# Socio-economic impacts of agricultural land conversion: A meta-analysis

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## ABSTRACT

Land use change (LUC) is one of the main factors of economic development, and humans have been changing land use for many years. Agricultural land conversion (ALC) is determined as a major process in many developing countries. The aim of this study was to investigate the widespread ALC and its main socio-economic impacts in developing countries during the last 50 years. This study was conducted through a meta-analysis of 56 original articles that identified the main impacts of the ALC from the 19th century onwards in four continents, including Africa, Asia, Europe, and America. The findings of meta-regression showed that spatiotemporal impacts had significant influences on socio-economic impacts, and the most important spatial impacts were related to the continents of America and Asia. In addition, the results of ALC's rate coefficients in meta-regression indicated that the greatest social impacts were related to crime (2.17%) and the greatest economic impacts were related to endangering households' revenue (2.98%). Therefore, it is concluded that the rapid conversion of agricultural land to achieve economic development leads to socio-economic impacts, and such economic development cannot be sustainable. Accordingly, it is suggested that the ALC consider such things as planning detailed investigations for the ALC, assessing the value of goods and services provided by agricultural land, monitoring unauthorized ALCs, and imposing fines and taxes on the unplanned ALC. Agricultural land provides important non-market goods and services with good management. Improper conversion of agricultural land to non-agricultural land makes it unproductive and endangered, leading to global warming and climate change.

## 1. Introduction

Land use change (LUC) is a major factor in the economic development process (Liu, 2018; Ning et al., 2018; Peerzado et al., 2018), which has socio-economic impacts and influences on land use decisions (Gomes et al., 2019; Gounaridis et al., 2019; Ren et al., 2019). Many developing nations (e.g., India and China) have transferred huge tracts of agricultural land to industrial use during the growth process (Kontgis et al., 2014; Nguyen et al., 2016; Schneider, 2012). Humans have changed land use since time immemorial, but the current rate of change is greater than ever (Munteanu et al., 2014; Widianingsih et al., 2019). The growth in LUC rates creates a conflict between protecting

agricultural land and achieving food security (Petrescu-Mag et al., 2019; Schaefer and Thinh, 2019) and the development of industrialization for employment (Cling et al., 2010; Zhu et al., 2019). Requests for ALC to non-agricultural land (e.g., residential, industrial, roadside, and forest) have mostly been observed in developing countries since such conversions in agricultural lands are highly economical in comparison to other LUCs (Azadi et al., 2011; Bórawski et al., 2019).

Agricultural land conversion (ALC) has raised concerns about endangering food security, reducing food production, diminishing agricultural labor, increasing rainfed land, and transformations in the culture and the livelihoods of indigenous peoples (Naab et al., 2013; Nguyen et al., 2016; Thuo, 2013). Therefore, the quick development of

industrialization may endanger agricultural land in emerging countries (Abu Hatab et al., 2019; Azadi et al., 2011). However, the ALC can lead to a significant increase in household income and thus enable households to escape poverty (Li et al., 2011; Nguyen et al., 2016). It should be highlighted that legal constraints, general land use rules, and indigenous people all have an impact on how land is used. This is the case in countries with private ownership of land use (e.g., Singapore and the USA) (Moroni, 2018; Thuo, 2013) and also in countries with state ownership of land use (e.g., China) (Long and Qu, 2018; Wang et al., 2018a).

Several studies, (i.e., Basakha and Hossein Mohaqeqi Kamal, 2018, Hussain and Imtiyaz, 2016, Lee et al., 2020, Nguyen et al., 2016, and Tran (2013)) have been conducted on the impact of the ALC and land ownership policy during the industrialization period. A study on the social welfare of industrial development trends was conducted by Baskha and Hossein Mohagheghi Kamal (2015) in Iran. They used two indicators of social welfare composite and absolute welfare for short-term and long-term dynamic relationships in an autoregressive distributed lag model. Their findings suggest that the current evolutionary process has a major beneficial influence on social welfare, particularly in the long run. In addition, Hussain and Imtiyaz (2016) conducted a study in Srinagar, India, to investigate the social impacts of rapid development and urbanization. Their results indicate significant impacts of the urbanization process on various social dimensions such as family structure, collapse of the family institution, and women's financial independence. Lee et al. (2020) investigated the impact of the ALC and the growth of urban areas on agricultural land values in Pingtung, Taiwan. They analyzed land price discrepancies using a multilevel analytic method. The average land values in each area of the research varied significantly, according to their findings. Furthermore, the results of the experimental regression model show that the ALC pressure and urbanization have direct and beneficial impacts on the prices of agricultural land. In addition, Nguyen et al. (2016) examined the livelihoods and economic benefits of farming households following the rapid urban development and the ALC in Vietnam. On average, farming households benefited less than other communities. Although households can turn to higher-income non-agricultural livelihoods, it is very difficult to maintain such livelihoods. In one study, Tran (2013) categorized families into three categories based on post-land subsistence strategies in Huai Duke, Hanoi. The first group has informal wage jobs, the second group focuses on trade, and the third group is known for subsistence diversity. According to the results of Tran (2013), due to the reduction of agricultural land in Vietnam, there are positive and significant relationships between agricultural land, social capital, and the livelihood of rural households.

Given that several primary studies on the social and economic repercussions of the ALC in the period of urbanization and industrialization have been undertaken, because of the increasing conversion of agricultural areas throughout the world, there is a study along with such impacts. The novelty of this study is specified to systematically review the impacts of the ALC on socio-economic impacts and to quantify them in the world. In the current study, a systemic review with the main aim of analyzing the impacts of the ALC on social and economic impacts has been conducted. According to a review of the articles, we first investigate the socio-economic impacts of the ALC and the accelerated industrialization process using meta-analysis. Hence, the primary goal of this study is to investigate the global socio-economic impacts of the ALC. Two research questions have been raised in the present study:

1) How does ALC affect the social status of the farmers?
2) How do farmers whose farmland has been converted during the industrialization process benefit economically?

## 2. Definition of the ALC

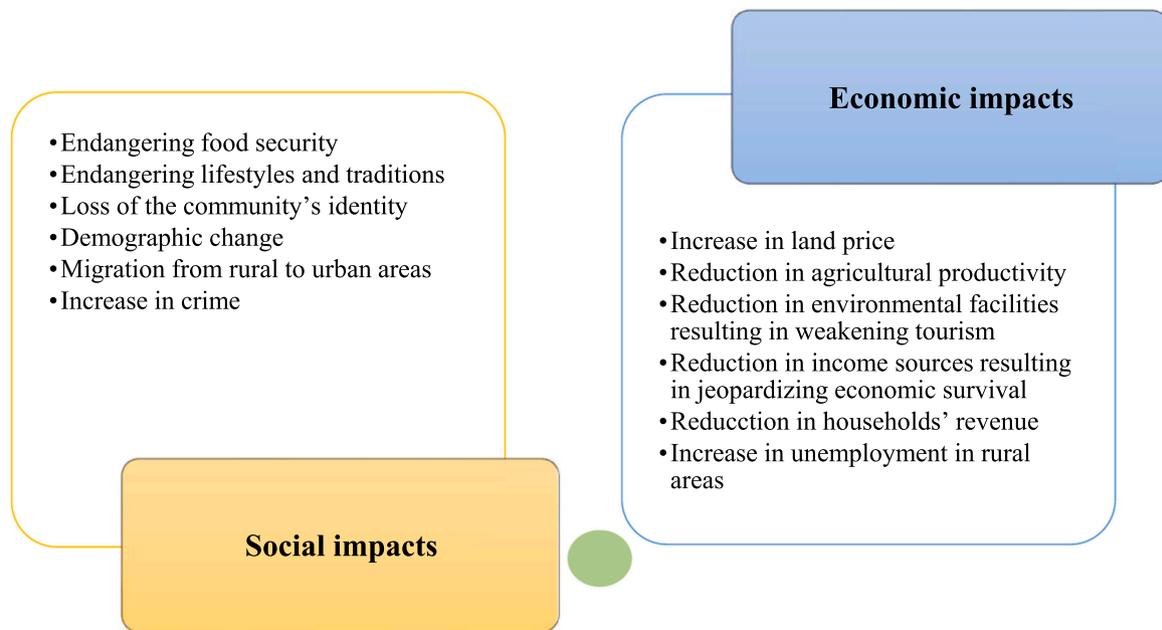Land is one of the basic inputs of production along with labor and capital in the economy, which is the main factor of housing and food production (Meyfroidt et al., 2019; Zhang et al., 2016). Moreover, land, which is the main driver of agricultural economies, has considerable social and economic benefits (Chen et al., 2018). Agricultural land is actually arable land for permanent or rangeland cultivation, where crops remain on the land for a long time and do not need to be replanted after each harvest (Oliveira et al., 2017). The definition of ALC also refers to the conversion of dry or barren land in accordance with the laws of most states (Azadi et al., 2011; Azadi et al., 2015; Rondhi et al., 2018; Teshome, 2014; Ustaoglu and Williams, 2017). Therefore, the process of LUC has widely occurred in the current economic development and population growth (Hu et al., 2019; Peerzado et al., 2018; Toure et al., 2018). The ALC, which is the most common kind of LUC, may result in difficulties like agricultural land loss and food shortages (Loehr, 2012; Zhong et al., 2020). In addition, agriculture, cultivation patterns, and agricultural management practices have an important role in emissions of greenhouse gas (GHG), availability of water, and soil quality (Abdalla et al., 2019; Azadi et al., 2015; Barão et al., 2018). Agricultural land is critical to rural communities' livelihoods since it provides them with food, money, shelter, and social rights (Elver, 2019; Guo et al., 2019). Therefore, accurate planning on the ALC is necessary for land use policymakers.

