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POVERTY REDUCTION MECHANISMS OF AGRICULTURAL GROWTH REVIEW

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Abstract: Agricultural growth is considered to be more pro-poor than other sectoral growth, as evidenced by numerous empirical studies. However, the process by which it contributes to poverty reduction has been discussed only to a limited extent. By systematically reviewing extant literature, the study synthesizes what are poverty reduction mechanisms of agricultural growth and how the poor are affected under each mechanism. The study finds that agricultural growth can help the poor escape poverty directly by creating more employment opportunities, reducing food prices, increasing wages and indirectly by stimulating other sectoral growth. The findings also suggest that under the same mechanism, the growth may benefit one group of the poor while having no impacts or increase poverty in another group. Benefits of the agricultural growth distributed through different mechanisms are driven by growth techniques and moderated by structural factors. As a result, comprehensive and customized agriculture-based poverty interventions are required if the growth aims to benefit all poor groups in the long run.

Keywords: powerty reduction, agricultural growth, powerty reduction mechanism

1. Introduction

Despite a dramatic decline in the world poverty during Green Revolution and 1980s (Chen & Ravallion 2004), progress toward poverty reduction has been uneven over time and remains a challenge for the world, especially with the aftermath of COVID-19 pandemic (World Bank 2022). As of 2014, nearly 80 percent of the world's poor people live in rural areas (World Bank 2014), relying directly or indirectly on agriculture for their living (Klasen & Reimers 2017). This heavy dependence on agriculture, together with the need to ensure food security for about 9 billion people by 2050 and increasing global food price, has shifted the world attention back to the agriculture as an important means of poverty reduction.

A number of empirical studies have indicated that agricultural growth is more pro-poor than other sectoral growth. For example, Diao et al. (2010) found that for each 1% increase in per capita GDP, agriculture reduces Ethiopia's annual poverty headcount rate by 1.7%, compared to only 0.7% by other sectors. Christiaensen et al. (2011) estimated that given the same growth rate, agriculture-driven growth reduces poverty by at least 5 times greater than growth led by other sectors, despite its considerably smaller size. However, the poverty reducing effects of agricultural growth still remains inconclusive. Some research have failed to report or have reported inconsistent magnitudes of the effect. Loayza & Raddatz (2010) did not find any statistically significant correlation between agricultural output growth and poverty reduction for developing countries. Although Benfica & Henderson (2021)

found a statistically significant correlation between agricultural productivity growth and poverty reduction in both urban and rural area in the sample of low and middle income countries, contributions of the growth to overall poverty reduction are relatively small. Ligon & Sadoulet (2018), and Dorosh & Thurlow (2018) found that agricultural growth leads to greater decline in poverty for the poor in the lowest decile than in the highest decile; and its poverty reducing effect diminishes when national income increases. Bekun & Akadiri (2019) also reported only short-run relationship between agricultural development and poverty reduction.

In addition to variation in empirical measure or econometric models, literature attributes inconsistent findings to differences in initial conditions among research contexts such as characteristics of the poor, ecological and socio-economic factors (Mellor & Malik 2017, Diao et al. 2010). Despite numerous studies to understand the relationship between growth and poverty, mechanisms through which agricultural growth benefits different groups of the poor has not yet been fully explained (Dorosh & Mellor 2013, Benfica & Henderson 2021). Understanding these mechanisms is instrumental for promoting inclusive and sustainable agricultural growth (Benfica & Henderson 2021). Therefore, by systematically reviewing literature, the study aims to synthesize the poverty reduction mechanisms of agricultural growth and how different poor groups are affected under each mechanism. The paper starts with characteristics of the poor, and mechanisms of agricultural growth into poverty reduction and factors affecting the distribution of benefits of the growth under each mechanism. The study then concludes with implications for agriculture-led poverty reduction interventions and future research.

