THE LINKAGE BETWEEN AGRICULTURAL MARKET IMPERFECTIONS AND MULTIDIMENSIONAL RURAL POVERTY: EVIDENCE FROM SIDAMA REGION OF ETHIOPIA

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Abstract
The inaccessibility of markets due to high transaction costs and asymmetric information is a common problem for smallholder farmers in the least developed countries. Thus, this study's objective was to explore the association between agricultural market imperfections and multidimensional rural poverty in the Sidama Region of Ethiopia in 2022. Hence, this study employed both qualitative and quantitative methods to achieve this objective. Through a multi-stage sampling technique, 400 sample sizes were selected. Additionally, the multidimensional poverty index (MPI) method was used to measure the level of rural poverty. And two limit Tobit model was used to identify the influences of agricultural market imperfections on multidimensional rural poverty. According to the findings of this study, about 43 per cent of farmers sell their products to middlemen by a trip to the market by loading on their shoulders. The multidimensional poverty index's (MPI) predicted value is 0.056, higher for farmers with asymmetric information than for those with symmetric information. Moreover, according to the results of the Tobit model, asymmetric information, inaccessibility of infrastructure, and climate change significantly and positively contributed to multidimensional rural poverty, while education, farm size, membership in cooperatives, and experience in trade affected multidimensional rural poverty significantly and negatively. As a result, asymmetric information remains a challenge for farmers. There is a need for institutional innovations and interference to enhance access to the market by recovering the organization of marketing channels for farmers and improving the exchange of information.

Keywords: Imperfect market, MPI, Multidimensional poverty, Tobit Model

1. INTRODUCTION
The agricultural sector plays a pivotal role in accelerating rural development and is referred to as the primary income source for rural households (Gascón, 2015). In developing countries, farmers are exposed to market imperfections and different types of constraints referred to as market failure. The inaccessibility of markets due to high transaction costs and asymmetric information is a common characteristic of smallholder farmers in developing countries. Moreover, market imperfections consist of inaccessibility to needs, high transaction costs, absence of insurance markets for farmers, asymmetry in the market, and unavailability of extension and technical assistance (Sekhar, 2021). And reducing market imperfections in the agricultural sector is initiated as an instrument for alleviating rural poverty. The existence of market imperfections directs farmers toward

Feb 2023 | 737
economically inefficient allocation and suboptimal use of available resources (da Silva e Souza & Gomes, 2018).

Market imperfections imply any market structure that does not adhere perfect flow of information and leads to inefficient resource allocation (Sekhar, 2021). Farmers in the rural area face agricultural market imperfections both in input and product markets. Hence, farmers sell their products at lower values and buy production inputs at higher prices. Additionally, production is decreasing from time to time (Wardhana et al., 2017). Different agents and Ethiopian government have been formulating different policies and programs to solve this problem. And sustainable agriculture development policy is widely accepted by the Ethiopian government and donors as a vital component of a policy to alleviate rural poverty. However, it is facing challenges due to agricultural market imperfections. Market imperfections are the main challenges hindering farmers' access to information, technology, market and productive packages (Wardhana et al., 2017).

The economic feasibility of farmers' well-being continues to be a significant concern in Ethiopia. Currently, the Ethiopian government and international donors launched several kinds of research that reduce the problems of agricultural market imperfections. These researches were supposed to find the causes of overpopulation, land degradation, deforestation, overgrazing, soil infertility, low output level, marketing inefficiency, etc., to achieve sustainable agricultural development and reduce rural poverty. However, almost all research findings are inactive and could not help to attain intended initiatives because they did not integrate the efforts of all research findings to disseminate results. Many researchers have conducted independent research and did not integrate agricultural market and institutional failures with multidimensional rural poverty. This study associated imperfect agricultural markets with multidimensional rural poverty by using the Tobit model. The lack of accessibility to physical infrastructure is backed up by high illiteracy, making it difficult for extension workers to fulfill their roles and access favorable new technologies. Generally, market imperfections are unfavorable to the smallholder producers.

Generally, this study was intended to examine imperfections in input, factor and product markets and their implication on alleviating multidimensional rural poverty. And to identify sources of market imperfections and their implications for reducing rural poverty.

**Theories and Concepts related to Agricultural Market Imperfections**

Markets play a variety of roles. These include the spatial and temporal distribution of inputs and outputs, the transformation of raw materials into value-added products, the transmission of information, and risk management (Barret and Mutambatsere, 2008). Competitive market equilibria enable an effective allocation of resources and hence maximize aggregate well-being, claims the first welfare theorem of neoclassical economics. Contrary to what the abstract textbook models imply, agricultural markets in emerging nations operate far less effectively (Barret and Mutambatsere, 2008; Harris-White, 1999). The neo-classical approach does not consider the inefficiencies caused by incomplete or ambiguous property rights, poor contract monitoring and enforcement, high transaction costs, and unavoidable liquidity limits. In rural markets of developing nations,
imperfections—defined as deviations from ideal market conditions—frequently occur (De Janvry, et al., 1991; Holden et al., 2001).

The concepts of imperfect markets, uncertainty, and transaction costs have been incorporated into New Institutional Economics (NIE), which acknowledges the shortcomings of neoclassical economic theory. NIE envisioned market institutions as a way to reduce costs related to organizing information, transactions, and property rights in the face of uncertainty (Bardhan, 1989). Acknowledging the complexity and diversity of agricultural markets in the World is critical. Markets serve as price channels and means of inter-sectoral resource transfer through the distribution of savings and reinvestment of earnings. They are also places where labour and small producers are exploited (Harris-White, 1999).

