Volume 3, Issue 2, 2024, pp. 15–22
https://doi.org/10.62078/grks.2024.v03i02.002
Research Article

GS WOW
Wisdom of Worthy Research Journal

Adverse Human Health and Environment of Pig Farming with Cost Benefit in the Mid-Terai of Nepal

Mayanath Ghimire[1], Jaishree Bolar[2], P. S. Aithal[3], Kiran Shrestha[4], Arjun Shrestha[5]

[1]*Post Doctorate Research Scholar, Srinivas University, India*
[2]*Professor, Institute of Education, Srinivas University, Mangalore, India*
3*Director, Poornaprajna Institute of Management, Udupi; Director (Development), Poornaprajna Group of Institutions, Udupi & Bangalore University, Mangalore, India*
[4]*Kiran Shrestha, Teacher, Sateshower Basic School, Nijgadh, Bara, Nepal*
[5]*Marigold Sec. Boarding School, Phatuwa Bijaypur, Rautahat, Nepal*

ARTICLE INFO

Corresponding Author
Mayanath Ghimire

Email
mayanathghimire@gmail.com

Article History
Received: 08 October 2024
Accepted: 28 November 2024

Cite
Ghimire, M., Bolar, J., Aithal, P. S., Shrestha, K., & Shrestha, A. (2024). Adverse human health and environment of pig farming with cost benefit in the mid-terai of Nepal. *GS WOW: Wisdom of Worthy Research Journal, 3*(2), 15–22. https://doi.org/10.5281/zenodo.14499817

ABSTRACT

The pig farming have adverse impact in human health and environment in the society and cost benefited from pig farming in Nepal. The research utilized a scientific review process known as meta-analysis to examine articles related to pig farming, disease, meat and piglet marketing, and sanitation synthesizing the information. Thorough archival analysis paired with a comprehensive review would be the strategies employed for the scientific review of systematic manner by gathering research papers, reports, and data. The socioeconomic situation of the pig farmers is really dire. They don't understand the importance of hygiene and health. Eighty percent of farmers in Terai districts keep their pigs in the open. The pig rearing majority of households in the communities that raise pigs lack latrines. They defecate in an open field. Pigs are typically fed hotels waste across Nepal. The pig rearing sheds are dirty and it make environment polluted and help transform disease to human. Farmers are unaware of the parasites and diseases afflicting pigs since they do not make a lot of effort to maintain the health of the native pigs. In Nepal, pigs can be affected by diseases such as swine fever, roundworm and tapeworm, as well as external parasites like lice, and myiasis. The zoonotic transformed disease and parasites harm to human also. Pig farming ranked around 3rd or 4th place among the sources of household income in Nepal and India sale from meat and piglet's especially in eastern area of Nepal from local Dharane black pork.

Keywords: analysis, business, benefit, human disease farming, income, pig

Introduction

According to Minu Sharma in Nepal the socioeconomic situation of the pig farmers is really dire. They don't understand the importance of hygiene and health. Eighty percent of farmers in Terai districts keep their pigs in the open. The majority of households in the communities that raise pigs lack latrines. They defecate in an open field. Pigs are typically fed on the free range across Nepal. The issue is made worse by the waste's unsanitary disposal. The majority of the pigs are housed indoors during the night and are fed

excrement and kitchen scraps. This is the crucial element that is connected to the high incidence of parasite infestations, such as taeniasis, in both humans and pigs (Sharma, 2006).

According to Khanal et al. (2022) the state of Nepalese livestock production systems and assess potential species-specific tactics to support a future livestock industry that is more sustainable and productive. Like in many other developing nations, Nepal views the cattle industry as crucial to reducing poverty and enhancing the population's nutritional status. To fully utilize the genetic potential of livestock, however, significant increases in animal productivity are required, particularly in feeding practices. The key concern for ruminants is increasing the nutritional value and, consequently, the use of current feedstuffs.

Gompo (2017) summarized Nepal has 870,197 pigs in total, or around one million. There are 477,984 total pig holdings. 7.29% of all meat produced is pork (MOLD, 2016). The scavenging/ free range approach was used to raise 73% of the pigs. In Nepal, 27% of pigs are raised in intensive or commercial systems. In Nepal, 68% of the pig meat is cooked, 4% is boiled, and 8% is raw pork meat.

