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Chapter 1

The Innovative Techniques in Animal Husbandry

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Abstract

Technology is developing rapidly. In this development, the transfer of computer systems and software to the application has made an important contribution. Technologic instruments made farmers can work more comfortable and increased animal production efficiency and profitability. Therefore, technologic developments are the main research area for animal productivity and sustainability. Many technologic equipment and tools made animal husbandry easier and comfortable. Especially management decisions and applications are effected highly ratio with this rapid development. In animal husbandry management decisions that need to be done daily are configured according to the correctness of the decisions to be made. At this point, smart systems give many opportunities to farmers. Milking, feeding, environmental control, reproductive performance constitute everyday jobs most affected by correct management decisions. Human errors in this works and decisions made big effect on last product quality and profitability are not able to be risked. This chapter deal with valuable information on the latest challenges and key innovations affecting the animal husbandry. Also, innovative approaches and applications for animal husbandry are tried to be summarized with detail latest research results.

Keywords: animal husbandry, futuristic techniques, innovative applications

1. Introduction

The increased world population is demanding more reliable quality livestock products the number of farms is decreasing but the number of animals for per farm and animal production are increasing In addition to this trend livestock production problems also increasing [1]. The solution of these problems comes from multidisciplinary studies from very different fields such as technology. In large enterprises it is not possible to obtain the expected performance without using technology and automation systems from animals with very high genetic values. Daily work on livestock farming is simple in and standard application

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routinely Data monitoring in the modern dairy farm enables the ongoing control of production, animal health, and welfare [2]. However, as the number of animals increases, error burden and work load increase. Successful livestock farmers will be capable of rapidly adapting their infrastructures to exploit changes in technology for better production. Mechanism and automation systems offer options in front of the user in intense competition for convenience. Currently, most data is extracted manually, yet manual observation is gradually being replaced by many milking systems by automated recording (milk yield, milk conductivity, activity recording and body weight measurements) leading to better data, both in quantity and quality. The number of farms automation systems has increased rapidly since 1980. Almost any medium- to large-sized farmers can benefit from enhanced automation [1, 2]. There are many opportunities for facilities in automation technologies and systems. Today livestock farmers increasingly use robots on production or algorithms to optimize their farm management decisions. Technological developments are creating a new automation system in which smarter and more flexible work possibilities in livestock production [3]. The automation of animal husbandry and integration of on-farm systems and processes have a key role to play in facilitating the process of meeting each of important challenges for competitive market [4]. The main technology are electronic recording, milking, heat detection auto-weighing, auto-drafting, genetic improvement, feeding, barn optimization, and health monitoring, livestock housing and equipment designs. These technologies provide to dairyman many opportunities to make easier and more convenient their decisions about dairy future plans. This chapter deal with valuable information on the latest challenges and key innovations affecting the animal husbandry aspect of milk, meat production and reproductive performances of the herds. Also, innovative approaches to dairy cattle, beef cattle breeding, and reproductive performance characteristics are tried to be summarized with detail research results. This chapter provides an introduction to systematic reviews and discuss the result of innovative research results in animal husbandry, animal welfare, animal health. The aim of this chapter is to present a review of the current scientific viewpoints about the concept and definition of animal husbandry innovations. The use of systematic reviews to address questions about intervention effects, usage, economy, positive and negative points of technology and innovations are discussed. The need of interaction among different disciplines is stressed, as well as the need to scientifically assess innovation using validated indicators. This chapter starts with examining technology requirements in animal production for getting better and good quality animal products and the role of innovation. Also, current innovative technologies and equipment's possibilities usage results were reviewed using most detailed research results. After these section chapter then examines the different technologies that use to obtain more convenient production knowledge and technologies usage level at farm level. Lastly, the chapter uses worldwide research results to assess the overall level of innovation of animal production. In addition to benefits of the innovation, some suggestions and implications about unintended side effects in its production and application will be summarized.