It is sound knowledge that increasing economic, environmental, and social sustainability is agriculture’s primary objective. Financial sustainability is a significant challenge for farm households since, like any other industry, agriculture's ability to continue rests on its ability to be sustainably profitable over time. Farm profitability is critically impacted by farm survival, food security, and farmers' well-being (Tey and Brindal, 2015). Improving the efficiency of factors and the product market in rural areas is crucial for the welfare of farm households in the light of issues like rising cultivation costs and inadequate output price realization, among others. The existence of market imperfections hampers farm household decisions on production and consumption. When factor markets are faulty, farm households will implicitly experience different factor price ratios (Brandt, 1987). This indicates that, under profit maximization, the output-input ratios and the best factor combinations will vary among farm households (ibid). For instance, households with small landholdings that cannot absorb the supply of family labour should be able to hire out some of their labour or rent extra land to alleviate the limitation if factor markets in rural areas function successfully (Brandt, 1987). These same households must, however, use their land more intensively by putting in more labour and other inputs per unit of land when the labour and real estate markets are dysfunctional (ibid).

Additionally, small and poor farmers are more likely to suffer from market defects than prominent and wealthy farmers (Holden and Binswanger, 1998). Poor farmers, for instance, are more likely to be excluded from loan markets, which limits their potential to remedy their problem through consumption smoothing (coping strategies). Furthermore, flawed markets pass poverty down through generations (Singh et al., 1986). Government interventions—support pricing, procurement, input provision, and subsidies—also play a crucial role in addressing the inefficiencies brought on by flaws in the rural market. Additionally, due to the pervasiveness of market imperfections and limits for farm households, these households develop techniques to lessen the welfare costs associated with these market failures using the limited resources at their disposal (De Janvry and Sadoulet, 2006). It is crucial to understand the coping mechanisms used by farm households in such a challenging environment. The following section reviews the available studies on rural market flaws while keeping these difficulties in mind. Imperfections in the rural market can be seen in input markets and issues like land, labour, and credit. Based on previous research on market flaws, each of the variables'
imperfections, the reasons why they exist, and the challenges they represent to farm households are briefly examined.

**Labour market imperfections**

While small farms mostly rely on family labour to carry out farming activities, large farms must rely on hired labour, either on a permanent or seasonal basis. Family labour is thought to be highly motivated because it is the residual claimant and risk bearer. While family labourers put forth more effort and use their judgement, hired labour is thought to need constant supervision (Heltberg, 1998). Supervisory costs are incurred when using hired labour instead of family labour. Charges associated with recruiting outside labour include search and hiring expenses and supervising costs. Moral hazard issues with hired employees lead to flaws in the labour market. Additionally, some or all labour markets might not exist or live just during specific seasons (Heltberg, 1998).

**Land market imperfections**

Imperfect land rental and sales markets are thought to lead to sticky operational holding and rigid owned holding, which are related to imperfect land markets, because of the uncertainty brought on by vague and ineffective land reform legislation, Marshallian inefficiency, and transaction costs, land rental markets exhibit defects (Heltberg, 1998). Long-term leasing agreements on land can be risky for the landowner due to specific land reform laws (such as the "land to the tiller" rule). Because the landowners worry that if the law is followed, the tenants may receive the land. Thus, the cost of renting land is correlated with the likelihood of property loss. Such real or perceived risks from land reform can hamper the efficient operation of the land rental markets.

Additionally, on plots with joint tenancy, Marshallian inefficiency would result in lesser input consumption and poorer profit (Cheung, 1969; Holden et al., 2001). One type of land renting arrangement called a shared tenancy calls for paying rent as a certain percentage of the harvest. Since their marginal returns on work and input are significantly lower than the relevant marginal products, tenants in such a situation are less motivated to invest than an owner-cultivator would be. Therefore, it was decided that owner cultivation and fixed rent tenancy were more effective than sharecropping. (Unal, 2012).

Cheung (1969) asserts that transaction costs vary depending on the kind of tenancy, with sharecropping having a disproportionately greater transaction cost (both bargaining and enforcement costs) than fixed rent tenancies (bargaining cost) and wage contracts (enforcement costs). However, different types of residences come with varying degrees of risk. For instance, all bets are assumed by the tenants in fixed rent tenancies; the landlord assumes all risks in salary contracts, and all hazards are shared evenly in share tenancies. All types of living are effective despite having different transaction costs because of the advantages of risk sharing. Fixed-rent tenancies are preferred when enforcement costs are high, while sharecropping is preferable when the tenant is risk-averse, according to Stiglitz (1974). If credit or insurance markets improve, farmers might reduce risk by diversifying their assets. Sharecropping should therefore become obsolete. Other justifications for the presence of various tenancies have to do with market inefficiencies in rural areas and uncertainty (Bardhan, 1977). Numerous types of
residences are possible due to the imperfection of markets, the dissociability of many inputs, the diversity of managerial abilities among persons, and the prevalence of uncertainty (Unal, 2012).

The markets for selling land also have several flaws. The markets for land of sale may be small or nonexistent. For a variety of reasons, land sales markets are distorted. For instance, in some regions of the World, selling land to strangers may be prohibited. Crop failure is another significant factor. Crop failure is a covariate risk, affecting all households in a given area equally. Still, because wealthy farmers have better access to credit markets and more vital asset positions, they are generally able to cope better. The lack of insurance markets and limited access to credit markets force impoverished people to look into alternative ways to smooth their consumption, which often results in distressed land sales to the area's wealthier farmers. This further distorts the already uneven land distribution in favour of large farmers. Due to the insurance, inflation-hedge, savings, prestige, and collateral qualities of land, land prices are frequently far higher than the anticipated average profits from farming, even during times of superior crop. This suggests that even if the financing were available for land purchases, non-farm income would still be required to pay the debt back (Binswanger and Deininger, 1997). Therefore, the actual land allocation is likely to differ significantly from the ideal distribution, which would optimize output or efficiency due to all these considerations.