Various factors including the execution of weak legislation, uncertain ownership status, a narrow area of land ownership, and excessive taxes influence the conversion of farmland. Such conversions influence humans and their environment (Azadi et al., 2015; Omrani et al., 2015; Yurui et al., 2019). The extensive conversion of agricultural land has considerable impacts on the environment and agricultural products (Alexander et al., 2019; Marques et al., 2019). Thus, the conversion of agricultural land to other land uses has been prevented by many countries (e.g., Indonesia, China, and India) (Fragkos et al., 2021). The crisis that countries have recently faced regarding agriculture and rural communities has been the widespread conversion of agricultural land (Calicioglu et al., 2019; Rondhi et al., 2019).

The literature on the ALC describes the drivers influencing the expansion of industrial regions. In order to study economic development, there are two groups of theories including the microeconomic theory on LUC (Calero and Turner, 2019; Fan et al., 2020; Wahyudi et al., 2019) and the bid-rent model (Gao et al., 2020; Yang et al., 2018). The microeconomic theory considers the ALC during economic development according to the decision-making of land users who maximize their expected profits. To understand the spatial and temporal dynamics of land use decisions, spatially-explicit land use models are among the strong tools based on microeconomics (Jiang and Zhang, 2016; Magliocca, 2020). In the offer-lease model, the length of an industrial area is the only motivator of land lease and the geographical impact of different land uses. Among the model's additions are the impacts of revenue, transportation, and geographical heterogeneities in terms of climate, soil characteristics, and blessings of natural resources (Gao et al., 2020; Li et al., 2020). Lease theory uses spatial land use models for agricultural and natural land change, industrial development, and urbanization (Deng et al., 2010; Gao et al., 2017).

## 3. Socio-economic impacts

Although LUC is essential in the economic development process, such change has various impacts (e.g., destroyed natural ecosystems, soil erosion, soil fertility decline, and declined biodiversity) and costs (Asabere et al., 2020; Lestrelin et al., 2019; Liu et al., 2018). In recent years, scholars (e.g., Asadi et al., 2015; Barca, 2012; Nguyen et al., 2016; Scholte et al., 2012) have focused on research into the consequences of LUC, especially the socio-economic impacts. It is impossible to examine all the socio-economic impacts of LUC, especially in one society (Bacher et al., 2017; Goryakin et al., 2015). The following are some examples of the socio-economic impacts of ALC. In fact, Fig. 1 illustrates the predicted impacts, positive or negative, on social and economic dimensions globally during the process of economic development when agricultural

**Fig. 1.** Socio-economic impacts of the ALC.
Source: Asadi et al. (2015) and Nguyen et al. (2016).

land is converted. Although the list is not exhaustive, it actually represents an example of socio-economic impacts. However, socio-economic impacts include two groups of social and economic impacts, which are described in two separate sections.

### 3.1. Social impacts

Conversion of agricultural land to non-agricultural uses decreases the amount of available farmland for food production (Busko and Szafranska, 2018; Rondhi et al., 2018). Thus, it can endanger food security in a community (Appiah et al., 2019; Ramankutty et al., 2018).

The migration of farming households from rural to urban areas and suburbanization around cities pose many challenges (Güneralp et al., 2017). For example, conflicts with other neighbors and subsequent destruction, such as damage to equipment, are a concern for marginalized households (Whyte et al., 2018). Neighboring households mostly engage in productive activities, including equipment sharing, land leasing, and irrigation system development. However, benefits are lost in the process of economic development (Alford and Yates, 2015). Farmers may not be able to share information and trade relations with neighbors. Thus, it can be said that tradition and lifestyle are changing (Ge et al., 2019).

In some regions such as Eastern Asia, Western Asia, and Latin America, the urbanization process has grown so rapidly that rural communities have lost themselves. Lack of opportunities for economic activity has turned some communities into ghost towns (Wu et al., 2016). Rapid economic growth has resulted in class gaps across areas (Chung et al., 2018). In urban areas, there is a tendency to attract low-income households and exclude high-income households. The combination of low average incomes in urban areas leads to lower tax bases as well as higher services (Morris et al., 2019).

Demographic change, which means individual's variation in terms of number and composition, contributes to changes in populations, including how individuals inhabit the earth, organize societies, and create culture (Lee and Zhou, 2017; Vollset et al., 2020; Weinberger et al., 2017). Increasing population concentration in a region can have different socio-economic environmental impacts (Wang et al., 2018b). Urban regions that were created as a result of the rapid development process or were affected by such a process have several problems that

require to be addressed (Dolley et al., 2020; Yu et al., 2019). One of these problems is the inadequacy of services in those areas because of population growth (Satterthwaite, 2017).

The implementation of industrial projects accelerates the rate of migration from rural to urban regions because jobs or social services are severely available only in urban regions (Zeng et al., 2019). Another reason for the increase in migration rates is the perception of the attractiveness of urban life (Schäfer and Just, 2018). Such rapid migration from rural regions has impacts there, such as demographic change (Holmes and Argent, 2016; Thurlow et al., 2019) and reduced rural survival (Davey, 2017). However, It also affects urban areas with rapid settlement expansion, especially in the suburbs, which are prone to extreme poverty (Imai et al., 2017) and increased crime in those suburbs (Battin and Crowl, 2017).

### 3.2. Economic impacts

During the ALC, the degradation of agricultural soil quality, including soil erosion, salinization, desertification due to intensive agriculture, reduced agricultural productivity due to reduced land quality, and reduced investment in new technology and rural unemployment due to uncertainty about the long-term stability and profitability of agriculture, occurs (Boone et al., 2019; Puspadjuita, 2017; Van Leeuwen et al., 2019).

As industrialization intensifies, conflicts over land use for agricultural or non-agricultural purposes increase (Wang et al., 2018a). This may lead farmers to suffer some of the negative impacts of declining agriculture such as endangering food security, rural unemployment, and immigrating to the city. When agricultural land and as a result agricultural activities decrease, the supply of inputs and services in this sector decreases (Helming and Tabeau, 2017). Thus, farmers may spend a lot of time and more money to prepare their inputs and repair their equipment. As the agricultural sector shrinks, the competition for jobs in the non-agricultural sector increases (Lu et al., 2018). If support for the agricultural sector is suddenly reduced and the income sources in this sector are reduced, there is a possibility that the survival of the local economy will be endangered and the agricultural economy will collapse (Sobczak-Szelc and Fekih, 2020).

The process of economic development can also bring positive

opportunities for farmers (Calicioglu et al., 2019). The industrial sector's demand for agricultural goods has grown as a result of industrialization, and farmers may now sell their products to this sector at better prices. For example, vegetable growers prefer to get higher prices from selling vegetables in urban regions (Mwangi and Crewett, 2019). The considerable growth of high-value agricultural products and the development of food processing industries around urban areas indicates the high rate of development in the agricultural economy (Martin, 2019). Many farmers have taken advantage of these new economic opportunities in the suburbs and have diverted their capital to those activities. Farmers in densely populated areas have turned to intensive agriculture. Therefore, the total value of agricultural products is higher in areas under urban pressure (Pölling et al., 2016; Pribadi and Pauleit, 2016).

Rural spaces have vast lands, vast watersheds, clean air, and pristine nature. So, it is a potential opportunity to attract tourists (Liu and Wong, 2019). There are a lot of concerns about how to exploit natural resources and convert those resources during industrialization. The process of economic development reduces environmental facilities and weakens tourism (Stoffelen and Vanneste, 2017), and the process of environmental degradation has profound socio-economic and political impacts in the future.

In addition, many local governments have enacted strict land use laws to protect agricultural land (Liu et al., 2017). Numerous policies such as government regulations and taxes have been quite effective in reducing ALC rates, so a potential cost to control ALC is that residential land prices are rising, which are unbearable for low- and middle-income households. So, there is an inverse relationship between land use laws and the affordability of residential land (Broxterman and Liu, 2019).

## 4. Methodology

A meta-analysis was used in this research to synthesize the socio-economic impacts of the ALC on a worldwide scale. A meta-analysis is a statistical compilation of the findings from multiple original papers in order to handle new problems (Pigott and Polanin, 2020). By combining the data, one can quantitatively evaluate whether the causal links found in the primary papers are still true in a broader variety of literature. A meta-regression is used to explore the causal connections, in which various dependent and independent variables combine. Based on the major variables mentioned in the previous section, Tables 1 and 2 illustrate the primary dependent and independent variables applied in this meta-regression.

