

# Analyzing the impact of land expropriation program on farmers' livelihood in urban fringes of Bahir Dar, Ethiopia

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## ABSTRACT

This paper analyzes the impact of urban land-use changes on farmers' livelihood around the city of Bahir Dar (Ethiopia). Rapid urban expansion in and around the city has resulted in massive land-use changes in its urban fringes, with land expropriation programs affecting communities' livelihood and the environment. A survey was conducted in three urbanizing villages near Bahir Dar, focusing on 150 farmers who were land-expropriated and 180 farmers who were non-land-expropriated. Regression models and propensity matching scoring are applied to examine the livelihood differences of farmers in terms of farm income, off-farm income, primary expenditure type, and perception of urban expansion benefits to farmers. The results reveal that land expropriation in the area has led to (a) a shift to off-farm income for land expropriated farmers; (b) an increase in their household expenditure on staple foods compared to other expenditure types, including farm inputs; and (c) diverging perceptions on whether and how city expansion benefits farmers in the neighboring villages. Our findings provide insight into the need for tighter and impactful policy actions to ensure the sustainability of urbanization through accommodating expropriated farmers' livelihood changes and protecting natural resources in the area.

## 1. Introduction

In the past few decades, many developing countries, including those in the sub-Saharan region, have experienced population surges and rapid urbanization (Cui et al., 2019; Shen et al., 2016). Urbanization is often seen as a double-edged sword, particularly in its impact on the livelihoods of communities in and around the city. On the one hand, urban expansion is argued to have a long-term contribution to urban residents' economic growth and livelihood improvement (Cui et al., 2019; Zhao & Wang, 2015). On the other hand, fast-paced urbanization processes often result in unplanned land demands and changes in peri-urban areas, especially in developing countries. This, in turn, affects farmers' livelihoods and amplifies a city's need for basic infrastructure and public services (Firdaus & Ahmad, 2011; Li et al., 2015). Indeed, electricity, water, and sewerage systems are often more inadequate and/or inaccessible in the newly included parts of a city where

land-expropriated farmers, our focus in this research often find a new home.

Physical, human, natural, financial, and social livelihood assets are crucial to determine household' livelihood status and sustainability (Mabe et al., 2019; Quansah et al., 2020). Land ownership, particularly for farming households, is among the primary influencing factors for choosing their livelihood strategies, including acquiring sufficient income and food (Khatiwada et al., 2017). Nonetheless, governments often forcibly implement various land expropriation programs, and this is for multiple reasons (Kusiluka et al., 2011). Usually, part of the rationale for land expropriation includes attracting investors and capital, thus creating job opportunities and intensifying technological adaptations (Adam, 2014a; Baye et al., 2020). As a result, farmers' struggles to protect land ownership have been at the epicenter of fast urbanization and land-use changes in and around many cities, including in Ethiopia (Debela et al., 2020; Wayessa, 2020).

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In previous studies, both qualitative (Kusiluka et al., 2011; Nguyen et al., 2019) and quantitative approaches (Cui et al., 2019; Wang, Qian, & Guo, 2019) have been applied to analyze land expropriation programs' influence on farmers' livelihood changes. Using a distributed lag model, Cui et al. (2019) have reported that land expropriated farmers gain improved access to public services and labor wages in Mongolia. Other studies showed that expropriated farmers' housing conditions had improved (Li et al., 2015; Nikuze et al., 2019). In addition, previous studies have shown an increase in household income, despite this being insufficient to compensate for the negative effects of land expropriation (Li et al., 2015; Tuyen et al., 2014; Wang, Qian, & Guo, 2019). Meanwhile, the challenges associated with land expropriation programs have been shown to include a lack of job opportunities and misuse of income (Nguyen et al., 2019), a dearth of occupational skills, and insecure social statuses in terms of education, health, and public services (Huang et al., 2017), loss in livelihood assets (Nikuze et al., 2019), and environmental depletion (Kusiluka et al., 2011). The negative impact of land expropriation has been shown to even stretch to land expropriated farmers' social security, happiness, and psychological conditions (Hui et al., 2013; Wang, Qian, & Guo, 2019).

As one of the most rapidly urbanizing countries in Sub-Saharan Africa, Ethiopia is not an exception to the massive urban land-use changes and the associated changes in farmers' livelihood. Much of the farming system in the country can still be characterized as smallholder farming in which farmers often engage in non-surplus production and struggle to fulfill family consumption (Jenberu & Admasu, 2019; Moreda, 2017). Because of this, land expropriation, whether formal or informal, is bound to influence the social and economic status of the farmers. Previous studies in the country showed the impact of urbanization through land expropriation on land-use changes, access to public services, labor wages, health care, and cultural services (Adam, 2014b; Baye et al., 2020; Fitawok et al., 2020; Wayessa, 2020). However, to the best of our knowledge, to date, this body of research lacks an analysis of the impact of land expropriation programs' on the livelihood of the farmers. Recently, Wang et al., (2019) studied livelihood changes in China using income and household happiness as parameters. Nonetheless, this research did not incorporate the household's primary expenditure type, which is relevant for examining the farmers' livelihood change (Chena et al., 2013; Li et al., 2015; Masters et al., 2013; Tuyen et al., 2014).