2. Current technology applications

The benefits of new technology are plentiful and include increased cost efficiency, improved animal welfare, improved working conditions, better production monitoring (e.g. remote monitoring, access to real-time data) and improved provision of important production data. The new technology means producers can work easier and improve cattle welfare, production efficiency, and profitability. Technologic developments provide more efficient, profitable and fast solutions for farmers to get on time process using management and direct manipulation possibilities. Continuous monitoring of disease, and its careful management is essential for the well-being of an animal management [5, 6]. This can be achieved through the detection of early stages and, subsequently, the detection and treatment of the infection [7, 8]. Automation today is super-sophisticated technology and software as well as complicated machinery. A number of computer-assisted image analysis applications are being developed for more convenient animal husbandry. The latest computer programs can identify and classify sounds of animal for specific situations. Many research concluded that these applications could be used to monitor the welfare of animals and provide early identification of disease, physiologic status, and abnormality [9, 10].

The main technology that livestock farmers requirements met is electronic records, milking, heat detection walk-over-weighing, auto-drafting, genetic improvement, feeding, barn environment optimization, and health recording etc. Some sensors are currently available for this purpose, but they do not fulfill all demands. Also, with advances in proteomics and genomics, new biomarkers are being discovered, allowing the disease to be detected at earlier stages. This will lead to assays with higher sensitivity, which can provide additional quantitative information on the level of inflammation 'on-site' and 'on-line' and which is also faster and less expensive. These technologies provide to dairyman many opportunities to make easier and more convenient their decisions about dairy future plans.

3. Breeding and genetics

In dairy farms which very high genetic value of breeding animals cannot get the expected performance without the use of latest technology. Dairy cattle herd management programs if can be used as effectively, dairy farming will have many advantages for consumer, farmer and also animals. Genetic information and type evaluation of herd members and bulls are particularly suitable for expanded electronic updating. However, to obtain these advantages from this system required to have knowledge of the functions and effective use of the functions. The large amount of data in the obtained on many issues related to animals, herd management, and an individual unless used in decisions about animals, ensuring the heavy data flow, record keeping or assessment will not give the expected results. Breeds in animal husbandry has changed a lot with the use of breeding and gene technology. Till 1980s livestock products demands have been met by breed substitution, cross-breeding, and within-breed selection. But these demand in future is to be met using new techniques such as such as artificial insemination and more specific selection techniques. Genomic selection provides more possibilities for the more high rate of genetic gain in the livestock sector. After all genomic breeding values will be calculated from the genetic marker, rather than from pedigree and phenotypic information in near future. The genome maps for poultry and cattle is completed and these developments provide new opportunities for animal breeding and animal models [11]. Leakey [12] reported that DNA-based tests for genes or markers affecting traits that are difficult to measure currently, such as meat quality and disease resistance, will be particularly useful. But genetic resources still important for helping livestock adapt to changing the climate [13]. Native breeds are to genetic insurance against future challenges. In combination with modem reproductive technologies, there is potential to use frozen and stored germplasm (genetic resource banks) to support conservation measures for the maintenance of genetic diversity in threatened species. Besides the direct application of technologically advanced reproductive procedures, modern approaches to non-invasive endocrine monitoring play an important role in optimizing the success of natural breeding programs [14]. A separate progeny-test category may be developed for farms that collect all data electronically and have those data monitored closely. Automated data collection along with parentage verification offers substantial opportunities for genetic improvement of overall economic merit. Nowadays biological samples are sent laboratory for genetic analysis to identify the relevant genes responsible for productive parameters. Also, selective breeding can reduce the need for alternative methods.