The land rental markets are typically more vibrant than the land sales markets. Farmers cannot effectively match the size of their owned and operated farms to their endowment of family labour and other fixed assets due to imperfections and interventions in the land leasing and sales markets (Heltberg, 1998). To maintain their way of life and cultural and social identities, socially vulnerable communities must have access to land. Therefore, efficient and equitable operation of the land market—both for rentals and sales—is crucial to enhancing the rural population’s ability to support themselves.

Credit market imperfections

Due to the inherent risks and asymmetry of information in agriculture, formal financial institutions ration the amount of credit provided to the farm sector (Heltberg, 1998). Farmers must provide financial institutions with collateral in the form of land or other fixed assets to get loans. Therefore, agricultural households experience credit or liquidity constraints. The ability of farmers to rent or buy the necessary inputs, such as land, labour, fertilizers, and other items, may be hampered by a lack of access to financing. Numerous theoretical and empirical studies have shown that the loan market in developing nations operates inefficiently due to various market flaws. Moral hazards, unfavourable selection, and asymmetric information are problems. Collateral can be used to avoid the moral hazard issue. However, lenders will view the farmers as less creditworthy because of either a lack of or difficult-to-collateralize assets (Holden and Binswanger, 1998).

Product market imperfections

It is clear that among market flaws are missing markets (the most severe kind), partially missing markets (due to rationing or seasonality), thin markets (due to unfair competition),
and interconnected markets (Holden and Binswanger, 1998). Asymmetric information, moral hazard, transaction costs, and covariate risk are the primary sources of pervasive market flaws. The same participants in an interlocking system of exchange engage in various transactions to get around the issue of there not being a complete set of marketplaces. As a result, interlinkage characterizes rural commerce. Interlocked factor markets, which occur when two markets are tied together in an intertemporal contract by combining two separate transactions into one contract, were an often seen phenomenon in Indian agricultural markets (De Janvry et al., 1991). Because of the insurer's vulnerability & ruin (Binswanger and Deininger, 1997) linked to the significant systemic & covariate risk inherent in agriculture and the considerable transaction costs related to dealing with millions of small farmers, the private insurance markets are ill-equipped to address these issues in nations like India.

When markets fail, alternative institutional structures are created to fill the void (De Janvry et al., 1991). These agreements could form a share contract, labour exchange, or extended family system. These arrangements are thought to have high-efficiency costs since there are unclear property rights and insufficient information. De Janvry et al. (1991) emphasize the importance of carefully balancing the respective merits of increased market performance and enhanced institutional performance to attain greater efficiency and welfare.

Nevertheless, research and subsequent development experiences revealed that market failures were linked to installed capacities, where the learning process plays a vital role. By acknowledging the following two points, the state may contribute significantly to increasing the economy’s capacity for learning. One is that even while markets often don't work well, they have a big part to play in policing producers to prevent resource waste. The other is that institutional adjustments necessary in a changing environment may not always occur naturally. The state can encourage and support the appropriate kinds of market institutions. The creation of suitable non-market organizations is required when market signals are ineffective. Building a mutually supportive system of market and non-market institutions is crucial for growing civilizations. In the case of commissions and omissions, the state can remedy market failures through market-excluding and market-complementing actions (Sekhar, 2005).

2. CONCEPTUAL FRAMEWORK

Multidimensional rural poverty was measured by MPI, which Alkire and indicators forwarded. Four dimensions and twelve indicators manifested the multidimensional poverty index (MPI). According to the MPI measurement, each household is given a deprivation score and based on the score, poor families are categorized as poor and non-poor. The deprivation score of each household is determined by taking a weighted sum of the scores of each indicator. The deprivation score of each person ranges between 0 and 1. If the score is 0, then that household is non-poor.

Similarly, when the score increases, the person's poverty rises and reaches its maximum of 1 when they are deprived of all indicators. A household is identified as multidimensionally poor if, and only if, it is deprived in some combination of indicators.
whose weighted sum exceeds 30 per cent of deprivations (Alkire, 2018). Then, the effects of an imperfect agricultural market on multidimensional rural poverty were captured in the study area based on the conceptual framework constructed below (Figure 1).

Figure 1: Conceptual framework of socio-economic determinants of rural poverty

3. MATERIALS AND METHODS

3.1. Description of the Study Area

Sidama Region, is found 275 km south of Addis Ababa, Ethiopia's capital city. It is one of 10 regions in Ethiopia and consists of 36 rural woredas for administrative purposes. The Region is bordered to the West by the Bilate River, which separates it from the Wolayita zone to the South by the Oromiya region, and on the north and east by the Oromiya region. Hawassa City is the capital city of the Sidama region. It was formed on 18 June 2020 from the Southern Nations, Nationalities, and Peoples' Region (SNNPR). The former administration of Sidama Zone transformed itself from a zone (lower) rank to Region (higher). It had a 98.52% public vote in favour of being a Region by referendum in 2019. The population of the Sidama region was around 5 million in 2017 who speak the Cushitic language Sidama (also known as Sidaamu Afoo). Sidama Region is defined by three agro-ecological zones: the highlands (32%), the midlands (48%) and the dry midlands/lowlands (20%).

