Food and Agriculture Organization of the United Nations

unicef for every child

# Local Economy Impacts and Cost-Benefit Analysis of Social Protection and Agricultural Interventions in Malawi

# Local Economy Impacts and Cost-Benefit Analysis of Social Protection and Agricultural Interventions in Malawi

Justin Kagin, Kagin's Consulting

J. Edward Taylor, University of California, Davis

Luca Pellerano, ILO

Silvio Daidone, FAO

Florian Juergens, ILO

Noemi Pace, FAO

Marco Knowles, FAO

Published by

the Food and Agriculture Organization of the United Nations

and

International Labour Organization

and

United Nations Children's Fund

Rome, 2019

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO), International Labour Organization (ILO) or United Nations Children's Fund (UNICEF) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO, ILO or UNICEF in preference to others of a similar nature that are not mentioned. The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO, ILO or UNICEF.

ISBN 978-92-5-131414-2 (FAO)

© FAO, ILO and UNICEF, 2019

FAO encourages the use, reproduction and dissemination of material in this information product. Except where otherwise indicated, material may be copied, downloaded and printed for private study, research and teaching purposes, or for use in non-commercial products or services, provided that appropriate acknowledgement of FAO/ILO/UNICEF as the source and copyright holder is given and that FAO/ILO/UNICEF's endorsement of users' views, products or services is not implied in any way.

All requests for translation and adaptation rights, and for resale and other commercial use rights should be made via www.fao.org/contact-us/licence-request or addressed to copyright@fao.org.

FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org

Information on ILO publications and digital products can be found at: www.ilo.org/publns

Information on UNICEF publications and digital products can be found at:
https://www.unicef.org/publications/

**Cover photo: ©Benedicte Kurzen Noor for FAO**

## Contents

Acknowledgments ..... v
Abbreviations ..... vi
Executive summary ..... vii
1. Introduction ..... 1
2. Methodologies ..... 3
2.1. Impacts of programmes on beneficiary households ..... 3
2.2. Local Economy-wide Impact Evaluation (LEWIE) ..... 4
2.3. Cost-Benefit Analysis ..... 7
3. Data ..... 8
4. Programmes considered ..... 9
4.1. The Social Cash Transfer ..... 9
4.2. Public works programmes ..... 9
4.3. The Farm Input Subsidy Programme ..... 9
4.4. Extension services ..... 10
4.5. Irrigation projects ..... 10
5. Household groups ..... 11
6. Construction of the LEWIE model ..... 13
6.1. Modelling household production ..... 13
6.2. Modelling household consumption ..... 17
7. Policy options and simulation results ..... 18
7.1. Social protection interventions ..... 18
7.2. Agricultural interventions ..... 30
7.3. Combined social protection and agricultural interventions ..... 42
8. Local economy-wide cost-benefit analysis ..... 49
8.1. Cost-benefit ratios of the SCT ..... 50
8.2. Cost-benefit ratios of PWPs ..... 51
8.3. Cost-benefit ratios of the FISP ..... 52
8.4. Cost-benefit ratios of extension services and irrigation ..... 54
8.5. Cost-benefit ratios of combining the SCT and FISP ..... 55
9. Conclusion ..... 57
References ..... 60
Appendix A: Impacts on poverty and inequality of policy options ..... 62

**Appendix B: Detailed tables** ..... **66**
**Appendix C: LEWIE methodology** ..... **78**

## Acknowledgments

The authors would like to acknowledge the invaluable contributions made to this report by members of the Government of Malawi, including Lukes Kalilombe (MoFEPD), Readwell Msopole, Osborne Tsoka (MoAIWD), Charles Chabuka, Brighton Ndambo (MoGCDSW) and Charity Kaunda (LDF). We would like to remember Harry Mwamlima, from the Ministry of Finance, passed away in early 2019, who provided critical insights and suggestions during the various stages of the analysis and the drafting of the report.

The authors would further like to thank those from FAO and UNICEF who helped to review and strengthen this report, including Edward Archibald, Bob Muchabaiwa (UNICEF), Florence Rolle, Doreen Kumwenda, Ervin Prifti and Fabio Veras (FAO).

## Abbreviations

| | |
|---|---|
| ASWAp | Agriculture Sector Wide Approach |
| CBA | Cost Benefit Analysis |
| DOI | Department of Irrigation |
| FAO | United Nations Food and Agriculture Organization |
| FISP | Farm Input Subsidy Programme |
| GoM | Government of Malawi |
| IFAD | International Fund for Agricultural Development |
| IHS | Integrated Household Survey |
| ILO | International Labour Organization |
| IRLAD | Irrigation, Rural Livelihoods and Agricultural Development Project |
| LDF | Local Development Fund |
| LEWIE | Local Economy Wide Impact Evaluation |
| MASAF | Malawi Social Action Fund |
| MGDS | Malawi Growth and Development Strategy |
| MK | Malawi Kwacha |
| MNSSP | Malawi National Social Support Programme |
| MoAIWD | Ministry of Agriculture, Irrigation and Water Development |
| MoFEPD | Ministry of Finance, Economic Planning and Development |
| MoGCDSW | Ministry of Gender, Children, Disability and Social Welfare |
| MoLGRD | Ministry of Local Government and Rural Development |
| NAIP | National Agricultural Investment Plan |
| NPV | Net Present Value |
| NSO | National Statistical Office |
| NSSP | National Social Support Programme |
| PV | Present Value |
| PWP | Public Works Programmes |
| RCT | Randomized Controlled Trials |
| SCT | Social Cash Transfer |
| UNICEF | United Nations Children's Fund |
| US$ | United States Dollar |

## Executive summary

**Using rural economy-wide impact simulation methods and cost-benefit analysis, this study examines the impacts of individual and combined social protection and agricultural interventions in Malawi on incomes, poverty and production.** The goal of this analysis is to provide evidence on policy options to increase coordination and coherence between social protection and agricultural programmes, with the objective of reducing poverty, increasing incomes and enhancing agricultural production and productivity.

**Impacts of interventions on targeted households can be estimated using experimental or quasi-experimental methods, but there are little rigorous evaluations available on the impacts of Malawi's social protection and agricultural interventions.** Therefore, to estimate the impacts of a range of policy options for standalone and combined interventions, the study uses micro-data from household surveys to model the production of targeted and non-targeted households in rural Malawi, as well as their impacts on poverty and inequality.

**Research shows that significant income gains in rural areas can extend beyond the direct beneficiary households, as a result of consumption and other local linkages.** Given the income gained by these vulnerable households, and its multiplier effects in local economies, the result could be substantial benefits for ineligible households living in the local economy. It is quite possible that the impacts of these programmes on communities as a whole are larger than the direct impact originating from interventions directly targeted to the beneficiaries themselves. The analytical approach taken in this paper makes it possible to quantify the impacts of a range of social protection and agricultural interventions on households living in Malawi's rural economy, which are usually missed by other types of (programme) evaluations. These economy-wide impacts are then used to undertake an economy-wide cost-benefit analysis of individual or combined interventions.

**Local Economy Impacts of Social Protection and Agricultural Programmes**

The economy-wide impact evaluations and cost-benefit analysis show that all selected programmes have direct impacts on beneficiary households and can also generate positive or negative income and production spillovers affecting non-targeted household groups. Programmes can create positive income and production spillovers if they raise the demand for goods and services, creating income generating opportunities for non-beneficiaries engaged in the production of those goods and services. However, they can also create negative spillovers, for example, by pushing up the prices of food and raising costs for food consumers, or by depressing prices for food producers.

In most cases, spillovers result in large positive indirect impacts on incomes of non-beneficiaries in rural Malawi and create considerable income multipliers. In most cases, each Malawi Kwacha (MK) invested in the programmes studied increases income in rural Malawi by more than 1 MK. For example, each MK transferred through the Social Cash Transfer (SCT) increases total real income by 1.88 MK - that is, by the MK transferred plus an additional 0.88 MK of income spillover. Impact evaluations that do not consider income and production spillovers miss many, and in some cases most of the benefits created by these programmes.

Income spillovers from social protection and agricultural interventions have important implications for equity, as some household groups are in a better position to benefit from income spillovers, whatever their cause. For example, non-poor households benefit significantly from the SCT - even though the transfers go only to ultra-poor households. So do moderately-poor labour-constrained households with land. These ineligible groups benefit from the transfers as they have the resources to expand production in response to rising local demand, thus capturing positive income and production spillovers. Asset-poor households do not have this capacity to respond and income gains of such households depend mostly upon whether or not they are direct beneficiaries of the SCT, highlighting the need to ensure that the most poor are befitting directly from transfers.

Income spillovers are an important part of cost-benefit analyses and strengthen the argument of the effectiveness of social protection and productive interventions by capturing the full impact of interventions in rural economies. The study demonstrates that for all SCT options, income spillovers tip the cost-benefit scale in favor of SCT programmes, as total discounted benefits, including spillovers, always exceed programme costs, including administrative costs. The same is true for nearly all productive interventions, as well as for all considered combined social protection plus productive interventions.

For some programmes, such as PWPs and FISP, benefits depend critically on whether or not the programme has productive impacts beyond the immediate direct impacts. For example, the FISP makes inputs cheaper and thus stimulates their use. However, the increased use of fertilizer and other inputs may not be enough to offset the programme costs. Likewise, PWPs are inefficient cash transfers if they do not lead to the creation of productive rural assets and improve productivity through transfers of skills. The simulations show that the FISP does not pass the cost-benefit test (having ratio of benefits to costs of larger than 1) if it does not lead to technological change - that is, if it does not make farmers more productive.

## Complementarities between Social Protection and Agricultural Programmes

There are inherent policy tradeoffs between the goals of raising agricultural productivity and achieving social protection of the Malawi's poor and vulnerable households. The study shows that the SCT has the largest direct impact on incomes and poverty amongst targeted ultra-poor and labour-constrained households, while the Farm Input Subsidy Programme (FISP), public works programmes (PWPs), irrigation and, to a smaller degree, extension services have larger impacts on agricultural production.

However, the simulations further reveal that there are important synergies between productive agricultural programmes and social protection. Interventions that raise agricultural productivity are found to lower food costs, and this has positive real-income effects for poor households. Conversely, programmes such as the SCT, which increase food demand creates new markets for food production. If the policy goal is to raise rural incomes and also increase crop production, the study finds that combining social protection and productive agricultural interventions is a more effective strategy than doing either one of these alone.

Ignoring production and income spillovers not only misses programme benefits, it also creates the risk of missing negative indirect impacts that could be avoided with well-designed complementary policies. For instance, if the FISP raises the market supply of food crops and thus pushes down food prices, any food producer who does not receive the FISP subsidies could suffer as his/her food crops will receive lower prices on the market. In fact, the study finds that the FISP reduces income in some household groups that do not receive the subsidies. Policies that increase local demand for food crops, such as cash transfers, or connect producers with outside markets to could alleviate this problem. Similarly, if the SCT pushes up food prices by raising the demand for food, households that do not receive the transfer could suffer, as such households will have to pay higher prices without benefitting from the transfer. The study finds that the SCT increases income for all household groups, but some groups benefit far less than others. Households that do not receive the SCT and have limited assets and capacities to expand production seem to benefit the least. Again, policies that simulate local production could alleviate these potentially negative spillovers by ensuring that increased demand created through the SCT is matched with increased production, thereby limiting prince increases.

