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Impact of COVID-19 Pandemic on Animal Husbandry: A Review

S. G. Patil[1] and N. A. Patel[2]
Principal, Shantiniketan Kanyashala, Sangli[1]
Assistant Professor, Vivekanand College(Autonomous), Kolhapur[2]

Abstract:*The COVID-19 pandemic across the world had different effects of the disease on almost all countries, various industries, and numerous economic sectors that in term were often managed in different ways. At the global level of quarantine and lockdowns to cope with the COVID-19 pandemic, the whole of humanity has been faced with various problems, food insecurity being one of them. This review highlighted the impact of the COVID-19 virus on the animal husbandry sector. Dairy, meat, poultry, aquaculture, and others (insects) are the segments of the animal husbandry industry. Animal husbandry plays a very vital role economy of many countries. The globe, almost all countries have forced the closure of schools, restaurants, malls, shops, and markets, limitations on public gatherings and travel resulted in decreased demand for animal products. Lockdown restricts movement and disrupts national and international trade routes is holding back farmers' access to breeding materials and replacement stocks. This can hit hard to sales for input providers. Pandemic has adversely affected livestock production, animal feed supply chain, skilled workforce, and products from animal husbandry.*

Keywords:Animal husbandry, COVID-19, pandemic, etc.

I. INTRODUCTION

Humanity faced an almost unusual situation in early 2020 when a novel coronavirus named SARS-CoV-2, causing a disease known as COVID-19, changed lives around the world (WHO Novel corona virus-china, 2021). The emergence of a COVID-19 pandemic disease should not have taken the world by surprise because zoonosis was already documented in the history of that term epidemic [1]. In the last century, the 1918 influenza pandemic infected approximately 500 million people and killed 17–50 million [2]. Also recently, the 2009 swine flu pandemic infected approximately 61 million and killed an estimated 284,000 [3]. In a pandemic, COVID-19 has had a considerable impact on many sectors at global, national, and regional levels, including the livestock sector [4]. During the 1950s and 1960s fears of the scarcity of food were increased by the rapid population growth [5]. 2.56 billion Human population in 1950 increased to 3.04 billion in 1960, and 4.34 billion in 1980. The fears of food scarcity were overcome by the tremendous increase in yields of cereal crops, which was achieved by the Green Revolution during the 1960s [6]. Now, the world population has reached 7.8 billion in 2020 and is predicted to be 9.8 billion by 2050 and will be 11.2 billion by 2100 [7]. As an effect of increased population and food scarcity 820 million people are prone to undernourishment [8], and nearly 2 billion are suffering from malnourishment because of protein and vitamins deficiencies [9]. A pandemic may bring expected challenges but there are always unforeseen consequences that beyond human health. The possible zoonotic nature of the disease and viral spill-over has become more serious due to the transmission patterns to humans from animals and with the continuation of the COVID-19 pandemic, transmission from humans to animals and spillback events to other animal species were reported [10] [11]. This pandemic affected many sectors of the economy adversely, one of these sectors includes the 'Animal husbandry sector'. This sector is currently under a tremendous burden. Basically, animal husbandry is a branch of agriculture, concerned with livestock that is raised for meat, milk, eggs, fibers, etc. Based on the regional viewpoint, the most affected regions are the US, China, Italy, France, Germany, Spain, the UK, and India (OMRP report, 2020). This review highlighted the impact of the COVID-19 virus on the animal husbandry sector. Along with a significant contribution to the economy, livestock also provides food and non-food items to common people such as milk, meat, egg, fiber, skin, draft-like bullocks, dung, and animal waste used in agriculture areas.

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The objective of sustainable agriculture with livestock is to adopt technologies that increase food production [12] [13] [14] and also minimize any risks of diseases and infections through intensive livestock farming [15] [16].

II. Materials And Methods

This systematic review of the impact of the COVID-19 pandemic on animal husbandry industries literature searches was conducted independently by authors. A preliminary search in Google Scholar for articles that reported data on Searches was retrieved from electronic databases including Web of Science and Pubmed through the use of multiple keywords and expressions that were collected in a reference manager system. In addition, literature including news from media, reports from international, governments, and non-governmental organizations were included.