Fig. 2 shows the step-by-step analysis of our adopted method in line with the studies by Vesco et al. (2020) and Woodcock et al. (2014). The five steps used in this paper's meta-analysis of the original papers are depicted in Fig. 5 (i.e., searching, inclusion and exclusion criteria, evaluation, data extraction, and synthesis).

### 4.1. Searching

Three key criteria should be present in a successful look for original papers. According to Turke et al. (2021), it should be: 1) comprehensive (finding the greatest number of original papers), 2) systematic (being a determined and consistent search), and 3) open (giving the users information on the search strategy). From 1970–2020, various databases, including ISI Web of Knowledge, ProQuest, Elsevier Science, Springer, and Oxford University Press, were carefully examined for original articles for this study. Also, the main keyword used to obtain the data was 'the conversion of agricultural land' along with other relevant concepts including 'ALC', 'agricultural land conversion', 'land conversion', and 'land use change'. These keywords were then combined with 'socio-economic impact', 'crime', 'tourism', 'lifestyles', 'traditions', 'land price', 'food security', 'income sources', 'unemployment', 'economic survival', 'households' revenue', 'community's identity', 'demographic change', 'agricultural productivity', 'environmental facilities', and 'migration from rural to urban areas'. About 2380 original articles were

**Table 1**
Definition of the dependent variables.

| Socio-economic impact | Dependent variable | Definition |
|---|---|---|
| Social impacts | Demographic change | Decrease in the number of people and increase in the average age in rural areas |
| | Migration | Moving the farming households from rural to urban areas |
| | Endangering lifestyles and traditions | Decreasing communication and trade relations among farmers and neighbors |
| | Endangering the community's identity | Losing the originality and culture of the community as a result of rapid urbanization |
| | Endangering food security | Decrease in food availability due to reduction in the amount of available farmland |
| | Crime | Increasing the villainy in urban and suburban areas as a result of migration and poverty |
| Economic impacts | Rural unemployment | Reduction in job opportunities in rural areas as a result of decreased investment in these areas |
| | Endangering household's revenue | Decreasing farmers' revenue due to spending a lot of money on inputs and equipment repair |
| | Endangering tourism | Reducing ecotourism due to the intensification of the use of natural resources during industrialization |
| | Land price | Increase in land value as a result of strict government regulations on rapid ALC |
| | Endangering income sources | Reduction in income sources as a result of fierce competition for using agricultural land. |
| | Endangering agricultural productivity | Decrease in agricultural products as a result of degradation of agricultural soil quality and reduction in farmlands |

Source: Asadi et al. (2015) and Nguyen et al. (2016)

**Table 2**
Main independent variables coded from the original articles and included in the meta-regression.

| Factor | Variable | Description |
|---|---|---|
| Land use | The ALC rate | Continuous variable: The conversion rate of agricultural land to non-agricultural land use. |
| Time | Year of project | Continuous variable: If the study gathered the required data from 1970 to 2020. |
| Space | Africa | Dummy variable: If the study is performed in Africa. |
| | Asia | Dummy variable: If the study is performed in Asia. |
| | Europe | Dummy variable: If the study is performed in Europe. |
| | America | Dummy variable: If the study is performed in America. |
| Type of article | ISI publication | Dummy variable: If the research is published in an ISI Journal. |
| Methodology applied | Appropriate method | Dummy variable: If the study captured unobserved heterogeneity. |

Source: Meemken (2020) and Pigott and Polanin (2020)

found in our initial search.

### 4.2. Inclusion and exclusion criteria

Our initial thorough scan turned up a lot of unique pieces. The suitability of the papers for the meta-analysis should then be decided. Setting inclusion and exclusion parameters for original papers is crucial at this point because it can have an impact on the meta-findings. Analysis transparency should be maintained in the selection of original
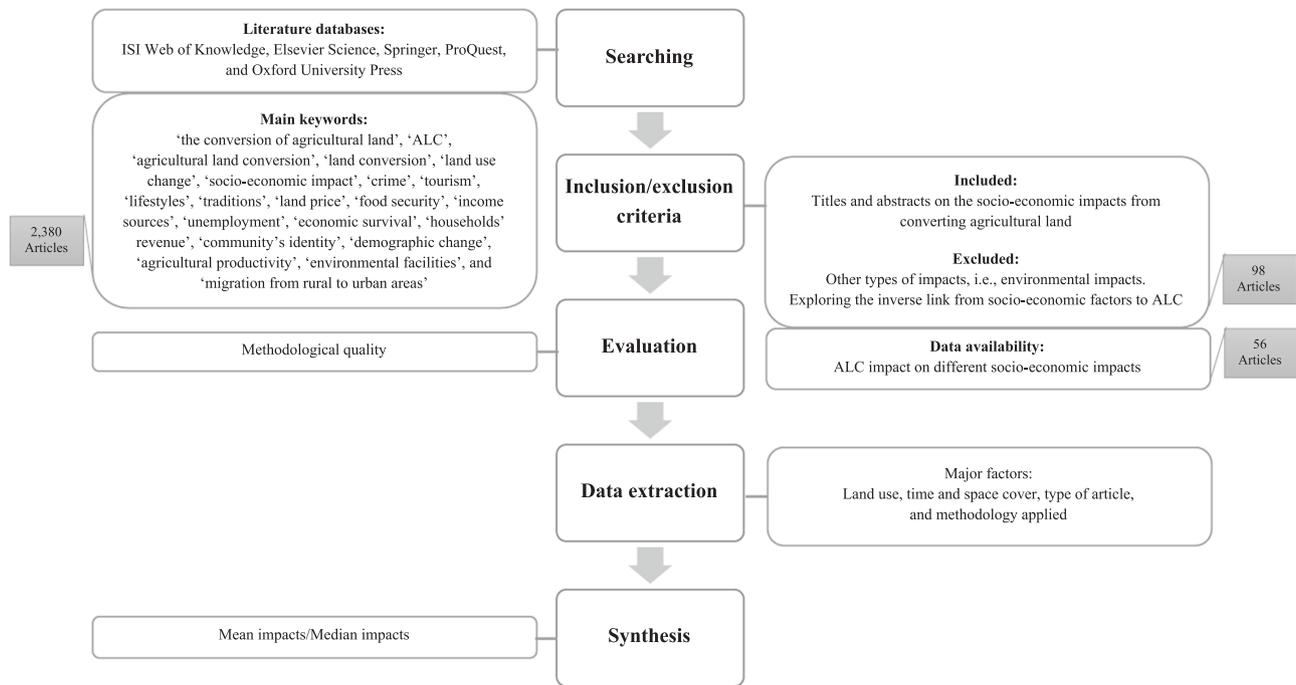
**Fig. 2.** The flowchart of research methodology steps.
Source: Study findings.

papers for the meta-analysis (Pigott and Polanin, 2020). As a result, some criteria for initial text inclusion and exclusion were used. As a result, headlines and abstracts of papers with an emphasis on the socio-economic impacts of ALC were extracted. During our meta-analysis, the social and economic impacts served as the dependent factors (Table 1). Social impact includes demographic change, migration, endangering lifestyles and traditions, endangering the community's identity, endangering food security, crime and economic impacts include rural unemployment, endangering households' revenue, endangering tourism, land price, endangering income sources, and endangering agricultural productivity (Table 1). Thus, papers addressing other types of impacts (such as environmental impacts) were excluded. Furthermore, articles that explored the inverse links from socio-economic factors to the ALC were also excluded from the current meta-analysis. Consequently, 98 journal articles were generated as a consequence of this step. However, the 98 original papers were applied to the criterion of "data availability" regarding the socio-economic impacts of the ALC. Reporting the impact size in the form of percentage difference, which represented the difference between converting and non-converting agricultural land, was required for different socio-economic impacts in the original articles. For example, when agricultural land became non-convertible to agricultural land, the impact of migration was reported as a percentage difference. The number of initial articles was consequently reduced to 56 because of the lack of quantifiable data on impact sizes on dependent variables. The complete list of the original articles is in Appendix A.

### 4.3. Evaluation

The original papers' methodologies varied, which should be taken into account when studying meta-analysis (Meemken, 2020; Vesco et al., 2020). Therefore, it is important to assess the papers' methodology in a clear manner. In the present meta-analysis, an explanatory variable (methodology employed) was used to assess the original papers' methodological quality (Table 2). To obtain consistent impact sizes and avoid the heterogeneity problem, the percentage changes for dependent factors in the meta-regression were also taken into account (which

frequently occurs in meta-analysis studies). Average impact sizes were created by weighing the data from original papers according to the sample size used in the pertinent studies (Meemken, 2020).

### 4.4. Data extraction

Even when they cover the same topic, original pieces have vastly different data collection quantities and standards. The conclusions of the meta-analysis may be impacted by choices regarding which data should be extracted. Therefore, the data extraction process should be clearly stated, and the data extraction measures should be uniform across all original pieces (Pigott and Polanin, 2020; Vesco et al., 2020). In this study, data extraction was conducted from 56 selected articles. In the original investigations, the dependent variables (Table 1) were measured in a variety of units (e.g., prices of land may be evaluated in local currencies, in USD, or percentage raise). To arrive at uniform impact sizes, adopted from Klümper and Qaim (2014) and Meemken (2020), percentage differences were calculated between converting and non-converting agricultural land for all the dependent variables. The changes in percentage have two advantages: first, they are easy to understand, and second, they can be computed without the need for measures of variance, which many original publications lack.

