The Impact of Large-Scale Agricultural Investments on Welfare and Livelihoods of Local Communities: A Meta-Analysis

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Abstract

Large-scale agricultural investments are often pursued as pro-poor investments by governments in developing countries. However, empirical literature on the impact of these investments on welfare and livelihoods of local communities has reported mixed results. We undertook a meta-analysis based on estimates of 37 primary studies to understand the overall impact of these investments on local communities. We find that expansion of large-scale land investments leads to a favorable impact on welfare and livelihoods of local communities (with mean effect size of 0.043). However, the sub-group analysis shows that the average impact is heterogeneous across groups. We discussed the source of these heterogeneity, the impact pathways and publication bias in the primary studies. The smaller mean effect size and the heterogeneous effects across host countries indicates that much remains to be done in the implementation of regulatory and guiding frameworks of large-scale land investments promulgated with an aim to respect tenure rights, livelihoods and resources so that these investments benefit the local community.

Keywords*: Large scale agricultural investments, welfare, livelihood, local communities, meta-analysis*

1. Introduction

Agricultural production in most developing countries has remained low amid a substantial potential for growth. Exploiting this potential has been promoted to reduce poverty in rural areas where most the world's poorest people live (FAO, 2012; World Bank, 2008). As this requires huge resources - investment in fertilizer, improved seeds, and infrastructures (roads, markets), governments promote an agricultural program through engaging the private sectors through largescale land investment programs with incentive packages, including tax breaks and provision of loan. This has coincided with boom in global commodity and food prices, resulting in higher demand for land for food production (Borras Jr & Franco, 2012; Deininger, 2011; Edelman et al., 2013). Consequently, in the last couple of decades, large scale agricultural investments (LSAIs) have increased dramatically. According to the database of the Land Matrix [1], since the early 2000, more than 65 million hectares of agricultural land through more than 2200 concluded deals have changed hands from local communities to private and public land investors. Africa (697 concluded deals) and Asia (679 concluded deals), respectively, are top two targeted regions by land investors (Land Matrix, 2023). The overall goal of most of the land investment programs is often to reduce poverty, ensure food security, improve livelihoods, and enhance agricultural export by increasing agricultural production through bringing land under other uses (e.g., forest) or smallholder farming system. Do agricultural large-scale land investment programs keep their promise, in relation to reducing poverty and improve livelihoods?

Answering this question has attracted a balanced debate in the literature. On the one hand, studies show that LSAIs provide an opportunity to eliminate poverty in the target countries by increasing (i) agricultural productivity through spillovers in terms of access to better technologies, access to input markets, and resilience to shocks (Ali et al., 2019); (ii) employment opportunities to the rural poor and lowering local prices and improving the access to food at a local level (Baumgartner et al., 2015; Cotula et al., 2014; Deininger & Byerlee, 2011), and (iii) increasing revenue and modernize the agriculture sector (Cotula, 2009). On the other hand, studies also indicate that LSAIs result in adverse impacts to the welfare and livelihoods of local communities in three ways. First, governments and investors overlook local communities' land values and make

[1] Land matrix is the most comprehensive and the most used database on land deals (available at www.landmatrix.org). However, land deals reported in the land Matrix data set are biased downwards due to under reporting of deals by host countries. Thus, the figures indicate the extreme lower bound (Lay et al., 2021).

decisions without adequately factoring in the value (Nolte & Väth, 2015). Second, the investments tend to concentrate on accessible, productive, and densely populated areas than idle and remote areas (Messerli et al., 2014), competing over land with small holders (Lay et al., 2021). Third, the investments often alienate local communities from land rights without providing appropriate compensations (Deininger & Xia, 2016), and cause displacements (Lay et al., 2021), resulting in loss of livelihoods (Nkansah-Dwamena, 2021), gender discrimination (Hajjar et al., 2020) and decline in income (Shete & Rutten, 2015).

Nonetheless, the empirical research on the impact of LSAIs has remained inconclusive as yet. In view of evidence synthesis at large, we find no quantitative meta-analytic study that evaluates the overall impact of LSAIs on local communities' welfare and livelihoods although a few qualitative systematic reviews are present (Borras et al., 2022; Cochrane & Legault, 2020; Hufe & Heuermann, 2017; Jung, 2018; Rasva & Jürgenson, 2022; Yang & He, 2021), which took a specific thematic or geographic focus. Based on the review of 28 studies on the failed large-scale land investments, Borras et al. (2022) underscored that the causes and consequences of the global land rush are only partially understood. After reviewing 71 studies on agricultural land investments from Ethiopia, Cochrane & Legault (2020) documented that the gendered impacts of LSAIs and the role of diaspora and domestic investors in LSAIs is under researched. Jung (2018) and Yang & He (2021), however, focus on the research designs of primary studies. While the former finds that adverse effects of LSAIs on livelihoods are reported by studies that use qualitative designs, the latter indicated that most of the studies reviewed focused at a community level disregarding potential impact at a regional level. The remaining two reviews emphasize the welfare and livelihoods impact of land transactions. Hufe & Heuermann (2017) reviewed 60 case studies in 22 countries from continental Africa while Rasva & Jürgenson (2022) reviewed 40 studies from Europe. Both studies highlighted the negative effect of land transactions on the livelihoods of host communities.

Yet, quantitative meta-analytic evidence on the overall impact of LSAIs is still absent. This paper goes further than the existing systematic reviews by undertaking a meta-analysis to provide evidence on the overall impact of LSAIs on welfare and livelihoods of local communities based on 176 estimates collected from 37 primary studies. The overall effect size on the impact of LSAIs is computed by the random effects model. Meta-regression and subgroup meta-analysis are applied to discover the source of heterogeneity in the primary studies. The results would provide inputs for policy makers in the implementation of regulatory and guiding frameworks of large-scale land investments and maximize the benefits of the program to local communities. The rest of the paper is organized as follows: section two explains how LSAIs relate to welfare and livelihoods; section three introduces the data and methods; section four demonstrates the results and the last section presents conclusions and discussions.

2. LSAIs and Welfare and Livelihoods of Local Communities

In the initial periods when LSAIs proliferate, there were two contradicting views on the effect of LSAIs on local communities. Proponents and governments in the global south promote such investments because it could contribute to rural development and the betterment of welfare and livelihoods of host countries through employment opportunities, spillover effects that increase productivity of farm households, market linkages, infrastructure development and by generating state revenues through taxation (Deininger & Byerlee, 2011). On the other hand opponents also argue that such investments will pose challenges to the local community access to resources, displacement and further environmental implications (Cotula, 2009; Deininger, 2011). After more than two decades since large scale agricultural investments picked, large number of case studies are conducted to understand the effect of LSAIs on local communities. Yet, the results reported by these studies are not conclusive. The effect of LSAIs on local community welfare outcomes also depends on the production arrangements these investments choose. Large scale land acquisition and a more integrated production model such as out grower schemes and contract farming platforms perform differently on the effect of local communities. Studies show that farm households who engage in out-grower schemes registered a better livelihood outcomes (Akyoo et al., 2018; Herrmann & Grote, 2015; Herrmann, 2017).

A more nuanced theoretical explanation on the impact pathway of LSAIs on welfare of local communities is illustrated in Kleemann & Thiele, (2015) which builds on Dessy et al., (2012). The theoretical framework demonstrated that the level of compensation, employment effects and spillover effects are the channels through which the effect of LSAIs is traced. The theory argues that the level of labor demands by the LSAI farms and availability of spillover effects in the form of technology transfer from the LSAI farm to local farmers mainly determines whether LSAIs result in to welfare improvements for local communities. The other theoretical framework used in the literature to link LSAIs and welfare outcomes of local communities is the Sustainable Livelihood Approach (SLA) (e.g. see Alhassan et al., 2018; Bosch & Zeller, 2019; Talleh Nkobou et al., 2021). The studies used SLA to understand how policies and programs such as LSAIs affect welfare and livelihood outcomes (wellbeing, income, food security, asset, sustainable use of natural resources and wealth) by affecting livelihoods strategies (farm and non-farm activities) and livelihood capitals (human, social, physical, natural and financial capital). Livelihood outcomes in the SLA (see Figure 1) are determined by an interaction of the SLA components such as context, assets, policies and institutions and livelihood strategies (Serrat, 2017; DFID 1999).

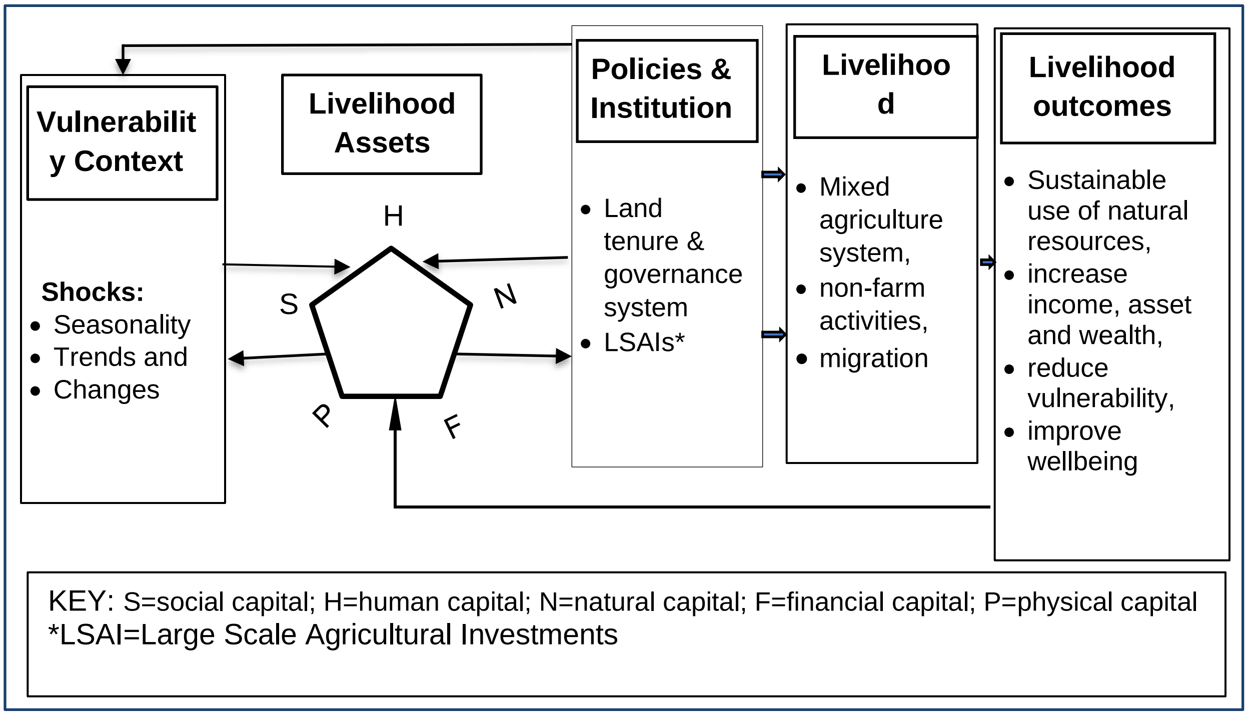

Figure 1: The theoretical framework of the study [adapted from DFID (1999)]