According to Iyai et al. (2011) Pigs' physiological ages showed a considerable degree of variability in small-scale pig production systems. Physiological ages and pig herd size may play comparable roles in classifying the evolution of pig farming systems. Indicators of the growth of pig farming methods in Manokwari include the number of piglets, sows, and the size of the entire herd. Pig production potential (PPP), farmers' household members, and regional status are poor indicators of the growth of pig farming. This research implies that the region's status has influenced pig profiles, especially those of sows and weaned piglets. A limited number of farmers were able to sustain and oversee their farms while maintaining a consistent pig profile makeup.

Native pigs are kept by farmers for both domestic use and financial gain. Some pigs are left to scrounge for food, while the others are housed in the backyard and fed kitchen scraps. Farmers are unaware of the parasites and diseases afflicting pigs since they do not make a lot of effort to maintain the health of the native pigs (Thutwa, 2020).

According to Singh et al. (2023) this research revealed that the area studied has a backyard pig farming system employing old technologies that raise the likelihood of spreading diseases such as ASF and other infections. Pigs are kept in wooden structures that are primarily situated along the roadside. There is a considerable amount of unregulated trading and movement of pigs in the region.

According to Chapagain et al. (2018) the observational research indicated that the pig farming communities in both districts were characterized by poverty, low literacy rates, a lack of training, and a strong reliance on pig farming as their primary occupation, with some individuals being landless. In contrast, pig farmers in Kathmandu exhibited higher levels of education, received training in pig farming, and had better income, although they had less land ownership compared to those in Morang. The number of male and female respondents was balanced in Kathmandu and nearly equal in Morang district.

Waste has no specific alternative use and is less expensive than maize. The results from this study indicated that bakery waste could substitute for maize in the diet of growing piglets by up to 50%, based on comparative benefits regarding feed consumption, feed conversion ratio (FCR), and weight gain. A cost-benefit analysis also suggested that replacing 50% of maize with bakery waste could provide relative advantages. However, further research under actual farming conditions should be carried out to explore detailed substitution possibilities with other ingredients before recommending these findings for broader adoption. (Tiwari et al., 2020).

According to national Animal Breeding & Genetics Research Centre, Kathmandu livestock accounts for approximately 11% of the total Gross Domestic Product (GDP), with 63% derived from milk and dairy products, 32% from meat and meat

products, and 5% from eggs. Historically, livestock has been raised for the regular consumption of animal proteins such as meat, milk, and eggs, as well as for the production of non-food items like hides, skins, wool, transportation, and fuel (derived from dung) in certain communities. (Gorkhali et al., 2021).

FAO summarised a pig farming venture plays a key role in enhancing the quality of life for disadvantaged small-scale farmers in various ways. Pork and other pig products offer a rich source of high-quality animal protein. The meat is simple to prepare and possesses excellent curing and storage capabilities. Extra revenue is generated through the sale of animals and, significantly, through the products derived from them. The extra income can be utilized to invest in farm assets, cover school fees, and medical expenses. Pigs serve as a source of income for women, enhancing their participation in both family dynamics and community life. The sick and disabled can engage in pig farming as it involves manageable tasks and doesn't demand excessive physical exertion.

The modest initial costs and minimal investment needed for buildings and equipment can be recouped quite promptly since slaughter usually occurs around six to eight months after farrowing, depending on the breed and feed availability. Pigs can also serve as a form of wealth storage and a safety measure during challenging times (Dietze, 2011).

According to Silva et al. (2016) the findings indicated that a large proportion of farmers (over 80%) relied on indigenous pigs for income in both countries. In Sri Lanka, raising pigs in a free-range system with low-cost feeding, primarily using kitchen waste, was common. In contrast, in Vietnam, the predominant practice was confining pigs and feeding them commercial concentrates. Pig farming by indigenous communities in Vietnam and Sri Lanka holds great importance in terms of economy, genetics, and culture. Pig farming contributes to boosting income, elevating the quality of life for farmers, and enhancing the nutritional well-being of rural families in both nations.

