[ORIGINAL RESEARCH ARTICLE]

Migration and Farmland Abandonment in Nepal: A Systematic Review

Pradip Raj Tiwari iD
pradip.tiwari@bimc.tu.edu.np
Department of Population Studies, Birendra Multiple Campus, Tribhuvan University, Bharatpur, Nepal
Corresponding Email: pradip.tiwari@bimc.tu.edu.np

Published by
Department of Population Studies
Prithvi Narayan Campus
Tribhuvan University
Pokhara, Nepal

Abstract
This systematic review aims to synthesize current knowledge on farmland abandonment in Nepal through the lens of migration. Specifically, it addresses the question: How does the existing literature on farmland abandonment incorporate migration issues in Nepal? By exploring this question, the review contributes to the broader discourse on the effects of migration on farmland abandonment, offering insights that can inform policy and research on land use and rural development in Nepal. The relationship between farmland abandonment and migration in Nepal is complex and multifaceted, driven by economic, social, cultural, environmental, and policy-related factors. The reviewed articles focused more on drivers of farmland abandonment and migration and treated the drivers rather than their cause-effect relationship on farmland abandonment. So, farmland abandonment research needs to focus on migration issues to gain a comprehensive understanding of the issues. By understanding these relations, stakeholders can develop integrated strategies to address migration and farmland abandonment, ensuring sustainable rural development in Nepal.

Keywords: migration, farmland abandonment, land use change, drivers, Nepal

INTRODUCTION

In recent periods, the population dynamic of Nepal has shifted primarily due to a significant increase in migration. Historically, people have migrated from the hills and mountains to the low plains of Tarai, urban centers, and India (Gartaula & Niehof, 2013; KC, 2004; Sharma & Sharma, 2011). The present trend involves a notable change in migration patterns to urban areas or foreign countries beyond India (Karki Nepal et al., 2022; Khanal et al., 2019; Rai et al., 2019a). This shift brings a substantial demographic

change in hill and mountain regions as negative population growth and high population density in urban and semi-urban areas. During the last two censuses, from 2011 to 2021, thirty-two districts experienced negative population growth in Nepal (Nepal, 2022). Most of these districts belong to the mountain and hill regions of Nepal. Many people, especially the younger population, migrate from rural areas to urban centers or foreign countries for employment, education, and higher living standards, resulting in a negative population growth rate (KC, 2020). These changes may have implications for livelihoods and resource utilization, particularly for farmland abandonment in the place of origin. Out-migration and farmland abandonment are interconnected issues, and it is observed that farmland is being abandoned at an unprecedented rate in Nepal, particularly in the hilly and mountainous rural regions (Chaudhary et al., 2020; KC & Race, 2020). A study by Chaudhary et al. (2020) revealed that about 23 percent of farmland was abandoned from 2001 to 2010 in Nepal; it is associated with the shift of settlement due to out-migration(Chaudhary et al., 2020; KC & Race, 2020).

Farmland abandonment is the cessation of agricultural activities on land surfaces (Haddaway et al., 2014). Several drivers of farmland abandonment include socio-political, economic, environmental, and demographic causes (Huang et al., 2020; Subedi et al., 2022). In recent decades, the extent of farmland abandonment has been experienced in developing countries (S. Li & Li, 2017). Farmland abandonment has been a common phenomenon in rural areas, particularly mountainous regions (Chaudhary et al., 2020a; Huang et al., 2020). Farmland abandonment in Nepal is a significant issue in mountain and hill regions, particularly in rural areas (Bhawana et al., 2020; Chaudhary et al., 2020b). Migration from hill and mountain to Tarai, rural to urban, as well as massive youth migration abroad, has been identified as a major driver of farmland abandonment in Nepal (Chaudhary et al., 2020a; Gartaula & Niehof, 2013; KC, 2004; KC & Race, 2020; KC, 2020; Paul et al., 2022). The steep physical landscape, low productivity, and occurrence of natural hazards are the major causes of the high rate of farmland abandonment in mountain and hill regions of Nepal (Chaudhary et al., 2020c; Rai et al., 2019). Scholars noted the various driving factors for widespread farmland abandonment in Nepal, which range from demographic to socio-economic, geographical, ecological, and policy factors. Rural-to-urban migration, rapid urbanization, scattered settlement, imbalance of development, and land fragmentation are the major drivers of farmland abandonment in Nepal.

Nowadays, migration is not only limited to internal rural-urban shifts; it also extends beyond national boundaries. So, the shortage of youth labor force in rural areas and abandonment of agricultural land as baron is a common debate in Nepal (Gartaula et al., 2014). Although there is growing concern about the linkages between migration and farmland abandonment in Nepal, there is a significant gap in the study of farmland abandonment from a migration perspective. This systematic review aims to synthesize current knowledge on farmland abandonment in Nepal through the lens of migration. Specifically, it addresses the question: *How does the existing literature on farmland abandonment incorporate migration issues in Nepal?* By exploring this question, the review contributes to the broader discourse on the effects of migration on farmland abandonment, offering insights that can inform policy and research on land use and rural development in Nepal.

METHODOLOGY

This research was based on a systematic review of existing literature on the research area. A systematic review was designed to comprehensively study a given topic, which helps to identify, appraise, and synthesize the existing literature (Petticrew & Roberts, 2008). In the same way, this research was based on a comprehensive literature search to identify the scholarly article on farmland abandonment related to the Nepalese context, followed by the Preferred Items for Systematic Review and Meta-Analysis (PRISMA) approach (Page et al., 2021). The following section describes the methodology of the systematic review of the study, which explains the detailed step-by-step process of identification, selection, inclusion, and exclusion criteria, as well as methods of analysis of selected articles.