3. Data and Methods

3.1. Literature searching

The systematic search and selection process is undertaken under the guideline for the meta-analysis of economics research-network (MAER-Net) by Stanley et al. (2013). To retrieve both published articles and unpublished working papers, a combination of digital bibliographic databases including Web of Sciences Core Collection (WS), Scopus and Google Scholar are applied. The first two databases help to capture published academic studies while the last one help to capture grey literature in addition to the studies that are published on datasets other than WS. The search for primary studies in these databases is made based on two keywords sets: LSAIs and welfare or livelihoods. During the search process, terms within an individual set are connected by 'OR' whereas the two keyword sets were connected by 'AND' (Table 1). The search is undertaken in the topics and abstracts of papers in the period from Nov. 18, 2022 to Dec. 12, 2022.

To check the efficiency of the search strategy, the keywords are piloted using a sample of nine studies (available in the supplementary material). It shows that all the studies presented in the databases are picked by the search, which proves that the search strategy is efficient in capturing primary studies conducted in the impact of LSAIs on welfare and livelihoods of local communities. We also carried out an additional search for primary studies through backward citation search from the seven review studies although no new studies were found. The systematic search and selection process is presented in Figure 2.

Table 1. List of key words used in the search process

Set	Category	Synonyms
Set 1	Largescale land transactions (LSAIs)	Large-Scale Land Transactions, Large-Scale Land Acquisitions, Large-Scale Land deals, Large-Scale Land Investments, Large-Scale Land Transfers, land concession, land investment, Land transactions, Land transaction, land acquisitions, land acquisition, land deals, land deal, farmland deal, farmland deals, farm-land deal, farm-land deals, farm land deal, farm land deals, land rush, land transfer, land transfers, land investment, land investments, farm land grab, farmland grab, farm-land grab, farm land grabbing, farmland grabbing, farm-land grabbing, land grab, land grabbing, land transfer, land transfers, land concession, land concessions, farm land rush, farmland rush, farm-land rush, large scale Oversea Farm Investment
Set 2	Welfare & Livelihoods	Welfare, income, consumption, expenditure, food security, food-security, food insecurity, food-insecurity, nutrition security, nutrition-security, nutrition insecurity, nutrition-insecurity, food and nutrition security, food and nutrition insecurity, poor, poverty, asset, livelihoods, employment, wage, living standard, living-standard

We identified 2681 records from the three databases. EndNote is used for preliminary screening (duplicate identification). The remaining screening procedures are made manually. We excluded 453 duplicates and additional 1354 studies that are in other topics and do not relate LSAIs to welfare or livelihood outcomes based on title and abstract screening. We undertook full text reviews of 874 primary studies and excluded 731 studies that do not relate the LSAIs to welfare or livelihood outcomes and retained 143 of them. From these, 104 are excluded from the meta-analysis as the studies are qualitative (39), descriptive (41), reviews (seven) and not located (two). We further excluded (i) four papers as the impacts on local communities are not clearly shown; (ii) four papers are dissertations as they are already published as a journal article; (iii) three articles are macro (national) level studies; (iv) 2 studies as they used similar data, meaning that they were previously published in different publication format; (v) one study as the results are presented at a disaggregated enumeration area level; and (vi) one as it did not report sample size. Consequently, we retained 39 primary studies for data extraction and meta-analysis (Figure 2).

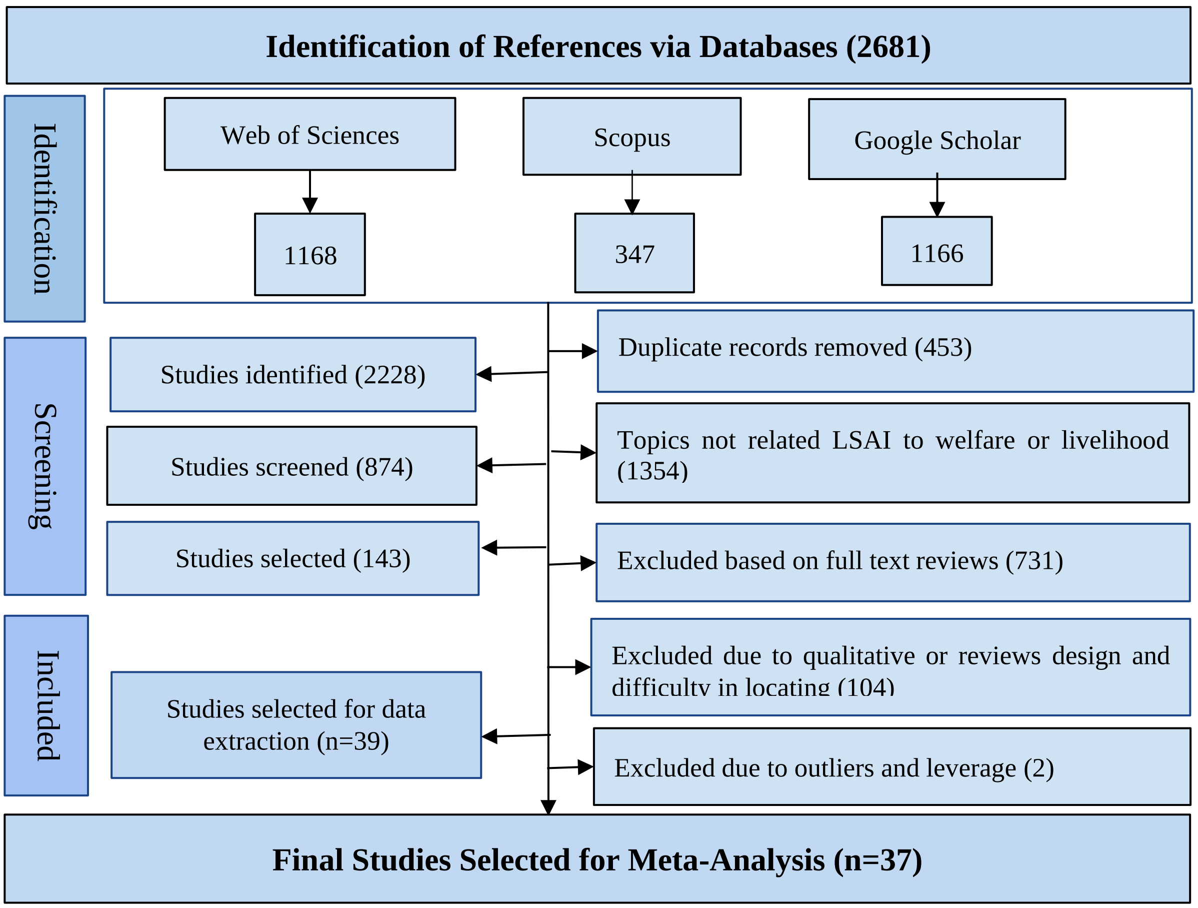

Figure 2. Identification and screening of primary studies

3.2. Coding and data processing

Estimates are extracted and coded from the 37 primary studies, in which nine primary studies report multiple estimates of the same outcome variable: some reported estimates of different statistical models; some reported estimates at level and logarithmic transformations; and the others report estimates as a continuous and categorical form. An "all-set" estimates approach is adopted to extract and code the estimates[2]. The approach takes all the estimates reported by the author. By doing so, this approach has the following advantages: increase the number of observations for meta-analysis, and avoid bias arising from the selection of the best estimate (Stanley & Doucouliagos, 2012). The potential interdependencies between data points could pose an estimation challenge. However, it can easily be handled by employing appropriate statistical methods such as mixed effects regression.

We extracted the point estimate (effect size) and information that indicates the quality of the point estimate of the study, which is measured through the precision of the estimate, the impact factor and the number of citations of the studies. The precision of the estimate is calculated as the inverse of the estimate's standard error so that higher precision of the estimate implies higher quality. The impact factor is obtained from the journals that publish the study. However, not all journals that published the studies have impact factors; the impact factor is reported in per-reviewed Social Science Citation Indexed (SSCI) Journals. The peer-review process ensures the quality of the study, and it helps to see whether the peer review process explains heterogeneity in effect size estimates.