2. Methodology

2.1. Search strategy

The study used the EBSCO Discovery Service (EDS) to search articles on the relationship between agricultural growth and poverty reduction. The article search process followed systematic literature review steps suggested by Tranfield et al. (2003). Key words, including agricultural productivity/growth/development and poverty reduction/alleviation, were used to search in titles and abstracts. To increase the matching rate during searching, quotation marks were used for each term such as “agricultural productivity” and “poverty reduction” when searching in abstracts. After reviewing some selected articles, the study adopted new terms: agricultural employment growth and poverty reduction; food prices, agricultural growth and poverty reduction; agricultural productivity and wage increase, while referring to citations in other articles to seek out additional information. The list of articles after using keywords were then filtered further to those written in English, peer reviewed and with full text covering the period 1990 to 2023.

2.2. Article selection

The filtered articles were then screened further to ensure their relevance to the study's objective by the following criteria:

(1) Titles contain at least one keyword agricultural growth or poverty reduction.

(2) Abstracts contain at least one keyword related to poverty reducing effect as dependent variable and agricultural growth or proximal (proxy) measure as independent variable.

(3) Full text can be downloaded.

(4) Studies mention empirical evidence of poverty reducing effect of agricultural growth, not aggregate economic growth.

The process of searching and selecting articles is shown in *Table 1*.

Table 1.: Article search and selection process

Step	No of articles
Terms used: agricultural productivity/growth/development and poverty reduction/alleviation; agricultural employment growth and poverty reduction; food prices, agricultural growth and poverty reduction; agricultural productivity and wage increase	462
Articles after eliminating duplicated	347
Articles selected from title screening	86
Articles selected from abstract	47
Articles referred from citation	6
Articles selected for final analysis	53

In addition to searching for articles related to the primary topic of the study, the author also sought articles about general concepts such as pro-poor growth, the importance of agriculture in economic development, poverty, and productivity to gain more background information; and browsed the World Bank website for general statistics.

3. Characteristics of the poor

Poverty is a complex phenomenon that happens for a variety of reasons. Literature divides poverty causes into three groups: individual factors such as lack of capabilities and skills (Li et al. 2021), lack of effort to improve life or poor money management; structural factors such as socio, economic, political and cultural conditions; and fatalistic or unforeseen circumstances such as illness, bad luck, bad fate or even natural disaster (Davids & Gouws 2013). Davids & Gouws highlighted

that if the poor perceive their poverty as a result of fatalistic, it is not easy to help them get out of the poverty.

Poverty can be measured in different approaches either absolute or relative. Absolute approach involves comparing people's income and/or non-income conditions to predetermined poverty standards, while relative approach compares their conditions with those of the non-poor (Warr 2005). The most commonly used poverty threshold is World Bank's multiple poverty measure (MPM) and UNDP's multiple poverty index (MPI). MPM consists of three dimensions with six indicators: income or consumption (threshold of $2.15 per person per day), education (educational attainment and educational enrollment), and access to basic infrastructure (drinking water, sanitation and electricity). In contrast, MPI uses three dimensions with ten factors: health (nutrition and child mortality), education (years of schooling and school attendance), standard of living (cooking fuel, sanitation, drinking water, electricity, housing and assets). If the deprivation score for households is 1/3 or higher for both MPM and MPI, the households or their members are considered poor.

The usage of multidimensional poverty measurement leads to another on-going discussion among researchers and administrators about how to measure poverty appropriately. Although non-income indicators in poverty measurement like MPM and MPI are helpful in providing a better description of poverty reality (Mellor et al. 2001), they are considered less effective in providing quantitative basis for tracking poverty reduction progress (Dewbre et al. 2011). Income indicators can avoid this administrative shortcoming, yet their usefulness for comparison purposes is questionable. They can drive and complement most of the other non-income dimensions of poverty (Mellor et al. 2001), but they fail to reflect variations in the local circumstances of the poor such as calorie requirement due to demographical and geographical conditions, or consumption pattern due to the availability of commodity or local price structure (Allen 2017). Without a suitable measurement, the effectiveness of poverty reduction interventions is questionable.