Sidama Region is known for its intensive, diverse and well-established agroforestry systems in which a diversity of perennial and annual crops is grown together. According to CSA 2010/11 the economy of the Region is mainly agriculture-based, which is predominantly the major source of employment, export earnings and livelihoods.
3.2. Study Design

Both qualitative and quantitative methods were employed in this study. The qualitative approach helps to dig out detailed data, which enriches the study's findings. At the same time, the quantitative method creates robust results and discussions in the analytical analysis of quantitative data.

3.3. Types and Sources of Data

This study used both primary and secondary data types. Primary data sources were collected from households using data collection instruments like key informant interviews, focus group discussions and structured questionnaires. Secondary data were collected from reports of different institutions like the national bank, planning and development ministry, finance bureau, agriculture office, Ethiopian economic association, central statistics authority; articles and journals; books and magazines. The data collected from different sources were related to the nature of agricultural markets and rural poverty.

3.4. Sample Size Determination and Sampling Procedures

To determine sample size, a sample size determination formula was adopted, which is the clearest and precisely represents the target population's proportion. The formula is given as follows (Madow, 1968):

\[ n = \frac{N}{1+N(e)^2} \]

Where \( n \) represents the sample size, \( N \) represent the population size, \( e \) (5%) is the level of precision or error margin, and \( N = 661,690 \) is the total rural population size of selected sample Woredas and data of rural population size of each Woreda was taken from CSA (2013) report. Hence,
Thus, the sample size was 400. Multi-stage sampling technique was used to select the determined sample size. In the first stage, the Sidama region was chosen out of 11 regions of Ethiopia with a purposive sampling technique since Region consists of several imperfect agricultural markets; Sidama Region is divided into 36 Woredas, referred to as districts, for administrative purposes. In the second stage, the Sidama Region clustered into four zones (administration structure) and one city administration (Hawassa City administration). This study considers only those four zones and thirty Woredas, which consist of the rural population. These zones are Northern, Central, Southern, and Eastern Zones. Hence, each administrative zone has 8, 6, 8, and 8 Woredas, respectively. In the third stage, since all zones have almost an equal number of woredas, one Woreda from each zone was randomly selected, as shown in Table 1. In the fourth stage, sample households were selected from each sample Woreda by random sampling method based on the proportion of the rural population size, as shown in Table 1a.

### Table 1a: Targeted rural population and sample size distribution among sample Woredas

<table>
<thead>
<tr>
<th>No.</th>
<th>Administrative Zones of Sidama Region</th>
<th>Name of Woredas (Districts) selected</th>
<th>Total rural population (Ni)</th>
<th>Proportion (p) = Ni/N</th>
<th>Sample size n = P*400</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Northern Zone</td>
<td>Boricha</td>
<td>275,320</td>
<td>0.346</td>
<td>138</td>
</tr>
<tr>
<td>2</td>
<td>Central Zone</td>
<td>Dale</td>
<td>243,702</td>
<td>0.306</td>
<td>123</td>
</tr>
<tr>
<td>3</td>
<td>Southern Zone</td>
<td>Hula</td>
<td>141,016</td>
<td>0.177</td>
<td>71</td>
</tr>
<tr>
<td>4</td>
<td>Eastern Zone</td>
<td>Chirre</td>
<td>135,551</td>
<td>0.170</td>
<td>68</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>795,589</td>
<td>1</td>
<td>400</td>
</tr>
</tbody>
</table>

3.5. Multidimensional poverty line and indices estimation methods

It is crucial to pick a few suitable dimensions to analyze poverty using MPI. The global MPI uses three dimensions and ten indicators that mirror images of the HDI are implicitly drawn in this study using the Alkire and Foster selection criteria for OPHI (2018). Each MPI's indicator's weights will have been established in this phase to measure poverty. It can be helpful to pick the dimensions so that the weights among them are similar because weighting systems pose difficulties for interpretation (Alkire and Foster, 2018). Three dimensions are equally weighted in this study, therefore, each one is given 1/3 of the total weight. Then some indications are equally weighted inside each corresponding dimension. As a result, each indication within the dimensions of health and education is given a 1/6 weight (1/3 divided by 2 indicator each). In comparison, each indicator within the dimensions of living conditions is given a 1/18 weight (1/3 divided by 6 indicators). Here we note the indicator i weight as Wi, with \( \sum_{i=0}^{d} w_i = 1 \). According to Maha's recommendation, deprivation cut-offs in this study are based on the internationally agreed-upon Millennium Development Goals standards (2018). In this phase, the person's score is replaced with their status concerning each cutoff; for each indicator, people are classified as being deprived or not deprived. For all indicators for all other dimensions, the procedure is repeated. The deprivations in each household's component indicators are then used to determine their deprivation score. Each person's deprivation...
score is determined by adding up their unique deprivations in a weighted manner, resulting in a score that ranges from 0 to 1, or between 0 percent and 100 percent. The score rises as the person experiences more deprivations, reaching a maximum of 1 when the person is deficient across all component indicators. A person with no deprivation in any indicator gets a score of 0. Formally:

\[ C_i = W_1 I_1 + W_2 I_2 + \cdots + W_d I_d \]

Where \( I \) represents score of each indicator, if the person is deprived in indicator \( I_i \), \( I = 1 \) and \( I = 0 \) otherwise, and \( w_i \) is the weight given to each indicator \( i \) with \( \sum_{i=0}^{d} w_i = 1 \).

