges in dairy farming has to face in their routine life. Brief introduction of dairy farming (DF) is presented with respect to the innovation in feeding, watering, diseases detecting, herd controlling through drone, production and the processes of smart dairy farming.

Keyword: innovative, internet of things, Artificial Intelligences, challenges, Dairy sector.

Introduction:

India is recognized as a country of agricultural land, with agriculture providing a living for 70-75 percent of the population. They had to put in a lot of effort to earn their capital, which is very little in comparison to other industries. So the question that comes to mind is "Why can't we turn their hard work into smart work"? One of our coworkers, who was travelling through the toll booth, saw the new rapid Global Positioning System (GPS) and suggested that we adopt a similar approach, but in a different way, by using innovative approach in dairy farming, which is still using conventional techniques from monitoring of cattle herd, detection of disease and robotic milking. The desire to help our nation by applying innovative technology and eliminating hard labour has led us to this initiative, which will take the dairy sector and farming to a new level of success. As young people, we see it as our responsibility to help others in rural areas that are uninformed of technological advancements.

Dairy farming (DF) is the key concept that can satisfy the increasing demand of quality dairy products. DF can reduce the environmental issues; decrease the use of re-sources, and raises the animal health by using advanced sensing and data analyzing technologies. In India (Hindu people) milk is the most demanding product and it has become the product with heavy price fluctuation during Hindu festivals, Marriages Party, Birthday party etc. In order to compete in the worldwide market, The Indian dairy market needs to improve its production by using Internet of things.

1. Herding Cattle with Drones.

The drone is an unpiloted aircraft. Sometime it is also referred as unmanned aerial vehicles (UAVs). This aircraft play a significant role in monitoring the cattle herd. Replacement of human labor with robots is a reality in many industries, especially those posing significant health risks to people. Farmers in the dairy industry can now use drones to herd cows instead of employing human or dog herders that might take considerable time to move the cattle around the ranch. Once the drone cameras locate the cows in the pastures, the herd owner directs the crewless vehicle to a particular side. The cattle will always move away from the sound of a low-flying drone. This facilitates remote control of cattle movement within the grazing field. The unmanned aerial vehicles usually fly around the grazing field or cattle shed, capturing the animal images or video, which the farmer evaluates to detect any unusual activity and register cattle numbers. Again, the drones for dairy farms allow anyone within or outside the farm to watch live footage of animal in the field .UAVs Technology is crucial, particularly for animal monitoring at night when darkness limits human vision.. A herder might be needed to bring the straying animals back to the herd, thereby limiting the risk of cattle losses. However, in hilly pastures, the terrain poses a challenge to navigating the fields and moving animals by foot-on-the-ground strategy. Drones for dairy farms allow you to locate herds, move them around while identifying the sick animals, body temperature, pulse rate, heart beats just like a herder with more effective. The drones fly at about 90-270 feet above the herd and produce thermal image unique to each animal.

2. Geofencing.

Geofencing is an area-based technique in which an application or other programming techniques can utilize Global Positioning System (GPS),Radio-Frequency Identification (RFID),Wireless Fidelity (Wi-Fi), cell information or a fitbit for cow to trigger a pre-modified activity when a cell phone or RFID label enters or leaves virtual limit setup around a topographical area, known as a geofence. In dairy farming, a farmer equips a herd of cattle with hardware device which consists of different sensors and GPS tracking unit. Sensors are used to track down animal health and other key behavior to increase output and overall animal wellness. Geofencing uses GPS network and other related means like Wi-Fi nodes and Bluetooth beacons to create a geofence around the farmer area; then the geofence is paired with animal collar and software application, and when the animal leaves that specific area, it triggers the alerts for the farmer. Today, many of us have Fitbits attached to our wrists to monitor our steps, calories, heart rate, and sleep quality. But a new wearable technology has made its way to the barn. Introducing the cow collar – a “Fitbit”. With cow collars you can gather a large amount of data on the health, habits, and happiness of your herd. This includes the number of steps per day as well as rumination. All the data gathered is sent to a portal you can access from your computer or smart phone. You can share any abnormal information you find with your veterinarian, making it easier to

detect and resolve stress, illnesses, or health-related issues early on. Perhaps the biggest benefit of all – it allows you to detect when a cow is in heat. Because of this, you can potentially increase the chances of healthy pregnancies, which can lead to enhanced milk production.