Reducing poverty is the single most important goal of rural development programmes and social and productive interventions can directly reduce poverty, by targeting poor households, as well as indirectly, by creating real-income spillovers. The simulation confirms that social protection interventions, the SCT and PWPs (those that increase productivity through skills transfers and/or the creation of productive rural assets) are cost-effective (benefits exceeding costs) and have stronger direct and indirect impacts on poverty reduction than any of the productive programmes studied.

Nevertheless, the largest decrease in poverty results from combined interventions that target ultra-poor households with the SCT, while raising crop productivity, thus reducing food prices. Increasing crop productivity can be done through FISP or through other productive interventions such as irrigation and extension. Even creating effective rural assets with the PWPs could raise crop productivity and complement the SCT. Lower food prices have a disproportionately large impact on welfare in poor households, which allocate most of their budgets to food.

In fact, ensuring overlapping targeting between the SCT and FISP should increase the cost-effectiveness of both programmes, as partially and fully overlapping policy options of the SCT and FISP have consistently higher cost-benefit ratios than non-overlapping options. For the SCT and FISP, non-overlapping policy options have the lowest cost-benefit ratios and fully overlapping options have consistently the highest ratios. A full overlap of FISP and SCT targeting to the ultra-poor not only produces higher multipliers for the whole economy compared to partial and non-overlapping targeting, but also has a better distributional impact, with larger increase of incomes and production amongst the poorest households. This points to efficiencies that can be gained by targeting the same groups for interventions rather than separate groups, even when taking local economy spillovers into account.

Overall, the findings from this study underline the importance of coordinating social protection with interventions to increase crop productivity. This appears to be critical in order to create

positive real-income multipliers and stimulate agricultural production while alleviating rural poverty.

## Social Cash Transfer Findings

The SCT creates significant multipliers and income gains for all household groups, with the non-poor and moderately-poor benefitting the most from indirect spillovers. The simulation models a range of options for the SCT with different transfer and coverage levels, from the status quo of reaching ultra-poor and labour-constrained households to scenarios with broader coverage and higher transfer levels. Under all design options the SCT creates large increases in total rural income, substantially exceeding the amount transferred. These total real income multipliers range from MK 1.88 to MK 1.91 and if measures are taken to avoid price increases (e.g., productive interventions), these multipliers could rise to as high as 2.9 to 3.06 MK. While SCT beneficiaries also benefit from spillovers, non-poor households are better placed to capitalize on economic opportunities created by spillovers, as they have more resources to increase their production of goods and services when local demand increases.

SCT income multipliers are similar across all options but the distribution of income gains across household groups depends on who gets the transfers, with the poor benefitting mainly from the direct transfer and the non-poor from the spillovers. The study finds that the non-poor benefit the most from spillovers and that the ultra-poor and moderately-poor benefit only to a limited degree from spillovers and rely primarily on the direct transfer for their income gains. It is important to note that the study finds that the larger the transfer the greater the direct impacts to the beneficiary groups and indirect spillovers. Finally, the SCT, despite being targeted to poor and labour-constrained households, leads to increased production of crops, livestock, retail, service and production goods amongst all household groups.

## Public Works Programmes Findings

Income multipliers of PWPs are similar to those of SCT but rise considerably if PWPs can increase productivity through asset creation and skills transfers. Total income multipliers of PWPs are in the order of 2.9 MK. However, when land productivity is increased, additional benefits per MK of transfer are created, resulting in multipliers of up-to 3.24 MK (assuming a 5% increase of land productivity). Similar to the SCT, the largest income gains are for the targeted household groups. However income spillovers to non-beneficiary households, including the non-poor, are also large and widespread. For every MK transferred, the incomes of non-beneficiaries increase in real terms by between 0.8 and 1.9 MK. Real income multipliers are larger for non-beneficiaries when PWPs increase productivity, as non-beneficiaries benefit directly from higher productivity resulting from community assets. The largest percentage impacts occur when PWPs target all poor households with labour with the highest number of days and assuming productivity increases. Similar results are observed when targeting all ultra-poor households with labour, strengthening the case for long-term PWPs with substantive transfers and a investments in assets quality and skills transfers. Such investments are important, as the magnitude of income and production effects depend on the quality of assets,

skills transferred and their relevance to agricultural productivity. If productivity increases by less than the 5% estimated in Ethiopia's Productive Safety Net Programme (PSNP), total income multipliers of PWPs will be at the lower bound of estimates given above.

Direct transfer and productivity effects of PWPs can potentially be are mutually reinforcing. The biggest impact of productivity growth is to increase real income, because food prices fall when productivity rises. PWPs, by increasing the productivity of crop production, mitigate upward pressure on prices caused by the cash transfers. Price increases from increased demand are offset by falling prices due to increased supply. This simulation demonstrates the importance of creating effective PWP-assets (and transferring skills and knowledge) to increase production and to mitigate price inflation caused by PWP-wages.

**Farm Input Subsidy Programme Findings**

Regardless of the scenarios studies, the FISP stimulates crop production and increases both nominal and real incomes of targeted households. Crop output increases by 0.6% to 8.9% if only the direct effects of the subsidies are considered. However, the study finds additional effects of the FISP, beyond the subsidy, on crop productivity, suggesting that FISP beneficiaries use different or improved technologies to produce crops. When considering the full effect, including this element of technology change, crop output increases by 2% to 13.2%. As with all interventions, real income impacts diverge from nominal impacts because of changes in prices of local goods and services (including crop prices). All poor households with land experience real income increase except under the options where the poorest household groups are excluded from the FISP.

Directing the FISP toward households with land above the median significantly increases crop production and rural incomes. Recently, directing the FISP towards households with land has been piloted in some districts, which has been found to be enhance the FISP's effectiveness. This study appears to confirm these results. Simulating a policy option that keeps total coverage and subsidy level constant but targets households with land above the median, the study finds increases in overall crop production and rural income. Under these reforms, the impact of the FISP without technology change rises from 15% to 8.5% (from 2.2% to 13.2%. with technology change). Higher food production puts downward pressure on prices, increasing real incomes for food consumers and leading to real income increases for all groups. Only ultra-poor labour-constrained households with limited land have a slightly lower real income under this reform, as they do not access the subsidy and receive lower prices for their crops. Total real income increases from 1.67% to 3.34% without technology change and from 2.49% to 5.14% with technology change. It is important to note that households with land includes ultra-poor and moderately poor households, and both groups show positive income and production multipliers across all scenarios.

Targeting poor and ultra-poor farmers with access to land, rather than better off farmers, produces larger income and production multipliers for the economy as a whole. The study examines options for a more narrow coverage and cost of the FISP, comparing a more and less pro-poor targeting approach, while maintaining the focus on productive farmers (land above

1.5 acres), in line with current policy discussions. Remarkably, real income multipliers are larger across the board when the FISP is targeted towards ultra-poor farmers and excludes the non-poor. FISP increases crop production capacity of ultra-poor households with labour and land by between 66% and 117%. However, when this group is excluded from the FISP their production capacity falls between 50% and 55%. Interestingly, non-poor households with land see income increase in real terms even when they do not directly receive the FISP, as they benefit from lower prices and increase their production in other sectors (e.g. retail). From an aggregate production perspective, targeting FISP to the most vulnerable (ultra-poor and moderately poor) amongst "productive" farmers delivers a three times higher increase in the total volume of crops produced in the economy, compared to when scenarios where the subsidy is directed to better off-productive farmers.

It is important to note that the FISP has the potential to create negative spillovers, which are especially concerning if the poor farmers with land are excluded from the programme. The FISP's income spillovers are large and positive under some scenarios but frequently they are negative for households that do not receive FISP subsidies, due to the effect on food prices. Subsidized inputs stimulate crop production and drive down prices, which negatively affects surplus-producing farmers who do not receive the subsidy. In all scenarios non-beneficiaries reduce crop production and when the poorest households are excluded from the programme, their real income is negatively affected. In this case, the FISP causes a net welfare loss for the poor and can have potentially regressive distributional effects.

Should the Government decide to reform the FISP, it should be directed to households with land above the median, while those who no longer receive the FISP should be supported with the SCT. This should create larger productive effects while limiting the adverse consequences on the real incomes of former FISP beneficiaries. The resulting SCT targeted toward the poorer households should have a greater impact on poverty. Still, careful attention should be paid to the marginal farm household with low amounts of land who lose the FISP and may also be impacted by the negative price effects from increased production by farmers with land above 1.5 acres that receive the FISP.

**Irrigation and Extension Findings**

Doubling the share of households with land above 1.5 acres and access to irrigation results in a significant increase in crop production and total real incomes. Crop production increases by 9.55% (full cost annualized) and 15.58% (annual cost once operational), while incomes increases by 5.87% and 11.3% respectively. It should be noted that nominal income effects of the transfer and productivity increase even higher (6.09% and 14.66% respectively) but increased irrigation is expected to drive down the price of crops, benefiting households with irrigation but resulting in decreases of crop production for non-beneficiaries. Still, real incomes rise across households because the cost of food consumption decreases with larger crop output and spillovers benefit all households. Irrigation creates spillovers to other production sectors as well. Not surprisingly, there are large income gains for household groups with land above 1.5 acres targeted by irrigation projects, however, spillovers on real income in households with less land are also large. For the groups with land below 1.5 acres, those who receive the

spillovers but not the direct effects, the real income increases are smaller but still significant. For ultra-poor groups, both those with direct access to irrigation and those who receive only spillovers, real income gains range from 2.45% (limited labour and land) to 34% (labour and/or land, under the annual cost once operational simulation). This simulation demonstrates the potentially large and far-reaching impact of irrigation for the rural economy of Malawi.

Real income and production impacts of agricultural extension services are positive but smaller than those of irrigation projects. Total real income rises by 2.48% and real incomes increase for all household groups. Importantly, incomes rise by as much as 7% for ultra-poor households. Access to extension services, like irrigation, creates real benefits that extend beyond crop production, as there are small spillovers to other production sectors. Extension has both real income and production multipliers that are above 2 MWK per MWK spent. Thus, even though the percentage increases in real income and production due to extension is lower than for irrigation, the benefit of 1 MWK spent on extension is more than for 1 MWK spent on irrigation. Even if costs are born by households with land above 1.5 acres (as is the case with those who receive extension services in this simulation), they still have positive income. Extension services tend to benefit workers in rural areas (extension agents), who contribute to the local economy by spending their wage on products and services from those locations.

Irrigation on the other hand has smaller multipliers and in fact a lower than one cost-benefit ratio for both real income and production. The reason for this is the high capital cost for imported irrigation equipment (either from outside Malawi or more generally outside the simulated local economy). However, the multipliers do not capture the benefits of lower crop prices that urban consumers receive due to irrigation improvements nor the resulting increase in food security and exports. This may be significant given crop production increases of 16% rising to 24% once completed. It should be noted that Malawi has seen a rise in smallholder irrigation schemes, which may be a more cost-effective approach to expanding irrigation and increase cost-benefit ratios.

# 1. Introduction

The objective of this report is to inform the design of agriculutural and social protection interventions and associated resource allocation decisions, by simulating the cost-benefit of alternative design options for standalone as well as different combinations of social protection and agricultural programmes in Malawi. These analyses provide evidence on the policy options to increase coordination and coherence between the two sectors with the objective of reducing poverty, increasing incomes and enhancing agricultural production/productivity.