The poverty cut-off, which we'll refer to ask, is the proportion of (weighted) deprivations that a person must experience to be classified as poor. As a result, if a person's deprivation score is equal to or higher than the poverty cut-off, that individual is considered poor. If \( C_i \geq k \), someone is said to be impoverished. If a person's deprivation score exceeds or exceeds 1/3, the MPI classifies them as poor. In other words, for a person to be classified as MPI poor, their deprivation must be at least a third of the (weighted) evaluated indicators. This is substituted with a "0" for people whose deprivation score is below the poverty cut-off, even if it is non-zero; this is known as censoring in poverty measurement. We use the notation \( C_i \) for the censored deprivation score to distinguish it from the original \( C_i \) deprivation score. Note that when \( C_i \geq k \), then \( C_i (k) = C_i \), but if \( C_i < k \), then \( C_i (k) = 0 \). \( C_i (k) \) is the deprivation score of the poor.

**Multidimensional Headcount ratio (H):** is a measure of the proportion of the poor to all persons. It is a helpful indicator, but it is unaffected by the degree of deprivation experienced by the poor. It cannot be disaggregated to examine how poverty varies between groups. Mathematically, to the parameter \( k \)

\[ H = \frac{q(k)}{n} \]

Where \( q (k) \) is the number of multi-dimensionally poor households and \( n \) is the total number of people.

**The intensity of multidimensional poverty (A):** It is defined as the typical percentage or level of weighted indicators that multidimensionally poor households experience as a deprivation, mathematically, written as

\[ A = \sum_{i=1}^{q} \frac{c_i(k)}{q(k)} \]

Where \( q \) is the proportion of people who are multidimensionally poor and \( C_i (k) \) is the censored deprivation score of individual \( i \). \( A \) is the average number of hardships experienced by the impoverished. It was computed by multiplying the total number of poor people by the sum of the fraction of overall deprivations experienced by each individual.

The breadth of deprivations faced by multidimensionally poor households can be calculated by multiplying headcount poverty by the "average" number of deprivations that all poor persons suffer. The MPI incorporates two crucial pieces of information, as was described in the overview: (1) the percentage or frequency of individuals (within a given population) who suffer from many deprivations, and (2) the severity of their deprivation or the average percentage of (weighted) deprivations they endure. The MPI combines \( H \), and \( A \). \( M_0 = H \times A \) is the multidimensional index.
Education, health, and the standard of living, were the four dimensions employed in this study to quantify multidimensional rural poverty. Ten indicators were chosen based on data availability and the global multidimensional poverty Index (OPHI's Alkire and Foster, 2018). The indicators and associated cutoffs used to identify households in need are shown in the following table.

Table 1b: The dimensions, indicators, deprivation cutoffs, and weights of the MPI

<table>
<thead>
<tr>
<th>Dimension (weight)</th>
<th>Indicator</th>
<th>Deprived if</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education (1/3)</td>
<td>Years of Schooling</td>
<td>No household member has completed five years of schooling</td>
<td>1/6</td>
</tr>
<tr>
<td></td>
<td>Child enrolment</td>
<td>Any school-aged child is not attending school in years 1 to 8</td>
<td>1/6</td>
</tr>
<tr>
<td>Health (1/3)</td>
<td>Child Mortality</td>
<td>Any child has died in the family in the five years preceding the survey.</td>
<td>1/6</td>
</tr>
<tr>
<td></td>
<td>Nutrition</td>
<td>Any adult under 70 years of age or any child is undernourished in terms of weight for age</td>
<td>1/6</td>
</tr>
<tr>
<td>Living Standard (1/3)</td>
<td>Sanitation</td>
<td>the household has no flush toilet, or ventilated improved pit or composting toilet and they are shared or (It is open defecation)</td>
<td>1/18</td>
</tr>
<tr>
<td></td>
<td>Electricity</td>
<td>Household has no electricity</td>
<td>1/18</td>
</tr>
<tr>
<td></td>
<td>Drinking Water</td>
<td>The water source is not piped water, public tap, borehole or pump, protected well, protected spring, and it is not within a distance of 30 minutes walk (round trip)</td>
<td>1/18</td>
</tr>
<tr>
<td></td>
<td>Housing</td>
<td>The household has a dirt, sand and dung type of floor, wall or roof</td>
<td>1/18</td>
</tr>
<tr>
<td></td>
<td>Cooking Fuel/Energy</td>
<td>The household cooks with dung, wood fire, or charcoal</td>
<td>1/18</td>
</tr>
<tr>
<td></td>
<td>Asset Ownership</td>
<td>The household does not own more than one of these assets: radio, TV, telephone, bicycle, motorbike, or refrigerator, and does not own a car or truck.</td>
<td>1/18</td>
</tr>
</tbody>
</table>

Where 1 = Deprived and 0 = Not deprived

According to the Ministry of Education [MOE] (2009), the compulsory school age for children in Ethiopia is 6-14 years.

Piped water near the plot or yard, protected springs, bottled water, hand pumps, public standpipes, protected wells, and piped water into the home are improved water sources, according to WHO and UNICEF (2006) and WHO (2014). Unprotected wells, carts with tiny tanks, unprotected springs, tankers, and surface water are examples of unimproved water sources. The flush-to-piped sewer system, flush-to-pit, bucket, pit latrine, and composting toilet options are included in the WHO and UNICEF (2006) and WHO (2014) guidelines for improved sanitation facilities. Open defecation or using a field or bush are examples of inadequate sanitation services. Clearly, all the living standard indicators are means rather than ends; they are not direct measures of functionings. Yet, they have two strengths. In the first place, they are very closely connected to the end (or the functionings) they are supposed to facilitate. Second, most of the indicators are related to the MDGs, which provide stronger grounds for their inclusion in our index.
Following the MDGs, improved water sources do not include vendor-provided water, bottled water, tanker trucks or unprotected wells and springs. Note that the “asset index” of the MPI is exactly the same for all countries. It is not based on principal components analysis (PCA) as other asset indices are (such as the DHS Wealth Index) because if such a procedure were used, (a) it would require a relative cutoff rather than an absolute cut-off for the asset index, which would be inconsistent with the rest of the measure; (b) it would not be comparable across countries or across time, because the PCA would weight each component differently in each survey. Prices could not be used to construct the asset index as the surveys lack information on the price, quality or age of assets.