While the productivity and efficiency of indigenous pigs pose significant challenges from an economic perspective, the role of pig farming plays a crucial part in ensuring sustainability in both demand-driven and resource-driven scenarios. Raising indigenous pigs for personal consumption or as a way to earn an income is heavily impacted by various factors of the farming system, particularly those associated with social and economic aspects, regardless of any operational distinctions. These factors need to be taken into account when shaping policies for the conservation and sustainable utilization of indigenous pigs, as well as when developing initiatives to improve indigenous pig production (Silva et al., 2016).

According to Chen et al. (2022) an in-depth examination of the progress in China's pig breeding industry over the past thirty years. Small-scale pig farming has given way to highly commercialized and specialized companies, which have partnered with skilled large-scale pig farming households to establish a comprehensive pig breeding and sales network. However, pig farming continues to play a significant role in supporting the livelihoods of impoverished rural families. It is important to have policies and subsidies in place to safeguard the interests of individual breeders.

According to (Deka & Thorpe, 2008) India Nagaland Traditional management practices are still prevalent in production, apart from two exceptions: penning has mostly replaced scavenging systems, and crossbreeds have largely substituted indigenous pigs. Scavenging indigenous pigs are predominantly found in distant, secluded regions.

According to (Khanal et al., 2014) Pigs are susceptible to various parasitic, fungal, bacterial, and viral diseases that are significant in terms of both public health and economic impact. Recently, Porcine Reproductive and Respiratory Syndrome (PRRS) has become a significant viral disease leading to substantial economic impacts on the global swine industry. Emerging diseases such as H1N1 and Nipah viruses not only affect pigs but also represent a significant zoonotic threat to humans. Neurocysticercosis, which leads to epilepsy, has been observed in humans due to Taenia solium

infection, mainly linked to the rearing of pigs. This has resulted in significant impacts following outbreaks of PRRS, Classical Swine Fever (CSF), and Foot and Mouth Disease (FMD) among the pig population. To guarantee food security and safety in pork meat, it is crucial to implement effective husbandry practices to prevent and control viral, bacterial, fungal, protozoan, and parasitic diseases, many of which can also be transmitted to humans. The economic losses caused by emerging and infectious diseases are quite significant. This paper aims to shed light on the economic and zoonotic impacts of existing pig diseases, as well as the threat posed by emerging and trans boundary diseases in Nepal..

Government of Nepal and FAO (2009) summarized In Nepal, can find a variety of native breeds such as Jangali Bandel (Wild Boar), Pygmy Bandel, Hurra, Chwanche, Banmpudke, Pakhribas Black Pig, Dharane Kalo Banggur, as well as exotic breeds like Yorkshire, Landrace, Hampshire, Duroc, Tibetan, Tamworth, and Meishan. In Nepal, pigs can be affected by diseases such as roundworm and tapeworm, as well as external parasites like mange, lice, and myiasis.

One of the benefits of pig farming is that pigs have the highest feed conversion efficiency. They are able to achieve higher live weight gain from a specific amount of feed compared to any other category of meat-producing animals except broilers. Pigs have the ability to use a wide range of feed options. Transform grains, forages, damaged feeds, and garbage into nutritious meat, acquiring valuable sustenance in the process. Pig farming involves minimal expenses for infrastructure and equipment. Pigs are renowned for their high meat yield, ranging from 65% to 80% in terms of dressing percentage, surpassing other livestock species with dressing yields often not exceeding 65%.

Pork is renowned for its high fat content and low water content, making it one of the most nutritious meats available with superior energy value compared to other meats. This product boasts a wealth of essential vitamins such as thiamin, niacin, and riboflavin. The manure from pigs is commonly utilized as fertilizer in agriculture farms and fish ponds. Pigs possess the ability to quickly accumulate fat, resulting in a rising demand for their fat in various industries such as poultry feed, soap, paints, and other chemical sectors. Pig farming yields rapid profits as fatteners reach marketable weight within 6-8 months. Good demand exists for pig products like pork in both the domestic and export markets (Detailed Project Report on Setting up of Apigr Earing Farm, n.d.)