The different causes and measurement approaches to poverty suggest that it is not only multidimensional but also heterogeneous. However, compared to multidimension aspect, heterogeneity is less discussed or analyzed. The poor are more likely to be described collectively as people living in rural areas, unskilled labor (Klasen & Reimers 2017), and lack of resources to enjoy the standard living conditions that are customary to the society (Watete et al. 2016, p124). Minten & Barrett (2008), and Dorosh & Mellor (2013) are among few scholars that attempted to classify the poor before further analyzing the association between agriculture-led interventions and poverty reduction. The authors divide the poor - people whose income falls below national income poverty line - further into three different groups on the basis of agricultural production engagement, food availability pattern and cultivable land possession. The first group is poor farmers - or small commercial farmers in some studies - who have sufficient land and livestock to engage fully in

on-farm self-employment for their income and enjoy a net marketable food surplus (Minten & Barrett 2008). Their income is driven mostly by their farming practices (Dorosh & Mellor 2013) and market price for their farm products (Minten & Barrett 2008). The second group is poor farmers who are net food buyers (Minten & Barrett 2008). They do not participate or participate minimally in agricultural production (Dorosh & Mellor 2013) partly because they have no land or inadequate land to produce enough food to cover their subsistence consumption (Minten & Barrett 2008). A part or a whole of their income derives from their labor for other larger farms or in low skilled non-farm activities such as clerks in stores, bus conductors or expansion and improvement of houses (Dorosh & Mellor 2013). The third group is non-rural poor people who do not participate in agricultural occupations, earn their income in part or in whole from their wages in unskilled labor market (Minten & Barrett 2008).

The heterogeneity among the poor suggests that they may not benefit equally from agricultural growth and an effective agricultural growth strategy may involve balancing between income increment and food availability priority (Diao & Pratt 2007).

4. Poverty reduction mechanism

Agricultural growth can be achieved by either increasing efficiency of given input level or adding more inputs in the production (Ivanic & Martin 2018). It can be measured in either physical quantity or net production costs (FAO 2017). Literature review shows that agricultural growth contributes to poverty reduction through four mechanisms: employment, wages, food prices (Ligon & Sadoulet 2018) and indirect effect on the rest of the rural economy (Devkota & Upadhyay 2013). The benefits of the growth for each poor group through different mechanisms are different and influenced by the way agricultural growth is achieved and structural circumstances.

4.1. Employment

Lack of decent employment opportunities is a major challenge for reducing poverty (OCED, 2008). Therefore, employment creation is one of critical channels through which agricultural growth can help people escape income poverty (Mellor et al., 2001; Loayza and Raddatz, 2010). Abro et al. (2014) found that a 2% increase in aggregate crop outputs in 15 villages in Ethiopia led to a 10% increase in the number of required labor. However, the relationship between the output growth and job creation is not always straightforward and affected by the nature of crops. For example, although Mellor et al. (2001) found the positive relationship between agricultural output and employment level, their elasticity is only 0.6 at highest, which is much smaller than findings of Abro et al. Bustos et al. (2016) using Brazil data indicated that for each 1% increase in cultivated area, labor requirement for maize production increased by 0.74%, while that for soy production decreased by 0.48%.

The opposite relationship between two crops is explained by their natural differences: maize is more labor intensive than soy.

The characteristics of the second poor group suggests that they benefit from labor-intensive agricultural growth the most, compared to other groups. However, the relationship between employment growth in agriculture and poverty alleviation remains debatable. Gutierrez et al. (2007) using data of 39 developing countries between 1980 and 2004 found significant positive correlation between the employment-intensive growth in agriculture and number of poor people in the short-run. The authors attributed this paradoxical correlation to mobility of urban people falling into poverty due to urban crises to rural area to look for jobs in agriculture. If the authors had separated the poverty reducing effects by area: rural and urban, the correlation would have been negative for rural areas, which is similar to the findings by Thurlow & Wobst (2006) during industrial crisis 1990s in Zambian.