Social protection in Malawi is guided by the Malawi Growth and Development Strategy (MGDS III) and the National Social Support Policy (NSSP). The Ministry of Finance, Economic Planning and Development (MoFEPD) develops social protection policy coordinates the implementation of social protection interventions by sectoral ministry and development partners. The NSSP has four strategic objectives. These are: 1) To provide welfare support to those unable to develop viable livelihoods; 2) To protect assets and improve the resilience of poor and vulnerable households; 3) To increase productive capacity and the asset base of poor and vulnerable households, and 4) To establish coherent synergies by ensuring strong linkages to economic and social policies, and disaster management. The Malawi National Social Support Programme (MNSSP) was designed to operationalize the NSSP over the period of 2012-2016, based on the NSSP's vision of enhanced quality of life for those suffering from poverty and hunger and improved resilience of those vulnerable to shocks. To achieve these objectives, the following five intervention areas where prioritized: 1) Social Cash Transfer (SCT), an unconditional cash transfer targeted to ultra-poor and labour-constrained households; 2) Public works programmes (PWPs) that provide regular payments to individuals in exchange for work, with the objective of decreasing chronic or shock-induced poverty; 3) School meals programmes (SMP) serve fortified corn-soya porridge to all children in targeted schools and provide take-home-rations during the lean season; and 4) Village savings and loans, as well as microfinance interventions, provide financial services including savings, loans and insurance to rural Malawians.

In 2016, the MNSSP expired and after an extensive process of stakeholder consultations, a successor programme, the MNSSP II was developed and finalized. The MNSSP II will run for five years and will build on the successes and lessons learned during the implementation of the first MNSSP. It maintains the same prioritized interventions but these are organised around thematic priority areas, thus providing enhanced strategic policy guidance on promoting linkages, strengthening systems, and improving monitoring activities.
Similarly, the National Agricultural Investment Plan (NAIP) is the framework for coordinating and prioritising investments in agriculture by government agencies, development partners and Non-State Actors including the private sector. The NAIP adopts the goal of the National Agricultural Policy and has three objectives: (1) broad-based and resilient agricultural growth; (2) improved well-being and livelihoods of Malawians; and (3) improved food and nutrition

security. Speaking especially to points (3) and (4) of the MNSSP and to points (2) and (3) of the NAIP, this analysis brings together the priorities of the MNSPP and of the NAIP.
The agricultural policy and programmes in Malawi, coordinated and implemented by MoAIWD, consist of programmes to increase yields for staple crops (predominately maize), support extension services, research and disseminate new varieties, aid in animal husbandry, support commercialization and agricultural import/export markets, promote food security, and aid poor and vulnerable small farmers. In the recent past the Farm Input Subsidy Programme (FISP) has been– in budgetary terms – the largest programme, providing input sudsidies for fertilizer, better maize seed varieties and other farm inputs.[1] This programme was intended to increase yields and aid poor farmers. Other important programmes include irrigation and extension services for small and large farmers as well as the development of watershed resources.

The programmes considered in this report include a subset of activities from the social protection and agricultural programmes: the SCT and Local Development Fund (LDF) PWP on the social protection side; and the FISP, extension services, and irrigation services on the agriculture side. These interventions are considered priority interventions for study by the different stakeholders of this analysis: the Government of Malawi (GoM), the International Labour Organization (ILO), the United Nations Food and Agriculture Organization (FAO), and the United Nations Children's Fund (UNICEF). They are also significant programmes – in terms of their budget and coverage.

Using a local economy wide model, this study aims at simulating ex-ante the impacts on the targeted beneficiaries of social protection and agriculture programmes, as well as the spillover effects on other households in the local (rural) economy. It proposes to address the following policy questions: What could be the most effective policy scenario(s), in terms of: a) supporting the poorest households; b) increasing agricultural production; c) stimulating economic growth and d) reducing poverty and inequality. The report also includes cost-benefit analysis (CBA) of policy options discussed above to compare their relative effectiveness and combinations of these options in order to evaluate potential synergies. It is expected that the results and recommendations of this analysis will aid in the formulation and implementation of the 2018-2022 NAIP, the follow-up to the Malawi Agricultural Sector Wide Approach (ASWAp), and new Malawi National Social Support Programme (MNSSP II) launched in 2018.

[1] According to the ASWAp Review Final Draft for 2010-2014 (2016), a total of 1 billion USD or 72% of this period's government expenditure on agriculture was on FISP. Agriculture makes up approximately 30% of GDP for Malawi.

## 2. Methodologies

All of the programmes outlined above - the SCT, PWPs, FISP, irrigation and extension services - have direct impacts on the beneficiary households: those households directly benefiting from a policy. They also potentially have benefits beyond the beneficiary group: other households that are in the same village or nearby villages of the beneficiary households but do not receive direct benefits of a programme.

### 2.1. Impacts of programmes on beneficiary households

The impacts of interventions on targeted households can be estimated using experimental methods if the programme treatment is random, or with quasi-experimental methods if they are non-random but a comparison group can be created synthetically using matching methods. Rigorous randomized control trials (RCTs) are not available to evaluate the direct impacts of FISP, extension, irrigation investments, or other productive interventions on the households that are directly "treated" by these interventions.[2] Using a large sample of micro-data from household surveys, we can estimate a model to predict crop yield for households that currently do and do not receive FISP subsidies, extension services, and access to irrigation. Under general conditions, this gives us the best linear unbiased predictor of crop yield, conditional upon whether (or to what extent) households are treated by the interventions, regardless of whether or not the interventions randomly target the rural population. This may not tell us whether changing the interventions—their targeting or magnitude—will cause changes in crop yield if the targeting is not random.[3]

For simpler simulations, for example, of changes in crop output prices, a structural approach can be used. We can use micro data together with econometric methods to estimate agricultural household models for different household groups. The agricultural household models can then be used to simulate the direct impacts of programmes or combinations of programmes on the targeted groups, similar to what is done in Singh, Squire and Strauss' (1986) classic book. For example, the FISP lowers the price of an input, which stimulates the demand for the input and also creates an income effect in the FISP beneficiary households.[4] Once we have estimated an agricultural household model, the challenge is to determine how to actually simulate different interventions or combinations of interventions. For some interventions, like input subsidies, productivity increases, or output price supports, simulating the intervention in the model is fairly straightforward. For others, for example, programmes that loosen liquidity constraints on production (as cash transfers might do), it is somewhat more challenging and may require

[2] Experimental evaluation results exist for SCT (e.g. Asfaw et al. 2016 and UNC, 2016) and PWP (e.g. Beegle, Galasso, and Goldberg, 2017) but they are not representative of nationally scaled up programmes. There are also quasi-experimental evaluations of FISP including two on synergies between the FISP and SCT (Daidone et al. 2017 and Pace et al. 2017). We add to these latter studies by including cost-benefit analysis and additional programmes (PWP, irrigation, and extension services).

[3] An econometric approach that controls for crop inputs, household characteristics and district fixed effects to estimate direct impacts of FISP, irrigation, and extension on predicted crop yields is used. This is a reasonable and conservative approach to evaluate the impacts of these three interventions, which may affect crop production in complex ways—including changes in the ways in which farmers grow crops.

[4] These impacts come out of the first-order conditions for optimization in the agricultural household model.

additional information from studies that have tested for programme impacts on beneficiary households. Fortunately, there is a rich literature on the direct impacts of many of these programmes on beneficiary households that we can draw from as needed.

## 2.2. Local Economy-wide Impact Evaluation (LEWIE)

Existing research shows that significant income gains in rural areas can extend beyond the direct beneficiary households, as a result of consumption and other local linkages (e.g., Thome, Filipski, et al. 2013; Kagin, et al. 2014; Taylor and Filipski 2014). Given the income gained by these vulnerable households, and its multiplier effects in local economies, the result could be substantial benefits for ineligible households living in the local economy, as well. It is quite possible that the impacts of these programmes on communities as a whole are larger than the direct impact originating from cash or in-kind transfers received by the beneficiaries, themselves.

In real life, beneficiaries interact with other households within local economies. Market linkages transmit the impacts of programmes from the directly affected households to others in the local economy. We designed and carried out a Local Economy-Wide Impact Evaluation (LEWIE) to simulate the direct and indirect impacts of alternative policy options. The LEWIE model captures multiplier effects of government programmes on the activities and incomes of target groups as well as the indirect impacts on groups not targeted by these programmes.[5] The households that are not eligible for, or not targeted by, programmes, with few exceptions, are beyond the purview of experimental approaches. By treating eligible households with cash transfers and other interventions, social protection and agriculture programmes "treat" the local economies of which these households are part. Market interactions shift impacts from beneficiary to non-beneficiary households. For example, beneficiaries of the SCT spend a large part of their cash on goods or services supplied by local farms and businesses. As local production expands to meet the new demand, incomes in the households connected with these farms and businesses rise, together with the demand for labour and other inputs. This generates additional rounds of spending and income growth in the local economy. As impacts swirl through the local economy, the programme is likely to benefit non-beneficiaries, including local business owners, traders, farmers, livestock producers, and others. However, if the local supply of goods and services is not responsive or elastic, there may also be inflationary pressures that create costs for local consumers and cause real income gains to diverge from nominal ones.

Table 1 presents a theory of change table which describes the channels in which final impacts occur. Figure 1 summarizes the LEWIE model and how channels through which different policies could have impacts on beneficiary and non-beneficiary households in the rural economy.

[5] Some examples of these types of studies are in included in the PtoP project of the UNFAO, http://www.fao.org/economic/ptop/publications/reports/en/

It is important to note that spillovers accrue to non-beneficiaries as well as to beneficiaries, which add to the direct effects on beneficiaries. Direct and spillover effects on beneficiaries are estimated simultaneously in the LEWIE model, and are part of the local economy-wide effects.

The model developed for this study builds upon the previous use of LEWIE in Malawi to study the impacts of cash transfers by Taylor and Filipski (2014, Chapter 10).[6] This study represents the first comprehensive rural economy cost-benefit analysis of social protection and agricultural production programmes in Malawi.

The LEWIE model includes a breakdown of household groups with respect to their eligibility for each of the programmes. Each simulation reports the distributional impacts of the policies across different household groups as well as the overall impacts on the rural economy. This study defines the local economy as all of rural Malawi. An additional benefit of using a LEWIE approach is that we can simulate impacts on beneficiaries and non-beneficiaries of different programme design options as well as combinations of programmes.