Against this background, the purpose of this research is to measure the impact of urban land-use changes through land expropriation programs on farmers' livelihood in and around Bahir Dar (Ethiopia). In doing this, we show the influence of land expropriation programs on the livelihood of farmers in neighboring villages in terms of their income, expenditure type, and perception towards the benefit of urban expansion on surrounding communities. This study thus aims to provide broader insights into the need to reconsider expropriation programs in rapidly urbanizing regions.

The remainder of the paper is organized as follows. Section 2 describes the study area, data collection, and methods. Section 3 presents our findings, followed by a discussion of the implications of the empirical findings in section 4. Finally, in section 5, we summarize our main findings and outline avenues for further research.

## 2. Materials and methods

### 2.1. Description of the study area

With a projected population of about 115 million in 2022, Ethiopia is the second-most populous country in Africa after Nigeria (United Nations, 2018). Despite its rapid urbanization with an average annual growth rate of about 4% over the last three decades, the country remains one of the least urbanized in Sub-Saharan Africa, with only 22% of the population predicted to live in urban areas by 2021 (United Nations, 2018; World Bank, 2015). Bahir Dar is one of the largest and most rapidly growing cities in the country, with a projected population of

above 400'000 people in 2022 (Ethiopian Statistics Service, 2022). The city is divided into nine administrative sub-cities and fast expanding into neighboring *Kebeles*<sup>1</sup> (local villages). The presence of rapidly expanding cities in developing countries such as Ethiopia goes hand in hand with a range of shifts in land ownership and displacements to neighboring communities. For example, in Bahir Dar, previous studies have identified that urban expansion has been most prominent in the neighboring Kebeles of AddisAlem, Weramit, and Zenzelima. Around 3500 ha of farmland have been converted into other land uses in the last three decades. Most of these conversions occur in the city's southwestern and northeastern directions (Fitawok et al., 2020) (Fig. 1). Most of the urban expansion in the area was unplanned and has likely impacted farmers' livelihoods (Adam, 2014b; Admasu et al., 2019). Initially, smallholder farmers in these villages focused on producing maize, sorghum, teff and poultry, dairy, and animal fattening. In recent years, the Zenzelima and Weramit areas have also become known for cultivating Chat, a commercial stimulant plant.

### 2.2. Land expropriation and data collection

Ethiopia has a hybrid land administration system in which land—both rural and urban—is the property of the state, and citizens have land-holding rights (Adam, 2014b). Article 40:3–8 of the 1995 constitution mentions that, as a common property, land cannot be transferred or sold without a fixed private property such as a house attached to it. The government has the right to confiscate the land owned by individuals or groups if needed for other purposes, i.e., 'for the sake of public interest' (FDRE, 1995). In the land expropriation process, which is the transfer of land ownership rights among actors, land compensation can be made in cash, kind, or a combination thereof (FDRE Proclamation L. expropriation, 2005). According to the national land expropriation proclamation Articles 7 and 8, local government authorities (for example, the city administration) will organize a committee to decide the amount of compensation. In the urban areas, compensation is calculated for properties situated on the land and permanent improvements made to the land. In rural areas, the amount of compensation for permanent land expropriation should be equivalent to ten times the average annual income the landholder secured during the five years preceding the expropriation of the land. According to Article 4 of the proclamation, the government authority has to clearly notify the landowner at least three months before the expropriation in a written letter indicating the amount of compensation to be paid and when the land has to be vacated. The landowner may appeal to a land value committee and subsequently to the ordinary court system if there is a disagreement over the amount of compensation (FDRE Proclamation L. expropriation, 2005).

In the study area, land expropriation has been occurring for various reasons. For example, in the Zenzelima and Weramit Kebeles, massive land expropriations were undertaken to expand residential areas, government offices, and new investments instead of agricultural activities. In these areas, apart from the constitution and national land proclamation, local government officials dominate the process despite land valuation experts determining compensation in enacting the land expropriation program. In practice, other actors, including farmers, do not have a significant role in the decision-making process of land expropriation. As a result, farmers in Bahir Dar's neighboring villages have been exposed to various socio-economic challenges. For example, the land acquisition process has affected farmers' farm income that implies the disposable income from the production and selling of crops such as Teff and Maize, vegetation and fruit, livestock, and dairy and poultry products. Farmers' off-farm income, which refers to the household's annual disposable income from formal and informal employment and remittances, has also been impacted due to the loss of farmland. As a result, farmers' spending patterns and perceptions of urban expansion

<sup>1</sup> Kebele is the smallest administrative unit and local village in Ethiopia.