Other information relevant to estimate the overall effect size is also extracted and coded. It includes t-statistic[3], p-values or level of significance, sample size, degrees of freedom and sign of the estimate. Coding errors and existence of outliers and leverage points are also checked using the funnel and Galbraith plots. Outliers are extreme and implausible values of the effect size, whereas leverage points are extreme values of the precession, which would cause the bias in the true effect size (Stanley & Doucouliagos, 2012). In the primary studies, two estimates of Alemu Y. & Tolossa D. (2022), one estimate from Alhasen et al (2018) and the study by He, Q, et al (2022) are identified as an outlier points since they have a relatively larger effect size with lower precision compared with the others. The study by Anti (2021) is identified as a leverage point with extremely higher precession that leverages the effect size upwards and causes the bias in the effect

[2]There are two alternative approaches (Stanley & Doucouliagos, 2012). The first is taking the "best-set" estimates, i.e., extracting estimates from regression results preferred by the author. However, in many instances authors may not reveal their preferred estimates and even if they do, taking only the preferred estimates may result in publication selection bias. Thus, the best-set estimates might not be the best data set to be used in meta-analysis. The results of the best-set sample are presented in Table A 2. The second is taking the "average-set" estimates, i.e., taking the average of all the reported estimates of each study. However, this approach conceals the within study variation-a relevant information in meta-analysis.

[3] Coding procedures for studies that do not report t-statistics is presented in the supplementary material

size by taking a larger weight[4]. The outlier and leverage points are not due to a coding error. At length the metanalysis of this paper is based on 176 estimates extracted from 37 studies.

3.3. Mean Effect Size (MES) Estimation

Partial correlation coefficient which is commonly used in economic meta-analysis literature is applied in this research (Cipollina et al., 2018; Doucouliagos, 2005; Doucouliagos & Ulubasoglu, 2006; Efendic et al., 2011; Valickova et al., 2015). It indicates the degree and direction of association between two variables (Borenstein et al., 2009; Stanley & Doucouliagos, 2012) and have two major advantages: (i) unit lessness, enabling direct comparison of one study with the other and (ii) simplicity in defining and interpreting. In this study, the partial correlation coefficient indicates the degree and direction of relationship between LSAIs and welfare and livelihoods of local communities. However, most primary studies rarely report partial correlation coefficients. Hence, partial correlation coefficients are computed from reported regression statistics such as t-statistics and degrees of freedom as follows:

$$r_{ij} = \frac{t_{ij}}{\sqrt{t_{ij}^2 + df_{ij}}} \tag{1}$$

where r_{ij} represents the partial correlation coefficient of the j^{th} outcome variable in the i^{th} study, t_{ij} denotes t-statistic of the j^{th} outcome variable in the i^{th} study and df_{ij} is the degrees of freedom of the t-statistic (Stanley & Doucouliagos, 2012). The standard error of the partial correlation coefficient is calculated as;

$$SEr_{ij} = \sqrt{(1 - r_{ij}^2)/df_{ij}} \tag{2}$$

where SEr_{ij} is standard error of the partial correlation coefficient, r_{ij} and t_{ij} are as defined earlier.

In meta-analyses applications, before the partial correlation coefficient is used to compute mean effect size, it is transformed using Fisher's r-to-z transformation (Z_r)[5]. This is because the partial correlation coefficient does not follow normal distributions especially when its value gets closer to +1 and -1 whereas Z_r is symmetric: a characteristic desirable in computing the mean effect

[4] The MES computed with the outlier and leverage points is significantly larger (Table A 3).

[5] Z_r is computed as: $Z_r = 0.5ln\,(1 + r_{ij}/1 - r_{ij})$ where Z_r is the Fisher's transformed partial correlation coefficient and r_{ij} is as defined in eq. (1).

size. How ever, Z_r is not readily interpretable as the values are not bounded to +1 and -1. Thus, for reporting, Z_r is transformed back to partial correlation coefficients (Card, 2012).

The average partial correlation coefficient calculated from each study using r_{ij} provides the mean effect size, which is simple average of individual effect sizes. This MES is based on equal weight of the individual effect sizes as it does not take into account the precision of the effect sizes – measured in standard errors. An effect size that considers estimated precession is computed using the fixed-effects or random-effects model (Borenstein et al., 2009; Card, 2012). The fixed effect model assumes that all studies measure a common effect, which is often implausible as the studies employ different methods using unique data sets and contexts as in the current study. The test for the validity of this assumption: test of heterogeneity[6] shows that there is a significant heterogeneity of the effect sizes between studies suggesting the common effect assumption is not valid. Hence random effect model which relaxes the common effect assumption is applied. The MES in the random effects model is estimated as:

$$r_{ij} = \theta + \mu_i + \varepsilon_{ij} \qquad (3)$$

where r_{ij} is as defined earlier, θ represents the population effect size, $\mu_i \sim \mathrm{N}(0,\ \tau^2)$ which indicates the between study variation and $\varepsilon_{ij} \sim \mathrm{N}(0,\ v_{ij})$ which is the error term that measures by how much the observed effect size deviates from the true effect. The MES can be obtained from each studies' estimate weighted by the inverse of the sum of within and between study variance:

$$w_{ij} = \frac{1}{vr_{ij} + \hat{\tau}^2} \qquad (4)$$

where: w_{ij} represents the random effect weight, tau-squared (τ^2) is the between study variance and vr_{ij} captures the within variance. The between study variability (τ^2) is estimated by the methods of restricted maximum likelihood (REML), which is preferred in most applications as it produces an unbiased, nonnegative estimate of τ^2 (Raudenbush, 2009).

3.4. Test of Publication Bias

To measure the presence of publication bias, funnel plot and funnel Asymmetry Test and Precision Effect Test (FAT-PET) are utilized. The funnel plot provides visual inspection of the presence of publication bias, which is plotted with effect size on the X-axis and the precession

[6] The heterogeneity test result is presented in the supplementary material

(inverse of standard errors) on the Y-axis. In the absence of publication bias, the studies will be distributed symmetrically taking the shape of an inverted funnel indicating random sampling error as selection for publication is not systematic (Borenstein et al., 2009). FAT-PET provides formal test for the presence of publication bias and corrects it if it is presents using meta-regression analysis (MRA). The effect size is regressed on its standard error as in equation (5) (Stanley, 2008).

$$r_{ij} = \beta_1 + \beta_0 SE_{ij} + \varepsilon_i \qquad (5)$$

where $j = 1,2, \dots, N; i = 1,2, \dots, S$; N represents the number of selected primary studies and S is the number of estimates in the j^{th} study. The coefficient β_0 indicates the magnitude of publication bias, and β_1 denotes the true effect.

In the absence of publication bias, the partial correlation coefficient will be independent of its standard error. Then the statistically significant β_0 gives a valid evidence for the presence of publication bias and a statistically significant β_1 indicates that the effect size genuinely represents the true impact of LSAIs on welfare and livelihoods of local communities without exaggeration caused by publication selection (Stanley, 2008). We estimate equation (5) using weighted least squares (WLS) (weighting by the invers of the standard error) as regressing the effect sizes by their standard errors results in a significant heteroscedasticity. The weighted specification takes the form:

$$t_{ij} = \frac{r_{ij}}{SE_{ij}} = \beta_0 + \frac{\beta_1}{SE_{ij}} + \omega_j + \varphi_{ij} \qquad (6)$$

where ω_j denotes study level random effects and φ_{ij} represents estimate level disturbances.

Since we are using multiple estimates from each study, to control the potential within study dependencies of estimates we use mixed-effects model in estimating equation (6).

3.5. Multivariate Meta-Regression

To investigate the sources of the heterogeneity, heteroskedasticity-adjusted multivariate meta regression analysis is applied in this research (Doucouliagos & Laroche, 2009; Doucouliagos & Stanley, 2009; Efendic et al., 2011; Havranek & Irsova, 2011; Valickova et al., 2015). The model of multivariate meta regression is as following:

$$t_{ij} = \beta_0 + \beta_1 \left(\frac{1}{SE_{ij}} \right) + \sum_{k=1}^{k} \frac{\gamma_k z_{ijk}}{SE_{ij}} + \omega_j + \varphi_{ij} \qquad (7)$$

where z refers to the set of moderator variables that affect the reported effect sizes (Table A 5), k denotes the number of moderator variables, and each of the moderator variables are weighted by $1/SE_{ij}$ to account for heteroscedasticity.

4. Results and Discussion

4.1 Description of the selected studies

The meta-analysis dataset we created captures information from 37 primary studies that document quantitative estimates on the welfare and livelihoods impact of large-scale land transactions. Table 2 summarizes the key characteristics of the selected studies and estimated coefficients. In these studies, different research designs and estimation methodologies, type of data and type of outcome variables are employed. Majority of the studies used quantitative research design (60.8%); nearly 60% used impact evaluation estimation methods such as PSM and DID by employing cross sectional data (75%). Closer to 70% of estimates are from outcome variables related to welfare such as food security, income, and expenditure.

Table 2. Description of the key features of the estimates extracted from selected primary studies

Variable	Category	Count (percent)	Significant		Insignificant
			Positive	Negative	
Outcome	Welfare	121(68.75)	48	26	42
	Livelihood	55(31.25)	15	20	20
Publication status	Published	122(69%)	40	41	41
	Unpublished	54(31%)	23	10	21
Journal Impact factor	Yes	102(57.9%)	36	31	35
	No	74 (42.1)	27	20	27
Type of data	Cross sectional	132 (75%)	51	39	42
	Panel	44 (25)	12	12	20
Research Design	Mixed	69 (39.2)	24	16	29
	Quantitative	107(60.8%)	39	35	33
Impact Evaluation Method	Yes	137 (77.8)	45	42	50
	No	39 (22.1%)	18	9	12
First Author Region	Africa	58 (33%)	17	22	19
	Non-Africa	118 (67%)	46	29	43
LSAIs country Region	Africa	146 (83%)	49	36	51
	Non-Africa	30 (17%)	14	5	11
Year of publication	2014 to 2022				

Most of the estimates (close to 70%) are published as journal articles while the rest are either working papers or dissertations. The studies are published from the years 2014 to 2022, indicating that empirical investigations towards welfare and livelihood impacts of LSAIs started recently. Of the total statistically significant estimates reported in the primary studies (62%), positive effects outnumber the negatives. Looking at the geographic distribution of the primary studies by the source of data used, LSAIs in Africa appeared to have attracted more research initiatives. Of the total primary studies included in our quantitative analysis, 83 percent are based on data collected from land transactions that took place in continental Africa. However, the geographic distribution of first authors shows that the studies are largely led by researchers based in the global North (63%) (Figure 3).