While agricultural growth can create more jobs and then lead to poverty reduction, this positive impact can be diminished by population growth rates. Mellor et al. (2001) suggested that for poverty reduction to occur, agricultural growth rates must surpass population growth rates. The author estimated that with population growth rate of 2.6%, Pakistan would need an agricultural growth rate of 4.6% if they want to achieve 2% per capita rate of growth of agricultural growth. Diao & Pratt (2007) estimated that given annual population growth rate of 2.5% in Ethopia during 2003-2015, if the annual growth rates of total crops and cereal remained at about 0.2% and 0.6% per year, respectively, the national poverty rate would increase to 45.7% in 2015 from the highest level of 44.4% in 2003. Local inflation is another factor that can reduce the positive poverty reducing effect of agricultural growth. Increases in food prices can erode the purchasing power of additional income earned from employment, making it difficult for the poor to achieve a decent life (Abro et al. 2014). Warr & Suphannachart (2021) found that higher food prices reduced the positive impact of agricultural income growth on poverty reduction.

4.2. Wages

Another important poverty reducing mechanism of agricultural growth is wage increment. Ivanic & Martin (2018) found that when keeping unemployment rate constant, agricultural productivity growth is positively associated with increase in wages across countries, contributing to reducing poverty. The author estimated that for each 1% increase in productivity, wages increase by 0.25% for small open economy and by 0.29% for all other cases. Minten & Barrett (2008) found that a doubling of rice yields increases real agricultural wages by 65% to 89% and area with higher yields has significantly higher real wages. Increased wages often result from higher agricultural profits that is gained from higher outputs, better productivity or more technical efficiency. For example, Nguezet et al. (2020) found that the adoption of crop intensification technologies, including crop diversification, crop

and postharvest management, and pest management, increased bean yeild by 22% or additional $49.7 to income of small commercial farmers.

Compared to other poor groups, the second poor group seems to benefit the most from increased wages. However, actual benefits of agricultural growth on their poverty are still inconclusive. First, employers do not adjust labor wages simultaneously when their agricultural profits increase (Datt & Ravallion 1998). Second, the actual impacts of agricultural productivity growth on the poor are positive only when their loss due to declined labor demand is less than their gains from increased labor wages. However, research on the long-term and short-term wage response to agricultural growth and net effect of agricultural productivity growth on poverty reduction remain limited. The review was able to find only one study by Emran & Shilpi (2018), which used productivity shock (rainfall) and examined its net effect on poverty reduction. The authors found that when agricultural productivity increases by 1%, agricultural employment reduces by 0.12% while agricultural wages increase by 0.46%.

Moreover, in open economy, the poor group may not enjoy higher wages for too long as higher wages in farming sector may attract more people to join this labor market sector, eventually lowering wages. However, Emran & Shilpi (2018) noted that more labors entering agricultural sector may not be always the case because of the hetegenority in farming production among farmers. Some farmers utilize their free labor as a result of higher productivity to look for wage employment, while others allocate their labor to their own farming. If the number of the latter group is larger than the former group, total labor supply will not increase and wages may not be affected too much. The authors found that for each 1% increase in productivity, the number of people engaged in their own farming increased by nearly 1.4% while the number of hired daily labor in agriculture decreased by about 1.5%.

4.3. Food prices

According to Engel's law, the poor spend majority of their family budget on food and other necessaries. Mellor & Ranade (2006) estimated that food expenditure take up to 80% of the poor's income. Haq et al. (2008) indicated that a food price shock increased number of poor people in rural and urban areas increased by 32.5% and 44.6% respectively. Therefore, the decline in food prices is considered another crucial source of poverty reduction, especially for the second and third poor group. Lower food prices can come from higher output level as per demand and supply model, or from lower production costs. Ivanic & Martin (2011) using data from 29 countries with a global general equilibrium model estimated that for each 10% increase in agricultural productivity, the world food price decreased by more than 10%. At national level, Minten & Barrett (2008) found that keeping other external factors constant, when rice yields are doubled as result of improvement in agricultural technologies such as modern seed varieties, fertilizers, rice price declines by 31-44% in the harvest periods and by 18–26% in the lean season in Madagascar.