4. Computer and internet usage

New technology in computers, biotechnology and scientific discoveries regarding ruminant nutrition and genetics provide the basis for accelerated progress in milk production for those dairy farmers that adopt these technologies. 10 years ago most dairy farmers focused their attention solely on animal husbandry practices. The use of computers for farm management in dairy sector started in as early in 1990s in many developing countries. As personal computer was developed and the price has dramatically declined, more and more farmers began to use computers by themselves in the last decade. But generally, computers have been used by producers with larger farms. Small-scale farmers bypassed the technology because of its cost and their lack of knowledge about computer use in farming. Many computer programs were described, by which data on data in dairy herds may be processed. The some computer software is designed for timely and direct convenience to farmers. Thus, the breeder can evaluate the monthly lots of data using many formulas with high accuracy using these software. It can also be programmed for annual report for detail evaluation of herd evaluation. In addition to all these, daily milk yields feed consumption, pregnancy check, inseminated cow list can be programmed for daily work routine. In recent years there is a form of high interest to cattle breeding and this is leading to the establishment of intensive farms. The only criteria for the life cycle continuity of these intensive farms would be on maximum profitability and competitiveness ability on market. This concept mainly related to forceful usage of knowledge, technology and management at intensive farms and small enterprises and cattle breeding organizations. Whenever the farmers meet any problem in order to refer to an organization for learning to new solutions and the absolute result most probably they prefer to share with farmers who are more experienced for them [15]. But developed countries heavily use computer and internet that is the main way to reach information [16, 17]. Meanwhile in undeveloped or developing countries, several reasons limit using computer and internet these are listed as high financial cost, difficulties to use technology, loss of knowledge to economic benefits, hesitate to use new technologies, lack of education, strict personality, poor infrastructure, lack of personal

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experience and not enough time to spent [18]. On the other hand, the country wide effect of the communication instruments extends to 80% and this is enough to eliminate most of the reasons which are mentioned above. If the farmer evaluates the benefits of using computer and internet they will replace this technology in farm management.

5. Electronic identification

The Electronic identification system is started 1970s. However, current laws deal with the visual, readable markings that are placed on the animal (EU Directives 92:102:EEC and EU Directives 820:97:EC) [19]. There are numerous animal ID technologies available to livestock producers. Radio frequency identification (RFID) will likely be used to identify cattle. These devices have an electronic number that will be unique for an individual animal and link that animal to the database [20]. Electronic ear tags, injectable transponders and boluses with a transponder, inside in the reticulum are the latest technology for animal identification technology [18]. Many types of RFID tags (boluses, ear tags, injectable glass tags) are used subcutaneous placement for animal identification. These systems work using radio frequency for sending data. Boluses retain in the first two stomachs of the ruminants and accepted as safe for animal health [21]. They can be administered even to lambs after weaning at the fifth week and the retention rate can reach 100% [22]. The injectable transponders, on the other hand, can be applied easily after birth [23], while the preferable locations differ in each animal species [24–26]. These technologies (implants, ear tags, and rumen boluses) are available on the market for cattle farmers. All these devices has special chip system for sending data for the base computer for evaluation. These devices has some specific components on their system regarding storing and evaluating data used for evaluating herd data. Some electronic tags has reader which can be receive and store the required many data for evaluation. Some of tag works transferring the number to another storage system for another evaluation stage. Data sends using antenna for transfer data on the system [27]. From a technological point of view, RFID tags can be grouped in two categories according to the carrier frequency band: LF (low frequency) tags function at 125–134.2 kHz, whereas HF (high frequency) tags function at 13.56 MHz. Electronic scales may be justified as a way to determine body condition score automatically. Another technology which is very useful for farmers is electronic weighing system. An easy and powerful electronic weighing system that accurately measures cattle weight. So farmers can monitor cattle performance easily and continuously. These system established on the road the waterer or cattle squeeze. Stored information send to the main computer for evaluation. Complimenting this is auto-drafting, where cattle going through a race are automatically separated on the basis on age, sex, or weight, or any other criteria the producer preferences.