According to Gurung et al. (2004) Pig farming is steadily gaining traction as a commercial venture in Nepal, with sizeable commercial pig farms now springing up even within urban areas. It holds great promise for job opportunities and revenue generation, yet it also poses a risk to human health through certain zoonotic diseases and the unpleasant odor it emits in the vicinity of the facility. Therefore, it has been deemed necessary to implement regulations for establishing entities that take into account social and cultural factors, public health concerns, and farm biosecurity measures. A congenial policy environment that encourages both pig production and processing, while also taking into account the potential for export, is essential.

According to Dhakal et al. (2014) Japanese encephalitis, or JE, is a zoonotic disease transmitted by mosquitoes with pigs as the primary amplifying hosts. The primary cause of viral encephalitis amongst individuals in Nepal is on the rise across different regions of the country. The expansion of pig farming in Nepal is on the upswing, attributed to the decline in cultural prejudices against pigs and government initiatives promoting pig rearing for poverty alleviation. Key measures to prevent and control Japanese encephalitis involve educating the public, managing vectors, and vaccinating both humans and pigs.

The vast majority of individuals interviewed were from the Janjati community, making up 92%, while 8% identified themselves as belonging to the Brahmin/Chettri group. Every household derives revenue from various streams, with pig farming being a customary practice among them. Households typically sold between 2 to 5 fattened pigs annually, with some even selling 10 to 20 piglets in the same timeframe. Earnings from pig

farming varied between Rs 30,000 to Rs 80,000 annually. The majority of individuals earned an annual income between 50,000 and 60,000 Rs, with the next most common range being 60,000 to 80,000 Rs per year. Most men were occupied with different sources of income such as farming, raising animals, running small businesses, and working in various job roles (Niraula et al., 2015).

Pig farming likely ranked around 3rd or 4th place among the sources of household income. The knowledgeable Bhuni farmer, Pig Market Agent (PMA), and Commercial Pig Breeder Farmer (CPBF) have been offering valuable insights on pig farming to their clients. CPBF and PMA catered to a larger male clientele, thereby offering pig rearing information to men. In contrast, Bhuni farmer's customer base mainly consisted of women who sought information on pig rearing. The CPBF assisted female buyers by delivering piglets to them using his personal vehicle.

According to (Pati et al., 2022) Pig is an even toes animal, shortest gestation period, Highest Pig population is in Assam (Livestock Census) Pig Meat Known as Pork. 2 or more farrowing every year 8-12 Piglets in every farrowing. Adult male Boar, Adult female Sow, new born piglet and castrated Hog. Deworming is most important for pig. The Deworming schedule are 21 days 1st, 42 days 2nd, 90 days 3rd, 6 months 4th, 9 months 5th and 12 months 6th total 6 times deworming needed every year.

Ensure that swine fever vaccination is administered at two months of age, and foot and mouth disease (FMD) vaccination is given at one month of age. These vaccinations should be repeated annually, with a booster shot at three to four months and another booster at six months. For puppies aged 1-3 months, feed 1 kg; for those between 3-4 months, provide 1. 25 kg; for pups aged 4-5 months, offer 1. 5 kg; for those between 5-7 months, serve 2 kg; and for puppies 7 months and older, provide 2. 5 kg of food each day, divided into halves for each feeding in the morning and evening. Facts about breeding: Age of maturity is around 7-8 months, the estrus cycle lasts for 21 days, gestation period is 114 days (equivalent to 3 months and 3 weeks), castration typically occurs at 4-8 weeks, and the ideal market age is 7-8 months with a body weight ranging from 800-100kg (Pati et al., 2022).

Pigs (Susscrofa domesticus), an important domestic animal, often succumbs to infections caused by helminth and protozoan parasites. In rural areas of Nepal, it is a common tradition to rear pigs as a part of subsistence farming. Female pigs exhibited a higher incidence of protozoan infection compared to males, whereas there was no significant contrast observed in terms of helminth parasites. Strongyles and Oesophagostomum infections were more prevalent in commercial farms than in small holder farms, whereas E. coli and other protozoans had a higher prevalence in small holder farms (Chaudhary, 2023).