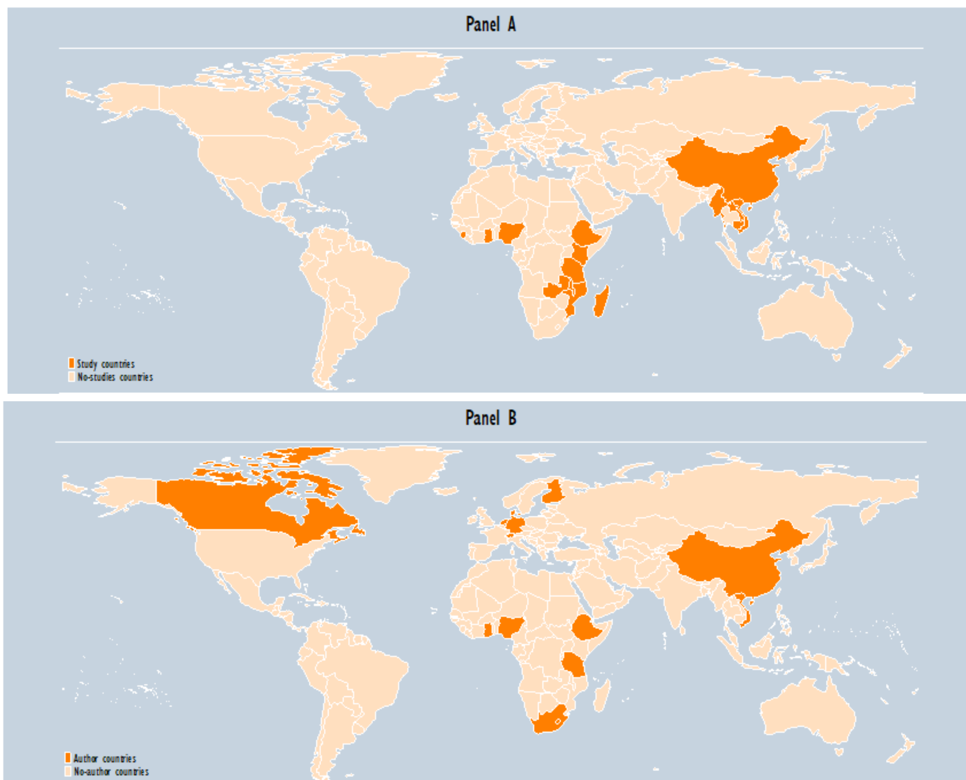

Figure 3. Distribution of primary studies (Panel A) and their authors (Panel B) (Source: generated based on authors affiliation data and UN Member Countries GADM)

4.2. Estimated Mean Effect Size (MES)

We estimate the overall MES using fixed effect and random effect models. In addition, we perform a sub-group meta-analysis and meta-regression to capture and explain the substantial heterogeneity that we observe in the primary studies (for the heterogeneity test, see the supplementary material).

4.2.1. *Overall Mean Effect Size*

The forest plot provides a graphical summary of each study's individual and overall effect estimates and confidence intervals. Individual studies' effect estimate is represented by the box. The size of the box is associated with the weight of the study. Studies with larger weight have relatively larger boxes. The width of the confidence intervals of the effect estimates are indicated by the horizontal line. The pooled effect size is demonstrated by the diamond shape. The forest plot in Figure 4 graphically displays the estimated mean effect-size for 176 individual estimates collected from 37 studies, of each contributing from 1 to 20 estimates. The summary forest plot is drawn by aggregating each estimate at the study level (Viechtbauer, 2010)[7]. Despite the heterogeneous individual effect-size reported by our sample primary studies, the overall effect of LSAIs turns out to be significant and positive. Our analysis results in an overall simple MES of 0.04237. The weighted MES estimated from the fixed effect model (0.0354) is somehow lower than the simple average while the estimate from the random effect model (0.04234) is almost equivalent to the simple mean effect size[8]. The estimated partial correlation coefficient of 0.0423 can be interpreted as small MES according to the more liberal guideline of 0.07 propounded by Doucouliagos, (2011)[9]. The small but statistically significant positive MES implies that the extant LSAIs have, on average, favorable effect on the welfare and livelihoods of local communities.

Given the strong optimism about the potential transformational role of LSAIs, the small MES sends a clear message that the association between expansion of LSAIs and measures of host communities' welfare and livelihoods is rather weak to meet the high expectations of implementing governments. In terms of the ongoing policy debate with regard to the distributional impact of LSAIs, however, the positive MES we document in this paper supports the argument for more LSAIs.

[7] Aggregation of estimates at the study level is made using the meta for package in R (Viechtbauer, 2010). Besides, in order to take the dependencies into account, we used the marginal variance-covariance matrix of the estimates based on the random effect model during aggregation.

[8] Table A 1 in the Appendix summarizes the results from both models

[9] According to Doucouliagos (2011), the strength of effect sizes measured in partial correlation coefficients is divided into large (greater than 0.33), medium, (between 0.07 and 0.33) and small (less than 0.07).

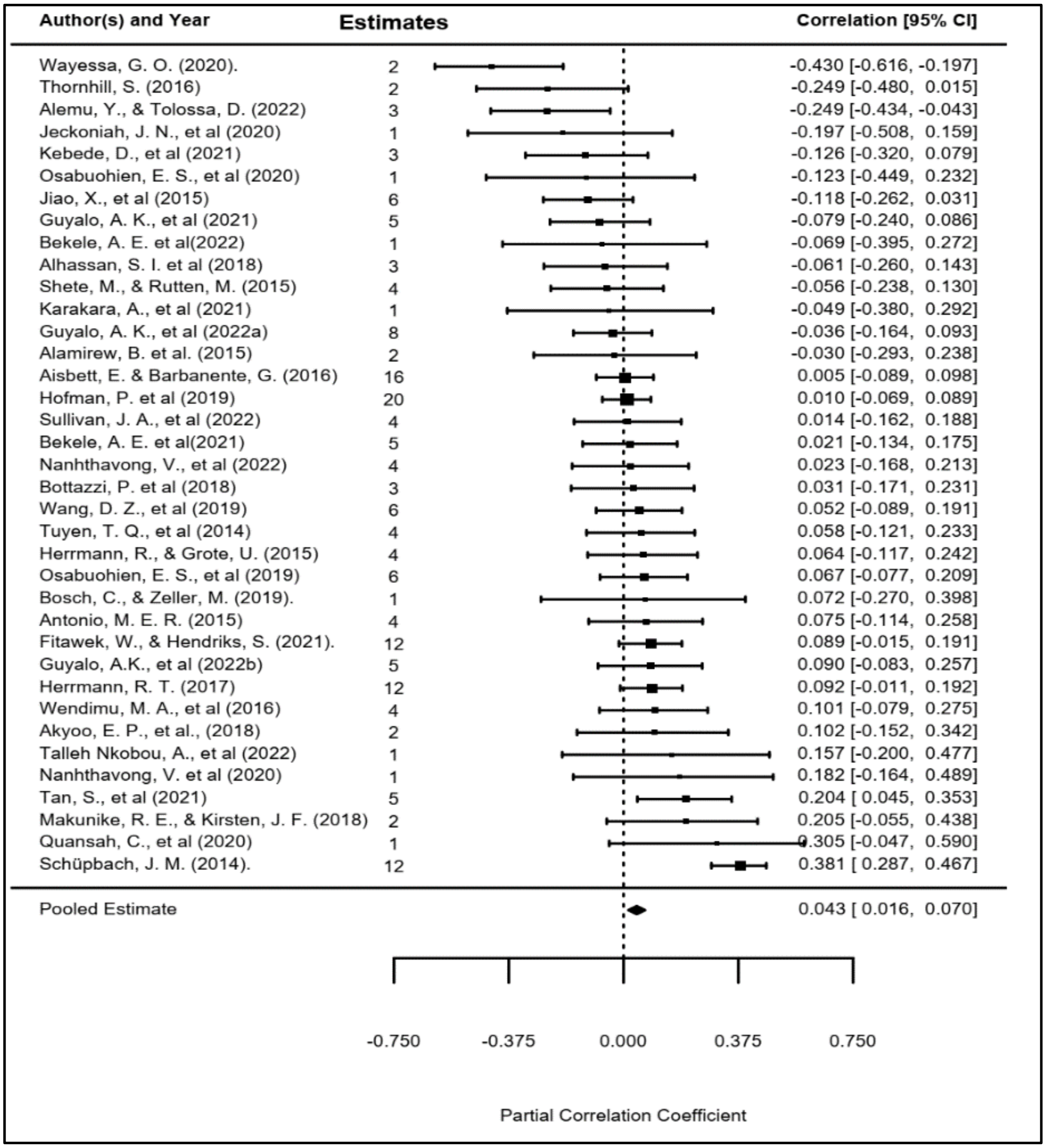

Figure 4. An aggregated Forest plot summarizing the effect size of primary studies selected for the meta-analysis.

4.2.2. Subgroup *Meta-Analysis*

To understand on how the effect of LSAIs vary by groups, subgroup meta-analysis is conducted based on different welfare and livelihood indicators, methods of estimation and host countries. We present estimates from the random effects model for the 15 LSAIs countries in Figure 5. Policy relevant information emerge from the country-based estimates in that LSAIs affect differently the welfare and livelihoods of host communities in different countries. The positive significant effect of LSAIs on the welfare and livelihoods of host communities holds for most host countries included in our synthesis. However, the estimated MES for Cambodia, Nigeria and Ethiopia turns out significantly negative signaling the deteriorating welfare and livelihoods of host communities due to the advent of LSAIs. The estimates for Ghana and Sera Leon are not significant at all.