6. Milking automation

Milking automation system is also involve the dairy sector at 1990s [28]. Suitable objective measuring systems are needed in animal husbandry to quickly and safely recognize illness, normal estrus cycle, quiet heat or stress in animals [29, 30]. An automatic milking system requires a completely different management system for milking, feeding, cow traffic, cow behavior and grazing, but also for safeguarding milk quality and animal health [31]. Electronic devices or sensors are the tools that need to take over the human visual inspection for abnormality. In order to develop sensors to detect abnormal milk a definition of abnormal milk is still basic requirements [32–36].

Sensors have been in the market for a long time, but their use in milking systems is quite new. Because milks were being evaluated by milkers during milking. However, with the development of intelligent milking systems, the use of sensors in the milking systems has become widespread [37].

The milking robots equipped with sensors to detect signs of mastitis which measures the many characters of the abnormal milk pH, Somatic cell count, milk acidity, milk conductivity etc. systems also can be regarded milking specifications of the system such as parlor performances, milking efficiency etc. [5]. Simple automatic cup removal devices monitor the milk flow rate from individual cows and at a threshold, the milking vacuum is shut off and the system is activated to withdraw the cups from the cow. Post-milking teat disinfection is an established component of many mastitis control strategies. This is normally performed manually in many farmers using either a pressure operated spray lance or more a dip cup. Behavior meter also installed to the milking systems for animal monitoring. The behavior meter continuously records the lying time, lying bouts and the activity of the individual animals. The cow-behavior observations enable animal welfare assessment in different environmental conditions and stressful situations, as well as reproductive and health status [38]. Another options to separation gate usage at automatic management systems.

The cattle separation is a risky and challenging activity that needs to be done frequently. If milkers also make an animal separation, the milking efficiency and parlor performances decrease. Reducing the need and risk of this workforce for separation is an important advantage. The grouping and separation of cattle in the big herd constitutes an enormous workload for the farmers. Electronic separation gates are not common in many cattle farms [19, 20].

Removing the labor required to separate animals can have a significant impact on the performance of the handling and management operations. To a lesser extent, diseased cows need to be brought to the attention of the dairy farmer. Some sensors are currently available for this purpose, but they do not fulfill all demands. When an operator is involved with animal separation, other tasks are not being done and performance suffers. With larger herds, identification and drafting of individuals are major tasks. Automatic drafting is not routinely installed on many dairy farms. Electronic tongue technology gives more advantage for farmers for many aspects [39]. Electronic tongue used potentiometric chemical sensors. An array comprised sensors with plasticized PVC membranes with cross-sensitivity to inorganic and organic cations and anions, chalcogenide glass sensors, chloride-, potassium- and sodium-selective electrodes, and glass pH electrode. Automatic milking systems using newly developed sensors (NIR, SCC and LDH etc.) provide much faster and more effective results. Many biosensor search studies for mastitis diagnosis continue [40].