To code the independent variables that were present in each original article, the following major factors (Table 2) were specified in accordance with Pigott and Polanin's (2020) approach: land use, time and area coverage, story category, and methodology used. In the first stage, qualitative statistics for each component were combined. In the second stage, the aggregated data included under each factor was specified (if it is a continuous or dummy variable). When the original article addressed a specific feature, a dummy variable in the third stage would be set to 1, otherwise, it would be set to 0.

### 4.5. Synthesis

The present meta-analysis attempts to summarize the extent of the ALC's impact on socioeconomic outcomes. The techniques for combining original articles vary significantly, and some approaches are

more effective in reducing measurement bias (Meemken, 2020). Among the most successful methods are the mean and median impacts (Klümper and Qaim, 2014). The mean impacts are calculated using metaregression, and the medians for the main articles were quantitatively synthesized. In addition, based on Appendix B, the publishing bias test show the primary socio-economic impacts of converting arable land. Furthermore, our research included English-language publications in peer-reviewed foreign journals that investigated the ALC's socioeconomic impacts. Moreover, it required 50 days to collect information from the original articles for the aforementioned steps.

## 5. Results

### 5.1. Data distribution

According to the review of 56 original articles, the maximum rate of the ALC is 46%, and the distribution of the conversion rate of agricultural land is shown in five different groups in Fig. 3. The general view of the figure indicates a normal distribution. The two groups of 0%– 10% and 11%– 20% rates of the ALC include three and 10 studies, respectively. Then, 33 articles show that the conversion rate of agricultural land is in the range of 21–30%. The next groups of rates of the ALC have fewer studies, with eight studies in the 31% − 40% group and 2 studies in the 41% − 50% group.

Based on the spatial distribution, 56 original articles were performed in 37 countries over four continents (Fig. 4). Most of the projects (29 articles; 51.8%) are determined in Asia, which are mostly distributed in China (9 articles; 16.1%). Investigating the socio-economic impacts, while 36.5% of China's arable land has been transformed for residential and industrial purposes, the ALC has become an attractive issue for scholars in the nation. Also, 20 articles (35.7%) are performed in America. Few projects that evaluated the socio-economic impacts of the ALC have focused on European (4 articles; 7.1%) and African (3 articles; 5.4%) countries. In addition, Appendix C arranged original articles based on country and continent.

Fig. 5 illustrates the temporal trend based on the year of the projects, which has an upward trend. During the two decades of 1971–1980 and 1981–1990, a small number of articles were three (5%) and one (2%) projects, respectively, while most of the projects (27 articles; 48.2%) were performed in the period of 2011–2020. As shown in Fig. 5, the number of ALC projects drastically increased after 2000. Therefore, since 2000, a growing number of scholars have concentrated on the issue of examining the ALC's socioeconomic impacts.

The criterion of "whether the paper is published in ISI-indexed journals" was used to assess the quality of the articles. According to the results, 40 (71.4%) papers were published in ISI journals. In addition, only four papers used panel models to incorporate unobserved heterogeneity in research findings. As a result, these investigations were
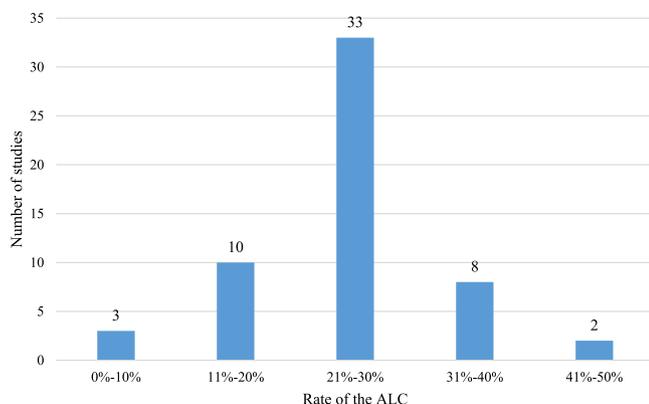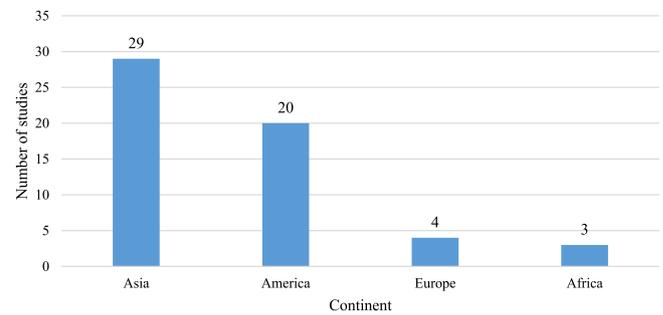


**Fig. 4.** The spatial distribution in different continents.
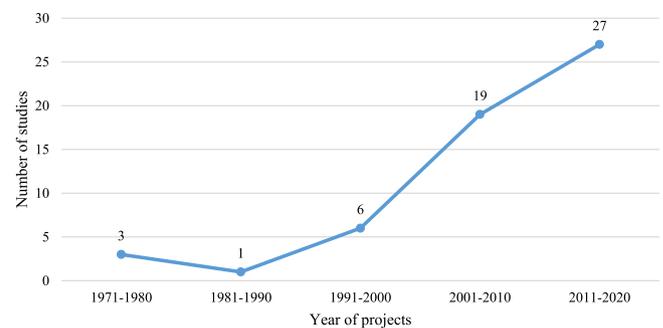Source: The study findings.



**Fig. 5.** The temporal trend based on the year of the projects.
Source: The study findings.

deemed unbiased (Wooldridge, 2009).

### 5.2. Ranking of types of socio-economic impacts

The distribution of socio-economic impacts due to the ALC is displayed in Table 3. Among the considered variables of social impacts, the three variables of demographic change, migration, and endangering lifestyle and traditions have the most distribution, which includes ten, nine, and seven articles, respectively (17.8%, 16.1%, and 12.5%). In contrast, only 5 studies (8.9%) examined the positive impact of the ALC on crime during the economic development process. Regarding economic impacts, the most important impacts of the ALC are related to rural unemployment, endangering households' revenue, and endangering tourism with eleven, ten, and nine articles, respectively. Also, the lowest distribution of ALC on economic impacts is related to endangering agricultural productivity with the number of six papers (10.7%).



**Fig. 3.** The distribution of the rate of the ALC.
Source: The study findings.

**Table 3**

Distribution of socio-economic impacts due to the ALC.

| Socio-economic impact | Dependent variable | Number of studies |
|---|---|---|
| Social impacts | Demographic change | 10 |
| | Migration | 9 |
| | Endangering lifestyles and traditions | 7 |
| | Endangering the community's identity | 6 |
| | Endangering food security | 6 |
| | Crime | 5 |
| Economic impacts | Rural unemployment | 11 |
| | Endangering households' revenue | 10 |
| | Endangering tourism | 9 |
| | Land price | 8 |
| | Endangering income sources | 7 |
| | Endangering agricultural productivity | 6 |

Source: The study findings

## 5.3. Meta-regressions on original articles

A scientific approach for summarizing and quantitatively evaluating studies with supporting data is meta-regression analysis (Doucouliagos, 2016). This study grouped original articles into two classes based on social and economic goals. Accordingly, two meta-regressions were estimated as follows: 1) factors influencing social impacts from the ALC (Tables 4), and 2) factors influencing economic impacts from the ALC (Table 5). As indicated in Table 4, $R^2$ ranges from 0.48 (endangering food security) to 0.93 (crime), and according to Table 5, $R^2$ ranges from 0.49 (endangering household's revenue) to 0.86 (endangering agricultural productivity). They display the ratio of the variation for the socioeconomic impacts that can be accounted for by adding explanatory factors to meta-regressions.

The temporal impacts have a significantly positive influence on some social impacts including demographic change (mean impact: 0.010, $P < 0.05$), migration (mean impact: 0.008, $P < 0.05$), endangering lifestyles and traditions (mean impact: 0.004, $P < 0.05$), and crime (mean impact: 0.010, $P < 0.05$). It means that due to the ALC, those social impacts have increased over time. However, in recent years, food security has improved, despite the high conversion rate of agricultural land because the coefficient of endangering food security is significantly negative (mean impact: $-0.002$, $P < 0.10$). Different continents have a substantially beneficial influence on the four social impacts, including demographic change, migration, threatening habits and customs, and crime, in terms of their geographical impacts. Thus, studies on ALC in Africa, Asia, Europe, and the Americas magnify these impacts differently. For example, the spatial impact of Africa on demographic change due to the ALC (mean impact: 20.319, $P < 0.01$) is different from the three continents of Asia (mean impact: 20.272, $P < 0.01$), Europe (mean impact: 20.280, $P < 0.01$), and America (mean impact: 20.378, $P < 0.01$) (Table 4, the column of demographic change).