The effect estimates of Ethiopia and Zambia are worth noting. Zambia (MES of 0.360) registered higher effect size than the overall MES which implies that LSAIs substantially improved welfare and livelihoods. The negative effect estimates for Ethiopia, where majority of the estimates are taken, indicates that LSAIs are deteriorating welfare and livelihoods of local communities. Given that Ethiopia is one of the most important target country in the world where more than 30 per cent of total land deals in Africa transpired (Lay et al., 2021), the negative impacts suggest that policies that promote large-scale agricultural investments should be discussed in-depth and weigh the pros and cons.

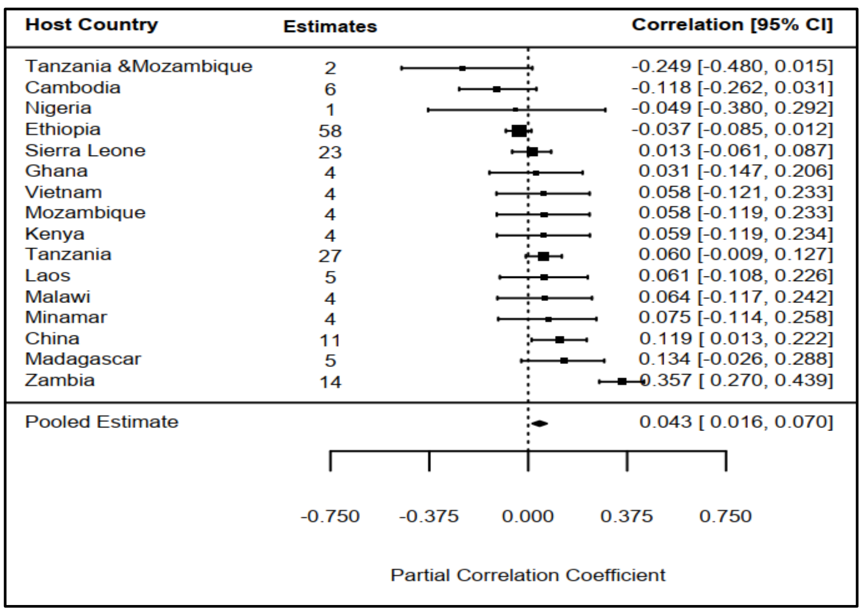

Figure 5. An aggregated Forest plot summarizing the effect size based on the hosting countries

The heterogeneity in the MES across countries could be attributed to the differences in the land tenure and land governance systems. Studies showed that LSAI mostly target countries with week institutional systems such as control of corruption (Bujko et al., 2016). To check this we resort in to the performance of the LSAI deals in compliance with the Voluntary Guidelines in Responsible Governance of Tenure (VGGT) principles. The VGGT is introduced by FAO to ensure the productive and sustainable use of resources by large scale agricultural investors so that the benefit to the local communities is not jeopardized (FAO, 2019). After 10 years of monitoring, in 2022, the Land Matrix Initiative produced an evaluation report of the deals in African continent based on compliance with VGGT principles (Anseeuw et al, 2022). 23 countries, with a total of 730 deals collectively, were fully assessed in the report and indicated low level of compliance with 78% of all deals assessed show unsatisfactory levels of VGGT uptake and implementation; 20% of all deals assessed do not comply with any of the VGGT principles. The report also produced an aggregated evaluation at a country level and 87% of countries present unsatisfactory results regarding VGGT implementation (see Figure 6).

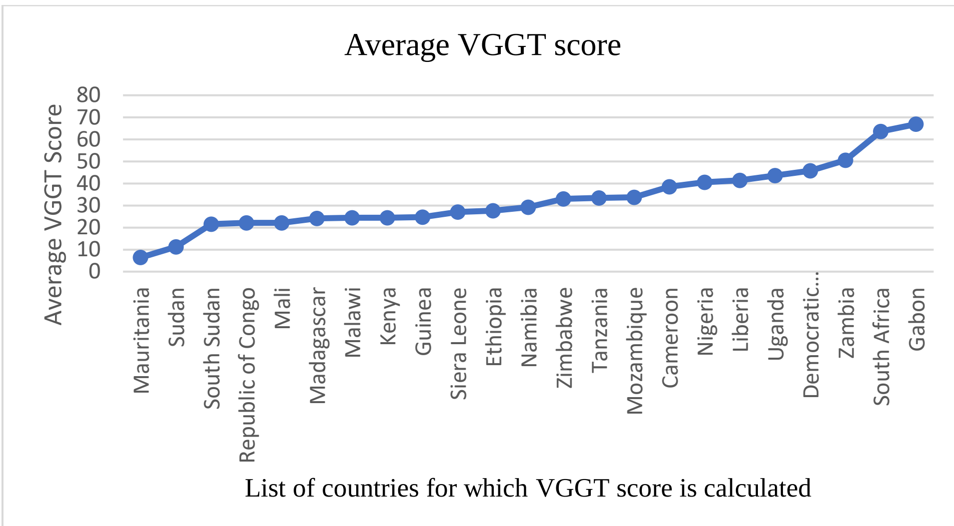

Figure 6. VGGT score of African countries Source: Based on VGGT score produced by the Land Matrix Initiative (Anseeuw et al, 2022)

We used the VGGT scores of countries included in this study to see if the heterogeneity in the MES across countries is attributed to differences in the land governance and tenure system. Figure 7 indicates that while we couldn't notice a significant association between VGGT scores and MES, countries with better VGGT score such as Mozambique and Zambia also recorded a relatively higher MES implying that better implementation of the VGGTs enable LSAIs contribute towards the betterment of local communities' wellbeing (Figure 7).

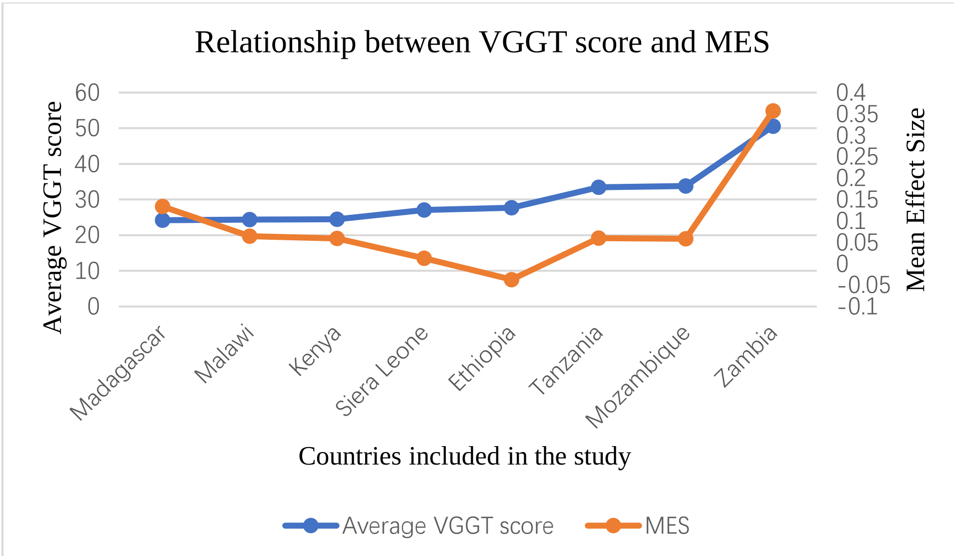

Figure 7. The relationship between VGGT score and mean effect size of African countries included in the meta-analysis

The results from outcome-based subgroup meta-analysis are presented in the left part of Figure 8. The estimates displayed are from the random effects model for 6 different measures of welfare and livelihood outcomes. Whereas the positive significant effect of LSAIs on the welfare and livelihoods of host communities holds for assets, food security status, employment and income opportunities, it turns out significantly negative for livelihood outcomes, inequality, health, empowerment and resilience. The main implication of this is that asset building, improved food security and increased income offer valid explanation for the observed overall positive effects of LSAIs.

The subgroup analysis based on methods of estimation used by primary studies shows that effect sizes are also heterogeneous across different methods. As indicated in the right part of Figure 8 effect estimates of primary studies that used PSM, OLS, IV(2SLS) and correlation methods are positive. Primary studies that used ANOVA and others (fixed effects, ordered random effects and logistic methods) are negative whereas effect estimates of primary studies that used DID is closer to zero.

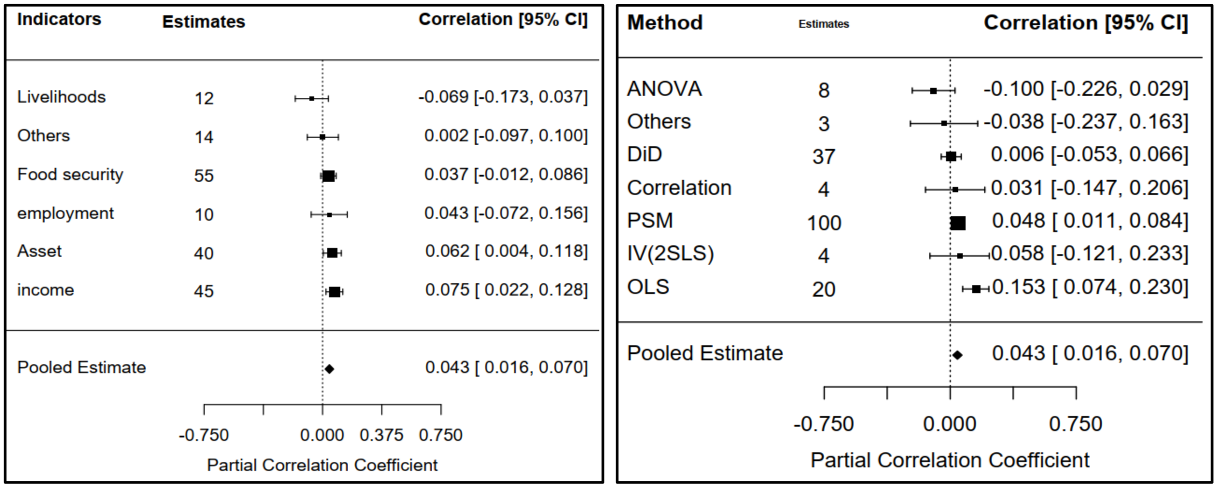

Figure 8. An aggregated Forest plot summarizing the effect size based on outcomes used by primary studies (left) and method of estimation used by primary studies (right).