3.6. Specification of Econometric model

The Tobit regression model is the best fit model when the dependent variable is a continuous variable with a constrained limit. To use poverty as a continuous variable, households’ scores of the multidimensional poverty index (MPI) were used. Therefore, the Tobit regression model was more appropriate than the binary Logit and Probit Models for this study. The fundamental weakness of binary Logit and Probit models is that they categorize poor households as a single uniform group. However, they are not relatively equally poor and rich households as another single uniform group. Still, they are not relatively equally rich, leading to the loss of helpful information when transforming consumption expenditure by households dichotomous variable (Abdul-Salam & Phimister, 2019). Hence, the Tobit regression model was used to determine the relationship between poverty and the imperfection of agricultural markets. This analytical model was defined and used previously by different studies such as (Andrew, W., Campbell, Y., 1996), as follow:

\[ Y_{i*_{MPI}} = \delta_0 + \sum_{j=1}^{7} \delta_j Z_{ij} + \mu_i \]

Where \( Y_{i*} \) is latent variable representing the multidimensional poverty index of the \( j^{th} \) respondent, \( \delta_0, \delta_1, \ldots, \delta_{12} \) are parameters to be estimated, and \( Z_i \) is a component of an imperfect agricultural market that affects poverty. And \( \mu_i \) is an error term that is independently and normally distributed with mean zero and variance \( \delta^2(\mu_i \sim \mathcal{N}(0, \delta^2)) \). And, individual-specific MPI scores for the individuals range between zero and one.

Therefore, Tobit model can be presented as follow

\[ Y_i = \begin{cases} Y_{i*}, & if \quad 0.333 \leq Y_{i*} \leq 1 \\ 0, & otherwise \end{cases} \]

Two-limit tobit model allows for censoring in tails of the distribution (Geta et al., 2013). The log likelihood that is based on the doubly censored data and built up from sets of the two-limit Tobit model is given by

\[
\ln L = \sum_{y_i=t_{0i}} \ln \Phi \left[ \frac{l_{0i} - X'_{i}\beta}{\sigma} \right] + \sum_{y_i=y_{i*}} \ln \frac{1}{\sigma} \left[ \frac{y_i - X'_{i}\beta}{\sigma} \right] + \sum_{y_i=t_{1i}} \ln \left[ 1 - \Phi \left( \frac{l_{1i} - X'_{i}\beta}{\sigma} \right) \right]
\]
Where \( L_0 = 0 \) (lower limit) and \( L_1 = 1 \) (upper limit) where \( \Phi \) and \( \phi \) are normal and standard density functions.

In a Tobit model, each marginal effect includes the influence of explanatory variables on the probability of the dependent variable falling in the uncensored part of the distribution and on the expected value of the dependent variable conditional on it being more prominent than the lower bound. By following (Geta et al., 2013), the likelihood function decomposition of marginal effects of the Tobit model was proposed as follows:

(1) The unconditional expected value of the dependent variable

\[
\frac{\partial E(y)}{\partial x_j} = [\Phi(Z_u) - \Phi(Z_L)] \frac{\partial E(y^*)}{\partial x_j} + \frac{\partial [\Phi(Z_u) - \Phi(Z_L)]}{\partial x_j} + \frac{\partial [1 - \Phi(Z_u)]}{\partial x_j}
\]

(2) The expected value of the dependent variable conditional upon being between the limits

\[
\frac{\partial E(y^*)}{\partial x_j} = \beta_m \left[ 1 + \frac{Z_L \phi(Z_L) - Z_u \phi(Z_u)}{\Phi(Z_u) - \Phi(Z_L)} \right] - \frac{[\Phi(Z_L) - \Phi(Z_u)]^2}{[\Phi(Z_u) - \Phi(Z_L)]^2}
\]

(3) The probability of being between the limits

\[
\frac{\partial [\Phi(Z_u) - \Phi(Z_L)]}{\partial x_j} = \frac{\beta_m}{\sigma} [\Phi(Z_L) - \Phi(Z_u)]
\]

Were, \( \Phi(\cdot) \) = the cumulative normal distribution, \( \phi(\cdot) \) = the normal density function

\[ Z_L = -\frac{\beta \beta}{\sigma} \] and \[ Z_u = \frac{(1-x)\beta}{1} \] are standardized variables that came from the likelihood function given the limits of \( y^* \) and \( \sigma = \text{standard deviation of the model.} \)

4. RESULTS AND DISCUSSIONS

4.1. Descriptive Results

4.1.1. Coverage of major cash crops

Regarding the expansion of cash crop products, the area of land covered by major cash crops has been decreasing from time to time. Table 2, about 75 per cent of farmers said that the area of land covered by main cash crops has been declining, and 16 per cent of respondents said that the area of land surrounded by major cash crops has been increasing. Moreover, about 9 per cent of farmers responded that there is no change in their cash harvesting farm. As rural life is directly or indirectly related to significant cash crops, this situation creates a severe future community problem. According to the field visits made to the substantial cash crops farms and the consensus with the various focus group discussions, the highland cash crop farms were not degrading much despite being harvested mainly for their use and sale in local markets. However, the low and midland cash crop farms were degrading and eventually disappearing quickly. According to Table 2, the principal responsible factors for infertility of Land area covered by cash crops were the increase in population (30 per cent), side effects of inorganic fertilizers usage (23 per cent) and environmental change (19 per cent).
Table 2: Status of farm covered by major cash crops