Similarly, using panel data analysis, Ivanic & Martin (2018) found that the biggest contribution to poverty reduction of agricultural productivity growth is through the decline in the cost of food consumption. The authors estimated that for each 1% increase in agricultural productivity, the cost of food consumption in all panels: individual countries, all developing countries reduces by 0.69%, 0.78% and 0.93% points respectively.

However, the relationship between agricultural growth and poverty alleviation through lower food prices is still questionable. First, agricultural growth may not be associated with lower food price if it grows more slowly than population and income that drives demand for food in the concerned area (Dewbre et al. 2011). Second, food price reduction may increase the poverty of the first poor group (net food seller) if their agricultural profit losses due to lower food prices outweigh their profit gains from optimal input costs and better access to broader market such as export. Minten & Barret (2008) found that for every doubling of rice yields, farmer's profits increase by 10-60% while prices fall by 18-45%. Ivanic & Martin (2018) also found negative correlation between agricultural productivity and agricultural profits. When agricultural productivity increases by 1%, agricultural profits in 3 panels decrease on average by 0.17%. Moreover, according to supply and demand model, lower food price may lead to lower agricultural production in the long run. Lower food price may also increase poverty of the second poor group in long run because employers may adjust nominal wages to match with it in open economy (Minten & Barrett 2008). Headey (2018) found evidence of co-integration between wages and food prices in the long run with elasticity of 0.78. The third poor group or urban poor may not enjoy the lower price if transportation of agricultural products to urban area is expensive (Minten & Barrett 2008).

4.4. Indirect effects on non-farm sectors of rural economy

The poverty reducing effect of agricultural growth can come from its ability to stimulate demand for non-farm products and to provide important sources including labor and capital source for other sectors 'growth, which in turn creates employment opportunities and increase income for the poor. Mellor et al. (2001) estimated that 5% growth rate in agriculture is associated with 6.25% rural non-farm growth rate and 5.6% employment expansion rate in rural non-farm sector, keeping population growth rate at 2.5%. Some research such as Mellor et al. (2001) and Dorosh & Mellor (2013) indicated that indirect contributions of agricultural growth to poverty reduction is stronger than direct contributions.

Higher incomes or wages resulted from agricultural growth not only prompt the poor to change their consumption pattern from subsistent food to non-farm products (Mellor & Ranade 2006), but also increase individual saving rate that can be used to finance other sectors 'activities (Ravallion 2012). However, the positive effect of demand for non-farm products on other sectoral growth may occur only when the demand is sufficiently large (Christiaensen et al. 2011) and the consumption is

localized (Bustos et al. 2016). Higher incomes or wages also lead to higher individual saving rate only when the poor are patient consumers (Ravallion 2012). Literature is calling for more research on these relationships, especially the spatial effect of the demand for non-farm products on other sectoral employment growth. Another financial source provided by agricultural growth is government taxation. However, this source is significant only when governments hold traditional bias against agriculture as a low productivity sector (Thurlow & Wobst 2006) or expect high sunk cost in agricultural production, thereby imposing relatively higher taxation on agriculture than other sectors (McMillan & Masters 2003).