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Tsenkova et al. [41]	Near infrared (NIR)	SCC in raw milk
Pemberton et al. [42]	Electrobiochemical sensor using a screen-printed carbon electrode (SPCE)	Detect NAGase via its ability to convert the substrate 1-naphthyl N-acetyl-b-D-glucosaminidinase to 1-naphthol
Eriksson et al. [43]	A gas-sensor array system, or 'electronic nose'	Interact with volatile substances, including sulfides, ketones, amines and acid
Whyte et al. [44]	To automatically determine the SCC based on measuring the DNA content of somatic cells	The DNA and histone levels can then be measured and correlated to the SCC
Wu et al. [45]	PicoGreen	The DNA from somatic cells was incubated with PicoGreen, and the resulting fluorescence was measured using an optical sensor
Akerstedt et al. [46]	Competitive biosensor assay	Surface plasmon resonance to monitor the interaction between Hp, which was immobilized onto the chip surface, and hemoglobin (Hb)
Choi et al. [47]	Fluorescence was measured using an optical sensor	A chip for simultaneously monitoring pathogens, somatic cells and pH in raw milk samples
Mottram et al. [48]	Chemical-array-based sensor ''electronic tongue'	To detect chloride, potassium and sodium ions released during mastitis in addition to inorganic and organic cations and anions
Moon et al. [49].	Disposable microchips	The milk sample is mixed with a lysis solution to burst the somatic cells, and a fluorescent dye is added to stain the DNA
Rodriguez and Galanaugh [50]	Disposable device	On counting milk leukocytes
Hettinga et al. [51]	Detection of the patterns of volatile metabolites produced	To identify different pathogens, such as *S. aureus*, coagulase negative staphylococci, streptococci and *E. coli*, and to determine infection-free udder quarters
Davis et al. [52]	A lactate screen printed sensor	Elevated levels of lactate
Garcia-Cordero and Ricco [53]	Biochips	Sensor-based platforms with the development of novel biomarkers could thus allow the diagnosis of the pre-clinical stage of mastitis
Garcia-Cordero and Ricco [54]	Microfluidic CD-based assay device	After centrifugation on a conventional CD-player, the SCC can be measured based on the height of the cell pellet formed
Lee et al. [55]	A biochip	Incorporated DNA amplification of genes that are specific for seven known mastitis-causing pathogens
Dimov et al. [56]	Microfluidic device	Integrates solid-phase extraction and NASBA has recently been reported for the identification of low numbers of *E. coli*

Table 1. Research results of sensors technology used for mastitis detection.

Viguier et al. [40] reported that the current SCC and alternative methods for detection of mastitis. There are a lot of sensors which are used for good quality milk productions. Faster results have been achieved with the use of microchip technologies. In addition, with these technologies, you are ready to diagnose more successful mastitis with more effective tests and results with wider angle, more accurate results. All these each tests provide rapid mastitis detection. Milk conductivity and appearance of milk is used commonly on the farms. But other methods give another early mastitis detection for the fast and accurate decision for cure disease.

A number of other methods using visible and other light spectra have shown promise in detecting milk abnormalities and measuring various components of milk [39]. **Table 1** summarized the technology of main sensors used for mastitis detection.

But De Mol and Ouweltjes [57] reported that the single and combined measures of 29,033 milkings to detect clinical mastitis and concluded that early warning is not reliable with sensors and software currently on the market. Lind et al. [58] reported that as of 2000 there were not yet sufficiently effective methods available to monitor characteristics of milk automatically so as to divert milk from unhealthy cows. Binda et al. [59] reported that many farmers were still reluctant to rely on electronic devices to monitor cow health status.

Automatic milking systems give many information about milk production, milking speed, milk acidity, milk conductivity etc. new sensor added some other new component such as milk progesterone level, milk temperature etc. But radio-frequency identification provide more possibilities for improving the reliability of collecting data.

7. Feeding automation

Computer programmer designed many software for make best option for farmer to ration preparation. Optimal feeding programs can be done for advanced options such as live weight, racing, lactation period and animal feed stock information. These programs use data from the National Research Council in animal feed and feed content.

Various systems for automated animal feeding will be used in many big dairy farms to get better production. They will comprise complete systems include each stage of feeding, feed preparation, mixing equipment and the installations for distributing feed. Feed components such as grass and maize/corn silage as well as mineral feed and feed concentrate will be loaded, mixed and delivered to the feed table built up there by the systems. The Automation systems as simple consists of a control panel, a programmable command manager, a scale, a communication interface and finally all the needed equipment to organize the feeding process and feed provision to the animal of each age groups. Computer-controlled calf feeders have many advantages over traditional calf feeding methods. Calves carry a transponder, and it is possible to follow the daily intake of individual calves [39]. Calves learn to use the computer-controlled milk feeding system fairly easily and this the technology offers a significant reduction in labor cost (73%). These systems can be combined with automatic weighing and health observation system for calf welfare. Calves reared in a group-pen had fewer