4.3. Publication Bias

Publication bias, also called small study bias, has become a common problem in economics research (Doucouliagos, 2005). It arises because studies with significant results are more likely to be published than studies with insignificant results. In addition, large studies have a higher likelihood to be published regardless of statistical significance and small studies with the small and moderate effects are likely to be unpublished (Borenstein et al., 2009). Effect size computed under such circumstances may likely overestimate the true effect size as it is based on a biased sample of the target population. Generally, publication bias is detected by funnel plot and funnel asymmetry test and precision effect test (FAT-PET).

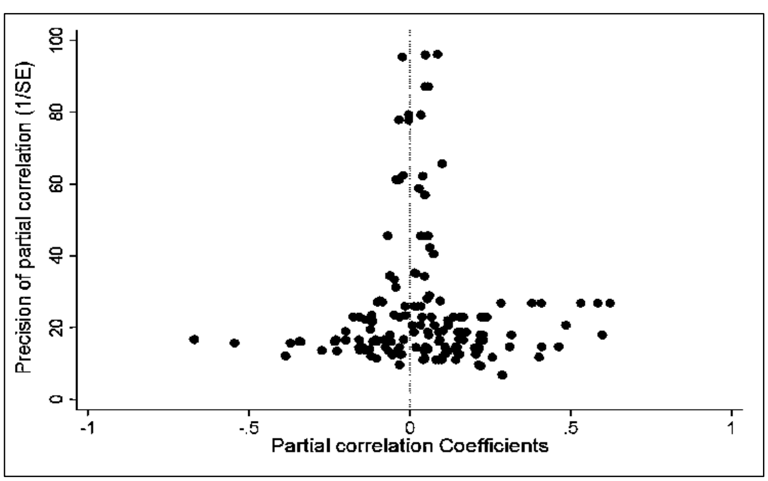

Figure 9. Funnel plot of the impact of LSAIs on welfare and livelihoods of local communities.

The funnel plot for selected primary studies is depicted in Figure 9. Even though the plots look like an inverted funnel, a closer look at them reveals that they are not symmetrical. It indicated that more positive estimates could probably be preferentially reported. Visual inspection of the funnel plot, however, do not provide conclusive evidence for the presence of publication bias.

The funnel asymmetry test presented in Table 3 provides definite evidence for publication bias. According to the result, the constant term is statistically insignificant and thus the null hypothesis can't be rejected at 10% level. It implies that there is no publication selection bias in this study. Meanwhile, the coefficient of precision effect test is found to be marginally significant at 10% level. It indicates that the impact of LSAIs on welfare and livelihoods of local communities is marginally genuine without exaggeration due to publication selection. The presence of marginal impact of LSAIs on welfare and livelihoods of local communities is corroborated by the smaller overall effect size in this study (0.0423).

Table 3. The results of funnel asymmetry test and precision effect test (FAT-PET)

Dependent variable = t-stat	Coefficients	Standard Error	p-value
Constant ($\beta_0 - bias$)	-0.1692	0.6930	0.807
$1/SE_{ij}$ (β_1 −Precision)	0.0334*	0.0198	0.091
Within-study correlation	0.4094	0.0907	
Observations	176		
Number of Studies	37		

Note: Estimated using the mixed-effects multilevel model; * denotes significance at the 10% level.

4.4. Meta-*Regression Analysis*

Table 4 presents the main result from our Multivariate Meta-Regression Analysis (MRA). Unlike the sub-group analysis, the MRA offer the possibilities to model the sources and facilitates comprehensive explanation about the observed heterogeneity in individual effect sizes among the primary studies[10]. Descriptions of the moderator variables is presented in the appendix (Table A 5). Among the potential sources of heterogeneity, we include in our MRA, we find methodological moderators to have systematic effects on the reported effect sizes by the primary

[10] As a robustness check to the mixed effect model, equation (7) is also estimated using the OLS method by clustering standard errors at a study level (Disdier & Head, 2008; Doucouliagos & Laroche, 2009; Havranek & Irsova, 2011). Results of the two models are very similar. However, we prefer the results of mixed-effects models to explain the heterogeneity in effect estimates of the impact of LSAIs on the welfare and livelihoods of local communities as the mixed-effects model is more appropriate when multiple estimates are extracted from a single study.

studies that constitute our sample. The type of welfare or livelihoods indicator, research design, data and sign of estimates are notable sources. Primary studies that investigated the welfare impact of LSAIs report significantly positive effect sizes compared with those applying livelihood indicators. It reveals the positive association between the expansion of LSAIs and welfare of local communities which is verified by the sub-group analysis as well.

Studies that employed mixed research design report greater positive effect sizes compared to those using only quantitative research design. Regarding the statistical method of estimation, primary studies that used impact evaluation estimation methods tend to report negative association between LSAIs and welfare of local communities but statistically insignificant, which imply that the statistical method of estimation is not the source of heterogeneity in effect size.

Other variables such as the type of data used by primary studies also contribute to the diversity in the effect size. The coefficient of the dummy for data type is significantly positive which indicates studies that using cross-sectional data would report greater effects than those using panel data. Sample size, however, is not the source of heterogeneity in the effect size reported by primary studies. In order to estimate how the peer review process affects the magnitude of the effect size reported, the variables of publication status, publication year and impact factor of the journal that published the primary studies are applied as moderators. The results confirm that publication status and publication year contribute to the diversity in effect size whereas the impact factor of the journal not. The negative sign of the coefficient of publication status demonstrates that studies published tend to report smaller effects than those unpublished. The structural moderators such as the host region of the LSAI and institutional affiliation of the first author don’t contribute to the heterogeneity in the effect size.

Table 4. Results of MRA to explain the source of heterogeneity in effect size of primary studies

Moderator Variables	Mixed effect model		Weighted Least squares	
	Coefficients	Standard Error (SE)	Coefficients	Robust SE
Precision ($1/SE_{ij}$)	36.568**	(17.921)	25.471*	(13.509)
Constant	-2.344***	(0.909)	-2.944***	(0.765)
Type of outcome variables used				
Welfare	0.028*	(0.017)	0.030	(0.020)
Research Design and Estimation characteristics				
Mixed research design	0.100**	(0.040)	0.098***	(0.027)
Impact evaluation	-0.021	(0.021)	-0.005	(0.022)
Sample size	-0.000	(0.000)	-0.000*	(0.000)
Data type	0.084**	(0.037)	0.122***	(0.026)
Reported Coefficient characteristics				
Sign of coefficient	0.115***	(0.013)	0.131***	(0.015)
Significant coefficient	-0.008	(0.015)	-0.006	(0.015)
Publication characteristics				
Publication status	-0.113*	(0.064)	-0.136***	(0.041)
Publication year	-0.018**	(0.009)	-0.013*	(0.007)
Impact factor	0.013	(0.042)	0.018	(0.027)
Regional differences				
LSAI country region	0.004	(0.045)	0.011	(0.036)
Author affiliation	0.058	(0.037)	0.048*	(0.028)
Observations	176		176	
Number of studies	37			
Within Study correlation	0.369	(0.118)		
Log restricted-likelihood	-453.991			
Adjusted R-squared			0.588	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Finally, the estimate of the constant that controls for publication bias becomes significant and larger in absolute terms. However, since the publication test results in Table 3 indicated that the effect estimates reported by primary studies are not significantly correlated with their standard errors, we expect that the estimate of the constant becomes insignificant after study aspects in addition to precision are accounted for. Valickova et al. (2015) encountered a similar result in their MRA, the possible explanation is that some aspects of the studies such as methodology, data or others may be associated with publication bias.

5. Conclusion

In recent decades, governments in developing countries have transacted large tracts of land to private and public companies in order to modernize the agricultural sector and use land assets more efficiently. However, the impacts of large-scale agricultural investments (LSAIs) on the welfare and livelihoods of the local community are still under debate as the empirical literatures report inconsistent results. In order to explore the overall impact of LSAIs on welfare and livelihoods of local communities, a meta-analysis on 176 estimates extracted from 37 primary studies is conducted. The overall effect of LSAIs turns out to be positive. In fact, the magnitude of the MES is quite small (~0.043) in view of the policy debate LSAIs triggered and the transformational role purported by governments in low-income countries. The interpretation is straight forward. The extant LSAIs have, on average, favorable effect on the welfare and livelihoods of host communities.

However, we observe important heterogeneity in the estimated effect size. Using sub-group meta-analysis, we further investigate the sources of heterogeneity. LSAIs are found to have differential effect across LSAIs countries, measures of welfare and livelihoods and the method of statistical estimation. The mixed effect across countries suggests that a one size fits all approach in the design and implementation of government programs that promote large-scale agricultural investments could be counterproductive. The outcome-based sub-group analysis highlights on the mechanism through which the positive welfare and livelihoods impact of LSAIs operate. The results provide evidence for income and employment opportunities, asset building and improved food security as the main channels. Overall, the results of our quantitative meta-analytic study are in support of government policies and programs that promote large-scale land investments within the broader policy debate about LSAIs. The rather small mean effect-size and heterogeneity across countries may fairly be attributed to the poor implementation, monitoring and evaluation of LSAIs.