Furthermore, the temporal impacts indicating the year of projects conducted on conversion rate of agricultural land have a considerable positive impact on some economic impacts, including endangering tourism (mean impact: 0.005, $P < 0.10$) and endangering income sources (mean impact: 0.003, $P < 0.10$). It means that those economic impacts due to the ALC have increased over time. However, in recent years, agricultural productivity has improved, despite the high conversion rate of agricultural land, because the coefficient of endangering agricultural productivity is significantly negative (mean impact: $-0.016$, $P < 0.05$). For spatial impacts, different continents have a significant positive impact on three economic impacts, including endangering tourism, endangering sources of income, and endangering agricultural productivity. Therefore, studies on ALC have been performed in Africa, Asia, Europe, and the Americas, which have different impacts on these impacts. For example, the impact of Africa on endangering tourism due to the ALC (mean impact: 11.941, $P < 0.10$) is different from the three continents of Asia (mean impact: 11.990,

$P < 0.10$), Europe (mean impact: 11.957, $P < 0.10$), and America (mean impact: 12.041, $P < 0.10$) (Table 5, the column of endangering tourism).

Overall, the component of the article category (defined in Table 2) explains approximately $-0.15\%$ and 0.25% of the variations in impact sizes of jeopardizing community identification and crime, respectively (Table 4). Additionally, the impact sizes of various factors on rural unemployment, household revenue, tourism, land price, income sources, and agricultural productivity showed variations of $-0.05\%$, $-0.15\%$, $-0.08\%$, $-0.14\%$, $-0.33\%$, and $-0.05\%$ respectively. These variations indicate the extent to which these factors contribute to the negative outcomes mentioned. Moreover, the coefficients of the approach used in Tables 4 and 5 are not substantial, implying that the original publications that recorded unobserved variability in their data have no substantial societal repercussions.

Additionally, Appendix B shows that the reported bias is symmetric for all social factors by merging the results of the original articles. As a result, the publishing bias test shows that there was no bias in presenting the results of the original articles. Therefore, the validity of the original articles in general and the meta-analysis in specific can be confirmed, as the impacts are accurately estimated and as there are no impacts.

## 5.4. Social impacts of the ALC

As Table 4 shows, with a 1% increase in the conversion rate of agricultural land, the demographic change will increase by about 0.94%. It is natural that during the economic development process, with an increase in the ALC, such a social impact occurs in the form of a change in the number and composition of individual population. Furthermore, the 1% increase in the ALC rate leads to an increase of more than 0.23% in rural migration to urban areas (Table 4). Although this is a social impact, it can also cause other issues such as unemployment or false jobs. During economic development and the ALC, farmers no longer share their inputs, equipment, and information with their neighbors in productive activities. Thus, this is perceived as a change in lifestyles and traditions and in a way a change in community's identity. According to Table 4, an increase of 1% in the amount of ALC causes more than 0.88% and 1.39%, respectively, to jeopardize the lifestyle, traditions and identity of the community. In contrast, the results indicated that increasing the conversion rate of agricultural land improves food security by about 87% per 1% of the ALC rate (Table 4). This is due to the conversion of agricultural land to non-agricultural use, the shrinking of farms, and the use of modern technologies such as chemical fertilizers and improved seeds, which have increased the yield and compensation of small-scale farms. Finally, a 1% increase in the ALC leads to more than a 2% increase in crime (Table 4).

Furthermore, Fig. 6 indicates the median impacts of the ALC on social impacts. The impact of the ALC on endangering food security is significantly negative (median impact: $-0.765$, $P < 0.05$) (Fig. 6). It

**Table 4**
Factors influencing social impacts in meta-regressions.

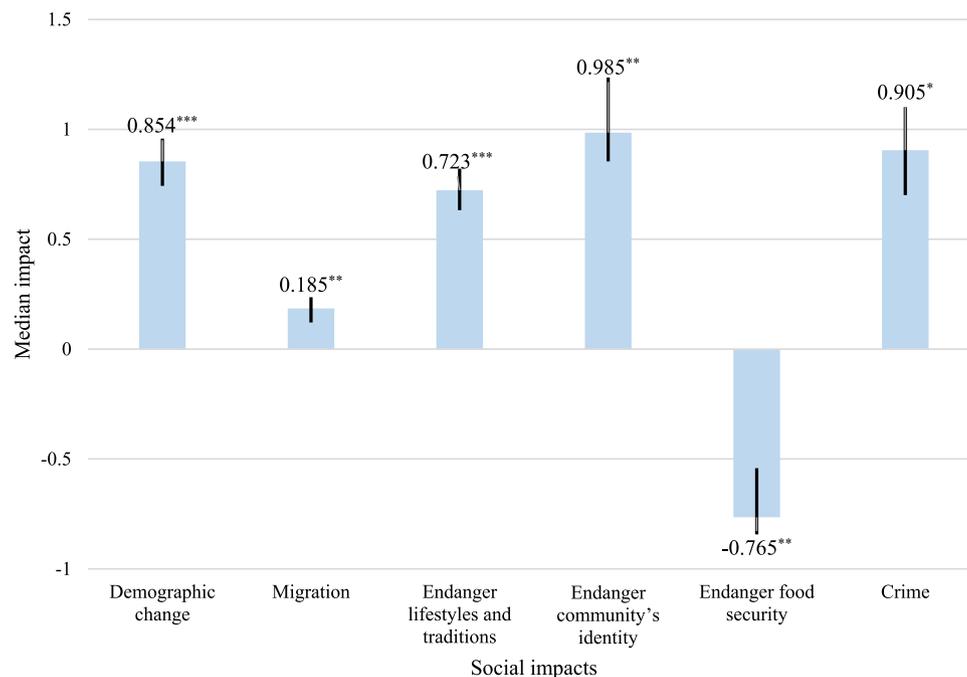| Factor | Variable | Demographic change | Migration | Endangering lifestyles and traditions | Endangering community's identity | Endangering food security | Crime |
|---|---|---|---|---|---|---|---|
| Land use | The ALC rate | 0.937*** | 0.232* | 0.882*** | 1.392*** | -0.873** | 2.172*** |
| Time | Year of project | 0.010** | 0.008** | 0.004** | 0.001 | -0.002* | 0.010** |
| Space | Africa | 20.319*** | 15.999*** | 8.349** | -4.114 | 13.337 | 21.138*** |
| | Asia | 20.272*** | 16.236*** | 8.488** | -4.161 | 13.374 | 21.142*** |
| | Europe | 20.280*** | 16.011*** | 8.211** | -4.058 | 13.189 | 21.134*** |
| | America | 20.378*** | 16.211*** | 8.431** | -4.019 | 13.253 | 21.123*** |
| Type of article | ISI publication | -0.013 | 0.064 | -0.014 | -0.149*** | 0.024 | 0.252*** |
| Methodology applied | Appropriate method | 10.391 | 5.443 | 11.625 | -15.108 | 1.994 | -12.283 |
| $R^2$ | | 0.82 | 0.79 | 0.75 | 0.53 | 0.48 | 0.93 |
| Number of observations | | 48 | 53 | 52 | 36 | 47 | 63 |

Source: Study findings
\* $P < 0.10$; \* \* $P < 0.05$; \* \* \* $P < 0.01$

**Table 5**
Factors influencing economic impacts in meta-regressions.

| Factor | Variable | Rural unemployment | Endangering household's revenue | Endangering tourism | Land price | Endangering income sources | Endangering agricultural productivity |
|---|---|---|---|---|---|---|---|
| Land use | The ALC rate | 2.887*** | 2.976*** | 1.706** | 1.309** | 2.142** | -2.308* |
| Time | Year of project | 0. 003 | -0.001 | 0.005* | -0.001 | 0.003* | -0.016** |
| Space | Africa | -1.238 | -0.458 | 11.941* | 3.416 | 8.127* | 33.337*** |
| | Asia | -1.499 | -0.482 | 11.990* | 3.239 | 8.297* | 33.374*** |
| | Europe | -1.485 | -0.311 | 11.957* | 3.265 | 8.224* | 33.189*** |
| | America | -1.292 | -0.428 | 12.041* | 3.226 | 8.467* | 33.253*** |
| Type of article | ISI publication | -0.053* | -0.153*** | -0.082** | -0.138*** | -0.328*** | -0.052* |
| Methodology applied | Appropriate method | 9.842 | 8.206 | 24.322 | 18.562 | 15.124 | 11.365 |
| $R^2$ | | 0.54 | 0.49 | 0.66 | 0.51 | 0.63 | 0.86 |
| Number of observations | | 46 | 39 | 51 | 42 | 56 | 64 |

Source: Study findings
* $P < 0.10$; * * $P < 0.05$; * ** $P < 0.01$



**Fig. 6.** Median impacts of the ALC on social impacts. Error bars illustrate standard errors. * $P < 0.10$; * * $P < 0.05$; * ** $P < 0.01$.
Source: Study findings.

means that increasing the ALC rate causes more food security on remaining lands. According to Fig. 6, the ALC significantly increases demographic change (median impact: 0.854, P < 0.01) and migration (median impact: 0.185, P < 0.05). Also, the ALC raises endangering lifestyles and traditions (median impact: 0.723, P < 0.01), endangering the community's identity (median impact: 0.985, P < 0.05), and crime (median impact: 0.905, P < 0.10). Thus, the most positive impact of the ALC is identified on the median of endangering the community's identity. The median impacts of the ALC on endangering the community's identity are about 13%, 81%, 27%, and 8% more than demographic change, migration, endangering lifestyles and traditions, and crime.