Article Search

This review covers literature on farmland abandonment in Nepal. For a comprehensive literature search, published peer-reviewed journal articles and official reports on farmland abandonment literature were identified by different database searches. At the initial state, publications were assembled through a systematic search of references of initial literature and expert insights. We used a systematic map (at an abstract level) to describe the nature and location of evidence on the review topic (Haddaway et al., 2014). The map provides primary information about the literature for further extensive systematic review. Published paper abstracts were identified by using ProQuest (preferred because of researcher accessibility), Google Scholar, NepJol, and Scopus (open access) databases for academic journals, and official websites were used for official reports. Literature searches for abstracts using databases' Boolean operators (OR, AND) search logic. ProQuest central database was considered the major search engine, whereas other sources will be verified and updated in the existing literature. All keywords related to farmland abandonment were searched by permutation terms related to keywords to be searched individually in the publication's title, abstract, and keywords. We used various terms to refer to farmland as "cropland," "cultivated land," "agricultural land," and "farming." Similarly, for the concept of abandonment, we included terms such as "abandon," "land use," and "abandonment" in our search. The search was focused on Nepal or specific regions within Nepal, and we limited our scope to titles, abstracts, and keywords of the articles within the selected database.
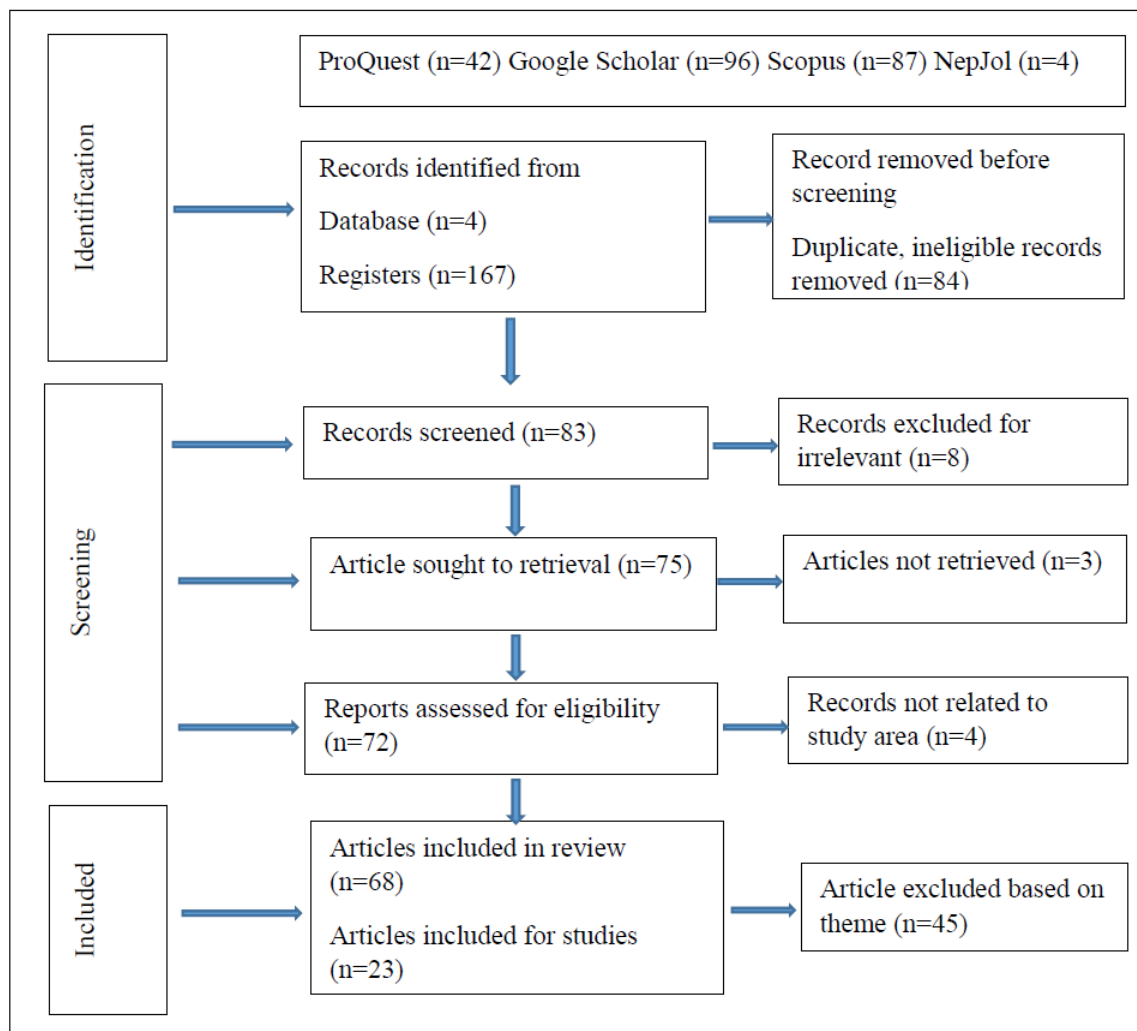
Article Selection

After locating and retrieving the required articles, the following inclusion criteria were utilized to select the articles. First, articles published in the English language, peer-reviewed, and study areas related to either Nepal or any parts of Nepal, as well as the combination of other countries, were set as the inclusion criterion for article selection. Farmland abandonment articles cover farmland abandonment aspects, including spatiotemporal characteristics of farmland change, drivers of farmland change, and social–environmental consequences of farmland change. Similarly, official reports on agricultural policy and plan, farmland abandonment, and related reports were selected for review. Journal articles and reports were excluded if they did not meet the inclusion criteria or were not relevant to the research topic.

The primary purpose of article selection is to ensure that it covers appropriate literature for analysis, so the Preferred Items for Systematic Review and Meta-Analysis (PRISMA) approach was utilized in this research (Figure 1). Irrelevant papers were

excluded based on selection criteria, and the screening of the papers was based on title and abstract. Hence, 68 articles were selected for this review.