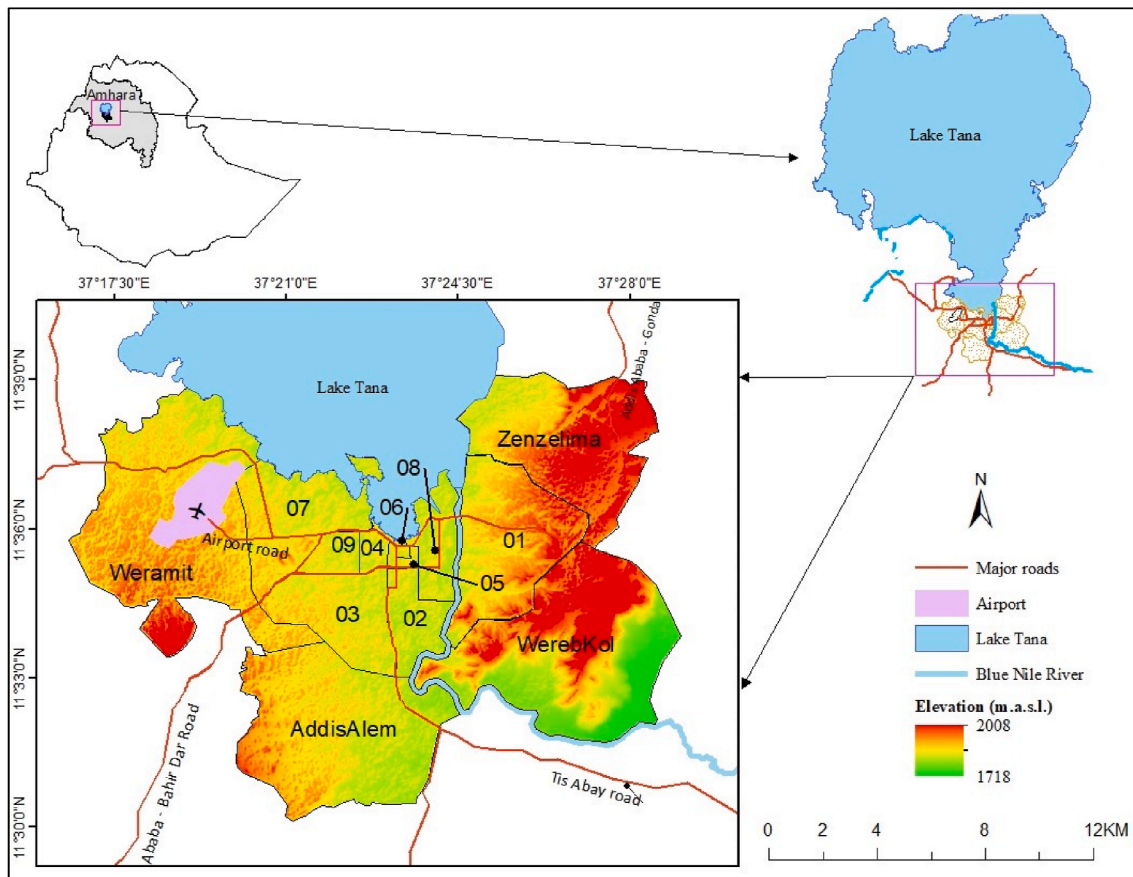


Fig. 1. Bahir Dar city. The nine sub-cities: 01 represents Atse-Tewodros, 02 Belay-Zeleke, 03 Dagmawi-Minlik, 04 Fasilo, 05 Gish-Abay, 06 Sefene-Selam, 07 Shimbt, 08 Shum-Abo, and 09 Tana.

have likely been affected.

To analyze livelihood differences between expropriated and non-expropriated farmers in the area, we collected household-level questionnaires in the three neighboring villages of Bahir Dar. The survey was carried out using Qualtrics software between December 2020 and January 2021. We surveyed 330 farmers from the three Kebeles: 95 AddisAlem, 111 Weramit, and 124 Zenzelima of which 150 land expropriated and 180 non-expropriated farmers (See Appendix A). The farmers in this survey were randomly selected from the roster of farmers from each Kebele administration office after scrutinizing the land expropriated and non-expropriated farmers with the help of agricultural development agents (DA's). The survey consists of questions about a household's assets, including land endowment, livestock, financial statuses, employment statuses, living standards, perceptions about the benefits of the urban expansion to farmers, and compensation adequacy.

### 2.3. Methodology

To measure the impact, we focused on four livelihood parameters: farm income, non-farm income, primary expenditure type, and farmers' perception of urban expansion benefits to farmers in the neighboring villages and the household. We used different types of regression models depending on the nature of the dependent variables: ordinary least square (OLS) regression models (Equations (1) and (2)) for income, a multinomial logit regression model (Equation (3)) for categorical primary expenditure type, and an ordered probit regression model (Equation (4)) for an ordered set of perception choices. The independent variable is a binary variable that shows whether a farmer has had their land expropriated or not.