3. Health Tracking Devices.

In dairy farming animals can get various diseases due to numerous reasons. When there are a lot of animals, to check every animal daily is impossible and time consuming. It is a lengthy process and a difficult task to do individually and manually, and the animal's disease is also contagious, so if not treated in time, the other animals can also be infected, causing loss. Yield of milk can also be monitored and controlled, and any minute change in animal behavior can also be recorded. Therefore, to cater for this situation and find automotive way of monitoring animals' health, we move towards automatic disease detection. An animal suffering from any disease changes its daily routine habits like lying down on different area, splitting itself from herd, or changing its eating habit. Sensors or tracking device that detect changes in animal body make it easy for a farmer to detect and treat that animal. Mounted sensor can sense the behavior of an animal and keep record of it. These types of records help us in making future decisions like calling a doctor. Any abnormality in this pattern is easily detected with the help of tracking device, and the farmer will be alerted through messages or other means. For example, the farmer can analyze any disease with the help of accelerometer, measuring animal movement, and activities can be captured, for example, whether the animal is less active compared to its daily routine. Just like any other sensors (e.g., temperature sensors, load sensors, microphones, and heartbeat sensors), these sensors can record animal daily life behavior such as disease symptoms, temperature change, movement, body weight, and pulse rate change. Timely detection of lameness is a big problem in the dairy industry which farmers are not yet able to adequately solve. It is one of the factors for reduced performance on many dairy farms, at least through reduced reproductive efficiency, milk production and increased culling (Chapinal et al., 2009). Lameness is considered to be the third disease of economic importance in dairy cows after reduced fertility and mastitis (Van Nuffel et al., 2015). An all-encompassing definition of lameness includes any abnormality which causes a cow to change the way that she walks, and can be caused by a range of foot and leg conditions, themselves caused by disease, management or environmental factors (AHDB, 2016). Prevention, early detection and treatment of lameness is therefore important to reduce these negative effects of lameness in dairy cows (Alsaod et al., 2015, Poursaberi et al., 2011).

Early detection of disease allows farmers to intervene earlier, leading to prevention of antibiotic administration and improvement in the milk yield, and savings on veterinary treatment for their herd. Health disorders reduce the productivity, longevity and reproductivity of cattle. Every year, farmers cough up huge amounts of money on their cattle's health and wellness. However, thanks to wearable animal gadgets which are akin to human fitness trackers, farmers can track, monitor and manage cattle's health. These smart animal trackers can be implanted in the cattle's ears, tail, legs, neck or any part of the body.

4. Robotic Milking Machines.

Traditionally, cows have always been milked manually by hands. This is not only a time-consuming activity but also has labour cost associated with, thereby increasing the price of milk. Robotic milking machines are enabling farmers to eliminate the pressure on physical labour, maintain a hygienic milking process, milk the cows anytime of the day instead of following a fixed schedule and improve the milk production. Milk production is dependent on the amount and quality of food given to the animals. Every cow in herd is different; some can be suffering from any disease, some are immature, or some can be pregnant, or someone is dry. Each cow has its own amount of nutrients requirement. To ensure that required nutrients are given to the animal, this cannot be done by simply looking at fodder; rather it has to be processed through a mechanized system that will show the amount of carbohydrates and proteins given to the cow.

Robotic milking machines also have automatic sorting functions so that if a cow is dry, they will be sorted out. If they are having cow hoof problems or any other health-related issues, you can program the machine to sort them out for treatment or to receive special dairy cattle nutrition requirements. The robotic milking machines have arms or cups with sensors that can be attached individually to cows' teats. The sensors can detect whether the cow or which of its teat is ready for milking or not. Once the milking starts, the machines can also identify impurities, colour and quality of milk. If the milk is not fit for human consumption, it is diverted to a separate container. The machines can also automatically clean and sanitize the teats once the milking process is completed.

5. Milk Freshness

Milk is a highly perishable product. In spite of treating it with pasteurization, freezing and preservation processes, it has a tendency to go stale. Millions of tons of milk turns stale before timely consumption and goes waste. Efforts are also being consistently made to increase the shelf life of milk without adding additives or preservatives.

Technology is now making it possible to detect the freshness of milk and store it for a longer period of time. Australia-based food technology company Naturo has developed a technology that can keep natural milk fresh in the refrigerator for at least 60 days without using any additives or preservatives. US scientists have pioneered a new pasteurization technique which increases shelf life of fresh milk from 13 days to 40 days without changing its taste or nutritional value. Back home in India, IIT Guwahati scientists have developed a Smartphone-app aided paper sensor kit that can test the freshness of milk and inform how well it has been pasteurized. This kit can come quite handy in large kitchens, milk collection centers and milk bars.