Figure 1

Systematic Review Flow-diagram (Based on PRISMA Standard, Page et al., 2021)

Methods of Analysis

After the selection of literature for this study, journal articles were entered into Mendeley Desktop to manage the data. First, all articles were exported to the RIS file for bibliometric analysis of the literature. Microsoft Excel database was formed for coding, and each article had a unique ID and related variables like Journal, volume, issue, keywords, and abstract. Furthermore, a citation index was posted to the corresponding articles based on Google Scholar citations. VOSviewer 1.6.18, a bibliometric analysis software, was used to analyze basic information, research progress, and research frontiers on farmland abandonment research (X. Li et al., 2023). We use titles, keywords, and abstracts in the bibliometric analysis. After bibliometric analysis, we further categorize the

article into three thematic areas. According to our research objectives, we further reviewed the article focused on migration issues related to farmland abandonment.

**RESULTS**
Bibliometric Analysis
This section performed a bibliometric analysis based on selected journal articles. Bibliometric analysis helps to perform quantitative evaluations, descriptions, and visualizations of literature within specific research domains (Liu et al., 2020). So, this analysis is based on a bibliometric analysis of the selected articles to describe the trends, numbers, citations, journals, topic mapping, and thematic clustering of the articles.

Trends of Article Publication
There were 66 journal articles selected in this systematic review of farmland abandonment in Nepal. The selected articles' publication date was used to identify the development of the academic discourse on farmland abandonment in Nepal. Results show that academic attention was increasingly focused on this area of research after 2015. Most of the journal articles selected for this study were published after 2015.

Figure 2

Numbers of Publication by Years
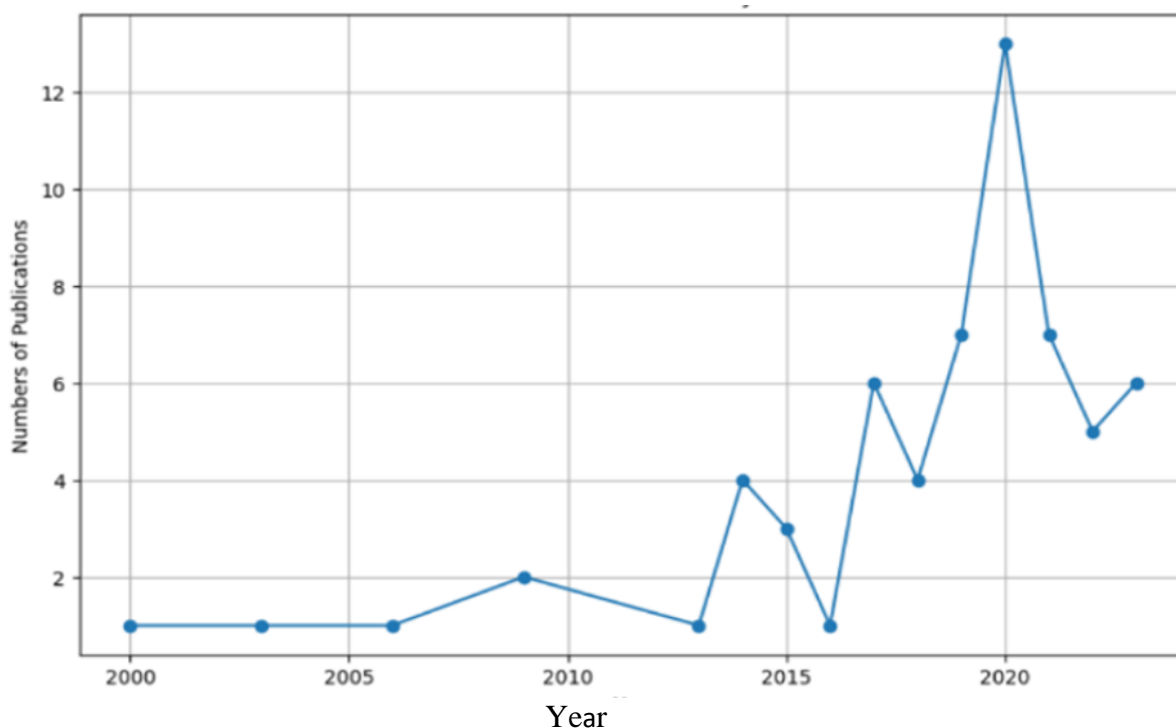
Citations of Articles
Figure 3 presents an overview of citations of selected articles by publication year. Citation counts are from Google Scholar at the end of April 2024. Of the articles, only five were cited more than 100 times, whereas twelve were cross-referred more than 50 and less than times. The majority of the articles have low citation index.

Figure 3

Numbers of Citation by Publication Years
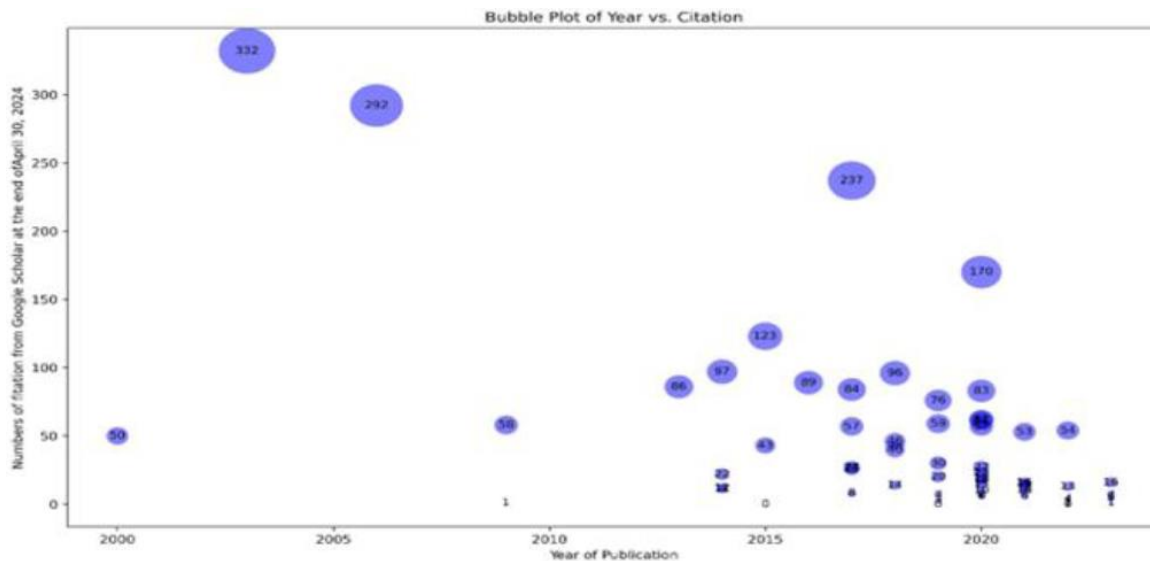
Major Journal of Articles