In calculating the famers' income, we used the household's self-

reported input purchasing and output selling prices in the income variables of the immediate past year (Khatiwada et al., 2017). Also, to reduce outlier effects and normalize the data, we used the logarithm of income variables in equations (1) and (2). In Equation (3), the primary expenditure type variable is used to understand the lifestyle change of the household from the expenditure perspective. We asked the respondents to choose their primary expenditure type from the following expenditure categories: farm inputs, food, medical care, school fees, transportation, and others. In the analysis, farm inputs served as the base category for the primary expenditure type variable. Finally, in equation (4), to measure the farmers' perception of the benefits of Bahir Dar's expansion, we used a five-tier Likert scale: strongly disagree, disagree, neutral, agree, and strongly agree to the question 'Do you agree that farmers in neighboring villages of Bahir Dar have benefited from the city's expansion?'

$$\ln Farm\_in = a_0 + a_1 expro + e_1 \tag{1}$$

$$\ln Off\_farm\_in = b_0 + b_1 expro + e_2 \tag{2}$$

$$Main\_exp\_type = \delta_0 + \delta_1 expro + e_3 \tag{3}$$

$$Perc = z_0 + z_1 expro + e_4 \tag{4}$$

where  $\ln Farm\_in$  and  $\ln Off\_farm\_in$  denote farm and off-farm income,  $Main\_exp\_type$  represents the household's primary expenditure type,  $Perc$  designates the farmer's perception of the benefits of urban expansion, and  $expro$  represents farmer's land expropriation status.

#### 2.3.1. Propensity score matching (PSM)

Previous studies have shown that selection bias and endogeneity

problems can arise when estimating the impact of an intervention in a quasi-experimental design (Dehejia & Wahba, 2002; Li et al., 2015; Wang, Qian, & Guo, 2019). This is because, in a quasi-experimental design, participation in a specific treatment is not random and is influenced by an individual's background. Propensity matching score is a method for determining the real impact of an intervention on certain parameters of two comparable groups, i.e., a group that received treatment and a group that did not (Rosenbaum & Rubin, 1983, 2006). The main assumption behind PSM is that other variables than the treatment itself might influence parameters of interest. Thus, in applying the PSM, first, the probability of participating in the intervention will be calculated using all possible background variables by comparing the parameters of interest across those who have the closest probability of participation from those who received and did not receive the treatment (Austin, 2011; Heckman et al., 1998). The closest neighborhood matching, also known as greedy matching, is a common technique used to report the matching that involves searching the closest eligible probability pair from the two groups (Diaz & Handa, 2006; Shi et al., 2020). Accordingly, a deviation from zero in Equation (5) is assumed to be associated with an individual's participation in the intervention. In addition, the average treatment effect on the treated in equation (6) shows the mean treatment effect for treated outcome considering the matched responses from the control group.

$$E(\Delta) = E(Y_1|p(x), D = 1) - E(Y_0|p(x), D = 0) \tag{5}$$

where  $Y_1$  and  $Y_0$  are the outcomes of the parameters of interest in the land expropriated ( $D = 1$ ) and non-expropriated ( $D = 0$ ) groups, respectively,  $E$  is the expected value,  $p$  is the propensity score of each farmer, and  $X$  denotes observable background characteristics.

The mean difference in the matched outcomes is the average treatment effect (ATT).

$$ATT = \frac{1}{N_1} \sum_{i=1}^{N_1} (Y_{1,i} - Y_{0,j} | D = 1) \tag{6}$$

where  $Y$  is the outcome of the parameters of interest,  $N$  is the number of sample respondents, and  $i$  and  $j$  are individuals from the treatment and control groups.

Assuming that the land expropriation program is built in a quasi-experimental design, farmer participation in the program depends on the farmer's background characteristics that may also affect the

livelihood parameters, including household's sex, marital status, age, family size, distance to a health center, and willingness to change livelihood strategy. Therefore, we used PSM to first predict the combined background covariates from both groups, which estimate the probability of participating in the land expropriation program. Second, we matched farmers using the PSM, and compared the outcomes of the parameter of interest in the expropriated farmers and matched non-expropriated farmer groups.

### 3. Results

#### 3.1. Descriptive statistics

Table 1 gives an overview of the different variables used in our analysis for both groups. On average, land expropriated farmers' have gained less farm income than non-expropriated farmers, and also feel farmers in neighboring areas of the city are not benefiting from the city's expansion. However, land-expropriated farmers are likely to gain extra average off-farm income than the non-expropriated farmers and spend more on food items than farm inputs. In addition, there are significant differences in terms of the distance to markets and health centers between both groups. Land-expropriated farmers are concentrated in the city's neighboring area, making them the most vulnerable to land-use changes because of urban expansion, given that there might be better access to the market.

Fig. 2 shows expropriated farmers' responses regarding the expropriation purpose, satisfaction with the land compensation, the primary cause of unemployment, and the primary policy choice. Accordingly, farmers in the survey stated that the land expropriation in the area was purposed to construct public institutions such as the expansion of university campuses and settlements. The vast majority believe that land compensation has been inadequate, which has dissatisfied about 83 percent of land-expropriated farmers. Also, about 75 percent of them are confronted with unemployment allied to their limited education and lack of required job skills. More than half of the farmers surveyed opted for a revised land policy to include compensatory (replacement) land in the land compensation scheme.