However, in relation to land governance, progresses have been made in ensuring LSAIs become beneficial to local communities through regulatory and guiding frameworks such as Voluntary Guidelines on the Responsible Governance of Tenure (VGGTs) (FAO, 2019) and Principles for Responsible Investment in Agriculture and Food Systems (RAIs) (CFS, 2014) at the international level and the Framework and Guidelines on Land Policy in Africa (ALPC, 2010), guiding principles on large scale land based investments in Africa (UN and ECA, 2014) and guidelines on promoting responsible investment in food, agriculture, and forestry in Southeastern

Asian Nations (ASEAN) (ATWGARD, 2018) at regional level. Despite these progresses, the results of this study suggested that much remains to be done in the implementation of these guidelines to realize the transformational potential of large-scale land investments both for local communities and national economies.

In this paper, using meta-analysis, we evaluate whether LSAIs keep their promises in improving welfare and livelihoods of local communities. Despite the overall impact of LSAIs are in favor of local communities, we find that primary studies do not provide information why the impact of LSAIs are heterogenous across countries. Evidence generated by the primary studies focused from assessment of a single investment project which makes it difficult to generalize findings beyond the community level where LSAIs carried out. Future studies could use cross country information to explain this heterogeneity. In addition, most of the studies evaluated the short-term effects of LSAIs using cross sectional data. However, the impact of such investments would turn out differently in the long term. For example, Hofman et al., (2019) showed that LSAIs resulted in a higher reduction in income for the long run than the short run. We also observed that the overall impact of LSAIs at a national level, that could accrue in the form of increased agricultural production, agricultural exports, tax revenue etc., didn't get much attention in the existing literature. Future studies could also focus in accounting the impact of LSAIs at national level.

Acknowledgment: The authors acknowledge National Natural Science Foundation of China (NSFC), grant number 71963006; and by the project “The Distributional Impact of Large-Scale Land Transactions in Ethiopia” funded by USAID Feed the Future Advancing Local Leadership & Innovations (ALL-IN) initiative, grant number ALL-IN-85-8154 for supporting this study.

References:

Akyoo, E. P., Jeckoniah, J., & Kabote, S. J. (2018). *Livelihood Outcomes Among Households Participating in Large-Scale Agricultural Investments in Kilombero Valley, Tanzania*.

Alhassan, S. I., Shaibu, M. T., & Kuwornu, J. K. M. (2018). Is land grabbing an opportunity or a menace to development in developing countries? Evidence from Ghana. *Local Environment*, *23*(12), 1121–1140. https://doi.org/10.1080/13549839.2018.1531839

Ali, D., Deininger, K., & Harris, A. (2019). Does Large Farm Establishment Create Benefits for Neighboring Smallholders? Evidence from Ethiopia. *Land Economics*, *95*(1), 71–90. https://doi.org/10.3368/le.95.1.71

ALPC (2010). Framework and Guidelines (F&G) on land policy in Africa. ALPC (African Land Policy Centre).

Anseeuw, W., Bourgoin, J., Harding, A. (2022). Little progress in Practice: Assessing transparency, inclusiveness and sustainability in large-scale land acquisitions in Africa. Pretoria, University of Pretoria. ISBN: 978-0-620-99156-8

Anti, S. (2021). Land grabs and labor in Cambodia. *Journal of Development Economics*, *149*, 102616. https://doi.org/10.1016/j.jdeveco.2020.102616

ATWGARD (2018). The ASEAN Guidelines on Promoting Responsible Investment in Food, Agriculture and Forestry. ATWGARD (ASEAN Technical Working Group on Agricultural Research and Development). https://asean.org/wp-content/uploads/2021/09/2018-ASEAN-Guideline-Responsible-Investment-FAF.pdf

Baumgartner, P., von Braun, J., Abebaw, D., & Müller, M. (2015). Impacts of Large-scale Land Investments on Income, Prices, and Employment: Empirical Analyses in Ethiopia. *World Development*, *72*, 175–190. https://doi.org/10.1016/j.worlddev.2015.02.017

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. John Wiley & Sons.

Borras Jr, S. M., & Franco, J. C. (2012). Global Land Grabbing and Trajectories of Agrarian Change: A Preliminary Analysis: Global Land Grabbing and Trajectories of Agrarian Change. *Journal of Agrarian Change*, *12*(1), 34–59. https://doi.org/10.1111/j.1471-0366.2011.00339.x

Borras, S. M., Franco, J. C., Moreda, T., Xu, Y., Bruna, N., & Afewerk Demena, B. (2022). The value of so-called 'failed' large-scale land acquisitions. *Land Use Policy*, *119*, 106199. https://doi.org/10.1016/j.landusepol.2022.106199

Bosch, C., & Zeller, M. (2019). Large-scale biofuel production and food security of smallholders: Evidence from Jatropha in Madagascar. *Food Security*, *11*(2), 431–445. https://doi.org/10.1007/s12571-019-00904-3

Bujko, M., Fischer, C., Krieger, T., & Meierrieks, D. (2016). How Institutions Shape Land Deals: The Role of Corruption. *Homo Oeconomicus*, *33*(3), 205–217. https://doi.org/10.1007/s41412-016-0021-4

Card, N. A. (2012). *Applied Meta-Analysis for Social Science Research* (D. A. Kenny, Ed.). THE GUILFORD PRESS New York NY 10012.

CFS. (2014). *Principles for Responsible Investment in Agriculture and Food Systems*. FAO, WFP, IFAD. https://www.fao.org/3/a-au866e.pdf

Chambers, R., & Conway, G. (1992). *Sustainable rural livelihoods: Practical concepts for the 21st century*. Institute of Development Studies (UK). https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/775

Cipollina, M., Cuffaro, N., & D'Agostino, G. (2018). Land Inequality and Economic Growth: A Meta-Analysis. *Sustainability*, *10*(12), 4655. https://doi.org/10.3390/su10124655

Cochrane, L., & Legault, D. (2020). The Rush for Land and Agricultural Investment in Ethiopia: What We Know and What We Are Missing. *Land*, *9*(5), 167. https://doi.org/10.3390/land9050167

Cotula, L. (2009). *Land grab or development opportunity?: Agricultural investment and international land deals in Africa*. IIED ; FAO : IFAD. http://www.fao.org/docrep/pdf/011/ak241e/ak241e.pdf

Cotula, L., Oya, C., Codjoe, E. A., Eid, A., Kakraba-Ampeh, M., Keeley, J., Kidewa, A. L., Makwarimba, M., Seide, W. M., Nasha, W. O., Asare, R. O., & Rizzo, M. (2014). Testing Claims about Large Land Deals in Africa: Findings from a Multi-Country Study. *The Journal of Development Studies*, *50*(7), 903–925. https://doi.org/10.1080/00220388.2014.901501

Deininger, K. (2011). Challenges posed by the new wave of farmland investment. *Journal of Peasant Studies*, *38*(2), 217–247. https://doi.org/10.1080/03066150.2011.559007

Deininger, K., & Byerlee, D. (2011). *Rising Global Interest in Farmland: Can It Yield Sustainable and Equitable Benefits?* The World Bank. https://doi.org/10.1596/978-0-8213-8591-3

Deininger, K., & Xia, F. (2016). Quantifying Spillover Effects from Large Land-based Investment: The Case of Mozambique. *World Development*, *87*, 227–241. https://doi.org/10.1016/j.worlddev.2016.06.016

Dessy, S., Gohou, G. L., & Vencatachellum, D. (2012). Foreign Direct Investments in Africa's Farmlands: Threat or Opportunity for Local Populations? *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1991290

DFID, (1999). Key sheets for sustainable development: Overview Department for International Development, London (1999)

Disdier, A.-C., & Head, K. (2008). The Puzzling Persistence of the Distance Effect on Bilateral Trade. *The Review of Economics and Statistics*, *90*(1), 37–48.

Doucouliagos, C. (2005). Publication Bias in the Economic Freedom and Economic Growth Literature. *Journal of Economic Surveys*, *19*(3), 367–387. https://doi.org/10.1111/j.0950-0804.2005.00252.x

Doucouliagos, C. (2011). *How large is large? Preliminary and relative guidelines for interpreting partial correlations in economics* [Report]. Deakin University. https://dro.deakin.edu.au/articles/report/How_large_is_large_Preliminary_and_relative_guidelines_for_interpreting_partial_correlations_in_economics/20821744/1

Doucouliagos, C., & Ulubasoglu, M. A. (2006). Economic freedom and economic growth: Does specification make a difference? *European Journal of Political Economy*, *22*(1), 60–81. https://doi.org/10.1016/j.ejpoleco.2005.06.003

Doucouliagos, H., & Laroche, P. (2009). Unions and Profits: A Meta-Regression Analysis1. *Industrial Relations: A Journal of Economy and Society*, *48*(1), 146–184. https://doi.org/10.1111/j.1468-232X.2008.00549.x

Doucouliagos, H., & Stanley, T. D. (2009). Publication Selection Bias in Minimum-Wage Research? A Meta-Regression Analysis. *British Journal of Industrial Relations*, *47*(2), 406–428. https://doi.org/10.1111/j.1467-8543.2009.00723.x

Edelman, M., Oya, C., & Borras, S. M. (2013). Global Land Grabs: Historical processes, theoretical and methodological implications and current trajectories. *Third World Quarterly*, *34*(9), 1517–1531. https://doi.org/10.1080/01436597.2013.850190

Efendic, A., Pugh, G., & Adnett, N. (2011). Institutions and economic performance: A meta-regression analysis. *European Journal of Political Economy*, *27*(3), 586–599. https://doi.org/10.1016/j.ejpoleco.2010.12.003

FAO. (2012). *The state of food and agriculture 2012: Investing in agriculture for a better future*. FAO. https://www.fao.org/publications/card/en/c/6f04a37a-f046-5bac-a88e-e05b476a040d/

FAO. (2019). *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security*. FAO. https://doi.org/10.4060/i2801e

Hajjar, R., Ayana, A. N., Rutt, R., Hinde, O., Liao, C., Keene, S., Bandiaky-Badji, S., & Agrawal, A. (2020). Capital, labor, and gender: The consequences of large-scale land transactions on household labor allocation. *The Journal of Peasant Studies*, *47*(3), 566–588. https://doi.org/10.1080/03066150.2019.1602520

Havranek, T., & Irsova, Z. (2011). Estimating vertical spillovers from FDI: Why results vary and what the true effect is. *Journal of International Economics*, *85*(2), 234–244. https://doi.org/10.1016/j.jinteco.2011.07.004

Herrmann, R., & Grote, U. (2015). Large-scale Agro-Industrial Investments and Rural Poverty: Evidence from Sugarcane in Malawi. *Journal of African Economies*, *24*(5), 645–676. https://doi.org/10.1093/jae/ejv015

Herrmann, R. T. (2017). Large-Scale Agricultural Investments and Smallholder Welfare: A Comparison of Wage Labor and Outgrower Channels in Tanzania. *World Development*, *90*, 294–310. https://doi.org/10.1016/j.worlddev.2016.10.007

Hofman, P., Mokuwa, E., Richards, P., & Voors, M. (2019). *Local Economy effects of Large-Scale Agricultural Investments*.