### 5.5. Economic impacts of the ALC

As Table 5 shows, with a 1% increase in the conversion rate of agricultural land, rural unemployment will increase by about 2.89%. It is certain that converting agricultural land use to non-agricultural land will cause unemployment for the farmers. Furthermore, as agricultural land is the most essential productive resource for farmers, a 1% increase in the ALC rate results in a 2.98% increase in family revenue (Table 5).

During the economic development and the conversion of agricultural land, along with the destruction of the rural natural resources, 1.706% of the tourist attraction is also endangered (Table 5). Another economic impact of the 1% increase in the ALC is that land prices will increase by approximately 1.31%, as Table 5 shows. The LUC limits this factor, and therefore its price increases as land is limited. Agricultural land is one of the income sources in rural areas because all kinds of agricultural activities can be implemented on it. Thus, the results of Table 5 show that a 1% increase in ALC leads to a 2.14% risk of income sources. Finally, the ALC cannot be a threat to agricultural productivity because the coefficient of the variable is significantly negative (mean impact: −2.308, P < 0.10) (Table 5). One reason is that small-scale farmers are efficient and thus increase agricultural productivity.

Furthermore, Fig. 7 indicates the median impacts of the ALC on economic impacts. According to Fig. 7, the ALC significantly increases rural unemployment (median impact: 0.752, P < 0.05), endangering households' revenue (median impact: 0.963, P < 0.01), endangering tourism (median impact: 0.653, P < 0.05), and land price (median impact: 0.268, P < 0.10). Thus, the most positive impact of the ALC is identified on the median of endangering households' revenue. The
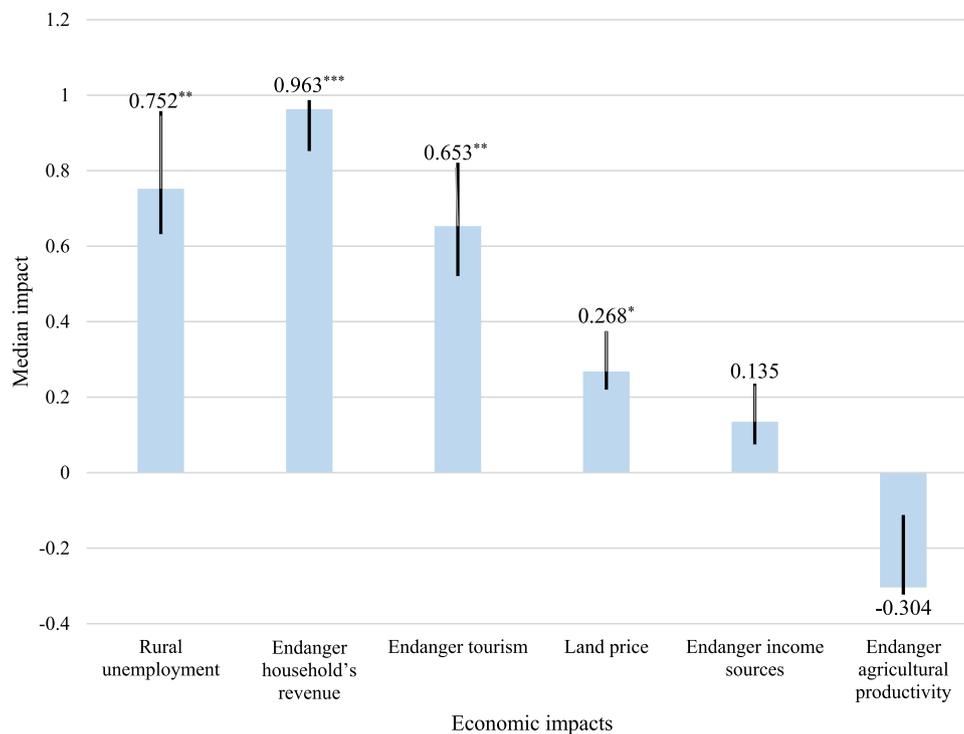
**Fig. 7.** Median impacts of the ALC on economic impacts. Error bars illustrate standard errors. * P < 0.10; * * P < 0.05; * ** P < 0.01. Source: Study findings.

median impacts of the ALC on endangering household's revenue are about 22%, 32%, and 72% more than rural unemployment, endangering tourism, and land price. On average, other types of economic impacts (e. g., jeopardizing income sources and jeopardizing agricultural productivity) are not affected by ALC due to large standard errors.

## 6. Discussion

### 6.1. The spatiotemporal impacts on socio-economic impacts

The significance of temporal impacts on socio-economic impacts in meta-regression results shows that those impacts have significant changes over time. Thus, the social impacts including demographic change, migration, endangering lifestyles and traditions, and crime increase significantly over time, but endangering food security decreases significantly. Accordingly, the economic impacts including endangering tourism and endangering income sources increase significantly over time, but endangering agricultural productivity decreases significantly. Therefore, agricultural productivity and food security will become safe over time. Spatial impacts on socio-economic impacts are also significant. These impacts in one region are not only related to ALC but also affect continental regions. In terms of social impacts, the most spatial impacts are related to American continent on demographic change (20.378) and Asia continent on migration (16.236), endanger lifestyles and traditions (8.488), and crime (21.142). In terms of economic impacts, the most spatial impacts are related to the American continent in the risk of tourism (12.041) and the risk of income sources (8.467) and the Asian continent in the risk of agricultural productivity (33.189).

Many academics, including Butler et al. (2020) and Wan et al. (2018) concur with the results of the present research. In this regard, Butler et al. (2020) demonstrate that there is a growing economic impact of wage inequality in rural regions of the United States. Income inequality is greatly impacted by population change over time in both directions. While population growth is linked to reduced marginal inequality, the decline in population is related to higher income inequality. Additionally, income inequality differs according to rural geography, inequality

levels, and population size, demonstrating that income inequality is not the same across all rural areas in America. The findings of the study by Wan et al. (2018) show that labor migration (as a social impact) to urban areas is a common event in the mountainous regions of southwest China. In these mountainous regions, 48% of households' experience non-labor migration, 29% of households experience labor migration in a local city, and 23% of households experience labor migration in different regions. Household asset is the main factor influencing the selection of the location of migration and the time period of labor migration.

### 6.2. Socio-economic impacts due to the ALC during the economic development process

The results indicate that all socio-economic impacts of the ALC rate have significant coefficients. In terms of social impacts, a 1% increase in the ALC rates causes an increase of 0.94%, 0.23%, 0.88%, 1.39%, and 2.17% in demographic change, migration, endangering lifestyles and traditions, endangering the community's identity, and crime, respectively. However, such a 1% increase reduces endangering food security by 0.87% (Table 4). In terms of economic impacts, a 1% increase in the ALC rates leads to an increase of 2.89%, 2.98%, 1.71%, 1.31%, and 2.14% in rural unemployment, endangering households' revenue, endangering tourism, land price, and endangering income sources, respectively. However, such a 1% increase reduces endangering agricultural productivity by 2.31% (Table 5).

The current study's conclusions are consistent with those of prior research on the ALC's socio-economic impacts (Asadi et al., 2015; Nguyen et al., 2016; Malkamäki et al., 2018). The most important economic and social consequences of the ALC, according to their findings, are "increased land prices" and "inspiration for additional farmers to join the ALC." In Vietnam, Nguyen et al. (2016) examined the economic benefits and livelihoods of farmers, following the conversion of agricultural land. Their results showed that the benefits are unequally distributed among different stakeholders. On average, the lowest benefit was allocated to the group of farmers. Farmers have difficulty maintaining non-agricultural activities and using investment compensation,

although they have the opportunity to turn their agricultural livelihoods into more non-agricultural income. Malkamäki et al. (2018) followed the 251 impacts identified for large-scale tree planting, with the most impacts identified in nine categories, mostly as negative impacts. The most generally studied categories were implications on employment (9%), land (17%), livelihoods (6%), and the often-entangled societal impacts (14%).

Unplanned conversion of agricultural land leads to widespread socio-economic impacts such as loss of income sources, rural unemployment, declining household incomes, increasing migration to urban areas, endangering rural lifestyles, and increasing crime. Therefore, policy-makers are advised either to reduce the conversion rate of agricultural lands to non-agricultural lands or to consider alternative job opportunities for rural households. It is necessary to plan properly to create alternatives for sources of earning income, create job opportunities for farmers, and prevent the improper migration of rural households to urban areas. Farmers and agricultural landowners are also counseled to avoid livelihood styles that are based on only agricultural activities and also to pay attention to other activities to increase income and reduce the risk of losing an income source. To date, due to the lack of required data and information and effective methods, the evaluation of all socio-economic impacts has not been reported, which can be considered as the limitation of the current study.