#### 3.2. Regression outputs

Table 2 shows the OLS regression results for the entire sample. They

**Table 1**  
Differences between the expropriated and non-expropriated farmers.

Variables	Definitions	Non-expropriated farmers		Expropriated farmers		Mean difference	t-value
		Mean	St. Dev	Mean	St. Dev		
Age_DR	Age dependency ratio of the household (hh)	5.16	4.14	5.47	4.43	0.31	0.65
Dis_health	Distance to the nearest health care service (in minutes)	40.97	31.51	32.81	24.68	-8.16	-2.50***
Dis_market	Distance to market, i.e., an average of livestock and crop market distance (in minutes)	44.75	34.20	36.48	22.57	-8.25	-2.53***
Educ_head	Education level of the hh head: illiterate = 1, writing and reading informal school = 2, formal education = 3	2.00	0.70	1.92	0.66	-0.08	-1.05
Hh_age2	Age square of the hh head	2602.61	1181.63	2379.68	1263.98	-222.93	-1.64
Hhs_fin_sta	Household financial status: dissaver = 1, not saver = 2, saver = 3	2.43	0.64	2.38	0.63	-0.05	-0.75
Kebele	Hhs village name AddisAlem = 1, Weramit = 2, Zenzelima = 3	2.13	0.82	2.00	0.81	-0.13	-1.48
lnfarm_in	The logarithm of hh's disposable farm income in the year 2020 (in Birr)	8.38	3.72	6.76	4.69	-1.62	-3.49***
lnoff_farm_in	Logarithm of hh's disposable off-farm income in the year 2020 (in Birr)	3.46	4.60	5.12	5.05	1.65	3.09***
lnTtu_livest	Logarithm of hh's tropical livestock unit	1.60	0.82	1.50	0.91	-0.10	-1.01
Main_exp_type	Primary expenditure type: farm inputs = 1, food = 2, medical care = 3, school fees = 4, transport = 5	1.28	0.60	1.51	0.72	0.24	3.24***
Mar_status	Marital status of the hh head: never married = 1, married = 2, divorced = 3, widowed = 4	2.06	0.37	2.00	0.14	-0.06	-1.85
Perc_farmer	Do you perceive that farmer are benefited from Bahir Dar's city expansion: strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly agree = 5	3.39	0.92	2.61	0.93	-0.78	-7.61***
Sex_hh	Sex of hh head: male = 0, female = 1	0.10	0.30	0.11	0.32	0.01	0.32
Willing_chan	Are you willing to shift your household's primary source of income: no = 0, yes = 1	0.72	0.033	0.62	0.04	-0.10	-1.92**

Note: T-statistics \*\*\* Significant at 1% level; \*\* Significant at 5% level.



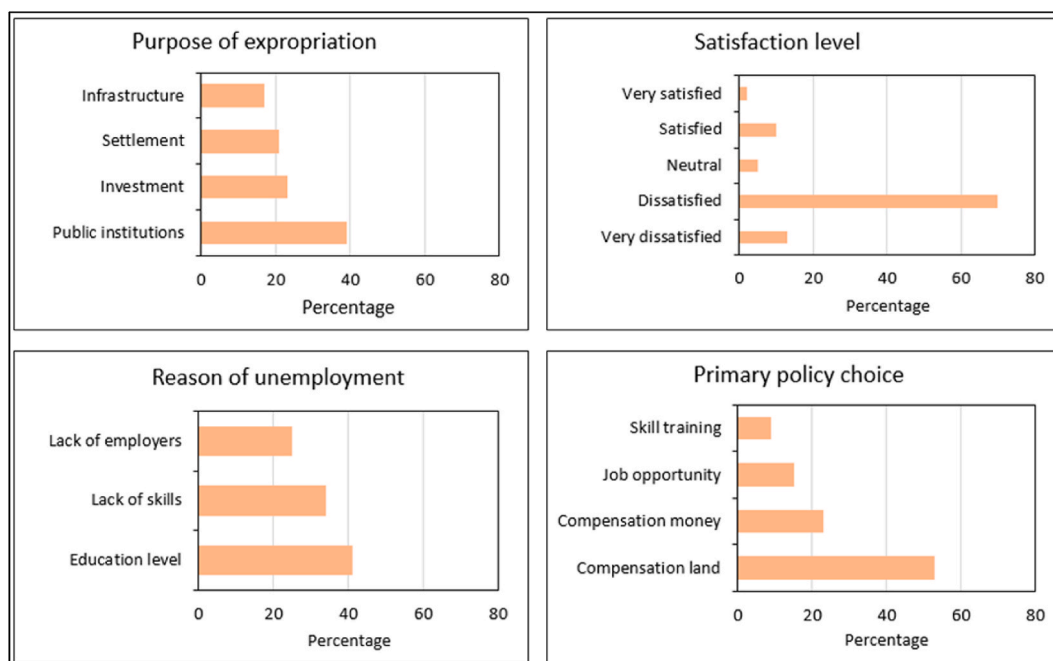


Fig. 2. Land-expropriated farmers' response to expropriation.