Statement of Problem

Due to conducive environmental and cultural factors for pig rearing, along with a high demand for pork meat, there is ample availability of water and electricity in Nepal. However, the lack of experience in large-scale pig rearing, high transportation costs due to difficult terrain, a scarcity of veterinary doctors, and rising labour costs have hindered the growth of pig farming in the region. Feeding, open spaces, knowledge about care, and management are essential for pig farming. Despite the high demand for pork, challenges such as cultural beliefs, cleanliness issues, susceptibility to diseases, high piglet mortality rate, and weather-related risks like heavy rain and landslides in hilly regions limit the widespread practice of pig farming. Not all of the piglets and pork were able to be sold in the rural area.

Research Objectives

To analyze the human health impacts of pig farming practices and pork consumption habits, assess the sanitation knowledge of community members, and evaluate the cost-benefit dynamics and environmental consequences of pig farming in Nepal.

Methodology

The research utilized a scientific review process known as meta-analysis to examine articles

related to pig farming, disease, meat marketing, and sanitation, ultimately synthesizing the information. In this review, the researcher primarily employed deductive logic reasoning, yet the observational insight of the researcher incorporated inductive logic reasoning for inference purposes, focusing on adductive logic to ensure comprehensive objectivity. Thorough archival analysis paired with a comprehensive review would be the strategies employed for the scientific review. The review was carried out in a systematic manner by gathering research papers, reports, and data.

Findings and discussion

In Nepal, the socioeconomic conditions of pig farmers are dire, characterized by a lack of hygiene awareness and inadequate sanitation practices. A significant 80% of farmers in the Terai districts keep their pigs in open environments, and many households lack proper latrines, resulting in open defecation. This practice not only poses health risks to the farmers but also affects the overall community hygiene. Additionally, pigs are often fed hotel waste, which raises concerns about the quality of food and potential health hazards associated with pig farming.Farmers frequently remain unaware of the parasites and diseases that can afflict their pigs due to insufficient efforts to maintain animal health. This lack of knowledge exacerbates the challenges faced by pig farmers, as they struggle to manage their livestock effectively. To address these issues, programs aimed at enhancing social welfare are essential. Initiatives such as adult education, construction of toilets, access to safe drinking water, and addressing gender inequality in pig farming can significantly alleviate poverty and improve living conditions for these farmers.Despite these challenges, pig farming remains an important source of income for many households in Nepal and India, often ranking third or fourth among income sources. Knowledgeable practitioners, such as Bhuni farmers in India and Pig Market Agents (PMAs), provide valuable insights into effective pig farming practices. Furthermore, pigs serve as a vital income source for women, enabling their participation in family and community dynamics. The manageable nature of pig farming allows even sick or disabled individuals to engage in this activity without excessive physical exertion.As of recent estimates, Nepal has approximately 870,197 pigs across 477,984 holdings, with pork accounting for 7.29% of all meat produced. While 27% of pigs are raised in intensive systems, a significant portion is still kept in less controlled environments where they scavenge for food or are fed kitchen scraps. Notably, the Dhare black pork breed is highly sought after in eastern Nepal and Kathmandu Valley for traditional dishes like sekuwa.To enhance pig farming practices in Nepal, support is needed for improving breeding methods for piglets and boars through crossbreeding initiatives. Additionally, providing farmers with access to quality feed, veterinary services, medications, and transportation is crucial for sustainable growth in this sector. Facilitating connections between pork producers and buyers—including hotels, restaurants, and local consumers—can also strengthen market access. Overall, while pig farming presents significant opportunities for economic development and income generation within communities in Nepal, addressing the associated health risks and improving overall farming practices is essential for ensuring the sustainability of this livelihood. (Mishra, 2024 a&b; Mishra et al., 2022) expressed more convincing approaches.

