CHALLENGES IN GROWTH OF LIVESTOCK AND DAIRY DEVELOPMENT SECTOR IN PUNJAB: POTENTIAL AND INNOVATIVE SOLUTIONS: A REVIEW

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ABSTRACT

KEYWORDS
livestock; innovative approaches; empowerment; economic growth

Livestock and dairy farming make up the bulk of Pakistan's economy. Punjab is the hub of agriculture and livestock due to its land and climatic features. However, there have been a lot of challenges that are slowing down the progress. Pandemics, epidemics and climate catastrophes have caused the major impact. Dairy farming is providing livelihood to rural communities but some environmental hazards are also associated with it like greenhouse gases, deforestation etc, animal welfare as well. Sustainable livestock and dairy farming practices are widely applied worldwide and needed to prosper in Pakistan as well. This study is aimed at comparative review of the researches and latest techniques being tested and implemented economically and how can we adopt appropriate techniques to improve the current situation of this sector. There are many latest techniques that offer environmentally friendly livestock and enhanced production to serve the economy and conserve the biodiversity like precison livestock farming, smart farming, real time monitoring using biosensors for eary diagnoses and prognosis of diseases, detection of feeding patterns, breeding patterns etc. The study shows that most farmers in the study have a higher level of education, which is a positive sign for the future of the industry. The study also suggests that regular trainings be organized for farmers to transfer the latest technology and practices in a timely manner.

INTRODUCTION

Pakistan is an agrarian country so agriculture is the foremost contributor to its economy, contributing approximately 20% to the GDP and employing around 45% of the labor force. The country is also a major producer of livestock, including cattle, sheep, and goats. Recently, this sector has been facing various challenges, including water scarcity, changing weather patterns, and a lack of access to modern technologies. The country also exports a significant amount of meat, including beef and mutton. The agricultural sector is a major source of exports uplift for Pakistan. The government has been focusing on increasing exports in order to boost the economy.

For the country's economic development, food security, and reduction of poverty, the government of Pakistan has redoubled its efforts in this sector. The general approach for livestock development is the intervention and collaboration of private developmental programs with public sector to foster progress and prosperity. By boosting veterinarian health coverage, husbandry techniques, animal breeding procedures, artificial insemination, usage of nutritional animal hay, and governing disease control managment, the regulatory measures seek to increase per unit animal productivity. In order to overcome concerns with investment in the value-added export of cattle, the government is looking into ways to grow this industry, including by creating export meat processing zones, disease-free zones (for diseases like Foot & Mouth, Avian Influenza and Peste des Petits Ruminants), facilitating the construction of

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modern slaughterhouses after considering the needs of the industry, and offering various programs with financial sector support. The current government's priorities are breed improvement for increased productivity, the creation of nucleus herds, and the identification of breeds that are well suited to Pakistan's various agro-ecological zones.

According to estimates, there were 31.2 million sheep, 1.1 million camels, 49.6 million cattle, 41.2 million buffalo, 78.2 million goats in Pakistan in the 2019–2020 fiscal year. According to estimates, there have been 42.4 million buffalo, 51.5 million cattle, 1.1 million camels, 31.6 million sheep, 80.3 million goats, in the world in 2020–2021 (GOP, 2021). There have been abruption in the estimated growth of due to climatic changes and other factors.