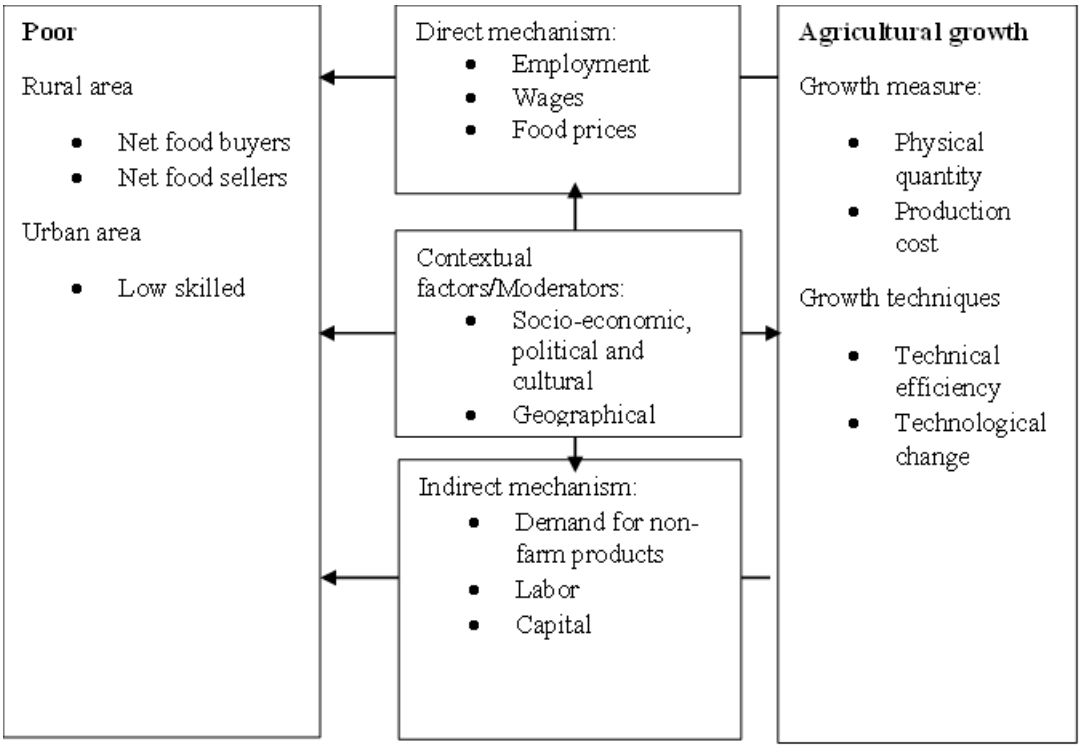
The last but biggest and well-investigated source for other sectoral growth is labor reallocation. Benfica & Henderson (2021) estimated that 1% increase in labor share of non-agricultural sector due to rural-urban immigration reduces rural urban poverty by 0.42% and it is the only factor that contributed to overall poverty reduction in sub-Sahara Africa region. Chu et al. (2022) indicated that without the reallocation of labor from agriculture, the US economy would have needed four decades more to start its industrialization successfully. Agriculture sector is considered a potential labor supply source for other sectors because of its high natural (or population) growth rate – approximately three times higher than other sectors (Kuznet 1961). Moreover, labor mobility to non-agricultural sectors is facilitated by rural infrastructure or greater rural-urban connections that result from investment for agricultural growth (Tambunan 2007). However, the actual and meaningful labor reallocation from agriculture to other sectors happens only when agricultural growth is based on labor saving or capital-intensive agricultural technologies rather than land augmenting techniques; and when agricultural productivity is high. Bustos et al. (2016) found that manufacturing employment increases by 1.05% for each 1% higher in crop area share under application of labor saving technology, while it remains unchanged under the application of land-augmenting technical change. Chu et al. (2022) found that high agricultural productivity reduces training time when labors move to manufacturing sector. The labor reallocation may be slowed down or does not happen when higher productivity makes agriculture become a comparative advantage sector of a nation or an area (Matsuyama 1992).