<table>
<thead>
<tr>
<th>Is the farm area covered by major cash crops increasing or decreasing?</th>
<th>No of respondents</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing</td>
<td>64</td>
<td>16</td>
</tr>
<tr>
<td>Decreasing</td>
<td>300</td>
<td>75</td>
</tr>
<tr>
<td>No change/neither</td>
<td>36</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100</td>
</tr>
</tbody>
</table>

Causes for a decrease in land coverage of significant cash crops

<table>
<thead>
<tr>
<th>Causes for a decrease in land coverage of significant cash crops</th>
<th>Number of respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase of population</td>
<td>120</td>
<td>30</td>
</tr>
<tr>
<td>Overgrazing</td>
<td>60</td>
<td>15</td>
</tr>
<tr>
<td>Environmental change</td>
<td>76</td>
<td>19</td>
</tr>
<tr>
<td>Other agricultural products Expansion</td>
<td>52</td>
<td>13</td>
</tr>
<tr>
<td>Side effects of inorganic fertilizers</td>
<td>92</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Own Survey, 2022

4.1.2. Sources and Types of market information for farmers

The farmers who use appropriate market information enable to know more about the crops they should produce. This information rises from different sources. The following table indicates the farmers that use market information from various sources. As we can see from figure 3, the respondents (farmers) who get information from agricultural experts constitute 30% (120) from out of 100% (400) respondents.

Although information provided by local farmers is sometimes inaccurate and unreliable, most of them around 15 per cent (60) of respondents are forced to use information from local farmers. And those get market information from both agricultural experts and local farmers are 19% (76). Around 23% (92) of individuals do not have information about where to sell, how to produce, how to use in a modernized way rather than what they have traditionally done by themselves, of those respondents who get agricultural market information from users, 13 per cent (52).

![Figure 3: Source of market information about major cash crops product](image-url)
As we see figure 3, the farmers get information from different sources. These various sources of information provide further information on multiple issues that are related directly or indirectly to the marketing and production of significant cash crops product, as the following table shows:

### Table 3: The information provided to the farmers

<table>
<thead>
<tr>
<th>The information provided by the source are</th>
<th>Number of respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major cash crops product demand in the market</td>
<td>62</td>
<td>20</td>
</tr>
<tr>
<td>How to supply their product to the market</td>
<td>74</td>
<td>24</td>
</tr>
<tr>
<td>Where to sell their product</td>
<td>34</td>
<td>11</td>
</tr>
<tr>
<td>The demand in the market and how to supply their product to the market</td>
<td>46</td>
<td>15</td>
</tr>
<tr>
<td>How to supply their product to the market and where to sell their product</td>
<td>37</td>
<td>12</td>
</tr>
<tr>
<td>The level of demand and where to sell</td>
<td>34</td>
<td>11</td>
</tr>
<tr>
<td>Demand, supply, and where they sell it</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>308</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: survey questionnaire, 2022

Table 3 shows that the types of information provided to the farmers were demand level for products, how to supply their product to the market and where to sell their product. The result of this study shows that 11 percent (34) of farmers information about where to sell their product, 20 percent (62) respondents get information on demand for the product, 24 percent (74) get information how to supply their products, 15 percent (46) households get information on the demand for their product and how to supply major cash crops to tree, 12 percent (37) of respondents get information how to supply their product and where to sell their product. And only 7 per cent (21) of farmers have full access to information on how to provide, where to sell and the level of demand for their products. Information is helping the farmers to get higher or better prices for their products to increase the quality and quantity of the significant cash crops product. The data shows that some farmers get information on different things, but the complete information is not efficiently available. This shows a lack of adequate market information on the products they produce in this Region.

### 4.1.3. Type of marketing and price determination methods

Farmers deal with buyers to sell their products in the local area or may provide products to the market by loading on their shoulders or by a trip to the local market on horses etc. Table 4 shows how farmers are marketing major cash crops products.
Table 4: Different types of marketing methods

<table>
<thead>
<tr>
<th>Marketing the product by</th>
<th>Number of respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retailing</td>
<td>60</td>
<td>15</td>
</tr>
<tr>
<td>Selling to marketing middleman by a trip to the local market by loading on their shoulder</td>
<td>172</td>
<td>43</td>
</tr>
<tr>
<td>Marketing middleman buying by coming to the village</td>
<td>140</td>
<td>35</td>
</tr>
<tr>
<td>Selling to marketing middleman by a trip to market and marketing middleman buying by coming to the village</td>
<td>28</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: survey questionnaire, 2022

The above Table 4, indicates that 43% (172) of farmers selling their products to marketing middleman by trip to market by loading on their shoulder, 35% (140) of farmers are selling their products by selling to marketing middlemen by coming to village, 15% (60) of respondents are selling their products through retailers, and the rest of 7% (28) of respondents are selling their products by Selling to marketing middleman by a trip to market and marketing middleman buying by coming to the village. Pricing decision plays a significant role in marketing decision. Most of the time price of the product is determined jointly by producers and consumers at the farm and the retail level in the marketing system. The figure 4 shows the information on by whom the major cash crops price is determined in the study area. According to figure 4, 37.5 percent of farmers responded that consumers or users determine price of their major cash crops. At the same time, 18.5 percent of farmers responded that farmers determine the price of their products. About 16.75 percent of respondents said that agricultural product price is determined by negotiation with the consumer or marketing middleman, 4.75 percent of respondents assess their major cash crops price by using market demand and supply. The rest of 12.5 percent of respondents assess their product price by negotiation, and demand and supply of market.