Since Pakistan's population is expected to reach 234 million by 2025, up from 65 to 165 million today, advances in cattle reproduction techniques, animals genetics, milk microbiota, livestock products technologies, and dairy functional foods have to be implemented. Intense competition of using abiotic resources like land area for habitat and water as well, will result to enhance food production. Already vulnerable natural systems will be put under more stress. If farmers are properly trained, they may be able to feed cattle using agro-industrial wastes and unconventional feed sources. If fodder conservation measures are included into cattle feeding systems, the situation might considerably improve. Pakistan requires a competitive and lucrative dairy farming sector for social, environmental, and economic reasons. The genetic improvement of local cattle through cross breeding has improved milk yield, accelerated growth rates, and increased prices, but its selective application has also been linked to immunity compromise due to rapid infections, nutritional or abiotic stress, or rapid thermal fluctuations in the region. Local breeds have a low potential for productivity. In order to simultaneously achieve enhanced technologies that curtail these strains, sustain high health and welfare ethics, and synthesizing value added products and integrating them into ordered feeding supply chains, ever more intelligent approaches will be required to address the enduring impacts of new schemes (such as robot milking, protracted lactations and continual housing). Milk, meat, and egg processing, packaging, and marketing with value addition would enhance our products for the people of the nation and serve as a foundation for exports, which would support the national economy. To supply halal diet to consumers in non-Islamic areas, there must be a national precedence of developing such local production units that can manufacture export quality international halal food (Khan et al., 2013; Nadeem et al., 2012).

There are challenges of climate variations, food security, and venture capital based farming techniques in South Asia, explicitly in India, Pakistan, and Bangladesh, according to the records from 1973 to 2020. The study of Yaqoob et al. employed a panel data set and the ARDL (PMG) approach, a active modeling technique for diverse data, to analyze the demographic patterns' impact on crop productivity and land use in these countries. The results suggest that technology innovation and climate-friendly farming practices are needed to address the food demands of the future and to prevent further degradation of small farmlands (Yaqoob et al., 2022). These factors that contribute to the less endurance of this sector in Pakistan, includes environmental changes, technological gaps, and lack of institutional support. Environmental catastrophs i.e., famine, water scarcity and flood, have a negative impact on the sector, and farmers' access to cutting-edge tools and skills, upgraded inputs, and management approaches is inadequate. Additionally, poor performance in the sector is also due to lack of established policies and scarcity of information and training and education for farmers. To improve agricultural productivity and to meet local revenue demands for food and other products, there is a need to address environmental constraints through adaptation, and technical and administrative blockades need to be addressed. Monetarial and information facilities should be made common and easily accessible to farmers under legit regulations. Training of latest techs and machineries will help farmers to maintain higher and better yields,

and agricultural advisory committee can also serve as a connection between scientific personnals and farmers to adopt new techs to overcome on-field restraints (Elahi et al., 2018).

The COVID-19 pandemic had a drastic impact on the dairy sector in Pakistan, resulting in economic losses and decreased milk production by 20% to 30%. The milk supplies were adversely affected due to closure of feed mills and restrictions on transportation. Milk production and its trade faced a lot of challenges due to the quality assessments checks and led to economic losses in dairy production. Fodder accessibility at commercial level to dairy farms was very low. Income of dairy industry is basically resourced by milk production, but this pandemic caused a downfall to food supplies, hospitality industries and dairy products transport. Ethiopian Country Commercial Guide (2020) surveyed that hotels were closed, as well as consumers considered milk and dairy products as possible carriers of the virus, so their consumption was decreased. This was only a myth and it had no scientific basis according to WHO and FAO data. In those time government support was direly needed to avoid any downfall of the dairy industy and associated enterprizes like restuarants, bakery, dairy nutraceuticals etc. Otherwise, prolonged consequences would remain beyond this pandemic (Hussain et al., 2020). It is also be noted that there are a number of complaints regarding the quality of dairy and meat products, and with the ever-increasing demand during these difficult times due to lack of checks.

Climate change is having a negative impact on livestock productivity by increasing heat stress in animals, leading to decreased milk production, reproduction, and health, as well as increased mortality rates. Studies have shown that temperature, moisture content, air quality and wind speed directly impact the quality of milk and reproduction rate as well. Drought and famines also pose a decline in milk production and value. It is predicted that livestock industry would decline by 20-30% in the future and major factors are global warming. Therefore, the crisis and retail prices are booming in the dairy and meat industry for consumer.In Pakistan, farmers are aware of the impacts of climatic fluctuations and extreme weathes, leading to frequently occuring severe heat waves, droughts, floods, pests and diseases, and varying humidity. The most dreadful climatic risk known is dorught, as it causes devastation to the herd distribution, feeding patterns, milk production, and production cost of dairy farming. Changing fodders, change in farming patterns, migration and off field practices and such other strategies are crucial to deal with these risks. It is suggested that the government should focus on evolving long-term and locally adaptable policies for the livestock sector, particularly for small-scale farmers. Additionally, education, extension services, and media should be used to educate and motivate farmers to adopt measures to cope with climatic risks (Abbas et al., 2019).