Table 3 lists the top 5 journals for published articles about agricultural land abandonment in Nepal. Sustainability journal published the highest number of articles, followed by Land, Mountain Research and Development, the productive Journal publishing eight papers, whereas Sustainability (9), Mountain Research and Development, Springer Geography, Land Use Policy.

Table 1

Major Journals Publishing Articles Related to Farmland Abandonment in Nepal

Journal name	Numbers of articles
Land	8
Sustainability	9
Mountain Research and Development	4
Springer Geography	4
Sustainability (Switzerland)	
Applied Geography	2
Journal of Environment Management	2
Journal of Forest and Livelihood	2

Topic Mapping, Thematic Clustering and Visualization

Network visualization of word co-occurrence in the titles and abstracts of the sample papers was conducted using VOSviewer software. This analysis of high-frequency words highlights the research focus based on their co-occurrence in the papers' titles, keywords, and abstracts. Words or phrases are represented as nodes, with their sizes proportional to their relative frequencies. The analyses employed VOSviewer's default settings, using the association strength method to normalize the strength of the links between nodes.

Figure 4

Network Visualization of Thematic Clustering of the Topics Identified from the Title and Abstract
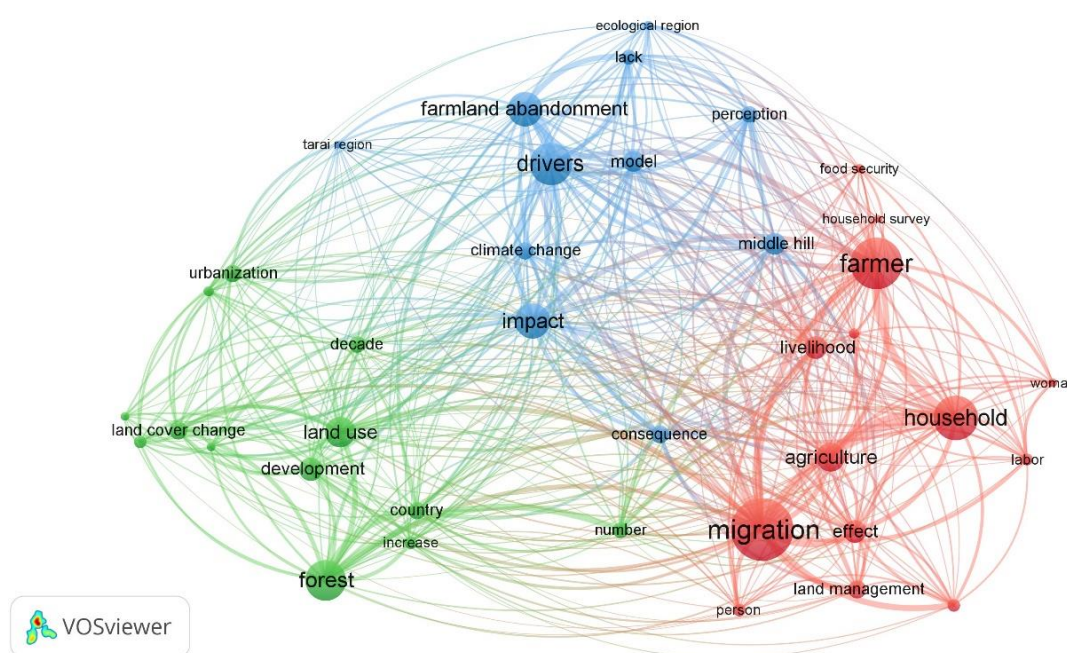
Figure (4) shows the network visualization of the title and abstract of the selected papers. The network visualization divided the papers into three clusters based on the titles and abstracts of the articles. The green cluster on farmland abandonment research in the context of land used land cover changed (LULC), and the second cluster in red indicates the research on farmland abandonment with its socio-economic dimension. The blue cluster indicates the research on farmland abandonment with association to its drivers with LULC and socio-economic dimensions (Figure 5). So, the latent topics that the paper addresses are two clusters based on the articles' title and keywords. Based on network visualization, the literature included in this review was divided into three broader thematic areas: farmland abandonment and its drivers, farmland abandonment and environment, and farmland abandonment and land management.