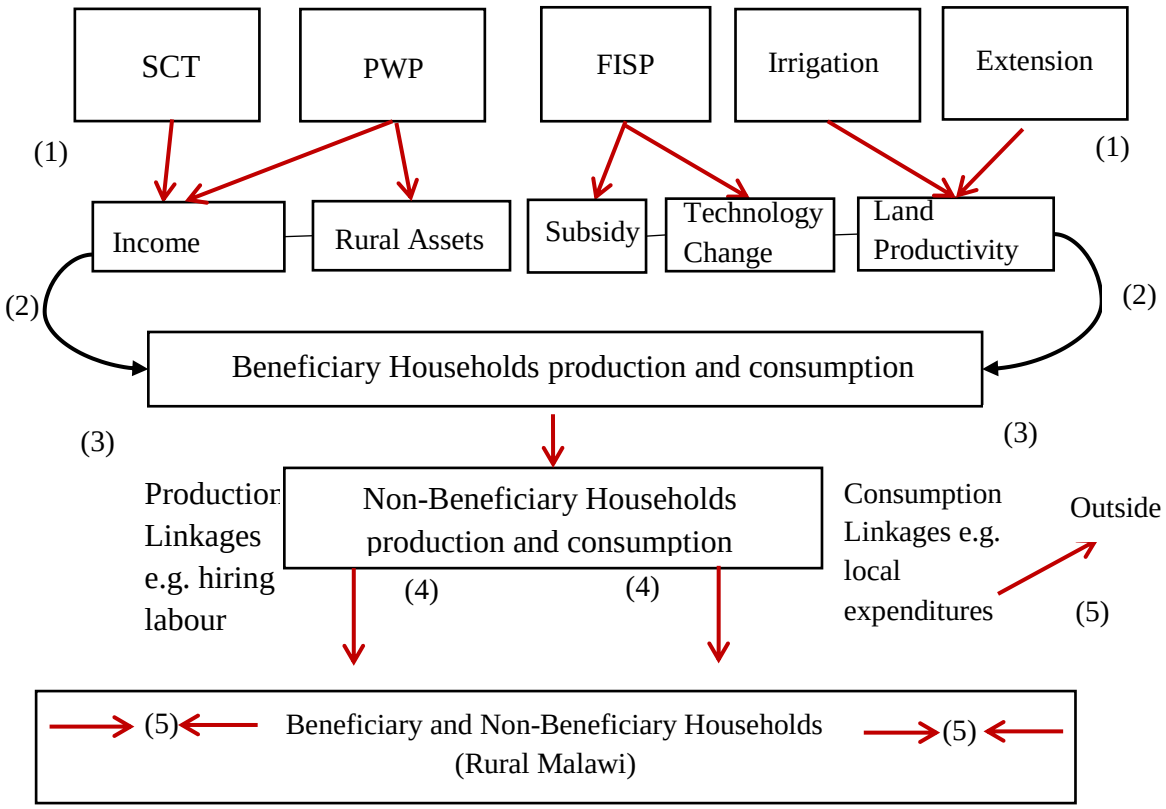
[6] The LEWIE methodology has been thoroughly vetted through the publication of a major Oxford University Press book (Taylor and Filipski 2014), several articles in academic journals, and most recently a study on host-country impacts of refugees and refugee assistance in Rwanda (Taylor, Filipski et al. 2016). For more on the LEWIE methodology see Appendix B.

**Table 1. Theory of Change - Summary of Programme Impacts on Beneficiary and Non-Beneficiary Households**

<table>
<tr><th>Programme</th><th>Channel of impact on beneficiaries</th><th>Spillovers to non-beneficiaries</th><th>Rural economy impact</th></tr>
<tr><td rowspan="3">SCT:<br>• Cash transfer to ultra-poor household groups</td><td rowspan="3">Increase in exogenous income</td><td>Spending on goods from local farms and businesses</td><td rowspan="9">Increased employment<br><br>Increased incomes<br><br>Reduced poverty<br><br>Increased production<br><br>Economic growth<br><br>Possible inflation<br><br>(Potentially lower production and/or income in non-beneficiary households due to lower crop prices, reduction in hired labour)</td></tr>
<tr><td>Production expands to meet increased demand</td></tr>
<tr><td>If production does not expand, inflationary impacts occur</td></tr>
<tr><td rowspan="2">PWPs:<br>• Wages paid to labour unconstrained households for constructing public works<br>• Assets created<br>• Skills and technology transferred</td><td>Increase in exogenous income</td><td>Spending on local farms and businesses</td></tr>
<tr><td>Public works such as watershed management and irrigation canals increase productivity of land for all households in rural Malawi. Transfer of skills and technology through public works can improve productivity of direct beneficiaries.</td><td rowspan="6">• Extra income from crop production is spent in the local economy leading to increases in local production<br><br>• Increase in hiring of agricultural labour<br><br>• Price changes due to beneficiary households' changes in production increase or decrease non-beneficiary household production across activities.</td></tr>
<tr><td rowspan="2">FISP:<br>• Fertilizer coupons distributed to low income maize farmers</td><td>Farm households purchase additional fertilizer and seeds</td></tr>
<tr><td>Farm households experience technology change, increasing yields through increased efficiency due to the FISP[7].</td></tr>
<tr><td>Irrigation<br>• Irrigation systems built for HHs with land above 1.5 acres</td><td>Land productivity for crops increases for beneficiary households</td></tr>
<tr><td>Extension<br>• Government extension services provided to HHs with land above 1.5 acres</td><td>New information leads to higher yields for beneficiary households</td></tr>
</table>

[7] Throughout the report, technology change with respect to FISP refers to increases in yields that are independent of input use. FISP stimulates input demands. We find evidence (see below) that FISP is also associated with higher yields even at the same levels of input usage. This reflects increases in farmer efficiency, beyond the FISP's direct subsidy effect.

**Figure 1. Summary of Programmes' Transmission Mechanisms for Rural Malaw**




Note: (1) The policy option transmits impacts through a variety of ways depending on the specific policy e.g. extension services can help farmers adopt best agricultural practices improving land productivity and therefore yields.

(2) Transmission mechanisms have heterogeneous impacts on beneficiary households e.g. the SCT operates through an increase in exogenous income whereas FISP subsidies will affect purchased inputs in crop production.

(3) Production and consumption linkages transmit impacts to other beneficiary households and to non-beneficiary households.

(4) Non-beneficiary households then transmit impacts through production and consumption linkages to the other household groups.

(5) In subsequent rounds households continue to transmit to each other, however, leakages, in the form of expenditures on consumption and production outside the rural economy, reduce the effect of subsequent cycles.

## 2.3. Cost-Benefit Analysis

LEWIE makes it possible to quantify impacts on the rural economy that are usually missed by other types of evaluation. These impacts can be folded into a LEWIE cost-benefit analysis of individual or combined programmes, taking into account the income spillovers the programmes create.[8]

The costs of programmes include administrative costs and in the case of the PWPs tools for the creation of agricultural assets. Benefits include the direct benefits of the programme, that is, on the eligible or targeted households, plus the spillover effects in the local economy. This study

[8] This was recently done for Lesotho by Taylor, Gupta, et al. (2016)

focuses on economic benefits. Other possible benefits include the accumulation of productive capital, social capital, improved nutrition, and education. We have estimated some of these additional impacts using experimental or quasi-experimental methods for social cash transfers elsewhere (e.g., see Taylor and Kagin 2016; Taylor, Gupta and Davis 2016); however, the lack of impact evaluation results in these social dimensions for each of the programmes considered in the current exercise prevents us considering them in this analysis.[9] In the absence of a proper baseline and follow-up survey for each of the policy scenarios we consider below makes this approach unfeasible in Malawi. LEWIE offers a particularly attractive alternative in cases where experimental or quasi-experimental information on beneficiaries and non-beneficiaries is not available.

## 3. Data

We primarily use the Integrated Household Survey III (IHS3) to build the LEWIE model for rural Malawi. The survey data encompass economic activities, demographics, welfare and other information on households and cover a wide range of topics, including the dynamics of poverty (consumption, cash and non-cash income; savings; assets; food security; health and education; vulnerability and social protection). Although the IHS3 household questionnaire covers a wide variety of topics in detail, it intentionally excludes in-depth information on topics covered by other surveys that are part of the NSO's statistical plan (for example, maternal and child health issues covered at length in the Malawi Demographic and Health Survey). For agriculture, the data cover crop production and inputs during the dry and rainy agricultural season in 2009-2010 as well as livestock production and inputs.[10] They also include questions pertaining to PWPs, the SCT and FISP by season.

Construction of the LEWIE model requires data on intermediate input demands by retail, service, and local non-agricultural production sectors, as well as value added shares for each business type. This includes data on products and services purchased by businesses in the local economy and how much value added these purchases add to the final products sold. Although this information was not asked in the IHS3, it was gathered as part of the SCT impact study by Thome et al. (2015). The limitations of these data, besides being from a source other than the IHS3, are that they are not representative of all rural districts in Malawi, but only a small subset of districts. Nevertheless, there is good reason to believe that input-output relationships in retail, service, and other non-agricultural production activities do not vary widely across rural areas of Malawi; for example, a village store is a village store, wherever it is. A detailed table of weighted averages of key variables used in our analysis appears in Appendix B.

[9] Social dimensions could be estimated for the Social Cash Transfer Programme (since the experimental data are available), but then the results would not be comparable with scenarios that involve other interventions such as PWP and FISP.

[10] Unfortunately, at the time of this report the IHS4 is currently in the field so data from the more recent 2015-2016 crop season cannot be utilized.

# 4. Programmes considered

The following agricultural and social protection programmes are included in the policy simulations presented below:

## 4.1. The Social Cash Transfer

The SCT is an unconditional transfer targeted to ultra-poor and labour-constrained households. It is operated by the Ministry of Gender, Children, Disability and Social Welfare (MoGCDSW). Ultra-poor households are statistically defined as having a total annual consumption lower than the food poverty line of 22,007 MK and the SCT operationalizes this through community targeting and criteria such as eating less than one meal a day. Labour constrained households are defined based on the ratio of members that are 'not fit to work' to those 'fit to work'. 'Unfit' in this context means being outside of the economically active ages (below 18 or above 64), having a chronic illness or disability or being otherwise unable to work. A household is considered labour constrained if it has no members that are 'fit to work' or if the ratio of 'unfit' to 'fit' exceeds three (Abdoulayi et al, 2014).

For the programme year 2016/2017, the SCT reaches all 28 districts of Malawi to approximately 330,000 households. This is approximately 12 percent of rural households. The main objectives of the SCT are to reduce poverty and hunger and increase school enrollment. Transfer amounts vary by household size and number of children enrolled in school. In 2016/2017, the transfer level varied between MK 1,700 and MK 3,700 per month, depending on household size, with a bonus of MK 500 per month for each child enrolled in primary school and MK 1000 for each child in secondary school.

## 4.2. Public works programmes

The LDF financed PWP provides a conditional cash transfer targeted to poor households with labour capacity. It is implemented by Malawi's 28 District Councils and the Ministry of Local Government and Rural Development (MoLGRD). Beneficiary selection is done via self-selection. The programme covers the whole country and reaches 450,000 households in 2016/17 for 3 years (same beneficiaries). In 2017, the transfer amount per beneficiary was MK 600 per day for 48 days per year, around MK 28,800 per year. The main objectives of the PWP is to increase incomes and food security of poor rural households and to create productive community assets. Historically, these community assets have been roads and bridges but the current focus lies on watershed management projects.

## 4.3. The Farm Input Subsidy Programme

In 2005/06 the Government introduced the FISP against the background of unfavorable weather conditions impacting agricultural production, prolonged and widespread food shortages and high input prices in the absence of appropriate farm input loans for smallholder farmers. The primary purpose of the programme was to increase resource-poor smallholder farmers' access to improved agricultural inputs in order to achieve food self-sufficiency and increase farm households' income through increased food and cash crop production. The FISP operates nationwide and covers around 50% of Malawi's smallholder farmers (1.5 million households).

Transfers amount to two vouchers allowing the purchase of 100 kg of fertilizer and 5-8 kg of seeds at heavily discounted prices. The transfer value was MK 29,400 per household/per year in the 2015/16 growing season.