According to Global Climate index 2022 of GermanWatch, Pakistan ranks 5th in the Country CRI score for the period of 1999-2018 (1998-2017). The death toll in Pakistan during this time period was 499.45, with deaths per 100,000 inhabitants at 0.3. The entire losses in million US dollars PPP were 3,792.52, with casualities per unit GDP at 0.53%. There were 152 trials recorded during this time period (Eckstein et al., 2019). It is to noted that the recent flood disasters in Pakistan have caused the most loses to the rural areas and agriculture, that has caused a drastic shift in national economy. The rapid restoration projects with the foremost aim of fulfilling farmers' loss, giving them lands and restarting their business; are the need of hour.

Livestock farming has a significant impact on the environment given the release of greenhouse gas, nutrient cycles disruption, and undesirable influences on biodiversity. The transmission of food and water borne diseases and the zoonotic diseases emerging from consumption of dairy foods causing a major threat to public health and one of the most common issue is antimicrobial resistance. The Gridded Livestock of the World Database (GLW) aims at arranging, collection, and broadcasting global national and multinational livestock data and predicting census of livestock animals in regions and also pointing at missing data. GLW 1 was

released in 2007 and GLW 2 in 2014, with updates including finer-scale input data and higher spatial resolution (Gilbert et al., 2018; Robinson et al., 2014). Moreover, the study aims to find out how the livestock sector can contribute towards food security, women empowerment and economic uplift?

RESEARCH METHOD

This study has been conducted through qualitative approach. The requisite data was obtained from primary and secondary sources like departmental reports, research articles and direct interaction with livestock farmers.

Researchers search and analyze literature relevant to the research topic, namely challenges in the growth of the livestock sector and dairy development in Punjab, as well as innovative solutions that may be applied. The study used secondary data sources, such as departmental reports and research articles, to gather the necessary data. Furthermore, researchers conduct an analysis of data obtained from literature relevant to the research topic. Therefore, the analysis method used is content analysis, which is the categorization and elaboration of verbal or behavioral data to classify, summarize, and create data.

RESULTS AND DISCUSSION

A World Bank report has highlighted that livestock production in Pakistan is a momentous to greenhouse gas emission. Extenuating these emissions can be achieved by training farmers and workers in the livestock and dairy industry to improve ventilation, sunlight, and sanitation in farm sheds, as well as properly disposing of dung and utilizing it to produce biogas. Livestock and dairy farming is an important sustenance and income source in Pakistan and financial institutions such as the Asian Development Bank and the International Union for Conservation of Nature are interested in supporting efforts to improve living conditions and reduce emissions in this sector ("Dawn "Green Livestock"," 2023).

The core of Pakistan's rural economy, the agriculture sector, has been severely impacted in 2022 as a result of a number of problems, including catastrophic floods, inefficiency, poor governance, and steadily rising inflation. Concerns have been raised about the state of the agriculture industry and the food security in Paksitan and the impact of these factors in the coming year. In 2021–2022, the agriculture industry grew by 4.4% as said by Economic Survey of Pakistan 2021–2022. The agriculture sector in Pakistan has been predicted to have suffered losses from floods of Rs800 billion ($3.725 billion) by the Planning Commission, with Sindh and Balochistan being the hardest hit provinces. A temporary reduction in livelihoods, employment, and revenue from agriculture has also resulted from the damage of crops, livestock, and aquaculture infrastructure and assets, as has a probable decline in the export. Although the government has pledged a Rs. 1,800 billion assistance packages, it is unclear whether it would have a meaningful effect on the industry. Overall, according to Chaudhry Ahmad Jawad, president of the Pakistan Businesses Forum (PBF), Pakistan's agriculture sector had significant setbacks in 2022 (Haq, 2022).