Pandemic Affected Animal Husbandry Adversely

Globe went through haphazard changes due to the COVID-19 pandemic; various sectors were threatened and concerns had upraised regarding basic global food security, including production, transport, and maintenance of the supply chain with demand [17]. Most animal organizations and individuals with animals under their care had emergency plans and preparations as per the lessons from previous pandemics in place for such conditions; however, to prevent the spread of COVID-19, human movements were restricted, coupled with the health effects of COVID-19 on the skilled workforce and economic impact, constituted a new threatto animal welfare for this condition there was no preparedness [18] having an unusual impact. Almost all countries had limitations on public gatherings and travel and forced the closure of schools, restaurants, malls, shops, and markets, resulting in decreased animal products demand [19]. COVID-19 infections among skilled workers and subsequent closure of slaughterhouses and food processing plants had also reduced slaughtering and processing throughput [20], all these conditions lead to the overstocking of animals and animal products, and also the killing of animals [21]. To reduce the unbearable costs of animal population maintenance, to whom farmers were not able to feed or trade, farmers depopulated their farms [22]. Decades of modelling pandemics predicted potential consequences, and COVID-19's had an unexpected impact on the food supply chain, and specifically livestock production [19]. Impact of Corona viruses on sectors of animal husbandry.

Poultry

COVID-19 was neither the first nor only challenge to the growing poultry sector faces. The avian influenza outbreak of 2007 had consequences like shutting down more than most of the poultry farms and hatcheries, and also the emergence of disease continues to afflict poultry farmers [23]. Even though chickens are not known to be infected with COVID-19 through the intranasal route, still COVID-19 has had economically negative impacts on the poultry industry [27]. Recurring outbreaks of other diseases in flocks have hindered overall production, leaving some farmers in irresolute financial positions [28]. Raise the price of Day-Old Chick by hatcheries for certain events and festivals, putting farmers at a disadvantage [29]. Because most poultry workers do not have paid sick time, no adequate health care, and low wages, they have limited reserves makes them able to leave steady employment. Additionally, workers in meat and poultry slaughterhouses may get infected through respiratory droplets in the air, from touching contaminated surfaces or objects such as workstations, break room tables, or tools. There was dramatically increase in egg prices during the lockdown period as consumers have started to change their behaviors and habits. The COVID pandemic might also substantially impact the international poultry trade over the next several months [30].

Piggery

The pandemic because the movement of animals comes under government restrictions had brought most pig production businesses to an entire halt [24]. At one point, there was a 45% reduction in pig processing capacity meaning about 250,000 pigs per day weren'tslaughtered. This resulted in longer transport distances to plants operating with extra capacity. Reduced demand for products resulted in increased pig population on farms in Europe [25]. Veterinary experts fear that the restricted movement of animals could produce overcrowding and disease in pig herds. [24] Additionally, large slaughter and processing plants (mainly within the United States) had to shut down because of COVID-19 outbreaks and labor shortages thanks to quarantine measures, resulting in a shortage in slaughter capacity [26].

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The growing pigs, the increasing problems caused by the shortage of space, and the incontrovertible fact that, despite great efforts, the farmers couldn't sell the pigs, caused psychological stress to farmers. By mid-November 2020, the pig jam grew up to 600,000 animals and farmers waited several weeks for a loading date. Farmers are in an absolute emergency with low prices for pork. Pig farmers faced high financial losses, and for many, it was a matter of livelihood [19].

Dairy

Milk and dairy products manufacture and sale is one of the primary branches of livestock, food production, and animal husbandry [36] that have suffered the most because dairy products are highly perishable goods and depend on integrated and time-sensitive supply chains [31][32][33][34] [35] [37][38]. It was reported that in China in early 2020 a lot of dairy farms, were not able to sell their milk and products even at the lowest prices, ultimately a few had to dump milk [33][39].The available data from various literature evidence that in 2020 the planet prices for meat fell by 8-19% and people for dairy products- by 4-8%, especially because of the decline in the economic growth process [42]. This exerted adverse effects on high value-added food products, such as milk, dairy product manufacturing branch, and meat products [36]. Moreover, changes were also observed in all stages of the value chain. During a pandemic, there was a delay and decreased feed supply related to the pandemic-driven restrictions, resulting in the reduced cow weight, and, therefore decrease in milk amount [43]. There is not enough evidence to suggest that cattle might have a role in the COVID-19 transmission. Data from a study on six animals, only two cattle tested positive for the virus in nasal swabs, indicating low susceptibility of cattle to SARS-CoV-2 infection, showing specific seroconversion [44]. However, close contact of infected humans with large numbers of cattle may still lead to infections in cattle [44]. The dairy farmers faced significant loss in both during and post-lockdown periods of the COVID-19 pandemic [40].

Fish and Cold-Storage Foods

Activities included in a fisheries/aquaculture supply chain are fishing, processing, manufacturing, transport, and an outlet to wholesale/retail markets. Every activity has an equal weightage for the success of the supply chain which was hampered by a pandemic. Each stage of the fisheries and aquaculture supply chain was disrupted by COVID-19 restrictions on human movements. After protecting every stage of the production and supply chain have continued availability of fish and fish products [4]. The SARS-CoV-2 outbreak in December 2019 has been linked to Wuhan - Huanan Seafood Market, China [45][46]. Customers' demand for packaged/frozen products increased in the second quarter of 2020 as they want to stock up on non-perishable food in fear of lockdown extension. In 2018, global fisheries and aquaculture production (excluding aquatic plants) have recorded a demand of nearly 179 million tonnes in live weight equivalent. But during the pandemic high-value fresh fish and aquatic food demand has decreased as restaurants and hotels had forced close, or partially close and restricted measures [4].