In the 2016/2017 farming season the FISP has undergone substantive reforms. Government deficits and programme cost overruns have made the budget for FISP untenable for the Government, which has led to a substantive reduction in the scale of the programme, amongst other reforms. For the 2016/17 farming season, 900,000 farmers have received coupons, compared to 1.5 million in previous years (Logistics Unit, GoM 2017). These farmers are being chosen from a pool of 4.2 million maize farmers who did not receive the subsidy in the 2015/16 season. Other reforms include distributing the subsidized inputs through primarily private agricultural input suppliers, giving a fixed amount of subsidy, MK 15,000 per beneficiary, and allowing the market to determine the actual price of maize seeds and fertilizer. For the 2017/18 season, the FISP is to focus not on resource-constrained smallholder farmers but on those who have productive capabilities, that is, those that cultivate two or more acres of land. Correspondingly, this study regards households with land above the median (1.5 acres) as those with more productive capacity.

Despite the proposed reform for the 2016/17 farming season, alternative policy options regarding FISP targeting and implementation are still under discussion.[11] These policy options envisage the targeting of poor and less poor agricultural households in different proportions, ranging from the exclusive targeting of smallholder farmers at the bottom of the poverty and wellbeing distribution to the exclusive targeting of farmers that have productive capabilities, including sufficient land and labour, and are more commercially-oriented.

### 4.4. Extension services

The state of agricultural extension services in Malawi is considered very weak but Malawian experts suggest that strengthened extension services could potentially have sizable impacts on agricultural productivity. There are approximately 15 extension workers per planning area. In the Lilongwe district there are 19 planning areas, so approximately 285 workers. If there are approximately 1 million people in this district, and according to IHS3 47% engage in agriculture, there is only one extension worker for every 1,650 farmers. According to IHS3 data, only 23% of households report having had a government extension worker give them advice during the previous rainy season (2008-2009). According to a representative from the MoAIWD, visits with an extension officer can help improve yields 60%-80%. Data from the IHS3 has been sued to estimate the effect of extension services on targeted farmers in Malawi.

### 4.5. Irrigation projects

The Government desires to invest considerably in scaling-up irrigation but currently does not devote significant resources to this policy. According to the IHS3 data, 17% of agricultural households reported having access to irrigation. The Department of Irrigation (DOI) stated that

[11] Authors' discussions with a representative from the Ministry of Agriculture, Irrigation and Water Development.

approximately 104,000 hectares of land were irrigated as of 2014/15. FAOSTAT, FAO's statistical databases, states that of the agricultural land in the country, only 1.3% is irrigated (2011). Several irrigation plans were implemented as part of the ASWAp plan 2011-2015. One of the plan's main aim was to increase sustainable irrigation to 280,000 hector or 4% of total agricultural land. A partner in this aim has been the Rural Livelihood and Agricultural Development Project (IRLAD), a joint project by the World Bank, IFAD and the Government. Agricultural intensification through irrigation has the potential to quadruple yields and provide at least two harvests per hectare to small farmers in a given year. A number of studies show that farmers involved in irrigation schemes in Malawi were more food self-sufficient and economically better off than farmers in rain-fed agriculture. At the time of design of the IRLAD project, the total formal or semi-formal irrigated area in Malawi was about 28,000 hectares (compared with a potential of up to 0.5 million hectares), of which 6,500 hectare were under self-help small holder schemes (farms with less than 10 hectares), 3,200 hectare were under Government-run smallholder schemes, and 18,300 hectare were in estates (farms with 10-500 hectares).

## 5. Household groups

The LEWIE analysis requires a practical household taxonomy in order to carry out simulations and compare outcomes across beneficiary and non-beneficiary household groups.

All households in rural Malawi were organized into the following categories, as shown in Table 2: Category I (non-poor), II (moderately poor labour unconstrained), III (moderately poor labour constrained), IV (ultra-poor labour unconstrained), and V (ultra-poor labour constrained). Each of these, in turn, was split into two sub-categories to take into account land possession. The non-poor households (I) are split into those with land above the median (~1.5 acres or ~0.6 hectares) (A) and land below the median (B). The moderately poor were split into four groups: Labour unconstrained (C) and labour constrained (D) with land above the median, and labour unconstrained and constrained with land below the median (E and F, respectively). The ultra-poor group was similarly disaggregated into labour unconstrained with land above the median (G) and below the median (H), and labour constrained with land above the median (I) and with land below the median (J). A cutoff of 1.5 acres was used to distinguish land-constrained from land-unconstrained households. Based on the IHS3 data on production and landholding size, we judged that dividing households by median landholding size was a reasonable criterion for determining land constraints.

In all, there are ten household groups in the LEWIE model. The underlying assumption behind this household taxonomy is that both poverty, labour availability and access to land are key factors influencing programme impacts. This is an important nuance, especially for the LEWIE analysis on combined interventions.

**Table 2. Household Taxonomy**

| | | | Land above 1.5 acres | Land below 1.5 acres |
|---|---|---|---|---|
| **Non poor** | | I | A | B |
| **Moderately poor** | Labour Unconstrained | II | C | E |
| | Labour Constrained | III | D | F |
| **Ultra poor** | Labour Unconstrained | IV | G | H |
| | Labour Constrained | V | I | J |

Descriptive statistics generated from IHS3 data across a variety of variables for each household group are given in Appendix B. A subset of these statistics are given below in Table 3.[12] As expected, labour constrained households have higher dependency ratios and shares of ill and/or disabled members. However, it is important to note that land size more accurately reflects average expenditures; the poor household groups (non-poor, moderately poor and ultra-poor) that cultivate less land have lower average expenditures, but within poverty groups labour constrained households are not necessarily poorer than those with labour.[13]

**Table 3. Descriptive Statistics across Household Groups**

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| | Non-poor HH with land >= 1.5 acres | Non-poor HH with land < 1.5 acres | Moderately poor HH with unconstrained labour and land >= 1.5 acres | Moderately poor HH with constrained labour and land >= 1.5 acres | Moderately poor HH with unconstrained labour and land < 1.5 acres | Moderately poor HH with constrained labour and land < 1.5 acres | Ultrapoor HH with unconstrained labour and land >= 1.5 acres | Ultrapoor HH with unconstrained labour and land < 1.5 acres | Ultrapoor HH with constrained labour and land >= 1.5 acres | Ultrapoor HH with constrained labour and land < 1.5 acres |
| **Socio-demographics** | | | | | | | | | | |
| HH size | 4.28 | 3.33 | 4.87 | 6.04 | 4.04 | 4.83 | 5.42 | 4.68 | 6.70 | 5.56 |
| Percent of total rural households | 17% | 30% | 4% | 3% | 8% | 9% | 6% | 11% | 5% | 7% |
| Percent of HH where the head attended school | 25% | 31% | 19% | 16% | 20% | 15% | 11% | 16% | 7% | 12% |
| Percent of HH that are female headed | 23% | 30% | 12% | 30% | 18% | 49% | 14% | 18% | 30% | 50% |
| Percent of HH where the head is unfit SHWR and/or chronically ill | 10% | 12% | 3% | 21% | 3% | 28% | 2% | 2% | 14% | 18% |
| Dependency ratio | 2.62 | 2.36 | 2.29 | 4.17 | 2.19 | 4.00 | 2.43 | 2.38 | 4.37 | 4.23 |
| **Crops** | | | | | | | | | | |
| Total value of crop harvest | 142,725 | 68,618 | 136,109 | 139,210 | 61,779 | 62,096 | 95,129 | 47,521 | 97,174 | 49,396 |
| Yields (output value per acre) | 57,859 | 76,644 | 55,262 | 53,849 | 69,377 | 68,890 | 40,695 | 54,663 | 40,849 | 57,578 |
| Land cultivated in acres | 2.50 | 0.93 | 2.50 | 2.63 | 0.92 | 0.97 | 2.40 | 0.94 | 2.44 | 0.94 |
| **Livestock** | | | | | | | | | | |
| Value of livestock owned now and livestock byproducts from last 12 months | 267,216 | 45,530 | 93,609 | 26,312 | 210,068 | 75,429 | 61,837 | 15,471 | 98,410 | 22,540 |
| **Household Enterprise** | | | | | | | | | | |
| HH annual own business sales | 176,946 | 329,225 | 66,197 | 41,427 | 59,407 | 65,659 | 25,109 | 27,495 | 35,788 | 25,781 |
| HH annual own business profits | 65,493 | 151,708 | 28,217 | 18,226 | 24,174 | 28,632 | 11,556 | 11,381 | 20,972 | 13,207 |
| **Expenditures** | | | | | | | | | | |
| HH annual expenditures on food | 787,094 | 658,818 | 352,185 | 433,464 | 293,401 | 350,364 | 211,723 | 180,881 | 249,983 | 205,462 |
| HH annual expenditures | 1,029,945 | 857,447 | 434,014 | 534,353 | 356,207 | 430,831 | 249,805 | 215,415 | 300,283 | 245,691 |
| **Income** | | | | | | | | | | |
| HH annual income | 962,455 | 1,194,584 | 627,862 | 670,878 | 492,604 | 482,230 | 512,174 | 343,268 | 466,474 | 351,133 |

Notes: All values are in 2016 MK yearly averages by household group

[12] Although income is reported as well as expenditures, consistent with other literature in Malawi (e.g. Meerendonk, Cunha, and Juergens, 2015), and believing it more accurately reflects actual income, we use yearly total expenditure as our baseline income for analysis.

[13] Across all households, households that are labour constrained have lower expenditures and income than labour unconstrained households.

# 6. Construction of the LEWIE model

Data from the IHS3 were used to construct the LEWIE model. Specifically, we used econometric regressions to estimate production functions for each sector (crops, livestock, retail, services, non-farm production) and expenditure functions for each good and household group (see Tables 3 and 4). The survey data were also used to obtain starting values of all variables in the model: inputs and output by production sector and incomes and expenditures by good for each household group. Combining the production and expenditure equations gives us an agricultural household model for each of the ten household groups. Market-clearing conditions link these households together into a LEWIE model for rural Malawi, which we used to simulate the rural economy-wide impacts of alternative individual and combined interventions.

## 6.1. Modelling household production

Table 4 reports the econometric estimates of production parameters by sector and household group. Production functions embody the technologies used to turn family and hired labour, land, capital, and purchased inputs like fertilizer into outputs for each production activity. Overall, households in rural Malawi use similar technologies to produce a given type of good. For example, there are no major differences in labour or merchandise purchases per MK of sales in rural stores. However, there are some differences in technologies for crop production between poor and non-poor households. Table 4 presents crop parameter estimates for each of these two broad groups of households.[14]

Ultra-poor household crop production is intensive in labour but not in capital or purchased inputs. The estimated parameters are the shares of factors in value added. (They also represent the elasticity of output with respect to each factor.) Labour accounts for 47% of crop value-added in non-poor and moderately poor households, but 85% in ultra-poor households. In non-poor and relatively poor households, purchased inputs account for just over 11% of crop value-added, compared with 8.3% in ultra-poor households. Capital (machinery and tools) accounts for 11% of value-added in non-poor and moderately-poor households but only 1% in ultra-poor households.

Livestock production is much less labour intensive than crop production, and it is much more intensive in land and capital (including investment in herds). Retail is intensive in capital (including investments in inventory), though less so in ultra-poor household retail businesses.

[14] For each production function we regressed the log of the output on the factor inputs, with dummy variables controlling for different household groups and interaction terms of the household groups with the factor inputs. Standard errors are not reported for some factors whose value-added shares were calculated as residuals assuming constant returns to scale. For inputs that may have zero values, following the World Bank study on poverty in Malawi (Forthcoming) and D'Souza and Jolliffe (2014) we use the inverse hyperbolic sine transformation (IHST) instead of the log transformation. IHST is a logarithmic-like transformation that enables negative as well as zero-valued observations and enables the coefficients to be interpreted as elasticities.