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days of medication than calves in hutches [60] fed milk-replacer from buckets twice a day. Electronic Concentrate Feeding system ensures that each cow is supplied with the exact ration of feed at the exact right time. The Belt Feeder feed distributor is the ideal introduction to the concept of automatic feed supply systems. Small, flexible, economical – the combination of a conveyor belt and sliding scraper. Grothmann et al. [61] reported that the various technical approaches to automation. These are reported that the stationary systems such as conveyor belts and mobile systems such as self-propelled or rail guided feeder wagons. In addition to feeding system automation approaches, rumen activity sensors are very popular innovative techniques for cattle farmers to reduce metabolic disorders. When the sensitive cows exhibit increasing acidosis, this allows a farmer to adjust feeding to prevent major problems [62].

Many electronic sensors can be used for rumen pH and rumen temperature of cattle. Especially rumen bolus can work 100 days continuously and data stored every 15 minutes for future evaluation [63].

The rumination activity is a good indicator of cattle health condition. A certain level of well being is a prerequisite for rumination [64] excitement and stress [65], states of anxiety [66] and various diseases [67, 68] inhibit rumination [69]. Another sensor used for collecting data for cow jaw movement to estimate chewing activity. This sensor works on the principle that the changing pressure of the animal is not detected during opening and closing of the mouth.

8. Health observation

The big hazard for animal production is to disease outbreak. The disease can spread quickly in the confined conditions. Many diseases has specific signals for detection, animals to look for signs of stress, disease, and damage caused by many agents. They alert staff or, potentially, other systems to find the affected animals and identify them report to manger before the problem spreads. An animal disease has serious economic implications on farm productivity. Public institutions and private groups are working collectively to assist individuals in addressing society's stake in disease prevention and control [69]. The right time detects disease three to 5 days' sooner, reduce treatment costs, reduce mortality rates, improve production efficiency. The production, product quality, product composition, body condition, and behavior provide a good indication for the health status of animals. By closely monitoring normal pattern changes, the farmers ensure animal health status. Many firms provided programs developed and provided by data collection and analysis products for monitoring animal behavior for the best early detection system. To monitor the health conditions of each cow the sensors are mounted on the cow. Sensor networks consist of several tiny, low price devices and are logically self-organizing ad hoc systems. The role of the sensor network is monitoring the health parameters of animals, gather and convey the information to other sink nodes. Sensors that collect data such as temperature, pH, etc., receive a lot of data, so it is possible to transmit data at intervals. Many new sensor technologies that will be useful in animal health and behavior are developed [70, 71].

Another sensor usage results of an experiment in which a temperature sensor built into a bolus were placed in the rumen of a cow [68, 72, 73]. On-farm scoring of behavioral indicators of animal welfare is challenging but the increasing availability of low cost technology now makes automated monitoring of animal behavior feasible. Furthermore, behavioral measures, such as the occurrence of aggression or stereotypic behavior, are important indicators of welfare problems. Including behavioral-based welfare criteria is, therefore, essential for an overall welfare assessment.

9. Reproductive performances

Estrus detection technology; Average calving interval in cattle farm is the best criteria for comparisons for reproductive performances of the farms which is varying between 13 and 18 months [60, 74], heat detection efficiency vary between 30 and 50% in most dairy herds [69, 75]. Research results showed that the 5–30% of the cows were not in or near oestrus when inseminated [76, 77]. Results of oestrus detection varied depending on the many factor such as threshold value, cow number, barn style, and the statistical method for data analysis. The detection error rates between 17 and 55% and indicate a large number of false warnings [78]. As a result of satisfying oestrus detection and conception rates, purchase and maintenance costs of the oestrus detection system should charge off. A number of both inexpensive to expensive aids and technologies are available to meet some but not all of these criteria [79]. Traditionally, oestrus detection is performed by visual observation of the dairy herd in many countries but this procedure particularly difficult on large dairy farms [80] because of short observation periods during feeding and milking. Galiç et al. [81] reported that the effect of herd size on milk yield, calving age, lactation number, and calving interval is significantly important ($P < 0.01$) and small farms are generally more successful than large farms. Mean duration of oestrus was calculated by Schofield et al. [82] as 13.5 h with a standard deviation of 2.3 h. [83, 84]. As a result of technical progress in monitoring cows using computers, automatic oestrus detection has become possible. In many studies, different traits have been analyzed for utilization in automatic oestrus detection. The electronic systems are an electronic device that detects cows that stand to be mounted by a herd mate and provides a continuous monitoring of activity [85], radiotelemetry is a computerized estrus detection devices. Also patches give another possibilities using mounting activity of cows. I a cow mount another cow then he transmitter is depressed and a signal sent to a receiver. During this time, date, time and duration of the mount stored and send to the main computer. On computer all these data evaluated and prepared for final decision.