**Table 2**  
Impact of land expropriation on farm income and off-farm income.

	(1)	(2)	(3)	(4)
	<i>lnfarm_in</i>	<i>lnoff_farm_in</i>	<i>lnfarm_in</i>	<i>lnoff_farm_in</i>
Expropriated	-1.619*** (0.001)	1.649** (0.002)	-1.357*** (0.000)	1.678** (0.002)
Intercept	8.383*** (0.000)	3.469*** (0.000)	7.363*** (0.001)	5.868 (0.054)
N	330	330	330	330

Note: p-values in parentheses \*  $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

confirm a decrease in farmers' farm income because of the expropriation of their land. Despite a minor decrease in the coefficients of farm income variable from -1.62 to -1.36, the findings suggest that the land expropriation program remained significant and negatively impacting even after control variables, including age, education, and sex of household head, were taken into account (see Appendix B). In contrast, land-expropriated farmers' off-farm income increases by 1.65 times when no other covariates are considered, and 1.68 times when other covariates are included, compared to non-expropriated farmers. Therefore, due to the land expropriation programs, farmers' income earning sources shifted to non-farm activities, indicating significant livelihood transitions in the area.

The land expropriation program significantly influences the household's primary expenditure type (see Appendix C). Accordingly, the multinomial regression output in Table 3 shows that, compared to non-expropriated farmers, land-expropriated farmers spend more money on food items than farm inputs (by 0.81), all other things being equal. This also shows that farm inputs are the primary expenditure type for the non-expropriated farmers rather than staple food. As a result, land expropriated farmers are more prone to change their livelihood, manifesting itself in an increased reliance on the market for their household staple food. However, medical care, school fees, and transportation had no statistically significant impact on spending differences between the two groups.

Based on the results of ordered probit regression, the impact of the land expropriation program on farmers' perceptions of the benefits of urban expansion is negative and significant (see Appendix D and E).

**Table 3**  
Impact of land expropriation on households' primary expenditure type.

Primary expenditure type	Coefficient	P-values
Farm inputs (base outcome)	-	-
Food	0.813**	0.001
Intercept	-1.290***	0.000
Medical care	1.378	0.104
Intercept	-4.234***	0.000
School fees	15.09	0.986
Intercept	-18.46	0.983
Transport	-0.232	0.851
Intercept	-4.234***	0.000
N	330	

Note: p-values in parentheses \*  $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table 4**  
Impacts of land expropriation on farmers' perception.

	(1)	(2)
	<i>Perc_farmer</i>	<i>Perc_farmer</i>
Expropriated	-0.781*** (0.000)	-0.798*** (0.000)
Intercept	3.394*** (0.000)	4.392*** (0.000)
N	330	330

Note: p-values in parentheses \*  $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Table 4 shows the regression output that remains significant without (column 1) or with (column 2) considering the influence of covariates on this model. Accordingly, land expropriated farmers are about 79 percent more likely to disagree that city expansion, especially the land expropriation programs, benefit neighboring farmers. This reveals that the neighboring farmers are dismayed and psychologically affected by urban expansion, especially land expropriation programs.

### 3.3. Matching outputs

The nearest neighborhood matching outputs in Table 5 show that land expropriation has a significant average treatment effect on the parameters of interest on the land-expropriated farmers. As a result, the

**Table 5**  
Average treatment effect of expropriation on outcome variables.

Variables	Matching	Expropriated	Non expropriated	Mean Differences	T-stat
<i>Infarm_in</i>	Before matching	6.76	8.38	-1.62	-3.50***
	After matching	6.84	8.17	-1.33	-2.49***
<i>Inoff_farm_in</i>	Before matching	5.12	3.47	1.65	3.10***
	After matching	5.00	3.24	1.75	2.77***
<i>Primary_exp_type</i>	Before matching	1.49	1.28	0.24	3.24***
	After matching	1.49	1.26	0.23	2.67***
<i>Perc_farmer</i>	Before matching	2.61	3.39	-0.78	-7.61***
	After matching	2.59	3.31	-0.73	-5.89***

Note: T-stat: \*\*\*Significant at 1% level; \*\*Significant at 5% level.

livelihood of the land expropriated farmers through farm income, off-farm income, primary expenditure type, and farmers' perception about the benefit of the urban expansion are substantially affected by the expropriation program. In fact, the t-statistics differ slightly after matching, but all the mean differences are still statistically significant showing the considerable influence of the land expropriation on the livelihood of expropriated farmers.

#### 4. Discussion

The present study determined the impact of urban land-use changes, particularly land expropriation programs, on key aspects of farmers' livelihood in and around Bahir Dar. Kindu et al. (2020) found that in the expansion of Bahir Dar, farmers in the neighboring Kebeles have lost their farmlands, affecting their social status and encountering potential unemployment. The absence of an appropriate compensation scheme for the land expropriated farmers, including a shortage of job skill training for smooth rural to urban transition, have worsened the unemployment problems (Cui et al., 2019; Li et al., 2015; Nikuze et al., 2019; Xie, 2019). Indeed, most previous land expropriation programs in and around Bahir Dar have been claimed for residential expansion and new investment attraction purposes (Fitawok et al., 2020). Our findings support these assertions, as they show that land expropriation in the area is done for public institutions (39%) and investments (23%), resulting in unemployment for most farmers (75%), exacerbated by a lack of education (41%) and job skills (34%).