AFM1 in raw milk and UV and ultra-heat treated milk samples during the winters were significantly higher than those from the summer using HPLC. However, there were no significant differences in the AFM1 levels in powdered milk, flavored milk, yogurt, and flavored yogurt between summer and winter samples. The variation in AFM1 levels is likely due to contamination of feedstuff used for dairy animals, which may be more contaminated in the winter due to the use of concentrated feed instead of green fodder (Iqbal et al., 2017). Similarly, there is a rising risk of parasitic infections. Financial impact of losses brought on by symptomatic and acute theileriosis in Pakistani Holstein Friesian cattle. Hemoparasite *Theileria annulata*, which is spread by ticks, can make calves infected with it anemic and less

likely to produce milk. From July to November 2015, an investigation was carried out in a dairy farm of Holstein Friesian cattle in Dajal, Pakistan. The cattle were brought here from Australia, and the property is a part of a private-commercial livestock farm. The study attempted to take into account additional health conditions such parturition disorders, intestinal parasites, and clinical or sub-clinical mastitis that can have an impact on milk production and animal health (Rashid et al., 2018).

The agricultural profitability in eastern Pakistan's Punjab province is related in relation to various variables. Profitability can be increased by removing the major obstacles, such as inadequate livestock management, a lack of technology, and a lack of available capital. Profitability can be significantly increased by using better managed dairy cattle, adopting more straightforward technical advancements, and improving loan availability. They also highlight the significance of finances in any intervention plan and show how these components work together harmoniously. Decision-makers in agricultural development to establish more specialized initiatives that will increase the profitability of farms. One of the major factors is the choice of species, with buffaloes generally producing greater profits than cows. Lack of fertility supervision, such as prolonged calving and birth control intervals, also affects productivity. Additionally, poor management of technologies like new variants, pesticides, and fertilizers can result in low yields of forage crops. A lack of animal nutrition education can also lead to poor livestock diets (Cain et al., 2007).

The Pakistan Bureau of Statistics and the Nation Food Security and Research provided annual time series data for the study. The Johansen Co-integration and Granger causality etc., approach can be utilized to ascertain the direction of the long-term link between the production of the dairy industry and agricultural GDP. The findings are positive and substantial. Based on empirical conclusions, the report advised that rural areas receive extension services, that ZTB and commercial banks introduce new financing programs for dairy farmers, and that the Pakistani government promote investment in the dairy sector (Chandio et al., 2017). MN Ishaq et al. evaluated the economic benefits of cooperative memberships in milk marketing associations in Vehari and Muzaffargarh, Punjab. The study found that co-operatives had man benefits over non members like greater yields of milk, meat and improved income, stable farming, tended breeding programs of new cattle breeds, more access to veterinarian health facilities, and used more nutritious fodder and silage. Milk marketing cooperatives can also achnieve more economic gains for women dairy small-holders and for rural development assistance (Ishaq et al., 2016).

Importing livestock to places where they are unfavored genetically can lead to poor productivity and increased costs for farmers. Instead of importing breeds that are not modified according to local climates and outbreaks, farmers should focus on breeding and cultivating animals that are already adapted to their regions. The use of cutting edge genomic evalutations can guide selective breeding to boost production of these animals. Additionally, keeping animals healthy and maintaining good animal welfare in order to prevent the spread of diseases that can infect both humans and animals. One way to boost the productivity of ruminant animals is by using supplements, such as certain plant extracts, that encourage the growth of beneficial microbes in the rumen, which can lead to more efficient use of nitrogen and energy and less production of greenhouse gases and ammonia. Like waterferns are grown around water ponds to provide more protein content to livestock. Governments and stakeholders should promote researches and cost effective ways to deliver them. Sustainably managed grazing can have positive effects on biodiversity, ecosystem, and carbon assimilation by plants and soil. Cattle also provide a number of by-products, such as hides, wool, traction, and biogas (Eisler et al., 2014; Montea et al., 2014).