Conclusion

The socioeconomic landscape of pig farming in Nepal presents a multifaceted challenge that intertwines health, economic opportunity, and community dynamics. Despite the potential benefits of pig farming as a source of income, particularly for women and marginalized groups, the lack of awareness about hygiene and health risks significantly undermines these advantages. Many Nepali farmers are unaware of the parasites and diseases that can affect pigs, which is exacerbated by their limited efforts to maintain the health of their livestock. This negligence not only jeopardizes the well-being of the animals but also poses substantial health risks to the farmers and their families. The role of pig farming extends beyond mere economic sustenance; it enhances women's participation in

family and community life, providing them with an opportunity to contribute financially without engaging in physically demanding work. This inclusivity is crucial, especially for individuals who may be sick or disabled, as pig farming involves manageable tasks that can be adapted to various physical capabilities. Pigs exhibit remarkable feed conversion efficiency, allowing them to transform a diverse range of feedstuffs—including grains, forages, and food waste—into high-quality meat. This efficiency is vital for optimizing resource use in agricultural systems. Furthermore, pig manure serves as an effective fertilizer, promoting sustainable agricultural practices by enriching soil fertility. However, the rapid returns associated with pig farming—where fatteners can reach marketable weight within 6-8 months—highlight the need for improved practices and education. There is an urgent requirement for awareness programs focused on controlling zoonotic diseases that can transfer from pigs to humans. Additionally, implementing social upliftment initiatives such as adult education, improved sanitation facilities, access to safe drinking water, and efforts to address gender and caste discrimination are essential for poverty alleviation within pig farming communities. Despite its challenges, pig farming holds significant economic potential in Nepal, ranking as a critical income source for many households. The Dhare black pork breed is particularly valued in eastern Nepal and Kathmandu Valley for its cultural significance and demand in traditional dishes. To harness this potential fully, support systems must be established to enhance breeding practices, provide veterinary services, and facilitate connections between producers and markets.In conclusion, addressing the barriers faced by pig farmers in Nepal requires a comprehensive approach that includes education on health practices, improved breeding techniques, and enhanced market access. By fostering an environment that promotes sustainable pig farming practices while prioritizing community health and welfare, Nepal can leverage this sector as a means of economic development and social empowerment..

Acknowledgment

Thank you to my professor time to time suggestion, Praveen B M and colleges for advice and discussion pig production and marketing in Nepalese condition.

References

Chapagain, A., Singh, S., & Thapa, D. B. (2018). Knowledge regarding Japanese Encephalitis among pig farmers of Kathmandu and Morang Districts of Nepal. *Journal of the Institute of Agriculture and Animal Science, 35*(1), 225–234.

Chaudhary, B., Parajuli, R. P., & Dhakal, P. (2023). Survey of intestinal parasites in swine farms raised in Western Nepal. *Veterinary Medicine and Science, 9*(5), 2107–2117. https://doi.org/10.1002/vms3.1206

Chen, C., Gong, Y., & Yang, L. (2022). Peasants and pork: The changing contribution of pig farming to rural livelihoods. *Open Journal of Social Sciences, 10*(8), 40–54. https://doi.org/10.4236/jss.2022.108003

Deka, R. P., & Thorpe, W. R. (2008). *Nagaland's pig sub-sector: Current status, constraints and opportunities*. ILRI, International Livestock Research Institute.

Dhakal, S., Joshi, D. D., Ale, A., Sharma, M., Dahal, M., Shah, Y., Pant, D. K., & Stephen, C. (2014). Regional variation in pig farmer awareness and actions regarding Japanese encephalitis in Nepal: Implications for public health education. *PloS one, 9*(1),1–7. https://doi.org/10.1371/journal.pone.0085399

Dietze, K.(2011). *Pigs for prosperity*. Rural Infrastructure and Agro-Industries Division Food and Agriculture Organization of the United Nations.

Food and Agriculture Organization of the United Nations. (2009). *Farmer's hand book on pig production* (For the small holders at village level). FAO.

Gompo, T. R. (2017). *Nepal: Pig production systems and their disease control challenges*. Livestock Statistics 2017, Ministry Of Livestock Development, Nepal

Gorkhali, N. A., Sapkota, S., Bhattarai, N., Pokhrel, B. R., & Bhandari, S. (2021). *Indigenous livestock breeds of Nepal: A reference book*. National Animal Breeding & Genetics Reseach Centre.