Frozen seafood items contaminated with COVID-19 have been reported in China [47]. Reports also revealed that Salmon-attached COVID-19 stayed in an infectious status for at least 8 days at 4°C, and 2 days at 25°C [47]. It is noticeable that at 4°C temperature of refrigerators, transport carriers, cold rooms for storage of fish before selling in the seafood market. Evidence suggested that the import/export of frozen aquaculture products/Cold storage foods can be a source of transmission of COVID-19 across countries and continents [49]. Some imported frozen package surfaces from China showed signs of contamination [48]. This calls for strict inspection measures for the detection of contamination in imported and exported fish during the pandemic [47]. Some countries have exempted the aquaculture sector from lockdown measures [50] or established guidelines to regulate the exercise of the free movement of workers during pandemics [51].

COVID-19 Effects on the Livestock Product Supply Chain

Livestock, particularly pig, dairy, and poultry sectors, increasingly in the developing world, is characterized by its thorough nature, started by post-war government policies have had intentions to increase production and decrease cost, but still continued by consumer demand now for cheap food [54]. COVID-19 pandemic had an immediate impact like a wave of panic buying by the public [19] affected the global animal husbandry industry. There was a sharp fall in the demand for meat because during an outbreak there were various rumours amongst the people that the virus can spread

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through the animal's meat. However, CDC (Centres for Disease Control & Prevention) declared that coronavirus is transmitted via direct contact with humans, and not via livestock. The regional demand for chicken and meat were decreased as there wasan increasing rate of virus spread. It has also been witnessed that the people were opting for the jackfruit as the replacement for chicken and mutton. Whereas, hampered food chain services including restaurants had affected the market growth (OMRP report, 2020). The disruption of the logistical channel and drop in demand was reducing sales and lowering prices. As a result of limited markets access and slaughterhouses/processing plants, farmers have kept their stock longer or dumped milk, meat or products burdened them with higher production costs or important losses [4].

Reduced Access to Animal Feeds

COVID-19 exposure and transmission risk of COVID-19 via contact with livestock like chickens, ducks, poultry, pigs, cattle, or through consumption of contaminated food are currently considered negligible [55][56]. However, concerns were raised about transmission through the consumption of aquatic animals- finfish, crustaceans, mollusks, and amphibians [57]. Physical distancing and additional personal protective equipment to avoid transmission were reducing the working efficiency of feed enterprises. Exports/imports of animal feed at the international level cease the supply of basic raw materials that are important for raising and fostering animals [58] which included a mixture of carbohydrates, proteins, fats, minerals, and vitamins. Argentina is the world leader in soybean meal exports, and had reduced exports of soybean, an important animal feed ingredient, to half for feed manufacturing factories [59][60]. Movement restrictions also affected the ability to feed farm animals [61]. International and regional restrictions have naturally led to increased costs of animal feed ingredients, which impacted animal farms. Dairy feed prices were raised by 3.7% in Bangladesh [62]. The prices of key animal feed ingredients have increased by 15% in India and many regions in Africa due to pandemics [42]. In the UK, the prices of soymeal, molasses, wheat corn, and some important animal feed had increased due to COVID-19 (Department for Environment, Food & Rural Affairs, 2020). Import restrictions have an adverse impact on areas to sustain production or rely on meat and dairy imports for consumption [61]. Live animal markets closure in many countries were in turn resulted in small-scale producers cannot sell their goods.

Reduction of animal production/Access to Market and Consumers

During a pandemic, essential livestock farming materials were largely unavailable. These include frozen semen aliquots for artificial insemination of livestock, replacement stocks (like piglet's day-old chicks, heifers, gilts), equipment (milking machines, manufacturing equipment), and animal feed additives (like vitamins, minerals, antibiotics) [4][59][55]. Veterinary healthcare services and other animal health preventative services had greatly reduced during the pandemic [63]. This caused significant delays in the diagnosis and treatmentof diseases. The reductions and delays resulted in halting the progress in the prevention, control, and eradication of different animal and zoonotic diseases. As zoonotic diseases have an impact on humans, the pandemic-triggered disruptions endangered human health in addition to animal health. Moreover, COVID-19 has severely impacted animal health extension services, food safety inspections, and disease surveillance efforts which were important to prevent the spread of zoonotic and infectious diseases that jolt human/animal health [4][63].The closure of animal markets and restrictions on export and import operations have deprived livestock producers of precious local and global marketing opportunities [59]. As well, mediators who collect animals, animal products, and by-products, and then process or sell them have hit hard, which caused farmers to disrupt links to important buyers [4]. This leads to a sharp decline in the processing and slaughtering of animals which further added to the huddle in the livestock market [19]. This had affected both animals and animal products such as milk, eggs, meat, and others. Some farmers had to cull their animals or dump their animal products such as milk, which caused them significant economic losses. According to the FAO, these losses were severe for women, unable to obtain the nutrients needed by their small ruminants and poultry [4].