Research is crucial to help pinpoint the factors that are hindering its growth. Various research methodologies, including questionnaires, in-depth interviews, field studies, literature review, and data analysis are essential to gather data and insights. Identifying major challenges, evaluating the effectiveness of existing policies and programs, exploring new solutions and technologies, and assessing the potential impact of these solutions on the industry and the region. The industry is facing a number of challenges such as low productivity, disease outbreaks, and lack of access to markets, which are hindering its growth. Research can be conducted to explore potential solutions such as new technologies, breeding programs, and marketing strategies. The effectiveness of existing policies and programs and assess the potential impact of new solutions on the sector and the region is also a mandate.

Livestock and Dairy Farming in Punjab; Current Situation and Challenges

One of the key states in Pakistan for raising cattle and producing dairy products is Punjab. Sahiwal, Red Sindhi, Holstein Friesian cattle make up the majority of the breeds in Punjab. Nili Ravi, Kundi and Jaffarabadi buffalo are the two most common breeds. Farmers have limited access to finance and funding. Lack of dairy product storage and transportation infrastructure. Other issues are: veterinary treatment and animal health care, feed and other input costs. Farmers have limited access to markets. Farmers are still utilizing traditional methods instead of emerging techs and tools. There are certain disease outbreaks that limited production. The Punjab government must have to launch a number of programmes to support the dairy and cattle agricultural industries in order to overcome these issues. These include constructing infrastructure for storage and transportation, breeding, managing and controlling, giving farmers credit and funding, and enhancing access to veterinary services and animal health care. Importantly, Punjab's cattle and dairy farming industry must keep up with the most recent trends and technologies to stay competitive as it competes with businesses from other states and nations.

A study indicates that most of the farmers in the study (62%) were having higher level of education than previously reported, which is a positive sign for the future of the industry. This is supported by research in India. Studies have also shown that farmers' education level is positively associated with productivity and income, as educated farmers are more likely to adopt new techniques and management practices like in the United States. 20% of farm managers had not more than to five years experience, 34% had 6-10 years of skill, 30% had 11-15 years of experience, and 16% had 16 years or more of experience. Farm management experience is positively associated with farm productivity, as experienced farmers are more likely to handle problems effectively, just like in Ireland, Germany and France, where similar trends of management experience were found among dairy farmers. In summary, trainings play a pivotal role in improving increased productivity and farm management. However, the study shows that the ratio of farmers who attended vocational trainings in 2014-15 was low, at only 26%. The dairy sector is particularly under-focused by government and non-government organizations. To improve this situation, it is suggested that regular trainings be organized for farmers to transfer the latest technology and practices in a timely manner (Ajmal et al., 2015).

CONCLUSION

In conclusion, Punjab is one of the key states in Pakistan for raising cattle and producing dairy products. However, the dairy and cattle agricultural industries in Punjab face several challenges, including limited access to finance and funding, lack of infrastructure for storage and transportation, limited access to markets, and disease outbreaks. The study shows that most farmers in the study have a higher level of education, which is a positive sign for the future of the industry. The study also suggests that regular trainings be organized for farmers to transfer

the latest technology and practices in a timely manner. Experienced farmers are more likely to handle problems effectively, and educated farmers are more likely to adopt new techniques and management practices. Therefore, it is important to launch a number of programs to support the dairy and cattle agricultural industries in Punjab, including constructing infrastructure for storage and transportation, breeding, managing and controlling, giving farmers credit and funding, and enhancing access to veterinary services and animal health care. Additionally, regular trainings should be organized for farmers to transfer the latest technology and practices in a timely manner. By doing so, the dairy and cattle agricultural industries in Punjab can stay competitive as they compete with businesses from other states and nations.

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