Figure 5

Overlay Visualization of Thematic Clustering of the Topics Identified from the Title and Abstract

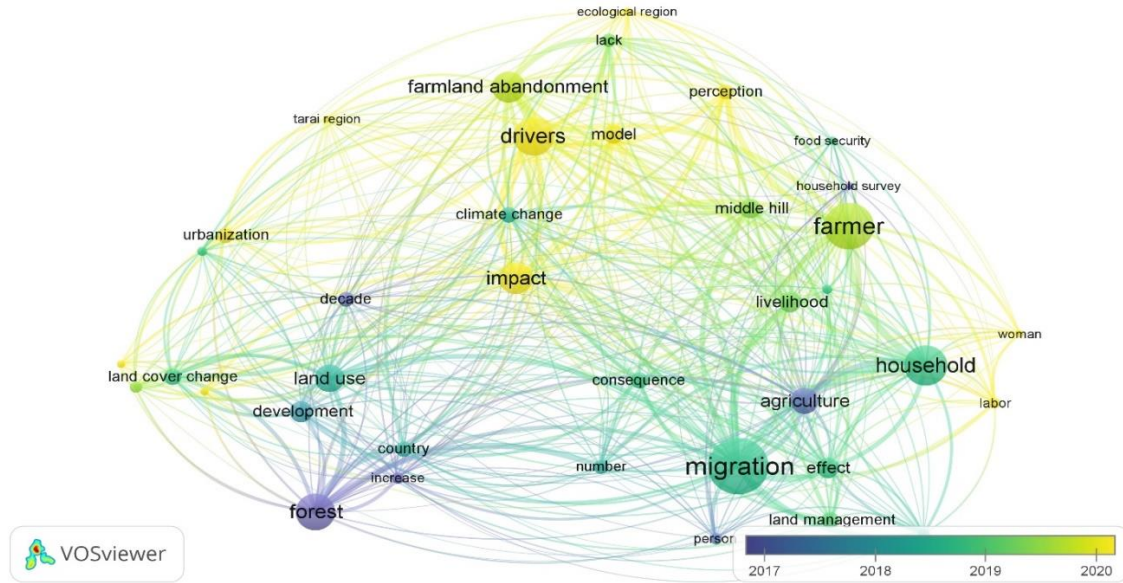Figure 5 indicates the change in the research paradigm on farmland abandonment in Nepal. Before 2017, most articles related to land used land cover change that studied farmland abandonment in Nepal. Now, farmland abandonment regarding its drivers and its impact on people's livelihood were considered a major theme of the study on farmland.

Thematic Categorization

The network analysis prided itself on the initial idea of categorizing the articles. The total articles were grouped into three thematic areas, as presented in Table 2. The primary objective of this research was to explore the relationship between farmland abandonment and migration. Hence, 23 articles were deliberately selected from the thematic clusters, farmland abandonment, and its drivers for in-depth review. These 23 articles were analyzed to understand how these articles address migration issues in the context of farmland abandonment in Nepal.

Table 2

Thematic Categorization of Farmland Abandonment Articles

Theme	Numbers of articles
Farmland abandonment and migration	23
Farmland abandonment and environment	27
Land used land cover change and land management	16

Thematic Analysis of Articles

Before the manual analysis of the articles, we used NVivo for thematic analysis. The first step involves preparing the data by importing the articles into the software in RIS format. These articles were then organized within NVivo for systematic analysis. NVivo's features, such as text search queries or word frequency analysis, were used to identify recurring terms and concepts. Each article was classified by adding new attributes like methodology, sampling, coverage, research questions, significant findings, and conclusions. The articles were based on diverse research methods, including quantitative, qualitative, mixed methods, geospatial analysis, and systematic review (Annex 1).

For thematic analysis, we used NVivo software. The first step of analyzing those selected 23 articles involved preparing the data by importing the articles into the software in an RSI format. The process begins with familiarizing oneself with the content of the articles by reading through them to identify initial ideas or recurring themes. First, articles were evaluated and categorized based on research objectives or purpose, methodology, study coverage, major findings, and conclusion.

Figure 6

Word Cloud of Selected Articles

Based on a comprehensive review of selected articles, we found that these articles covered three major dimensions in analyzing farmland abandonment in Nepal. Most of the articles deal with the role of migration in farmland abandonment, whereas others deal with farmland abandonment drivers in which migration was treated as a proxy cause of farmland abandonment. Similarly, most articles deal with the impacts of farmland abandonment (Table 4).

The existing literature demonstrates a clear link between migration and farmland abandonment in Nepal, highlighting this phenomenon's challenges and opportunities. Migration drives farmland abandonment by altering demographic patterns, labor availability, and economic priorities, while the consequences are evident in ecological degradation, social disruption, and economic stagnation. Addressing these issues requires interdisciplinary approaches integrating migration, land management, and sustainable rural development policies.

Table 4

Theme of Review Articles on Farmland Abandonment with Migration Perspectives

Major themes	Relation to farmland abandonment
Role of Migration	• Out-migration: rural to urban, Hill and Mountain to Tarai: results in farmland abandonment (1,3, 4, 5, 6, 7, 8,10, 11, 13, 14, 15, 16 19, 21, 22, 23): • Urbanization trends linked to migration create labor shortages in rural areas, further intensifying abandonment (8, 18, 20). • International migration Emigration, primarily male-dominated, creates labor imbalances (5, 6, 8, 9, 14, 15, 23, 20)
Drivers	• Migration: (most of all articles) • Remittance: reduces reliance on agriculture as a primary livelihood source, encouraging households to abandon labor-intensive farming (3, 16, 20, 21, 10, 11, 14, 16, 18). • Economic opportunities in urban areas or abroad diminish interest in farming (18, 23, 17, 16). • Migration-driven demographic shifts: reduced household size and aging rural populations limit agricultural capacity (19, 22, 23). • Education and changing aspirations for non-agrarian lifestyles lead to generational shifts away from farming (8, 13, 23). • Inadequate policies: for supporting rural agriculture, migration and farmland abandonment trends (1, 18, 20, 22). • An imbalance in development, such as roads, education, encourages migration by connecting remote areas to urban centers, and reduces the agricultural workforce (18). • Increased natural hazards, including landslides, soil erosion, and invasive species colonization (12, 17, 20) • Low agricultural productivity (8,11, 12 13)
Impacts	• Labor shortage (3, 4, 7, 9, 12, 13) • Food insecurity (5, 20, 21, 23) • biodiversity shifts (19, 22). • Underutilized farmland (most of the articles) • loss of Indigenous land management knowledge (16). • Low local or national economic growth (21, 23).