Shortage of labour

The pandemic disrupted a wide-scale market impacted the workforce and caused staff shortages and layoffs associated with animal production [64]. Labour layoffs were increased, due to confinement measures, travel barriers for migrant workers for extended periods of lockdown, and also because of financial issues for farmers, (Virginia Agricultural

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Research and Extension Centres, 2020) [19]. Many of them had to return to their home during the lockdown and other rules that were implemented during the pandemic [65]. Other reasons for the shortage of labour include quarantine, sick leave, and child care resulting in a 30% absence rate in some slaughterhouses in France and similar issues in some countries in Asia and Africa [4]. Owing to these and to other factors, the process to bring animals and animal products to local or global markets faced the path of many hurdles. In India, the labour shortage leads to a 23% production loss of food grain (animal feed) [65].Labour shortages were concerned with food insecurity and hunger concerns for daily wage workers in animal sectors [66]. Expecting a shorter duration lockdown due to COVID-19, the fishermen parked boats in the harbour areas. This created a huge influx of fishermen and workers left idle in congested dwellings lacking essential amenities like food, water, and electricity [74][75][76][41]. After the first lockdown, anticipating a prolonged effect of the pandemic, the fishermen and the migrant workers left (towards their native places) the harbour townships by stably parking the boats [77][78][79][41].

COVID-19 Pandemic and Maintenance of Hygiene

The worldwide demand for animal husbandry products has been increasing in recent years because of the rapid growth of the population in many parts of the world [67]. However, working in slaughterhouses and meatpacking plants was considered a major risk for COVID-19 infection during the pandemic [68]. Workers in meat plants and slaughterhouses in Germany, England, Wales, and Portugal have reportedly been infected [68]. The outbreak led to the closure of the poultry/ slaughterhouse and the implementation of strict hygienic measures, along with health screening of employees, adding new bathing areas, and replacing disinfectants with stronger ones [68]. There is no scientific evidence suggesting that the virus has been transmitted by eating contaminated food [69] or can the virus grow/ multiply on the surface of food stored in a cupboard or freezer [70]. Still, there is the possibility that food animals and their products could become contaminated when handled by infected people that may shed the virus or through contaminated surfaces.

New data have shown that COVID-19, in certain environmental conditions could survive in plastic for up to 3 days, in stainless steel for 2 days, and in cardboard for 1-day at 21–23°C [71]; this represents a transmission risk and highlighted the need of hand-washing and maintaining hygiene. Guidelines to prevent risks of COVID-19 have been provided by WHO, FAD, the European Food Safety Authority (EFSA), and the German Federal Institute for Risk Assessment (BfR). Along with that, industry and food business operators have taken steps forward the boosting measures for personal and food hygiene principles, in refresher training to help food workers reduce the risk of contamination with the virus on food surfaces and packaging materials. Nevertheless, the food industry has still been affected by facility closures [72] and numerous outbreaks [73].

Recommendations for Animal Producers

Recommendations for animal producers during the COVID-19 pandemic.

	Recommendations
Human Health Care and hygiene	Vaccinations
	Frequent hand washing
	Disinfectants for all employees.
	Use personal protective equipment
	Monitor worker's health and symptoms.
Animal Health Care	Vaccinations of animals
	Constant evaluation of prevalent diseases
	Seek help from veterinary healthcare professionals
Farm Environment	Disinfect environment, equipment, and all surfaces
	Following the all-in and all-out system
	Separate farm animals from wild animals
	Limit adding new animals to the herd
	Limit human access to the minimum

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III. Conclusion

This review provides an insight impact of COVID 19 on the sectors of animal husbandry, workforce, product, and supply food chain. Pandemic really hit hard on the animal husbandry and will need several years together to overcome. There is a rapidly growing body of literature on this topic and hopefully, it will help for further review on the topic. Only once this pandemic end, one will be able to assess the health, social and economic impact of this global disaster as a whole hence those dealt in this review may change and or will be explained different way in the future up on the full understanding of the disease and its control has got its reach. We should be able to learn lessons especially in terms of public and global health for any future similar pandemics with one health approach.

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