Our findings reveal that unplanned expropriation programs lead to differences between land-expropriated farmers and non-expropriated farmers in terms of income, expenditure type, and perceptions towards the benefits of city expansion to farmers. First, the farm income, particularly of the land-expropriated farmers, has declined 1.62 times compared to that of non-expropriated farmers. One possible explanation is that, after losing their small farmlands, most smallholder farmers in the study area have pursued alternative livelihood strategies, usually in temporary jobs such as guarding instead of farming activities. Moreover, farmers who have lost their grazing land due to the expropriation program obviously reduce their livestock assets, deteriorating their farm income. This finding is consistent with previous research, which found a substantial decrease in agricultural income for smallholder farmers who lost their farmland (Guo et al., 2019; Kusiluka et al., 2011; Liu et al., 2018). Our findings for the off-farm income, in particular, also corroborate the results of previous studies in which land lost farmers are engaged in multiple non-agricultural activities and earned more off-farm income than the non-expropriated farmers (Gebrekidan Abbay et al., 2018; Wang, Qian, & Guo, 2019). Second, farmers whose land was expropriated spend more on buying food items than farm inputs. One possible reason for this is that land expropriated farmers have changed their lifestyle and consequently started to purchase even their consumable items such as cereals and vegetables (Korah et al., 2018; Mezgebo & Porter, 2020). This, in turn, shows that the government could implement subsidy programs for essential consumable items in smoothing the expropriated farmers' livelihood transition. Third, land-expropriated farmers usually disagree more than non-expropriated farmers on the

perception that city expansion benefits the farmers in the neighboring villages. This could be due to inadequate compensation (Jenberu & Admasu, 2019; Wang, Qian, & Guo, 2019), lack of training (Hui et al., 2013; Li et al., 2018), and price surges of essential items in cities (Li et al., 2015; Mezgebo & Porter, 2020). In line with this, previous studies also found that land expropriated farmers are often dissatisfied since they have lost social engagement in the community (Wang, Qian, & Guo, 2019).

As land expropriation seems an inevitable outcome of rapid and uncontrolled urbanization decision-makers should strive for more inclusive urban development that considers the long-term impact of land requisition on farmers (Firdaus & Ahmad, 2011; Nikuze et al., 2019). In this regard, the World Bank's involuntary resettlement policy requires a meaningful participation of displaced persons in the expropriation and resettlement programs (World Bank, 2013). However, this has been impractical in many parts of Ethiopia, including the study area, where farmers have little influence in the expropriation decision-making process. Previous studies also highlighted the need to increase food security (Wayessa, 2020), and social welfare (Huang et al., 2017) for land lost farmers in processes of land expropriation. In China, it has been reported that land expropriated farmers face social exclusion, necessitating special attention in order to ensure their integration into the urban labor force and social systems (Hui et al., 2013). Overall, based on the research findings, we argue that follow-up measures and effective transition plans for the expropriated farmers are crucial in the study area. Land expropriation compensations could be part of a lifelong model (Li et al., 2015) and include a living subsidy (Xie, 2019) for the land expropriated farmers. This can be accomplished by offering yearly compensation money rather than everything at once, considering farmers' yearly essential expenditures and possible bank interest. For this, it is also necessary to organize farmers into groups and engage them in urban farming activities that employ land-expropriated farmers and generate a continuous income using part of the compensation money. Also, improving land expropriated farmers' engagement in non-farm activities (Mezgebo & Porter, 2020; Wang, Qian, & Guo, 2019) with impactful training, including income management and necessary job and life skill training (Huang et al., 2017), is crucial.

Yet, this study has some limitations, including data source and its scope. Because of the inaccessibility of socio-economic data in the area, this study considers only one-year statistics for analyzing the income and expenditure influence of the expropriation program. An investigation of the issue with a broader scope and timeframe could enable policymakers and academics to understand the situation better. Furthermore, future research could analyze the impact of land acquisition on land expropriated farmers at the individual level and for different intensities, i.e., full expropriation and partial expropriation.

#### 5. Conclusions

Despite the growing land expropriation programs in rapidly expanding cities, including Bahir Dar, little empirical evidence has been reported, especially concerning farmers' livelihoods and environmental changes resulting from land expropriation in peri-urban areas of

developing countries. The current study aimed to contribute to this literature by employing regression models to analyze the impact of urban land-use changes, particularly the land expropriation program, on key aspects of farmers' livelihood in neighboring villages of Bahir Dar, Ethiopia. It contrasted livelihood of land expropriated, and non-expropriated farmers based on parameters of annual household income (both farm income and off-farm income in Birr), primary expenditure type, and perception towards the benefit of city expansion to farmers.

One of the findings was that the farm income of the land-expropriated households is substantially lower compared to the non-expropriated farmers. In contrast, the off-farm income for land-expropriated farmers significantly exceeded those of the non-expropriated farmers due to a change in the livelihood choices associated with land expropriation. The study also identified that compared to the non-expropriated farmers, the land expropriated farmers are mostly incurring a cost for purchasing food items than spending on farm inputs for the case of the non-expropriated farmers. Finally, compared to non-expropriated farmers, land-expropriated farmers tend to disagree with observations that city expansion benefits farmers in neighboring villages. Land expropriated farmers, the majority of whom are for the expansion of public institutions such as Bahir Dar university's campuses, encounter unemployment given the lack of education and job skills. Combined with their perception of the insufficiency of compensation, this implies that most farmers are dissatisfied with the expropriation program.