6. Automatic Feed Pusher

Would you like to do less work for more yields? Who wouldn't? The automatic feed pusher is another top tech trend taking the dairy industry by storm. This machine pushes feed toward the feed fence during times and routes you set. This not only saves you hours of labor, it allows the cows to have constant access to fresh feed around the clock. An automatic feed pusher can kindle frequent feed consumption – day and night – resulting in higher feed intake among your herd. This can result in healthier animals, improved fertility, improved production, and can potentially save you money in the long run.

As today's technology continues to grow and evolve, the dairy industry will follow suit. From apps that monitor herd health, drones that scan fields and thermostat-controlled curtains that keep cows comfortable throughout the winter, the dairy industry is becoming more advanced than ever before. Farmers will continue to strive to improve production, promote animal quality, and save time and energy on the farm.

7. Rumination Collars

A rumination collar uses a microphone to measure a dairy cow's rumination to help ensure a smooth transition period. Changes in rumination can be an early sign of calving diseases, negative impacts of recent ration changes, cow comfort, etc. Knowing normal rumination patterns for your specific dairy cow can help mitigate the effects of manageable stressors, such as heat stress. The data can be used to help dairy producers treat those cows and minimize any negative impacts.

8. Rumen Bolus

The worldwide trend is to increase the number of animals on cattle farms from an economic point of view, but animal welfare, sustainable farming, and the carbon footprint, to which animal husbandry is often linked in a socially controversial way, are also important key terms in our modern era. The welfare of animals can be ensured with the reduction in human labor input only with continuous monitoring with the appropriate sensor technology

A rumen bolus or sensor measures rumen temperature and pH levels of ruminant stomach to help identify any systemic infections that need to be treated. If a rumen bolus tells a dairy producer that a cow's pH is dropping, it is a sign that a total mix ration (TMR) isn't mixed thoroughly, sorting is taking place, or a ration change is having negative impacts. This can help a producer make appropriate changes to their dairy cattle nutrition program.

9. Parlor Monitoring

Parlor monitoring systems measure daily milk flow per cow, and there are some systems that can measure components like daily milk fat and daily milk protein and can even address milk quality by measuring somatic cells. If a cow's milk production starts slowing down, the parlor monitoring system can send you an alert so you can get eyes on that specific cow and provide treatment or make necessary changes to its dairy cattle management and nutrition.

10. Automated Cattle traffic Management

Managing and moving animals to milk stalls and back to barns may be a time-consuming process. There is also the possibility of livestock injuries. A computer-controlled gate opens and closes electronically in an automated cow traffic management system. These gates can categorize livestock based on their readiness to milk. The animals who are ready to be milked are transferred to the milking area, while the others are either placed in the waiting area or back to their barns. Automatic cow traffic systems are manufactured by companies such as Delmer, Bump Gates, Full wood Packo, and Lely.

11. Ecommerce Marketplaces

In India, many online B2B marketplaces, such as AgroStar and Gold Farm, have been developed to provide sophisticated equipment and consulting services to farmers and dairy producers' doorsteps via their cellphones. Many B2C systems have sprung up quickly, such as FreshVnF, WayCool, and FarmLink, which harvest fresh fruit from farms and transport it to retail consumers, hotels, restaurants, and cafés.

Results and Conclusion

The worldwide trend is to increase the number of animals on cattle farms from an economic point of view, but animal welfare, sustainable farming, and the carbon footprint, to which animal husbandry is often linked in a socially controversial way, are also important key terms in our modern era. The welfare of animals can be ensured with the reduction in human labor input only with continuous monitoring with the appropriate sensor technology.

In this modern world, dairy farming is an attractive business that can be supported to improve the economic conditions of a country. This Innovative Approaches on different automated techniques like Herding, Geofencing, Health tracking device, Robotic milking Automatic feed pulser, Automatic traffic management device Not only to save time but also labour saving devices. These Innovative techniques are the key efficient techniques that can be the future of a smart dairy farm. Efficient monitoring, controlling, feeding and technological drinking method can lead to better nutrition and health of cows. Which can be ultimately the reason for more milk production? Furthermore, a framework that can help a farmer in increasing production of milk has been proposed. The proposed innovative data driven system is an overall architecture for better adoption of the latest techniques for improving feeding, watering and milking procedures etc. These computerized tools with overall architecture, better adaptation of technology, and versatile approaches can make Internet of things based farming more efficient. Although it may require heavy investment in initial stages, later on, the improved technological infrastructure can make balance between the invested amount and the earned amount.

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