Mechanization and automation trends in the urban dairy farms: A review

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Abstract
Application of automatic technologies is a growing trend in the livestock industry and plays an important role in the future prospects. The automatic systems most commonly used in animal production concern the various objectives (Cattaneo, 2009) which include automatic identification, drafting, feeding, milking, detection of estrus, detection of births and many other farm operations. Reduced labor demand and better social circumstances for the dairy farmers are the attractive benefits of Automated Milking Systems (AMS). Other potential benefits are improved animal health and well-being and increased milk yields.

Keywords: Mechanization, automation trends, urban dairy farms

Introduction
India, well known as oyster of the global dairy industry accounting to 132 million tonnes (MT) of milk production (DADF, GOI, 2012-13) is a major contributor to the total livestock output value to gross domestic product (GDP). By 2022 demand is expected to be 200 MT, due to this rapid increase in demand for dairy and its products and increasing urbanization, it might be dream for anyone to capitalize this fast growing milk and its products market. So the dairying has taken a new turn by venturing itself on commercial basis leading to the growth of milk production activities in and around urban areas.

Automation is the use of mechanical and electronic equipment to reduce the need for human labor (Evodarek, 2012) [3]. In the long terms, productivity and especially productivity growth are necessary conditions for the survival of a farm. To improve productivity at the farm level of investments in new technology are needed and across the globe, the trend towards fewer, larger dairy operations continues.

Mechanization and automation trends
Based on the herd size and availability of labour use of mechanization and automation in various operations in dairy farms was determined. The usage of mechanization in dairy farms was high as the average dairy farm size grew by 37.5 percentage in cows (Khanal et al. (2010) [4]. Jago and Woolford (2002) [5] studied on automatic milking system: an option to address the labor shortage on New Zealand dairy farms and reported that automated milking systems offer the dairy industry a future alternative to current milk harvesting techniques with potential for addressing the on-farm labor issues facing the industry and also said that automatic milking systems have the potential to allow more flexibility in the daily routine of farm staff.

Milking automation and infrastructure
Different milking parlor types that includes, Side Opening (Tandem) Parlor, Herringbone (Fishbone) Parlor, Parallel (Side by Side) Parlor, Swing (Swing-over) Parlor, the Rotary (Carousel, Turnstile) parlor are in use. According to him, Herringbone parlor is the most common parlor type Reinemann (2003) [6]. Bickert et al. (1973) [7] have considered basic types of parlors in which he has noticed that herring-bone and rotary parlors are equipped for the large herds and concluded that more than one parlor system may be economically feasible for a given farm.

Infrastructure and automation in storage and processing of milk
Various types of automation in storage and processing of milk used by the dairy units are bulk milk coolers, pasteurization unit, packaging unit, value addition equipments, clean in place, UHT plant etc.
Dhruv (2014) had reported in his studies that food processing sector continues to expand in response to changing demographics, strong local and international brands, emerging modern retail and growing consumer acceptance of processed foods and also reported that milk share is 35 percent which is a large segment of processed milk consists of packaged liquid milk.

**Mechanised feeding and watering**

Tower silos with mechanical unloader of total mixed ration to feed their animals through wagons along the feed bunks through TMR wagons are in popular use. Samer. M (2009) who observed that feeding equipments are common in the automated and semi-automated dairy units in the case of sizeable herds. The feed that is mechanically mixed and distributed along the feed bunks was also observed by Lindley and Whitaker (1996). Automated wagering facilities such as water troughs were used in loose housed herd. Tillie, (1999), who recommended water troughs for large herds in loose housing, with a capacity of about 200 L and the size of the trough, should allow cows to take 0.2 to 0.33 liters/second to drink regularly.

**Mechanical equipment for harvesting and chaffing of fodder**

Fixed chaff cutter, tractor mounted chaff cutter, Harvesters, elevators, threshers are developed and have been used on a large scale. Pathak and Gowripathi Rao (2015), the agricultural mechanization has been considerably progressed over the last few years and the tractor mounted implements have become popular and being commercialized.

**Automatic identification in herd**

Identification of herd especially RFID system (majority using collars and least have gone for ear tag) is most popular. Stankovski et al. (2011) reported in his studies that automatic identification with RFID system helps to analyze larger amount of valuable information for dairy cows which is beneficial with its characteristics such as simple installation, replacement of the handwritten records with electronic ones and also easily integrated into the new or existing complex farm management system. This can be helpful for computerization of data and easy management during different activities.

**Automatic estrous detectors**

Dairy units are using activity meters such as pedometers in detection of heat in animals. These results are comparable to the reports of Michaelis et al. (2013) and Giordano (2014) who reported that automated activity monitoring (AAM) systems may be a viable and alternative to dairy farms that are in either struggle with their estrous detection (ED) program or prefer to allocate their resources and time to other activities. Similarly Jeffrey Bewley (2010) studies revealed that automatic estrus detection monitors are already being utilized by dairy producers and are perceiving the benefits that include increased efficiency, reduced cost, improved product quality, minimized adverse environmental impacts, and improved animal health and well-being.

**Equipment and automation used in waste handling and disposal**

Waste handling and disposal has been the major concern in urban dairy farms. use of biogas plants, mechanical scrapers in combination with biogas plant, hydraulic flushing system has been in rise. Henna Hamadani and Azmat Khan (2015) in their studies revealed that use of barn cleaning equipments and their automation saves time, requires less labor, improves product quality and increases production efficiency, accuracy and safety and are gaining popularity.

**Equipment and automation used during summer management**

The use of equipments and automation in summer management among the dairy units is gaining popularity due to changing climate scenarios. Use of fans, foggers and combination of sprinklers and fans has been observed. Similarly Joe Harner (2011) in his studies reported that when the temperature-humidity index (THI) is above 72, sprinkler systems can be installed to prevent heat stress to cows. Automization to overcome the excess heat as heat stress improves the health, production and reproduction status in the herd and maintain the persistency in milk production.

**References**