Hufe, P., & Heuermann, D. F. (2017). The local impacts of large-scale land acquisitions: A review of case study evidence from Sub-Saharan Africa. *Journal of Contemporary African Studies*, *35*(2), 168–189. https://doi.org/10.1080/02589001.2017.1307505

Jung, S. (2018). Evidence on land deals' impacts on local livelihoods. *Current Opinion in Environmental Sustainability*, *32*, 90–95. https://doi.org/10.1016/j.cosust.2018.05.017

Kleemann, L., & Thiele, R. (2015). Rural welfare implications of large-scale land acquisitions in Africa: A theoretical framework. *Economic Modelling*, *51*, 269–279. https://doi.org/10.1016/j.econmod.2015.08.016

Land Matrix. (2023). *Global | Land Matrix*. Global Land Observatory. https://landmatrix.org/observatory/global/

Lay, J., Anseeuw, W., Eckert, S., Flachsbarth, I., Kubitza, C., Nolte, K., & Giger, M. (2021). *Taking stock of the global land rush: Few development benefits, many human and environmental risks. Analytical Report III*. Centre for Development and Environment, University of Bern; Centre de coopération internationale en recherche agronomique pour le développement; German Institute of Global and Area Studies; University of Pretoria; Bern Open Publishing. https://doi.org/10.48350/156861

Messerli, P., Giger, M., Dwyer, M. B., Breu, T., & Eckert, S. (2014). The geography of large-scale land acquisitions: Analysing socio-ecological patterns of target contexts in the global South. *Applied Geography*, *53*, 449–459. https://doi.org/10.1016/j.apgeog.2014.07.005

Nkansah-Dwamena, E. (2021). Can large-scale land acquisition deals improve livelihoods and lift people out of poverty in Sub-Saharan Africa? Empirical evidence from Tanzania. *Journal of Agriculture, Food Systems, and Community Development*, 1–22. https://doi.org/10.5304/jafscd.2021.103.013

Nolte, K., & Väth, S. J. (2015). Interplay of land governance and large-scale agricultural investment: Evidence from Ghana and Kenya. *The Journal of Modern African Studies*, *53*(1), 69–92. https://doi.org/10.1017/S0022278X14000688

Rasva, M., & Jürgenson, E. (2022). Europe's Large-Scale Land Acquisitions and Bibliometric Analysis. *Agriculture*, *12*(6), 850. https://doi.org/10.3390/agriculture12060850

Raudenbush. (2009). Analyzing effect sizes: Random-effects models. In H. M. Cooper, L. V. Hedges, & J. C. Valentine (Eds.), *The handbook of research synthesis and meta-analysis* (2nd ed, pp. 295–316). Russell Sage Foundation.

Serrat, O. (2017). The Sustainable Livelihoods Approach. In O. Serrat, *Knowledge Solutions* (pp. 21–26). Springer Singapore. https://doi.org/10.1007/978-981-10-0983-9_5

Shete, M., & Rutten, M. (2015). Impacts of large-scale farming on local communities' food security and income levels – Empirical evidence from Oromia Region, Ethiopia. *Land Use Policy*, *47*, 282–292. https://doi.org/10.1016/j.landusepol.2015.01.034

Stanley. (2008). Meta-Regression Methods for Detecting and Estimating Empirical Effects in the Presence of Publication Selection. *Oxford Bulletin of Economics and Statistics*, *70*(1), 103–127. https://doi.org/10.1111/j.1468-0084.2007.00487.x

Stanley, & Doucouliagos, H. (2012). *Meta-Regression Analysis in Economics and Business* (0 ed.). Routledge. https://doi.org/10.4324/9780203111710

Stanley, Doucouliagos, H., Giles, M., Heckemeyer, J. H., Johnston, R. J., Laroche, P., Nelson, J. P., Paldam, M., Poot, J., Pugh, G., Rosenberger, R. S., & Rost, K. (2013). Meta-Analysis of Economics Research Reporting Guidelines. *Journal of Economic Surveys*, *27*(2), 390–394. https://doi.org/10.1111/joes.12008

Talleh Nkobou, A., Ainslie, A., & Lemke, S. (2021). Broken promises: A rights-based analysis of marginalised livelihoods and experiences of food insecurity in large-scale land investments in Tanzania. *Food Security*. https://doi.org/10.1007/s12571-021-01195-3

Valickova, P., Havranek, T., & Horvath, R. (2015). Financial Development and Economic Growth: A Meta-Analysis. *Journal of Economic Surveys*, *29*(3), 506–526. https://doi.org/10.1111/joes.12068

Viechtbauer, W. (2010). Conducting Meta-Analyses in R with the metafor Package. *Journal of Statistical Software*, *36*, 1–48. https://doi.org/10.18637/jss.v036.i03

World Bank. (2008). *Agriculture for Development* (World Development Report). The World Bank. https://doi.org/10.1596/978-0-8213-6807-7F

Yang, B., & He, J. (2021). Global Land Grabbing: A Critical Review of Case Studies across the World. *Land*, *10*(3), 324. https://doi.org/10.3390/land10030324

Appendix

A. **Overall and Subgroup Mean effect size**

Table A 1. Weighted and unweighted overall mean effect sizes

	Mean	Se	t-stat	p-value	95% CI
Unweighted average	0.04237	0.0140	3.017	0.0029	(0.0146, 0.0701)
Fixed Effect	0.0354	0.0024	14.74	0.000	(0.0306, 0.0401)
Random Effect	0.04234	0.0139	3.04	0.002	(0.0149, 0.0697)

Number of studies=37 and number of estimates=176

Table A 2. Weighted and unweighted overall mean effect sizes of the best set sample

	Mean	Se	t-stat	p-value	95% CI
Unweighted average	0.041335	0.01563	3.449	0.0007	(0.0104, 0.0722)
Fixed Effect	0.04929	.00297	16.58	0.000	(0.0434, 0.0552)
Random Effect	0.04325	0.0165	2.62	0.009	(0.0106, 0.07576)

Number of studies=37 and number of estimates=144

Table A 3. Weighted and unweighted mean effect sizes of the whole sample before excluding outliers and leverages

	Mean	Se	t-stat	p-value	95% CI
Unweighted average	0.0689	0.0199	3.449	0.0007	(0.0295, 0.1084)
Fixed Effect	0.0078	0.0008	9.90	0.000	(0.0063, 0.0094)
Random Effect	0.0688	0.0199	3.45	0.001	(0.0295, 0.1079)

Number of studies=39 and number of estimates=195

Table A 4. Subgroup weighted effect sizes by welfare and livelihoods

Group	Method	Effect size	Se	z	P>z	[95% conf.	interval]
Livelihood	RE	0.031	0.035	0.87	0.382	-0.038	0.099
Welfare	RE	0.047	0.012	3.77	0.000	0.022	0.0708
Overall	RE	0.042	0.014	3.04	0.002	0.015	0.069

Table A 5. Description and summary of selected moderator variables

VARIABLES	Description of the variables	N	mean	Sd
Type of outcome variables used				
Welfare	=1 if the outcome variable indicates welfare (food security, income or asset)	176	0.688	0.465
Research Design and Estimation characteristics				
Mixed research design	=1 if the study uses mixed research designs and zero if the study uses quantitative design	176	0.399	0.491
Impact evaluation	=1 if the study uses impact evaluation methods (PSM or DID) and zero otherwise	176	0.778	0.417
Data Characteristics				
Sample size	Sample size of the reported coefficient	176	1,036	1,826
Data type	=1 if the data is cross sectional	176	0.750	0.434
Reported Coefficient characteristics				
t-stat	t-statistics of the estimated coefficient	176	1.067	3.929
Sign of coefficient	=1 if sign of the coefficient is positive	176	0.568	0.497
Significant coefficient	=1 if the reported coefficient is significant	176	0.675	0.470
Publication characteristics				
Publication status	=1 if the study is published	176	0.693	0.462
Publication year	Publication year of the study	176	2,018	2.644
Study quality indicators				
Precision ($1/SE_{ij}$)	Precision of the partial correlation coefficient	176	25.85	18.41
Impact factor	Impact factor of the journal	102	5.432	1.924
Impact factor dummy	=1 if the journal has impact factor	176	0.580	0.495
Regional differences				
LSAI country region	=1 if the host country of LSAI is in Africa	176	0.830	0.377
Author affiliation	=1 if the first author if from Africa	176	0.329	0.471