Services and non-farm production are more labour -intensive than retail or livestock production but less so than crops.

These estimates are consistent with what one would expect and also with production parameters in other LEWIE models for sub-Saharan Africa. They highlight that changes in production create important labour market linkages, particularly in crop, service, and non-agricultural production activities. Changes in the supply and demand for retail goods have smaller, but still important, employment effects: Labour accounts for just over a quarter of value-added in rural stores.

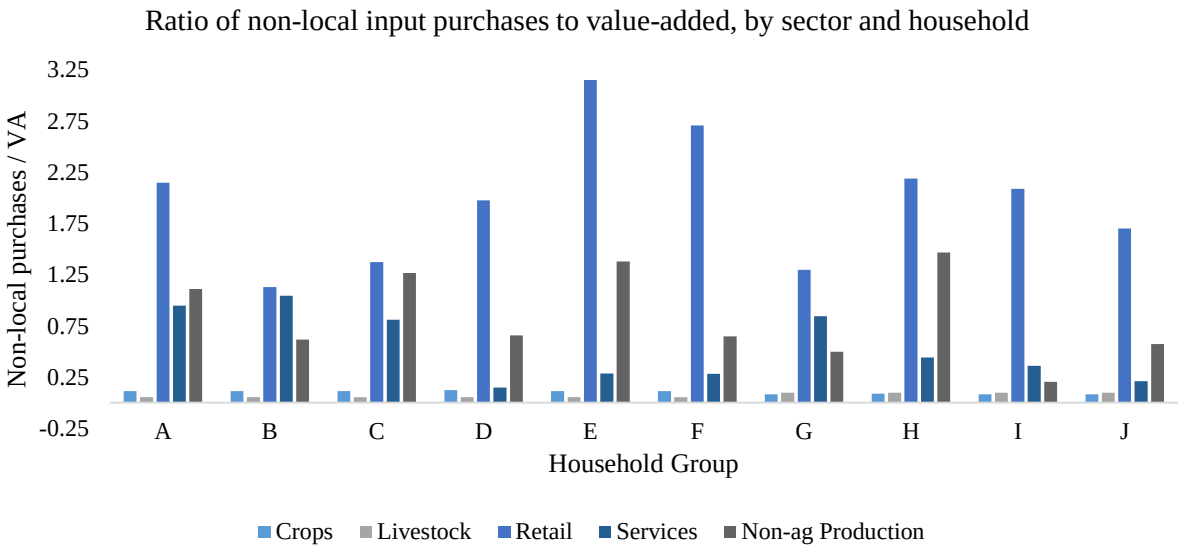
As sectors increase production they purchase inputs inside or outside the local economy. Purchases inside the local economy create local income linkages that contribute to the multiplier effects of production increases. Purchases outside the local economy transmit impacts to urban areas inside Malawi or to the rest of the world. A useful index of local versus outside input linkages is the ratio of MK outlays on inputs to total value-added in each sector. The figures below use data on locations from the SCT impact evaluation of Thome et al. (2015). Figure 2 shows these ratios for input purchases outside the rural economy by all five sectors. Figure 3 shows the same but for inputs purchased inside the rural economy. Detailed data appear in Appendix B.

## Table 4. Estimated Production Parameters, by Household Group

| Sector/Factor | Non-poor | Moderately Poor | Ultrapoor |
|---|---|---|---|
| | Unconstrained & Constrained Labor | Unconstrained & Constrained Labour | Unconstrained & Constrained Labor |
| | All Land Sizes | All Land Sizes | All Land Sizes |
| | A, B | C,D,E, F | G, H, I, J |
| **Crops** | | | |
| *Estimated Parameters* | | | |
| HL | 0.116 | 0.116 | 0.297 |
| FL | 0.358 | 0.358 | 0.559 |
| LAND | 0.300 | 0.300 | 0.073 |
| K | 0.113 | 0.113 | 0.010 |
| PURCH | 0.114 | 0.114 | 0.083 |
| *Standard Errors* | | | |
| HL | 0.015 | 0.015 | 0.030 |
| FL | 0.030 | 0.030 | 0.056 |
| LAND | 0.036 | 0.036 | 0.092 |
| K | 0.013 | 0.013 | 0.013 |
| PURCH | 0.009 | 0.009 | 0.011 |
| C-D Shift Parameter | 6.778 | 6.686 | 5.636 |
| Standard Error | 0.151 | 0.154 | 0.271 |
| **Livestock** | | | |
| *Estimated Parameters* | | | |
| HL | 0.132 | 0.132 | 0.132 |
| FL | 0.102 | 0.102 | 0.102 |
| LAND | 0.434 | 0.434 | 0.434 |
| K | 0.278 | 0.278 | 0.258 |
| PURCH | 0.055 | 0.055 | 0.099 |
| *Standard Errors* | | | |
| HL | 0.032 | 0.032 | 0.032 |
| FL | | | |
| LAND | 0.032 | 0.032 | 0.032 |
| K | 0.004 | 0.004 | 0.010 |
| PURCH | 0.019 | 0.019 | 0.017 |
| C-D Shift Parameter | 6.965 | 6.965 | 6.965 |
| Standard Error | 0.094 | 0.094 | 0.094 |
| **Retail** | | | |
| *Estimated Parameters* | | | |
| HL | 0.107 | 0.107 | 0.107 |
| FL | 0.158 | 0.158 | 0.158 |
| K | 0.736 | 0.477 | 0.477 |
| *Standard Errors* | | | |
| HL | 0.040 | 0.040 | 0.040 |
| FL | 0.038 | 0.038 | 0.038 |
| K | | | |
| C-D Shift Parameter | 5.737 | 8.330 | 8.330 |
| Standard Error | 0.577 | 0.323 | 0.323 |
| **Services** | | | |
| *Estimated Parameters* | | | |
| HL | 0.222 | 0.222 | 0.222 |
| FL | 0.149 | 0.149 | 0.149 |
| K | 0.629 | 0.629 | 0.629 |
| *Standard Errors* | | | |
| HL | 0.053 | 0.048 | 0.048 |
| FL | 0.080 | 0.045 | 0.045 |
| K | | | |
| C-D Shift Parameter | 9.919 | 9.919 | 9.919 |
| Standard Error | 0.024 | 0.024 | 0.024 |
| **Non-farm Production** | | | |
| *Estimated Parameters* | | | |
| HL | 0.183 | 0.183 | 0.183 |
| FL | 0.294 | 0.294 | 0.294 |
| K | 0.523 | 0.472 | 0.472 |
| *Standard Errors* | | | |
| HL | 0.045 | 0.045 | 0.045 |
| FL | 0.048 | 0.048 | 0.048 |
| K | | | |
| C-D Shift Parameter | 7.953 | 7.953 | 7.953 |
| Standard Error | 0.358 | 0.358 | 0.358 |

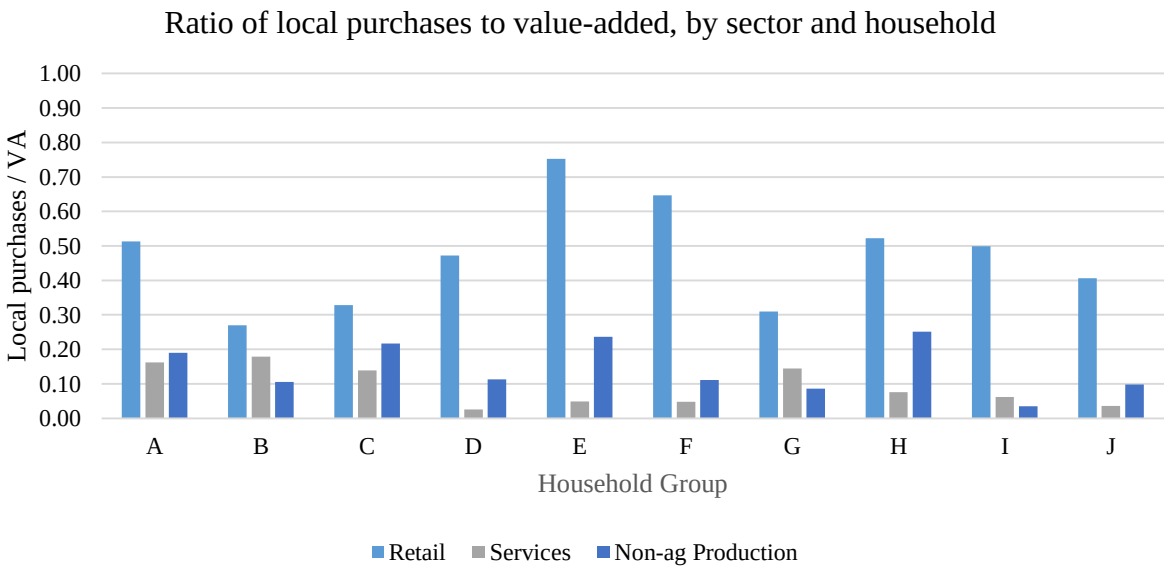
Note: HL is hired labour, FL is family labour, K is capital, PURCH is purchased inputs, and C-D is Cobb Douglas. Many of the interaction terms in the pooled regressions used to determine differences in production function parameters across household groups were insignificant. Thus, there are similarities across household groups for parameter estimates. This is not surprising given that one would not expect technology to change too much for similar households in a given activity. This may also be due to insufficient data to determine differences.

**Figure 2. Figure 2. Ratio of Non-local Input Purchases to Value-added, by Sector and Household**




Source: SCT impact data Thome et al (2015)

**Figure 3. Ratio of Local Purchases to Value-added, by Sector and Household**




Source: SCT impact data Thome et al (2015)

Household groups: A-Non-poor with land >= 1.5 acres, B- Non-poor with land < 1.5 acres, C- Moderately poor with unconstrained labour and land >= 1.5 acres, D- Moderately poor with constrained labour and land >= 1.5 acres, E- Moderately poor with unconstrained labour and land < 1.5 acres, F- Moderately poor with constrained labour and land < 1.5 acres, G-Ultra-poor HH with unconstrained labour and land >= 1.5 acres, H-Ultra-poor HH with unconstrained labour and land < 1.5 acres, I-Ultra-poor HH with constrained labour and land >= 1.5 acres, j-Ultra-poor HH with constrained labour and land < 1.5 acres.

Figure 2 shows that retail activities have by far the strongest linkages outside the rural economy. Retail businesses (see tall gray bars) spend MK 1.13 to 3.15 on merchandise purchased outside the rural economy per MK of value-added they generate. In contrast, crop producers (light blue bars) purchase only MK 0.09 to 0.11 in outside inputs per MK of value-added generated (mostly fertilizer), and livestock producers have even smaller outside input demands. Nearly all of the linkages between these two sectors are with the local economy, through the wages they pay and the profits they generate.

Despite this outward focus, rural retail businesses generate some linkages through their purchases of merchandise and other inputs (e.g., services) in rural areas. The blue bars in Figure 3 reveal that rural stores and traders spend MK 0.27 to 0.75 on locally-supplied goods and services per MK of value-added they generate. The local-input linkages from services and non-agricultural production are smaller but nontrivial in most cases.