## 7. Conclusion

The study of socio-economic impacts showed that among the temporal impacts, the highest impacts were related to demographic change and crime, which represent social impacts, and endangering agricultural productivity, which represents economic impact. This means that over time, as agricultural land use has converted, demographic change, crime, and endangering agricultural productivity have been identified as the greatest impacts. Moreover, among the spatial impacts, the largest impacts were related to crime and endangering agricultural productivity. In addition, the results of the ALC rate coefficients in meta-regression showed that the highest social impacts were related to crime, and the largest economic impacts were related to endangering households' revenue.

According to the findings of the current study, the quick conversion of agricultural land in the course of economic growth has a variety of socioeconomic consequences. The social impacts that emerge globally from the ALC include demographic change, migration, endangering lifestyles and traditions, endangering the community's identity, endangering food security, and crime. In addition, the global economic impacts include rural unemployment, endangering household income, endangering tourism, land prices, endangering sources of income, and endangering agricultural productivity.

Therefore, it is recommended that the land use system and the ALC should be modified with careful research programs to reduce the socio-economic impacts. Furthermore, it is advised that new land use strategies estimate the value of agricultural land's commodities and services.

Other recommendations include continuous monitoring of fast and unlawful changes in land use (from agriculture to non-agriculture). Finally, it is proposed that the national government apply fines and levies to unplanned agricultural land conversion in order to preserve the balance of agricultural and non-agricultural lands.

### 7.1. Policy implications

One of the most important policy implications of the findings is that as a result of the rapid growth of the ALC, rural unemployment can lead to severe financial hardship, poverty, and debt. Other repercussions include marriage difficulties and breakdown, boredom, alienation, stigmatization, increasing social exclusion, poor mental health, drug dependence, corruption, criminality, dishonesty, depression and anxiety, and loss of confidence and self-esteem. In addition, lack of attention to agricultural occupations and converting agricultural lands lead to rural migration. Natural resource depletion, environmental degradation, income inequality, urban growth, social unrest, and population congestion are all impacted by such movements. Therefore, policy-makers must adopt appropriate policies to introduce complementary rural occupations to farmers and hold training courses. Also, among the appropriate policies to control the migration of farmers to urban areas is to distribute agricultural land equally and to improve land fertility.

The findings indicate that future research should examine every region individually to determine how to reduce the socioeconomic impacts of the ALC. Future research can also investigate methods to protect agricultural land areas while also promoting economic growth. It is important to study how to boost the economy while protecting natural resources like land.

### CRediT authorship contribution statement

**Ghazali Samane:** Methodology, Resources, Writing – original draft, Writing – review & editing. **Zhang Zhihui:** Conceptualization, Data curation, Writing – original draft, Writing – review & editing. **Miceikienė Astrida:** Validation, Writing – review & editing. **Azadi Hossein:** Supervision, Validation, Writing – review & editing. **Pietrzykowski Marcin:** Validation, Writing – review & editing. **Choobchian Shahla:** Validation, Writing – review & editing. **Zejak Dejan:** Validation, Writing – review & editing.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
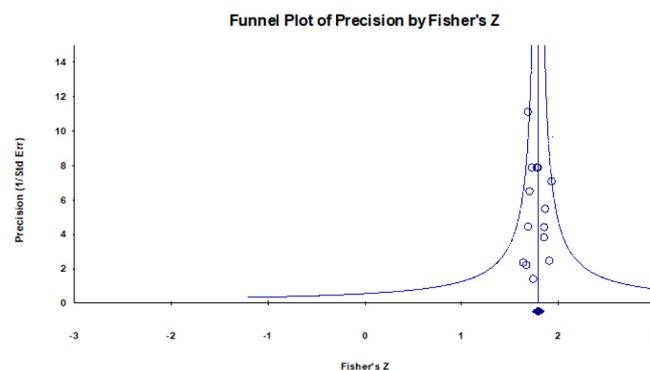
### Data Availability

No data was used for the research described in the article.

## Appendix A

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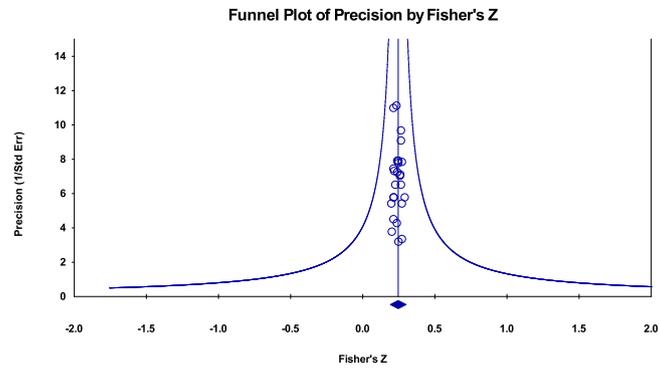
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**Appendix B**

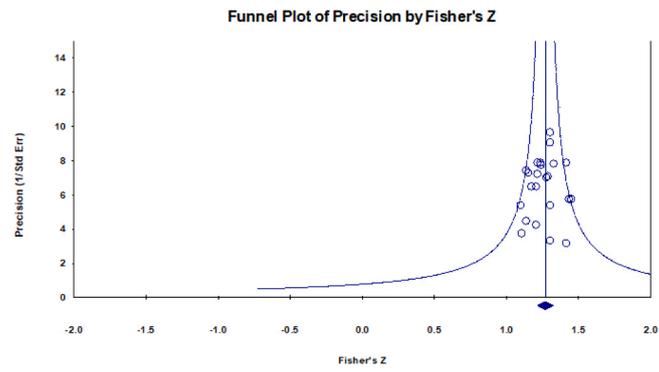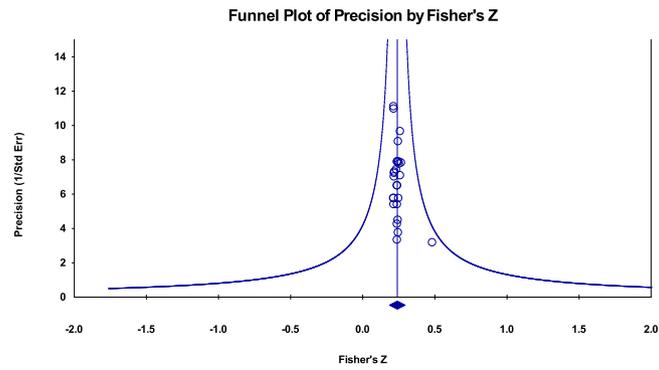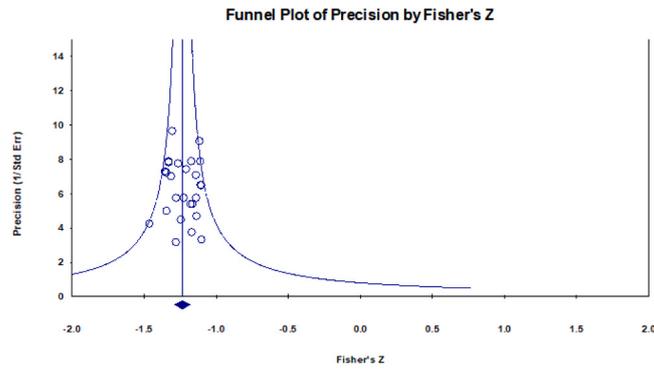Demographic change



.

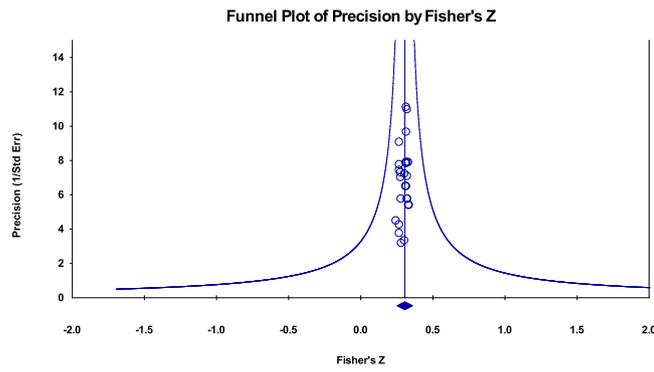Migration

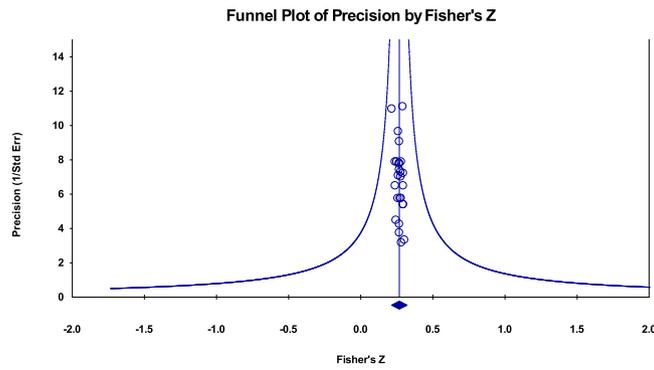. Endanger lifestyles and traditions
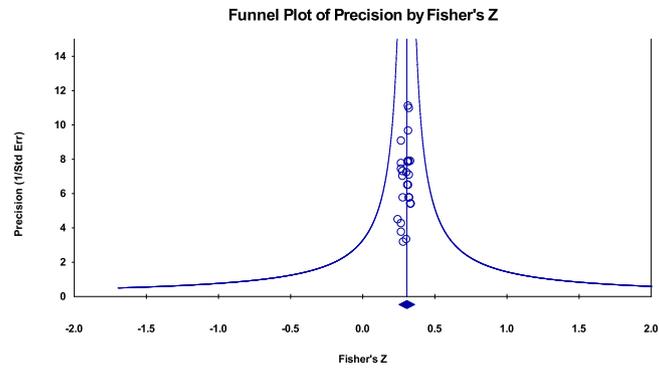