5. Conclusion

Poverty is multifaceted and heterogeneous. A description of the poor as people with low income, low labor skills and insufficient access to resources to afford a standard of living seems to be too simplistic. This is because it does not reflect the disparities among the poor in terms of their living location, perception of poverty, food availability and source of income that are essential to developing intervention programs. The poor can live in either urban or rural area that differ in demographical and geographical conditions, leading to variation in food or nutrition requirement. While majority of rural poor derive their income from farm work, urban poor earn theirs mostly from employment in the low skilled labor market. In rural areas, some

farmers who are net food sellers still fall into poverty due to their ineffective farming practices, while others are poor because of no access or limited access to land to produce enough food for their own consumption. Some poor strive to escape the poverty, while others believe their poverty is due to bad fate and become accustomed to it. Therefore, poverty reduction interventions need to be customized to each poverty area in question.

Figure 1.: Poverty reduction mechanism of agricultural growth



Source: Author's own editing.

Because the poor is heavily dependent on agriculture for their living, agricultural growth has been considered to be an important instrument to reduce poverty. It can drive poverty reduction directly by generating employment, increasing wage, and lowering food prices; indirectly by providing resources for the growth of other non-agricultural sectors. However, the benefits of agricultural growth for the poor vary according to different mechanisms that are influenced by the growth sources and structural conditions. Under the same mechanism, the growth may reduce poverty in one group while having no impacts or increasing poverty in another group. Agricultural growth achieved through labor intensity growth techniques benefits the poor, especially net food buying poor farmers by creating more job opportunities. Agricultural growth based on technical efficiency, crop intensification or

productivity enhancing techniques is likely to reduce the poverty among net food buying poor farmers and urban poor by increasing their purchasing power through lower food prices and higher wages, while reducing poverty among net food selling poor farmers by increasing their agricultural profits. However, the relationship between these driving factors and poverty reduction is nonlinear and inconclusive. More employment opportunities generated by agricultural growth may not necessarily lead to poverty reduction if they are not sufficient to accommodate growing population or new urban poor labors caused by development crises in non-agricultural sectors. Lower food price may make net food selling poor farmers fall into poverty again if their losses due to food price reduction cannot be offset by their gains from better technical efficiency, adequate technological change or broader market access. Urban poor may not enjoy lower food prices if infrastructure makes it more expensive to transport food from producers to market. Increased purchasing power gained from higher wages that take times to be effective can be eroded quickly by high inflation or diminish when wages are adjusted to match lower food prices in the long run. Agricultural growth contributes indirectly to poverty alleviation by promoting demands for non-farm products, increasing individual savings and freeing up labors. Although these contributions are found stronger than direct effects, they happen on the conditions that agricultural productivity is high; the demand for non-farm products is sufficiently high; consumption of non-farm products are localized; and the poor are impatient consumers. *Figure 1.* is a summary of the mechanism for reducing poverty reduction through agricultural growth, taking into account the effect of contextual factors.

5.1. Research implications and limitations

Mixed evidence on the impacts of agricultural growth on poverty reduction through different mechanisms suggests that poverty reduction is a stretch goal. It involves balancing different and sometimes competing priorities of poor groups. Therefore, under condition of limited resources if policymakers want to reduce poverty through agriculture-led interventions, it is essential to develop short-term and long-term plan in which poverty is identified, clustered and prioritized. After that, a comprehensive and customized interventions coupled with consideration of structural factors are developed for each area.

Despite attention to methodological requirements, the findings may be influenced by some limitations. First, the EDS database cannot cover all possible studies. Second, the study does not include literature from articles written in non-English language and inaccessible to full text. Third, scope of relevant articles may be limited because keywords and subjective selection criteria may differ from what other researchers define. Therefore, future research may expand the number of relevant articles by using alternative databases, selection criteria and keywords, and including articles written in another language.

5.2. Future research needs

Extant research on poverty reduction mechanisms of agricultural growth have focused mostly on aggregate poor. Therefore, future research can explore further and separate the poverty reducing effect of agricultural growth through each mechanism on different groups of poor. Moreover, since wages and food prices are closely related to each other, it is important for future research to separate short term and long term response of wages and prices to agricultural growth and their impact on poverty. Last but not least, indirect contributions of agricultural growth to poverty reduction through increased demand for non-farm products could be explored further by taking into consideration spatial effects.

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