Note: The number in parenthesis indicates the code of journal articles

Migration and Farmland Abandonment

The theme of the reviewed articles stated the relationship between farmland abandonment and migration in terms of its role, drivers, and impact (Table 4). Most articles stated that migration was the leading cause of farmland abandonment. Most articles stated several drivers of farmland abandonment, including demographic, economic, social, cultural, and environmental factors. Low agricultural profitability, lack of infrastructure, limited market access, rural-urban migration, and emigration are the push factors for farmland abandonment. Economic challenges like low agricultural productivity, low return on agriculture, lack of infrastructure, and limited market access compel individuals to migrate from rural areas to urban centers or abroad, significantly contributing to farmland abandonment.

Additionally, remittances from migrants provide financial support to their families, reducing dependency on agriculture and enabling families to diversify their income sources into non-agricultural activities, often leading to farmland abandonment. Out-migration results in significant labor shortages in rural agricultural areas, leading to reduced productivity and a labor shortage for farming that contributed to farmland abandonment. This shift also alters traditional labor dynamics, often leaving women and elderly individuals to manage the farms, impacting agricultural efficiency. As families adapt by diversifying their livelihoods into less labor-intensive or non-agricultural activities, this further contributes to farmland abandonment. Youth migration, driven by the pursuit of better educational and employment opportunities in urban areas or abroad, exacerbates labor shortages in rural areas and contributes to farmland abandonment.

DISCUSSION

The findings of this study indicate a multifaceted relationship between farmland abandonment and migration in Nepal, driven by economic, social, cultural, and environmental factors. The primary drivers of farmland abandonment in Nepal are diverse and included in the reviewed articles, ranging from economic, demographic, social, and cultural to environmental factors. Economic challenges such as low agricultural profitability, lack of infrastructure, and limited market access are significant push factors. These economic constraints induce individuals to migrate from rural to urban or abroad, leading to farmland abandonment in Nepal (Paudel, 2016; Jaquet et al., 2019). This result is consistent with the broader literature highlighting that economic hardship is a critical determinant of rural out-migration (Maharjan et al., 2020). Additionally, migrant remittances provide essential financial support to their families, reducing dependency on agriculture and enabling income diversification into non-agricultural activities. This financial shift often results in further farmland abandonment as agricultural activities are deprioritized (Adhikari & Hobley, 2015; Jaquet et al., 2019).

Labor shortages resulting from out-migration significantly impact agricultural productivity and efficiency. This study found that as economically active individuals migrate, fewer people are available to work the land, reducing productivity and efficiency (Gartaula et al., 2012). The traditional labor dynamics shift, often leaving women and elderly individuals to manage farms, exacerbating agricultural inefficiency and contributing to farmland abandonment (Adhikari & Hobley, 2015). This phenomenon aligns with the findings of the FAO (2011), which reported that labor shortages are a critical consequence of rural out-migration in developing countries. Youth migration is driven by pursuing better educational and employment opportunities, worsening labor shortages in rural areas, and contributing to farmland abandonment. The lack of adequate

educational, health, and recreational facilities in rural areas further fuel this migration (Seddon et al., 2002). Additionally, migration leads to changing notions of success and a good life, with many viewing urban or overseas opportunities as more desirable (Gartaula et al., 2012). This cultural shift, along with changes in social norms and community structures, affects the social fabric of rural areas and often results in farmland being left unattended (McCarthy et al., 2009).

Environmental and climate factors also play a vital role in farmland abandonment. Climate change increases the vulnerability of agricultural practices to natural disasters such as floods and landslides, reducing productivity and making farming less viable (Gentle & Maraseni, 2012). Adverse climatic conditions challenge the resilience of farming communities, further contributing to farmland abandonment. Land degradation leads to reduced agricultural production, prompting farmers to abandon cropland (Paudel et al., 2014). This is supported by the findings of those who reported that environmental degradation is a significant driver of agricultural land abandonment.

Effective policy measures are crucial in addressing farmland abandonment. Policies that support sustainable and alternative farming methods can counteract labor shortages caused by migration. Promoting agricultural practices that require less labor, such as mechanized farming, can help mitigate the impact of labor shortages (Raut et al., 2011). Ensuring secure land tenure can encourage investment in land and its productive use, preventing abandonment. Community-driven efforts are also essential in mitigating the negative impacts of migration, with initiatives supporting remaining farmers and encouraging the productive reutilization of abandoned farmland playing a key role (Gautam & Andersen, 2017).

CONCLUSION

The relationship between farmland abandonment and migration in Nepal is complex and multifaceted, driven by economic, social, cultural, environmental, and policy-related factors. The literature demonstrates a clear association between migration and farmland abandonment in Nepal. The reviewed articles were more focused on drivers of farmland abandonment and migration as treats the drivers rather than its cause-effect relationship on farmland abandonment. So, farmland abandonment research needs to focus on migration issues to gain a comprehensive understanding of the issues. By understanding these relations, stakeholders can develop integrated strategies to address migration and farmland abandonment, ensuring sustainable rural development in Nepal.

Research Gaps and Future Directions

This systematic review primarily focused on farmland abandonment literature with migration lens seeds these research gaps. First, empirical research needs to focus on farmland abandonment from a migration perspective. Future research should focus on the long-term impacts of remittances on rural agriculture, particularly on farmland abandonment in Nepal.