Although costs associated with computerized estrous detection are higher than other methods, the benefits may pay off with increased estrous detection accuracy. Estrus detection errors can result huge economic loses for dairy farms. The economic loses vary \$2–\$6/day for dairy farms. But missing 1 cycle cost \$42 to \$126 for a cow. Using detection aids provide advantages because of the prevention of these losses [85]. Pedometers are used to detect the estrus by storing past physical activity the current physical activity and comparing it previous activity data. After analyzing data programs prepare report for cow which is activity accepted as estrus. Beeper or flashing light is also use for alerts the farmer for control this cows [79].

Pedometers also used for estrus detection attached to the leg of the cow to measure the amount of her activity over a unit time span.

Many pedometric systems are commercially available in the market. Also standing activity systems is commercially available in the markets. Standing activity activated by the mounting cow. Radio signal picked up by receiver and relayed to a buffer and a personal computer to analyzing of data. This system record cows number, standing time, date and duration to evaluation on time [79].

Chung et al. [86] reported that voice identification processing can be used to detect estrus both economically (simple microphone) and accurately (over 94% accuracy), either as a stand alone solution. The Mount Count manual version of the Heat Watch system is also available in the markets at more low price which is not required a computer or software to process and display the data. One aid is a pressure sensitive device mounted on the back of each cow, which can be triggered when the cow stands for mounting. Pressure sensitive device is programmed when a certain number of valid mounts have been recorded a light give signals. The second one is effective aids for detecting standing estrus is a marker or teaser animal. Marker animals are worn marking device. When an animal in standing estrus is mounted by the marker animal, the chin-ball marker will rub against the animal in standing estrus, leaving marks on her back and rump. Mounting and standing activity are effective methods for estrus detection. There are many other methods available on the system such as cervical mucus, vaginal characteristics, temperature, blood flow, and hormone changes in blood and milk. But these methods not applicable on the farm level. Milk progesterone level is o good criteria for stage of the cycle or pregnancy. So it can be used for diagnose problem cows in herd [87].

The behavior meter continuously records the animal behavior for many purposes (lying time, lying bouts and the activity of the individual cows). The cow-behavior enables animal welfare assessment in different environmental conditions and stress situations, as well as reproductive and health status [28].

Pregnancy check: Pregnancy diagnosis is one of the most important factors to get ideal calving interval. The most common methods are rectal and transrectal ultrasonography of the reproductive tract. Both procedures are required training and time. An experienced practitioner using ultrasound can reliably diagnose pregnancy from 30 days gestation whilst an experienced veterinary is able to diagnose pregnancy from 35 days. Enzyme-linked immunosorbent assay (ELISA), radioimmunoassay (RIA) or latex agglutination (LA) tests use either blood or milk to detect a marker of pregnancy. Estrone sulfate, progesterone and glycoproteins are used for indicators of pregnancy in cattle [8, 88, 90]. Estrone sulfate is a conjugated steroid product of estrone, is produced by the fetus and as such offer high specificity. The negative part of this test is to high rate of false negatives and the inability of the test to reliably diagnose pregnancies before 100 days of gestation [88], progesterone [89]. Wireless system was designed to measure many characteristics of cows is also developed to detect early stage of pregnancy in multiple cows.