**Table 5. Intermediate Input Purchases by Sector, as Percentage of Sector Output**

| Purchasing/ Supplying Sector | Non-poor | | Moderately Poor | | | | Ultrapoor | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Unconstrained Labor | | Unconstrained Labour | Constrained Labour | Unconstrained Labour | Constrained Labour | Unconstrained Labor | | Constrained Labor | |
| | 1.5 acres or more | < 1.5 acres | Land >= 1.5 acres | Constrained labour and land >= 1.5 acres | Unconstrained labour and land < 1.5 acres | Constrained labour and land < 1.5 acres | Land >= 1.5 acres | Land < 1.5 acres | Land >= 1.5 acres | Land < 1.5 acres |
| | A | B | C | D | E | F | G | H | I | J |
| **Outside Purchases** | | | | | | | | | | |
| Crops | 0.11 | 0.11 | 0.11 | 0.12 | 0.11 | 0.11 | 0.08 | 0.09 | 0.08 | 0.08 |
| Livestock | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.10 | 0.10 | 0.10 | 0.10 |
| Retail | 2.15 | 1.13 | 1.37 | 1.98 | 3.15 | 2.71 | 1.30 | 2.19 | 2.09 | 1.70 |
| Services | 0.95 | 1.04 | 0.81 | 0.15 | 0.29 | 0.28 | 0.85 | 0.44 | 0.36 | 0.21 |
| Non-ag Production | 1.11 | 0.62 | 1.27 | 0.66 | 1.38 | 0.65 | 0.50 | 1.47 | 0.20 | 0.57 |
| **Loval Purchases** | | | | | | | | | | |
| Retail | 0.51 | 0.27 | 0.33 | 0.47 | 0.75 | 0.65 | 0.31 | 0.52 | 0.50 | 0.41 |
| Services | 0.16 | 0.18 | 0.14 | 0.03 | 0.05 | 0.05 | 0.14 | 0.08 | 0.06 | 0.04 |
| Non-ag Production | 0.19 | 0.11 | 0.22 | 0.11 | 0.24 | 0.11 | 0.09 | 0.25 | 0.03 | 0.10 |

Source: IHS3

## 6.2. Modelling household consumption

Household expenditure patterns determine how changes in household incomes translate into changes in the demand for goods and services supplied inside and outside the rural economy. Table 6 reports estimates of expenditure-function parameters for each of the household groups. The marginal budget shares tell us the share of an additional MK of income each household groups spends on each good.

The largest shares in all household groups are on crops (0.18 to 0.35), which are also the most labour-intensive of the production activities, and retail goods (0.40 to 0.58). High expenditure

shares on crops mean that increases in rural incomes potentially stimulate crop production. Because crop production is labour intensive, increases in crop production generate demand for rural labour and income in households that supply labour to farms. When these households' income rises, so does their demand for goods and services. This creates additional rounds of increases in rural production, incomes, and demand.

A large part of income increases goes to purchase goods from rural stores (retail). The retail sector purchases much of its merchandise outside the rural economy; thus, increases in consumer demand for retail goods creates a leakage of income out of the rural economy. This transmits impacts to other parts of Malawi, and abroad. Nevertheless, wages paid to retail workers, together with profits, remain inside the rural economy, creating additional rounds of income and production increases there.

**Table 6. Household Expenditures**

| Sector/Factor | Non-poor | | Moderately Poor | | | | Ultrapoor | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Unconstrained Labor | | Unconstrained Labour | Constrained Labour | Unconstrained Labour | Constrained Labour | Unconstrained Labor | | Constrained Labor | |
| | 1.5 acres or more | < 1.5 acres | Land >= 1.5 acres | Constrained labour and land >= 1.5 acres | Unconstrained labour and land < 1.5 acres | Constrained labour and land < 1.5 acres | Land >= 1.5 acres | Land < 1.5 acres | Land >= 1.5 acres | Land < 1.5 acres |
| | A | B | C | D | E | F | G | H | I | J |
| Marginal Budget Shares | | | | | | | | | | |
| crop | 0.320 | 0.180 | 0.349 | 0.320 | 0.271 | 0.320 | 0.320 | 0.393 | 0.320 | 0.320 |
| live | 0.054 | 0.040 | 0.054 | 0.079 | 0.005 | 0.054 | 0.088 | 0.054 | 0.054 | 0.054 |
| ret | 0.453 | 0.580 | 0.405 | 0.453 | 0.453 | 0.453 | 0.453 | 0.453 | 0.471 | 0.453 |
| ser | 0.081 | 0.093 | 0.081 | 0.053 | 0.081 | 0.055 | 0.039 | 0.034 | 0.042 | 0.081 |
| prod | 0.033 | 0.033 | 0.033 | 0.033 | 0.037 | 0.033 | 0.033 | 0.033 | 0.049 | 0.033 |
| Standard Errors | | | | | | | | | | |
| crop | 0.005 | 0.008 | 0.010 | 0.005 | 0.005 | 0.005 | 0.005 | 0.004 | 0.005 | 0.005 |
| live | 0.002 | 0.002 | 0.002 | 0.007 | 0.007 | 0.002 | 0.011 | 0.002 | 0.002 | 0.002 |
| ret | 0.005 | 0.007 | 0.011 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.009 | 0.005 |
| ser | 0.002 | 0.002 | 0.002 | 0.007 | 0.002 | 0.005 | 0.010 | 0.011 | 0.008 | 0.002 |
| prod | 0.001 | 0.001 | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.001 | 0.007 | 0.001 |
| Rest-of-Malawi Expenditure Shares | 0.060 | 0.067 | 0.075 | 0.083 | 0.060 | 0.083 | 0.060 | 0.060 | 0.060 | 0.060 |
| Sum of Budget Shares | 1.002 | 0.993 | 0.997 | 1.021 | 0.908 | 0.998 | 0.994 | 1.027 | 0.997 | 1.002 |

# 7. Policy options and simulation results

The following section outlines the various policy options studied, as well as key findings of each set of options, which have been defined on the basis of ongoing policy discussions in Malawi's social protection and agricultural sectors.

## 7.1. Social protection interventions

### 7.1.1 Policy options for the SCT LEWIE

The stand-alone SCT LEWIE policy options are presented below and summarized in Table 7.

1) Maintain the status quo: SCT to all ultra-poor and labour-constrained households (category V (I and J)), at current transfer amount.

This policy option aims to reflect the current implementation of SCT. It consists of providing regular transfers of 4, 7, 10 or 13 US dollars per month (respectively for HH with 1, 2, 3 or 4+ members) to all ultra-poor and labour constrained households.

2) Target all ultra-poor households (categories IV (G, H) and V (I, J)), maintaining current transfer amount.

Policy option 2) extends the transfers to all ultra-poor households, including those with labour capacity. It maintains the same transfer amount of policy option 1).

3) Target all ultra and moderately-poor labour-constrained households (categories III (D, F) and V (I, J)), maintaining current transfer amount.

Policy option 3) extends the transfers to all moderately poor labour-constrained households, in addition to the ultra-poor labour constrained. It maintains the transfer amount of policy option 1).

4) Target all ultra-poor households (categories V (I, J) and IV (G, H)), with a transfer amount increased by the monetary value of the FISP

Policy option 4) increases the amount of transfers targeted to all ultra-poor households. In this case the transfer amount would be equal to the sum of the current amount (as in option 1, 2 and 3) plus the monetary value of FISP in-kind transfer as reported for the amount for the status quo simulation for FISP (Option 1 for the FISP).

5) Target ultra-poor labour-constrained households (categories V (I,J)), with a transfer amount increased by the monetary value of the FISP

Similar to option 1), option 5) increases the transfers to the sum of the current amount (as in option 1, 2 and 3) plus the monetary value of FISP in kind transfer (the amount in option 1 for the FISP).

**Table 7. SCT Policy Options: Targeting, Coverage and Level of Benefits**

| | Category | Description | Coverage as % of total number of households | Benefit per month in USD | Total transfer cost without administrative cost in 2016 MK |
|---|---|---|---|---|---|
| **Option 1 (status quo by end of 2017)** | V (I, J) | Regular transfers to <u>all</u> ultra-poor and labour -constrained HH | Approx. 12 percent of the total number of HHs, about 330,000 HH. | 1 4<br>2 7<br>3 10<br>4+ 13 | 27.7 billion MK |
| **Option 2 (all ultra-poor HHs)** | IV (G, H)<br>V (I, J) | Regular transfers to <u>all</u> ultra-poor HH | Approx. 29 percent of the total number of HHs, about 820,000 HH. | See option 1 | 68.8 billion MK |
| **Option 3 (all poor labour-constrained HHs)** | III (D, F)<br>V (I,J) | Regular transfers to <u>all</u> ultra-poor and moderately poor | Approx. 20 percent of the total number of HHs, about 560,000 HH. | See option 1 | 56.1 billion MK |

| | | | | | |
|---|---|---|---|---|---|
| | | labour-constrained HH | | | |
| **Option 4 (all ultra-poor HHs + FISP value)** | IV (G, H)<br>V (I, J) | Transfers with the current amount plus the monetary value of FISP to all ultra-poor HH | Approx. 29 percent of the total number of HHs, about 820,000 HH. | See option 2 + Monetary value of the FISP | 100.3 billion MK |
| **Option 5 (all ultra-poor labour-constrained HHs + FISP value)** | V (I, J) | Transfers with the monetary value of FISP to all ultra-poor labour-constrained households | Approx. 12 percent of the total number of HHs, about 330,000 HH. | See option 1 + Monetary value of the FISP | 59.2 billion MK |

### 7.1.2. Key findings for the SCT

Table 8 presents the multiplier effects of the SCT and Table 9 presents the percentage impacts on income and production under options 1 through 5.[15] The multipliers in Table 8 take into account programme costs; they represent the MK increase in each income and production outcome per MK transferred to eligible households. The percentage impacts in Table 9 are benefits but do not reflect costs of the SCT under different scenarios. Detailed multiplier and percentage tables that include disaggregation by household and additional production by poverty status, are in Appendix B.

Figure 4 summarizes the multiplier effects of the SCT on income, which are derived from the numbers in the table. The bars show the impacts on real (inflation-adjusted) income of each poverty status group (ultra-poor, moderately-poor, and non-poor) that result from a 1 MK increase in the SCT to the eligible households, under each of the five policy options outlined in Table 6. The figure illustrates nicely the income spillovers created by the SCT in rural Malawi.[16] Five general findings emerge from our simulations.

First, the SCT creates large income spillovers. Under all options considered, the increases in total income substantially exceed the amount transferred. If the income gains for all groups are added up (the sum of the bars in Figure 7.1), total real income multipliers range from MK 1.88 to MK 1.91 (the percent impact on real income ranges from 5.06% to 16.93%). Real multipliers (percentages) are smaller than nominal ones because the increase in demand stimulated by the SCT potentially puts some upward pressure on prices, which affect all household groups. All total income multipliers are significantly greater than 1.0, as evident in the 95% confidence intervals around total nominal and real income multipliers in Table 8. In short, the most conservative estimates show that total real (inflation-adjusted) income in rural Malawi increases by between 1.88 and 1.91 MK per MK transferred. If measures (e.g., productive interventions) can be taken to avoid price increases, these multipliers could rise to as high as

[15] All of the simulation results presented below are "comparative static," meaning that they compare end-point outcomes with the policy or policy combinations to a baseline in which the policy or policies are not implemented. They do not tell us how long it would take to reach these outcomes, though the time period used to construct the model is always one year.

[16] Real income multipliers show that under all simulations, for each 1-MK spent, real income rises by more than 1-MK in the local economy

2.9 to 3.06 MK per MK transferred; thus for every 1 MK spent on transfers 1 MK plus an additional 1.9 to 2.06 MK in nominal income is generated in rural Malawi.