ACKNOWLEDGEMENTS

REFERENCES

Biggs, E. M., Tompkins, E. L., Allen, J., Moon, C., & Allen, R. (2013). Agricultural adaptation to climate change: Observations from the Mid-Hills of Nepal. *Climate and Development*, *5*(2), 165–173. https://doi.org/10.1080/17565529.2013.789791

Bista, R., Zhang, Q., Parajuli, R., Karki, R., Chhetri, B. B. K., & Song, C. (2021). Cropland abandonment in the community-forestry landscape in the middle hills of Nepal. *Earth Interactions*, *25*(1), 136–150. https://doi.org/10.1175/EI-D-21-0006.1

CBS (2022). *Nepal Census 2021* (pp. 1–96). https://censusnepal.cbs.gov.np/Home/Details?tpid=5&dcid=3479c092-7749-4ba6-9369-45486cd67f30&tfsid=17

Chaudhary, S., Wang, Y., Dixit, A. M., Khanal, N. R., Xu, P., Fu, B., Yan, K., Liu, Q., Lu, Y., & Li, M. (2020a). A synopsis of farmland abandonment and its driving factors in Nepal. *Land*, *9*(3), 84. https://doi.org/10.3390/land9030084

Chaudhary, S., Wang, Y., Khanal, N. R., Xu, P., Fu, B., Dixit, A. M., Yan, K., Liu, Q., & Lu, Y. (2018). Social impact of farmland abandonment and Its Eco-environmental vulnerability in the high Mountain region of Nepal: A case study of Dordi river basin. *Sustainability*, *10*(7), 2331. https://doi.org/https://doi.org/10.3390/su10072331

Chaudhary, S., Wang, Y., Dixit, A. M., Khanal, N. R., Xu, P., Fu, B., Yan, K., Liu, Q., Lu, Y., & Li, M. (2020b). Spatiotemporal degradation of abandoned farmland and associated eco-environmental risks in the high mountains of the Nepalese Himalayas. *Land*, *9*(1), 1. https://doi.org/10.3390/land9010001

Dahal, G. R., Pandit, B. H., & Shah, R. (2020). Abandoned agricultural land and its reutilisation by adoption of agroforestry: A case study from Kaski and Parbat districts of Nepal. *Journal of Forest and Livelihood*, *19*(1).

Gartaula, H. N., Chaudhary, P., & Khadka, K. (2014). Land redistribution and reutilization in the context of migration in rural Nepal. *Land*, *3*(3), 541–556. https://doi.org/10.3390/land3030541

Gartaula, H. N., & Niehof, A. (2013). Migration to and from the Nepal terai: shifting movements and motives. *The Southasianist*, *2*(2), 29–51.

Ghimire, D. J., Axinn, W. G., & Bhandari, P. (2021). Social change, out-migration, and exit from farming in Nepal. *Population and Environment*, *42*(3), 302–324. https://doi.org/10.4049/jimmunol.1801473

Haddaway, N. R., Styles, D., & Pullin, A. S. (2014). Evidence on the environmental impacts of farmland abandonment in high altitude/mountain regions: A systematic map. *Environmental Evidence*, *3*(1), 1–7. https://doi.org/10.1186/2047-2382-3-17

Huang, Y., Li, F., & Xie, H. (2020). A scientometrics review on farmland abandonment research. In *Land* (Vol. 9, Issue 8). https://doi.org/10.3390/LAND9080263

Jaquet, S., Schwilch, G., Hartung-Hofmann, F., Adhikari, A., Sudmeier-Rieux, K., Shrestha, G., Liniger, H. P., & Kohler, T. (2015). Does out-migration lead to land degradation? Labor shortage and land management in a western Nepal watershed. *Applied Geography*, *62*, 157–170. https://doi.org/10.1016/j.apgeog.2015.04.013

Jaquet, S., Shrestha, G., Kohler, T., & Schwilch, G. (2016). The effects of migration on livelihoods, land management, and vulnerability to natural disasters in the Harpan watershed in Western Nepal. *Mountain Research and Development*, *36*(4), 494–505. https://doi.org/10.1659/MRD-JOURNAL-D-16-00034.1

Karki, A., Nepal, M., & Bluffstone, R. (2022). Labor out-migration, farmland fallowing,

livelihood diversification and technology adoption in Nepal. *International Labour Review*. https://doi.org/10.1111/ilr.12375

KC, B. K. (2004). Chapter 15 Internal migration in Nepal. *Population Monograph of Nepal*.

KC, B., Wang, T., Gentle, P., Bhawana, K. C., Wang, T., & Gentle, P. (2017). Internal migration and land use and land cover changes in the middle Mountains of Nepal. *Mountain Research and Development*, *37*(4), 446–455. https://doi.org/10.1659/MRD-JOURNAL-D-17-00027.1

KC, B., & Race, D. (2020). Out-migration and land-use change: A case study from the middle hills of Nepal. *Land*, *9*(1). https://doi.org/10.3390/land9010002

KC, S. (2020). Chapter 13 Internal migration in Nepal. In M. Bell, A. Bernard, E. Charles-Edwards, & Y. Zhu (Eds.), *Internal Migration in the Countries of Asia A cross-national Comparision* (p. 229). Springer.

Khanal, N., & Watanabe, T. (2006). Abandonment of agricultural land and its consequences. *Mountain Research and Development*, *26*(1), 32–40. https://doi.org/10.1659/0276-4741(2006)026[0032:aoalai]2.0.co;2

Khanal, S., Paudel, R., & Kandel, B. P. (2019). Dimension of youth migration and its impact on agriculture production in Lamjung district of Nepal. *World Scientific News*, *116*(December 2018).