Gurung, T. B., Gurung, T. B., Shrestha, B. S., Shrestha, N. P., Bates, R., Neupane, D., ... & Achhami, K. (2004). Pig and Pork Industry in Nepal. In P*roceedings of the 1st National Workshop on Pig and Pork Industry in Nepal, 10–11 December 2013, Kathmandu Nepal*.

Iyai, D. A., Rahayu, B. W. I., Sumpe, I., & Saragih, D. (2011). Analysis of pig profiles on small-scale pig farmers in Manokwari-West Papua. *Journal of the Indonesian Tropical Animal Agriculture, 36*(3), 190–197. https://doi.org/10.14710/jitaa.36.3.190-197

Khanal, D. R., Jha, V. K., & Thakur, P. (2014). Challenges of some economically important and emerging swine diseases In Nepal. *Proceedings of the First National Workshop on Pig and Pork Industry in Nepal, 2014.*

Khanal, P., Dhakal, R., Khanal, T., Pandey, D., Devkota, N. R., & Nielsen, M. O. (2022). Sustainable livestock production in Nepal: A focus on animal nutrition strategies. *Agriculture, 12*(5), 1–22. https://doi.org/10.3390/agriculture12050679

Mishra, A. K. (2024a). Exploring entrepreneurial success factors in Nepal. *New Perspective: Journal of Business and Economics, 7*(1), 1–20. https://doi.org/10.5281/zenodo.13832318

Mishra, A. K. (2024b). Government investment in agriculture and policy recommendations. *SP Swag: Sudur Pashchim Wisdom of Academic Gentry Journal, 1*(1), 1–10. https://doi.org/10.5281/zenodo.11056826

Mishra, A. K., Nepal, A., & Aithal, P. S. (2022). Industry 4.0 concept for Nepal: Operating virtual farming industry. In K. Krishna Prasad, P. S. Aithal, & A. Jayanthiladevi (Eds.) *Proceedings on Future Trends in ICCT and its Applications in IT, Management, and Education* (*pp. 31-35*). https://doi.org/10.5281/zenodo.7215189

Niraula, K., Ibrahim, F., & Stewart, T. (2015). A study on the role of women in the pig sector in Kailali & Dhankuta districts, Nepal. S*amarth-Nepal market development programme* (*Samarth-NMDP*) *report.* Department for International Development (DFID).

Pati, P. R., Satapathy, A., Gupta, G., & Ray, S. (2022). Optimizing wear analysis of plasma sprayed Linz-Donawitz slag-Al2O3 coatings using experimental design and neural network. *Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology, 236*(9), 1723–1736. https://journals.sagepub.com/doi/abs/10.1177/13506501221106562

Sharma, M. (2006). Socio-demographic factors of pig farmers associated in transmission of taeniosis/cysticercosis. *Journal of Institute of Medicine Nepal, 28*(1), 57–60. https://doi.org/10.59779/jiomnepal.224

Silva, G. L. L. P., Thuy, L. T., Abeykoon, N. D., Hanh, N. T. H., Bett, R. C., Okeyo, M., & Ibrahim, M. N. (2016). Comparative study of Indigenous pig production in Vietnam and Sri Lanka. *International Journal of Livestock Production, 7*(10), 84–93. https://doi.org/10.5897/IJLP2016.0306

Singh, M., Pongenere, N., Mollier, R. T., Patton, R. N., Yadav, R., Katiyar, R., ... & Mishra, V. K. (2023). Participatory assessment of management and biosecurity practices of smallholder pig farms in North East India. *Frontiers in Veterinary Science, 10*, 1196955. https://doi.org/10.3389/fvets.2023.1196955

Thutwa, K., Chabo, R., Nsoso, S. J., Mareko, M., Kgwatalala, P. M., & Owusu-Sekyere, E. (2020). Indigenous Tswana pig production characteristics and management practices in southern districts of Botswana. *Tropical Animal Health and Production, 52*, 517–524. https://doi.org/10.1007/s11250-019-02037-3

Tiwari, M. R., Dhakal, H. R., & Sudi, M. S. (2020). Growth comparison of piglets fed with different level of bakery waste in basal diet. *Journal of Agriculture and Forestry University*, 4(1) 261–267.