Figure 4: Price determination of major cash crops by percentage
4.2. Analytical Results and Discussions

4.2.1. Linkage between agricultural imperfect market components and rural poverty

Table 5 shows the two-limit Tobit regression estimates associating market imperfections with rural poverty and some control variables. According to Table 5, the model showed that six out of seven variables were statistically significant in influencing multidimensional rural poverty (MPI). These include asymmetric information, inaccessibility of infrastructure, climate change, and membership in cooperatives, trade experience, and farm size.

Asymmetric information was positively related to the multidimensional poverty index (MPI) in a rural area at a 1 per cent level. The predicted value of the multidimensional poverty index (MPI) is 0.056 indexes higher for farmers with asymmetric information than for farmers with symmetric information, with other variables remaining constant. The result of the study goes in line with the findings of Thapa and Sing at the Institute of Economic Growth University of Delhi (Thapa & Singh, 2021). According to the findings of Thapa and Sing (2021), input, factor and output markets in agriculture should be free from any significant market imperfection. Also, since marginal and small farmers supplement their income through wage labour and dairying, defects in these markets assume vital importance. Complicated transaction costs and asymmetric information continue to challenge rural households, particularly those with poor access to markets and infrastructures for significant cash crop products. This cuts their ability to strive with well-built large-scale producers living in better areas with improved market infrastructure to connect available and emerging market opportunities.

According to Silva, souza and Gomes's findings, most farmers are not participating in marketing due to imperfect information. Weak market linkages and difficulties of high transaction cost regularly push households to sell their insignificant marketed surplus at the farm gate with lower prices. There is a need to reduce transaction costs through better management of marketing activities of smallholder farmers and increased exchange of information (da Silva e Souza & Gomes, 2018).

Besides, the predicted value of the multidimensional poverty index (MPI) is 0.031, which indexes higher for farmers with no infrastructure access than those with access to infrastructure, with other variables remaining constant. According to the findings of the focus group discussion, there are some reductions in trade barriers which hinder the marketing of significant cash crops set by the government. On the other side, the predicted value of rural poverty is 0.044 index higher for farmers with bad climate change than for farmers who have not faced climate change, with other variables remaining constant. Additionally, membership in cooperatives was negatively related and significantly affected MPI in the study area at a 5 per cent level. The reason was that membership in cooperatives created access to inputs and extension services in the study area. Hence, the predicted value of rural poverty (MPI) is 0.016, indexes lesser for farmers who are a member of cooperatives than for farmers who have not membership in cooperatives, with other variables remaining constant. In other words, farmers who were members of farmers’ cooperatives improved their livelihood by 0.016 index compared to
those who failed to join farmer groups assuming that other variables remain constant. On average, a one-year increase in trade experience is associated with 0.005 index decrease in predicted value of multidimensional rural poverty while other variables remain constant. While holding other variables constant, on average, for one Timad increase in farm size, there is a 0.024 MPI decrease in the predicted value of rural poverty. The result of this finding is in line with the findings obtained by (Takeshima, 2015).

Table 5: Tobit regression estimates associating market imperfections with rural poverty

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient ($\delta E(y)$)</th>
<th>Robust standard error</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymmetric information</td>
<td>0.056237***</td>
<td>0.0085519</td>
<td>6.58</td>
</tr>
<tr>
<td>Infrastructure inaccessibility</td>
<td>0.031993***</td>
<td>0.0031513</td>
<td>10.15</td>
</tr>
<tr>
<td>Experience in trade</td>
<td>-0.005472***</td>
<td>0.0004613</td>
<td>-11.86</td>
</tr>
<tr>
<td>Climate change</td>
<td>0.044509***</td>
<td>0.0098865</td>
<td>4.50</td>
</tr>
<tr>
<td>Membership to cooperatives</td>
<td>-0.016743**</td>
<td>0.0077294</td>
<td>-2.17</td>
</tr>
<tr>
<td>Farm size</td>
<td>-0.024734***</td>
<td>0.0023545</td>
<td>-10.51</td>
</tr>
<tr>
<td>Education status</td>
<td>-0.004623</td>
<td>0.0086674</td>
<td>-0.53</td>
</tr>
<tr>
<td>Constant</td>
<td>0.580494***</td>
<td>0.0348877</td>
<td>16.64</td>
</tr>
<tr>
<td>(\sigma</td>
<td>)</td>
<td>0.0448857</td>
<td>0.0016754</td>
</tr>
</tbody>
</table>

Log likelihood = 595.12261

Source: Model output; 1 Timads=1/4 Hectare

*** represent the significance level at 1 %, and ** means the significance level at 5%

5. CONCLUSION

Although the information provided by local farmers is sometimes inaccurate and unreliable, about 15 per cent of respondents are forced to use the information from local farmers. And those who get market information from both agricultural experts and local farmers are 19 per cent. Around 23 per cent of individuals do not have information about where to sell, how to produce, and how to use in a modernized way rather than what they have traditionally by themselves. Asymmetric information was positively related to the multidimensional poverty index (MPI) in a rural area at a 1 per cent level. According to the findings of this study, about 43 per cent of farmers sell their products to marketing mediators by a trip to the market by loading on their shoulders. The predicted value of the multidimensional poverty index (MPI) is 0.056, higher for farmers with asymmetric information than for those with symmetric information. Besides, the expected value of MPI is 0.031 indexes higher for farmers with no infrastructure access than for those with access to infrastructure.

Recommendation

Agricultural asymmetric information remains a challenge for farmers. There is a need for institutional innovations and interference to enhance access to the market by recovering the organization of marketing channels for farmers and improving communications among farmers to reduce multidimensional poverty.
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References