Kohler, T., & Schwilch, G. (2019). *Labour Migration in the Middle Hills of Nepal : Consequences on Land Management Strategies*. 1–19. https://doi.org/10.3390/su11051349

Li, S., & Li, X. (2017). Global understanding of farmland abandonment: A review and prospects. *Journal of Geographical Sciences*, *27*(9). https://doi.org/10.1007/s11442-017-1426-0

Li, X., Wu, K., & Liang, Y. (2023). A review of agricultural land functions: Analysis and visualization based on bibliometrics. *Land*, *12*(3). https://doi.org/10.3390/land12030561

Maharjan, A., Bauer, S., & Knerr, B. (2013). International migration, remittances and subsistence farming: Evidence from Nepal. *International Migration*, *51*(SUPPL.1). https://doi.org/10.1111/j.1468-2435.2012.00767.x

Maharjan, A., Kochhar, I., Chitale, V. S., Hussain, A., & Gioli, G. (2020). Understanding rural out-migration and agricultural land use change in the Gandaki Basin, Nepal. *Applied Geography*, *124*. https://doi.org/10.1016/j.apgeog.2020.102278

Ojha, R. B., Atreya, K., Kristiansen, P., Devkota, D., & Wilson, B. (2022). A systematic review and gap analysis of drivers, impacts, and restoration options for abandoned croplands in Nepal. *Land Use Policy*, *120*, 106237. https://doi.org/10.1016/J.LANDUSEPOL.2022.106237

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. In *The BMJ* (Vol. 372). https://doi.org/10.1136/bmj.n71

Paul, B. K., Munshi, K. R., Lu, M., & Crawford, T. W. (2022). Household migration and intentions for future migration in the climate change vulnerable lower Meghna estuary of coastal Bangladesh. *Sustainability*, *14*(8), 4686. https://doi.org/https://doi.org/10.3390/su14084686

Petticrew, M., & Roberts, H. (2008). Systematic reviews in the Social Sciences: A practical guide. In *Systematic Reviews in the Social Sciences: A Practical Guide*. https://doi.org/10.1002/9780470754887

Paudel, B., Zhang, Y., Yan, J., Rai, R., & Li, L. (2019). Farmers' perceptions of agricultural land use changes in Nepal and their major drivers. *Journal of Environmental Management*, *235*(January), 432–441. https://doi.org/https://doi.org/10.1016/j.jenvman.2019.01.091

Rai, R., Zhang, Y., Paudel, B., & Khanal, N. R. (2019). Status of farmland abandonment and its determinants in the transboundary Gandaki river basin. *Sustainability (Switzerland)*, *11*(19), 5267. https://doi.org/https://doi.org/10.3390/su11195267

Sharma, J. R., & Sharma, S. (2011). Enumerating migration in Nepal A review. In *Working Paper I*.

Subedi, Y. R., Kristiansen, P., Cacho, O., & Ojha, R. B. (2021). Agricultural Land Abandonment in the Hill Agro-ecological Region of Nepal: Analysis of Extent, Drivers and Impact of Change. *Environmental Management*, *67*(6), 1100–1118. https://doi.org/10.1007/s00267-021-01461-2

Subedi, Y. R., Kristiansen, P., & Cacho, O. (2022). Drivers and consequences of agricultural land abandonment and its reutilisation pathways: A systematic review. In *Environmental Development* (Vol. 42). https://doi.org/10.1016/j.envdev.2021.100681

Sunam, R. K., & McCarthy, J. F. (2016). Reconsidering the links between poverty, international labor migration, and agrarian change: critical insights from Nepal. *Journal of Peasant Studies*, *43*(1), 39–63. https://doi.org/10.1080/03066150.2015.1041520

Uttam Khanal Ramesh C. Khanal, Punya P. Regmi, K. A., Khanal, U., Alam, K., Khanal, R. C., Regmi, P. P., & Uttam Khanal, Khorshed Alam, Ramesh C. Khanal, P. P. R. (2015). Implications of out-migration in rural agriculture : A case study of Manapang village, Tanahun, Nepal. *The Journal of Developing Areas*, *49*(1), 331–352. https://doi.org/10.1353/jda.2015.0012

Annex 1:
Classification of Review Articles Based on their Attributes with Authors and Code

Code	Author/s	Research objective	Methods/Data sources
1	Dahal et al., 2020	status of agricultural land abandonment	Mixed: HH survey, FGD, KII
2	Biggs et al., 2013	agricultural adaptation strategies	Case Study
3	Kohler & Schwilch, 2019	impacts of labor shortage on land management	Mixed
4	Gartaula et al., 2014	examines migration and land utilization	HH survey, FGD, in-depth-interview , PO
5	Karki et al., 2023	effect of temporary international labor migration on farmland fallowing,	Secondary data
6	Maharjan et al., 2013	impact of international labor migration on subsistence agricultural production	Survey data
7	Rai et al., 2019	examined the status of farmland abandonment, along with its trends and determinants,	HHs interview
8	Maharjan et al., 2020	investigates agricultural land use change	Mixed
9	Sunam & McCarthy, 2016	analyze effects of migration on rural people's changing relationship to land and agriculture	Mixed
10	Ghimire et al., 2021	examine associations between labor out-migration, remittances, and agricultural change	Quantitative
11	Khanal et al., 2015	assess the relationship between agriculture and migration	Quantitative
12	Rai et al., 2019	examined the status of farmland abandonment	Quantitative, HHs survey
13	Ojha et al., 2022	identify the key causes and impacts of cropland abandonment	systematic review of existing studies to
14	Jaquet et al., 2016	explored the effects of migration on land and people	Mixed
15	Bista et al., 2021	understanding on how natural system influence cropland-use decision	Qualitative
16	Chaudhary et al., 2018	determine the driving factors of farmland abandonment	Mixed
17	Khanal & Watanabe, 2006	examines the extent, causes, and consequences of farmland abandonment	HHs survey, GIS
18	Paudel et al., 2019	assess farmers' perceptions on agriculture change	Quantitative
19	KC et al., 2017	investigated the causes and effects of internal migration on land use and land cover patterns	GIS, Survey research
20	Chaudhary et al., 2020	explore driving factors of farmland abandonment	GIS, Secondary data
21	KC & Race, 2020	explore how out-migration affects land management practices in rural area	Mixed method
22	Jaquet et al., 2015	To find the causes land degradation, land abandonment caused by out-migration	GIS, Survey
23	Subedi et al., 2021	investigated the extent of agricultural land abandonment	Mixed