Given the findings of this study and the inevitability of land expropriation because of urban growth, policymakers should reexamine the

compensation scheme to promote sustainable urban developments and enhance farmers' faith in the rural-urban transition. Accordingly, it is crucial to enforce transparent and participatory urban planning and guarantee equitable developments in the area. Yet, further research is needed to comprehend farmers' responses to changes in their livelihoods resulting from land expropriation and compensation schemes in the area and elsewhere.

**CRedit author statement**

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**Declarations of interest**

None.

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**Appendix**

(A)  
Number of participant farmers by Kebeles.

Kebeles	Total	Land expropriated	Non-expropriated
AddisAlem	95	40	55
Weramit	111	46	65
Zenzelima	124	64	60
N	330	150	180

(B)  
Impact of land expropriation on farm income and off-farm income.

	(1) <i>lnfarm_in</i>	(2) <i>lnoff_farm_in</i>	(3) <i>lnfarm_in</i>	(4) <i>lnoff_farm_in</i>
Expropriated	-1.619*** (0.001)	1.649** (0.002)	-1.357*** (0.000)	1.678** (0.002)
Kebele			-0.311 (0.201)	-0.669* (0.046)
Sex			-2.642*** (0.000)	-0.0792 (0.930)
Mar_Status			-0.382 (0.567)	0.682 (0.457)
H_age2			-0.0000960 (0.568)	-0.000277 (0.232)
lnFam_size			-0.328 (0.512)	1.034 (0.133)
Age_DR			-0.180 (0.068)	0.0988 (0.465)
Educ_head			-0.123 (0.674)	-0.163 (0.686)
lnTlulivestock			3.375*** (0.000)	-2.272** (0.001)
Hhs_fin_status			-0.246 (0.402)	-0.485 (0.230)
Dis_healthcenter			-0.0220 (0.056)	0.0311* (0.049)

(continued on next page)

**(B) (continued)**

	(1)	(2)	(3)	(4)
	<i>lnfarm_in</i>	<i>lnoff_farm_in</i>	<i>lnfarm_in</i>	<i>lnoff_farm_in</i>
Willing_chan			0.253 (0.543)	1.132* (0.048)
Dis_market			0.0144 (0.195)	-0.0216 (0.160)
_cons	8.383*** (0.000)	3.469*** (0.000)	7.363*** (0.001)	5.868 (0.054)
N	330	330	330	330

Note: p-values in parentheses \*  $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**(C)**

Impact of land expropriation on households' primary expenditure type with covariant.

	(1)		(2)	
	Primary expenditure	P-values	Primary expenditure	P-values
Expropriated	0.236**	(0.001)	0.220**	(0.001)
Kebele			0.0715	(0.097)
Sex_hh			0.243*	(0.037)
Mar_Status			-0.0526	(0.655)
Hh_age2			0.0000241	(0.419)
lnFam_size			0.00179	(0.984)
Age_DR			0.0151	(0.385)
Educ_head			0.114*	(0.027)
lnTlu_livest			-0.364***	(0.000)
Hhs_fin_sta			0.0466	(0.369)
Dis_health			0.00101	(0.617)
Willing_chan			0.0517	(0.482)
Dis_market			0.000628	(0.750)
Constant	1.278***	(0.000)	1.205**	(0.002)
N	330		330	

Note: p-values in parentheses \*  $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**(D)**

Impact of land expropriation on farmers' perception.

	Farmers perception	T-stat
Expropriated	-0.931***	-6.90
Cutpoint 1	-	
Constant	-2.777***	-13.53
Cutpoint 2	-	
Constant	-0.579***	-6.06
Cutpoint 3	-	
Constant	-0.374***	-4.00
Cutpoint 4	-	
Constant	2.041***	10.03
N	330	

Note: t statistics in parentheses  $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**(E)**

Impacts of land expropriation on farmers' perception

	(1)		(2)	
	Farmers' perception	P-value	Farmers' perception	P-value
Expropriated	-0.781***	(0.000)	-0.798***	(0.000)
Kebele			-0.0562	(0.402)
Sex_hh			0.0683	(0.705)
Mar_Status			-0.160	(0.384)
Hh_age2			-0.0000514	(0.269)
lnFam_size			0.0974	(0.480)
Age_DR			0.0225	(0.408)
Educ_head			0.0243	(0.763)
lnTlu_livest			-0.284*	(0.040)
Hhs_fin_sta			-0.161*	(0.047)
Dis_health			0.00274	(0.386)
Willing_chan			0.134	(0.243)
Dis_market			-0.00295	(0.337)
Constant	3.394***	(0.000)	4.392***	(0.000)
N	330		330	

Note: p-values in parentheses \*  $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .



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