10. Barn environment control

Animal production starts at environment which is cow lived in. Many factors affect the sensitivity of cows to their surrounding environmental conditions. Latest technologies involve the use of sensors to collect data, followed by data analyses with the objective of enhancing the understanding of the system interactions, and developing control systems [91]. Latest technologies aim to provide adequate data for producers and farmers to optimize the efficiency of their agricultural system, thus increasing the overall performance of the animals. There are many sensors for use at dairy barn environment control automation. Temperature and relative humidity sensors; airspeed sensors, carbon dioxide sensors, ammonia sensors and light sensors etc. When ambient temperature gets warmer than 25°C cow begins use their energies to cool themselves down rather than to produce milk. The effects of heat stress on dairy cattle physiology and productivity have been well established. Milk yield can decrease by about 10 percent. At the same time, if the environmental factors for example air quality are poor, milk production and quality can be affected adversely. However high producing dairy cows need an optimal indoor climate throughout the year, to maintain high production levels. Barn environment is also important for the farm worker. While the thermoneutral zone for cattle ranges from −5 to 25°C [91]; the thermoneutral zone for people is shifted to higher air temperature ranges. Modern technology also helps to control barn environment which is many sensor installations to measure factors such as temperature, humidity, solar radiation, and luminosity over a large cultivated surface. These sensor and automation systems planned as a capable of recording and adapting to environmental conditions inside the barn. The variety of sensors monitors a wide-ranging range of parameters of interest. Automation systems not only can automate for temperature, but also have wind and rain sensors. The wind sensors feed wind speed data into the controller, which then adjusts curtain height to compensate for higher air transfer rates. The rain sensor can be programmed to close the curtain to a predetermined height when it rains to keep moisture off cows and stalls. Cows likes bright environments. For this reason, equal illumination in barn improves milk yield. This is especially important during short winter days. For this reason the right kind of illumination planning, dimensioned to the size of barn, orientation of barn and roof material is very important for good illumination in barn.

Lighting is the most obvious change with the shift to automatize barn. Digitally controlled LEDs can extend the day, supplementing sun in autumn and winter. LEDs use less energy than traditional lamps, making artificial lighting economical. The availability of specialist barn luminaires makes it possible to tune the color. New technology provided is a self-regulating, micro-climate controlled environment for optimal animal growth and production. New technologic tools can monitor nearly every aspect of animal barn indoor environment. Incorporating the environment-sensing capability of wireless sensor networks into mobile monitoring systems can provide convenient control of the barn microclimate anywhere, anytime for more productive animal production. Environmental sensors and other control facilities of the barn is first component of the barn automation. Secondly computerize system for monitoring and controlling for barn environment. And thirdly supports the communication between this two component.

11. Conclusions

The industrial revolution has made a radical change in the production method and systems throughout the world. The net result has been the more comfortable animal, higher production, and decreased labor. The rapid penetration of these new age technologies will provide a further layer of sophistication of farm work and new strategies in animal production. Some of the technologies are already available on the market for framers but most are at the research stage in labs for new applications. Each new technology can enable productivity, growth and other benefits at farm level for animal and farmers as well as at the level of the country where productivity acceleration is sorely needed. Within countries, technology potential will be affected by their sector, and these activities will be affected within sectors. Although some of these technologies are already available, most are at the research stage in labs. Taking all of the factors into account, someone estimate it will take times for technology effect on current farm activities. Animal farming is to big market for technologic applications for more convenient production. While most of the farmers are reliant on new technologic applications to improve their productivity and competitiveness, technology plays a major role in achieving many critical tasks in many animal farms. In today's dynamic competitive market, it does not matter where they operate and where they operate for farmers that the use of technology is not an option is a solution for their problems.

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