. Endanger community's identity



. Endanger food security

. Crime



. Rural unemployment



. Endanger household's revenue

**Funnel Plot of Precision by Fisher's Z**

- Endanger tourism

**Funnel Plot of Precision by Fisher's Z**

- Land price

**Funnel Plot of Precision by Fisher's Z**

- Endanger income sources

**Funnel Plot of Precision by Fisher's Z**



. Endanger agricultural productivity

**Funnel Plot of Precision by Fisher's Z**



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**Appendix C. : Arranging original articles based on country and continent**

| Author | Title | Country | Continent |
|---|---|---|---|
| Adachi and Patel (1999) | Agricultural land conversion and inheritence tax in Japan | Japan | Asia |
| Nickerson and Lynch (2001) | The effect of farmland preservation programs on farmland prices | The United States | America |
| Plantinga et al. (2002) | The effects of potential land development on agricultural land prices | The United States | America |
| Münier et al. (2004) | Combined ecological and economic modelling in agricultural land use scenarios | Denmark | Europe |
| Deng et al. (2006) | Cultivated land conversion and potential agricultural productivity in China | China | Asia |
| Würtenberger et al. (2006) | Virtual land use and agricultural trade: estimating environmental and socio-economic impacts | Switzerland | Europe |
| Gellrich et al. (2007) | Agricultural land abandonment and natural forest re-growth in the Swiss mountains: a spatially explicit economic analysis | Switzerland | Europe |
| Wang et al. (2007) | Evaluation of the economic and environmental impact of converting cropland to forest: a case study in Dunhua county, China | China | Asia |
| Wu (2008) | Land use changes: economic, social, and environmental impacts | The United States | America |
| Van Suu (2009) | Agricultural land conversion and its effects on farmers in contemporary Vietnam | Vietnam | Asia |
| Yan et al. (2009) | Assessing the consequence of land use change on agricultural productivity in China | China | Asia |
| Yao and Li (2009) | Agricultural productivity changes induced by the Sloping Land Conversion Program: an analysis of Wuqi county in the Loess plateau region | China | Asia |
| Yao et al. (2009) | An empirical analysis of the effects of China's land conversion program on farmers' income growth and labor transfer | China | Asia |
| Xu et al. (2010) | China's Sloping Land Conversion Program: does expansion equal success? | China | Asia |
| Li et al. (2011) | Rural household income and inequality under the Sloping Land Conversion Program in western China | China | Asia |
| Zhong et al. (2011) | Temporal and spatial variability of agricultural land loss in relation to policy and accessibility in a low hilly region of southeast China | China | Asia |
| König et al. (2012) | Assessing the impact of the Sloping Land Conversion Program on rural sustainability in Guyuan, western China | China | Asia |
| Lodder (2012) | The impact of agricultural land conversion and the need for livelihood diversification in Thuy Duong commune | Vietnam | Asia |
| Author | Title | Country | Continent |
| Wang and Maclaren (2012) | Evaluation of economic and social impacts of the Sloping Land Conversion Program: A case study in Dunhua County, China | China | Asia |

*(continued on next page)*

(*continued*)

| Author | Title | Country | Continent |
|---|---|---|---|
| He et al. (2013) | A counterfactual scenario simulation approach for assessing the impact of farmland preservation policies on urban sprawl and food security in a major grain-producing area of China | China | Asia |
| Jiang et al. (2013) | The impact of urban expansion on agricultural land use intensity in China | China | Asia |
| Mazzocchi et al. (2013) | Land use conversion in metropolitan areas and the permanence of agriculture: Sensitivity Index of Agricultural Land (SIAL), a tool for territorial analysis | Italy | Europe |
| Renwick et al. (2013) | Policy reform and agricultural land abandonment in the EU | The EU countries | Europe |
| Sheng et al. (2013) | Effect of agricultural land use change on community composition of bacteria and ammonia oxidizers | China | Asia |
| Upton et al. (2013) | The potential economic returns of converting agricultural land to forestry: An analysis of system and soil effects from 1995 to 2009 | Ireland | Europe |
| Asadi et al. (2014) | Analyzing and modeling the impacts of agricultural land conversion | Iran | Asia |
| Baker et al. (2014) | Patterns of irrigated agricultural land conversion in a western U.S. watershed: implications for landscape-level water management and land-use planning | The United States | America |
| Komarek et al. (2014) | Household-level effects of China's Sloping Land Conversion Program under price and policy shifts | China | Asia |
| Lawry et al. (2014) | The impact of land property rights interventions on investment and agricultural productivity in developing countries: a systematic review | 11 developing countries | |
| Li et al. (2014) | Urban-rural transformation and farmland conversion in China: The application of the environmental Kuznets Curve | China | Asia |
| Lin and Yao (2014) | Impact of the Sloping Land Conversion Program on rural household income: An integrated estimation | China | Asia |
| Song and Pijanowski (2014) | The effects of China's cultivated land balance program on potential land productivity at a national scale | China | Asia |
| Zhang et al. (2014) | Economic development and farmland protection: An assessment of rewarded land conversion quotas trading in Zhejiang, China | China | Asia |
| Zhong et al. (2014) | The impacts on illegal farmland conversion of adopting remote sensing technology for land inspection in China | China | Asia |
| Asadi et al. (2015) | Take a look at the main impacts of agricultural land use change in Iran | Iran | Asia |
| Author | Title | Country | Continent |
| Barati et al. (2015) | Agricultural land conversion in Northwest Iran | Iran | Asia |
| Chen et al. (2015) | Is illegal farmland conversion ineffective in China? Study on the impact of illegal farmland conversion on economic growth | China | Asia |
| Duan et al. (2015) | The effects of the Sloping Land Conversion Program on poverty alleviation in the Wuling mountainous area of China | China | Asia |
| Gutzler et al. (2015) | Agricultural land use changes – a scenario-based sustainability impact assessment for Brandenburg, Germany | Germany | Europe |
| Li et al. (2015) | Assessing the decadal impact of China's Sloping Land Conversion Program on household income under enrollment and earning differentiation | China | Asia |
| Liu and Lan (2015) | The Sloping Land Conversion Program in China: effect on the livelihood diversification of rural households | China | Asia |
| Gutiérrez Rodríguez et al. (2016) | China's conversion of cropland to forest program: a systematic review of the environmental and socioeconomic effects | China | Asia |
| Jiang and Zhang (2016) | Modeling urban expansion and agricultural land conversion in Henan province, China: an integration of land use and socioeconomic data | China | Asia |
| Li et al. (2016) | Does farmland conversion improve or impair household livelihood in smallholder agriculture system? A case study of Grain for Green project impacts in China's Loess Plateau | China | Asia |
| Liu and Henningsen (2016) | The effects of China's Sloping Land Conversion Program on agricultural households | China | Asia |
| Nguyen et al. (2016) | Socio-economic effects of agricultural land conversion for urban development: Case study of Hanoi, Vietnam | Vietnam | Asia |
| Lanz et al. (2017) | Global economic growth and agricultural land conversion under uncertain productivity improvements in agriculture | 27 macro regions | |
| Liu and Lan (2017) | The effect of the Sloping Land Conversion Program on farm household productivity in rural China | China | Asia |
| Li et al. (2018) | Agricultural land conversion: impacts of economic and natural risk factors in a coastal area | The United States | America |
| Peerzado et al. (2018) | Land use conflicts and urban sprawl: conversion of agriculture lands into urbanization in Hyderabad, Pakistan | Pakistan | Asia |
| Author | Title | Country | Continent |
| Rondhi et al. (2018) | Agricultural land conversion, land economic value, and sustainable agriculture: a case study in east Java, Indonesia | Indonesia | Asia |
| Rosdiana et al. (2018) | The agricultural land conversion: finding the legal, social and economic impacts | Indonesia | Asia |
| Setiyowati et al. (2018) | Farmer exchange rate and agricultural land conversion analysis to agricultural sector poverty in Indonesia | Indonesia | Asia |
| Appiah et al. (2019) | Perspectives on agricultural land use conversion and food security in rural Ghana | Ghana | Africa |
| Lee et al. (2020) | Multilevel analysis of the pressure of agricultural land conversion, degree of urbanization and agricultural land prices in Taiwan | Taiwan | Asia |
| Lu and Yin (2020) | Evaluating the evaluated socioeconomic impacts of China's Sloping Land Conversion Program | China | Asia |

Source: Study findings

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