Second, most SCT spillovers go to households that are not eligible for cash transfers. The two non-poor household groups (A and B), do not receive cash transfers under any of the five options, yet their incomes increase. Group A's real income rises by around MK 0.19 to 0.2 per MK transferred to eligible households, while Group B's income rises by MK 0.39 to 0.42, depending on the programme considered. The total impact on non-beneficiary households is MK 0.73 to 0.88 per MK transferred to eligible households, adjusting for inflation (MK 1.48 to 1.85 if prices do not change). All of these spillover impacts are indirect, completely missed by evaluations focusing only on SCT-eligible households. It is not surprising that the largest shares of spillovers accrue to the non-poor groups, because they have more resources to increase their supply of goods and services when local demand increases as a result of the SCT. The income gains to non-poor households rival or exceed the gains to direct beneficiary household, though they also benefit directly from receiving cash. The two moderately poor labour unconstrained groups (C and E), who are never direct beneficiaries under the various options considered, also benefit from indirect spillovers, though their income gains are smaller, on the order of MK 0.03 per MK transferred to eligible households, an increase of real income ranging from 1.6% to 7.61%. The eligible household groups benefit both directly and indirectly from cash transfers. Adding across eligible households, the SCT real income multipliers on eligible households are always positive. However, most of the income benefits to transfer-eligible households are direct; that is, they are in the form of the cash transfers themselves.

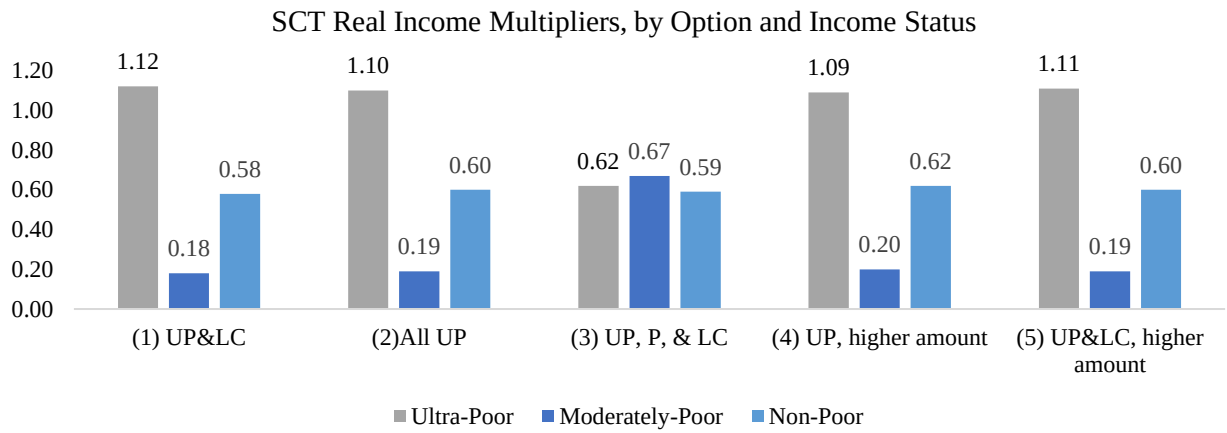
Third, total income multipliers are similar across the five options, but the distribution of income gains across household groups depends upon who gets the transfers. Non-poor households (A and B) benefit significantly under all five options. So do the moderately poor labour constrained with land (group D), particularly when they receive cash (option 3) as well as spillovers. This appears due to the fact that the groups with more land on average have the resources to expand production and thus benefit from spillovers, e.g., by increasing their local crop and livestock sales. The income gains to the other groups depend mostly upon whether or not the groups are targeted for the SCT. Ultra-poor groups I and J benefit under all options. Groups G and H benefit under options 2 and 4. Group F benefits under option 3. Different household groups spend their income differently (Table 5), and this shapes the spillovers resulting from different SCT options.

Fourth, the larger the cash transfer the greater the impacts to the beneficiary groups and indirect spillovers. When the SCT transfer is increased by the amount currently provided through FISP under options 4 and 5, the targeted impacts and spillovers substantially increase. For example, option 4 gives a larger amount of cash to ultra-poor households (G, H, I and J) than these groups receive under option 2. The result is to increase real income effects from a range of 36.63% to 54.97% to a range of 52.71% to 78.79%. Spillover effects also increase from option 2 to option 4; real income increases for non-poor households A and B from 4.71% and 6.88% to 7.08% to 10.36%, respectively. Option 5 shows a similar substantial increase vis-à-vis the status-quo option 1 except that more cash is given to those who currently receive transfers, the labour

constrained ultra-poor households (I and J). This increase in cash results in almost triple the impact on household income than under option 1.

Fifth, SCT have productive impacts for both beneficiaries and non-beneficiaries. Despite being targeted to poor and vulnerable households, all households increase production of crops, livestock, retail, service and production goods. As expected, the larger the cash transfer the more the percentage increase in production. This is due to linkages in the local economy whereby the increase in cash allows beneficiary households to demand more goods and services in the local economy. This in turn puts some upward pressure on the prices of agricultural and non-agricultural products, stimulating their supply by all households. Per MK of cash transfer, productive impacts are generally larger for non-beneficiaries - particularly the non-poor household who benefit from increase in local demand - and originate primarily from an increase in retail production. There are also positive productive impacts for beneficiaries, including for the ultra-poor. These are mainly in crop production for beneficiaries, and larger when households with labour capacity are targeted.

**Figure 4. SCT Real Income Multipliers, by Option and Income Status**




Notes: SCT simulated options: (1) UP&LC – all ultra-poor and labour constrained households. (2) All UP – all ultra-poor households. (3) UP, P, & LC – all ultra-poor and moderately poor labour constrained households. (4) UP, higher amount – all ultra-poor households plus the value of the FISP. (5) UP&LC, higher amount - all ultra-poor households who are labour constrained plus the value of the FISP.

**Table 8. Multiplier Impacts of SCT under Five Options**

| Household | Multipliers | | | | |
|---|---|---|---|---|---|
| | Option | | | | |
| | (1) UP&LC | (2)All UP | (3) UP, P, & LC | (4) UP, higher amount | (5) UP&LC, higher amount |
| Total Income Multiplier | | | | | |
| Nominal | 2.90 | 2.99 | 2.93 | 3.06 | 2.96 |
| (CI) | ( 2.76- 3.09) | ( 2.84- 3.21) | ( 2.78- 3.14) | ( 2.88- 3.30) | ( 2.80- 3.17) |
| Real | 1.88 | 1.90 | 1.88 | 1.91 | 1.89 |
| (CI) | ( 1.80- 1.99) | ( 1.81- 2.03) | ( 1.79- 2.00) | ( 1.81- 2.04) | ( 1.80- 2.01) |

| | | | | | |
|---|---|---|---|---|---|
| Total Beneficiary Income Multiplier | | | | | |
| Nominal | 1.11 | 1.31 | 1.46 | 1.32 | 1.11 |
| Real | 1.03 | 1.10 | 1.15 | 1.09 | 1.01 |
| Total Non-Beneficiary Income Multiplier | | | | | |
| Nominal | 1.79 | 1.69 | 1.48 | 1.74 | 1.85 |
| Real | 0.85 | 0.80 | 0.73 | 0.82 | 0.88 |
| Total Ultra-Poor Income Multiplier | | | | | |
| Nominal | 1.29 | 1.31 | 0.79 | 1.32 | 1.30 |
| Real | 1.12 | 1.10 | 0.62 | 1.09 | 1.11 |
| Total Moderately-Poor Income Multiplier | | | | | |
| Nominal | 0.45 | 0.48 | 0.97 | 0.49 | 0.47 |
| Real | 0.18 | 0.19 | 0.67 | 0.20 | 0.19 |
| Total Non-Poor Income Multiplier | | | | | |
| Nominal | 1.15 | 1.21 | 1.18 | 1.25 | 1.19 |
| Real | 0.58 | 0.60 | 0.59 | 0.62 | 0.60 |
| Production Multipliers | | | | | |
| Total | 1.94 | 1.96 | 1.93 | 1.98 | 1.95 |
| Beneficiary Households | 0.19 | 0.56 | 0.36 | 0.59 | 0.20 |
| Non-Beneficiary | 1.75 | 1.41 | 1.57 | 1.39 | 1.75 |
| Ultra-Poor | 0.51 | 0.56 | 0.53 | 0.59 | 0.53 |
| Moderately-Poor | 0.25 | 0.25 | 0.25 | 0.24 | 0.25 |
| Non-Poor | 1.18 | 1.16 | 1.15 | 1.14 | 1.16 |
| Production Multipliers by Sector | | | | | |
| crop | 0.63 | 0.67 | 0.64 | 0.69 | 0.65 |
| livestock | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| retail | 0.95 | 0.94 | 0.93 | 0.94 | 0.94 |
| services | 0.20 | 0.18 | 0.19 | 0.18 | 0.20 |
| non-agricultural production | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Production Multipliers by Sector Beneficiary HHs | | | | | |
| crop | 0.15 | 0.46 | 0.22 | 0.49 | 0.17 |
| livestock | 0.01 | 0.02 | 0.03 | 0.02 | 0.01 |
| retail | 0.02 | 0.05 | 0.07 | 0.05 | 0.02 |
| services | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 |
| non-agricultural production | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | | | |
| crop | 0.48 | 0.21 | 0.42 | 0.20 | 0.48 |
| livestock | 0.08 | 0.07 | 0.06 | 0.07 | 0.08 |
| retail | 0.93 | 0.89 | 0.86 | 0.89 | 0.93 |
| services | 0.19 | 0.17 | 0.17 | 0.17 | 0.19 |
| non-agricultural production | 0.07 | 0.06 | 0.06 | 0.06 | 0.07 |

Notes: SCT simulated options: (1) UP&LC – all ultra-poor and labour constrained households. (2) All UP – all ultra-poor households. (3) UP, P, & LC – all ultra-poor and moderately poor labour constrained households. (4) UP, higher amount – all ultra-poor households plus the value of the FISP. (5) UP&LC, higher amount - all ultra-poor households who are labour constrained plus the value of the FISP.

## Table 9. Percentage Impacts of SCT under Five Options

| Percentage Changes | (1) UP&LC | (2)All UP | (3) UP, P, & LC | (4) UP, higher amount | (5) UP&LC, higher amount |
|---|---|---|---|---|---|
| Total Rural Income | | | | | |
| Nominal | 7.39% | 17.80% | 14.76% | 26.55% | 16.13% |
| (CI) | (7.04%, 7.86%) | (16.83%, 19.10%) | (13.99%, 15.81%) | (24.91%, 28.65%) | (15.30%, 17.26%) |
| Real | 5.06% | 11.57% | 9.82% | 16.93% | 10.82% |
| (CI) | (4.81%, 5.37%) | (10.88%, 12.43%) | (9.28%, 10.49%) | (15.84%, 18.22%) | (10.24%, 11.54%) |
| Total Beneficiary Income | | | | | |
| Nominal | 47.29% | 52.04% | 37.57% | 76.53% | 101.54% |
| Real | 44.11% | 44.03% | 31.66% | 63.23% | 92.41% |
| Total Non-Beneficiary Income | | | | | |
| Nominal | 4.38% | 11.38% | 9.34% | 17.17% | 9.69% |
| Real | 2.11% | 5.47% | 4.62% | 8.24% | 4.67% |
| Total Ultra-Poor Income | | | | | |
| Nominal | 23.51% | 52.04% | 28.40% | 76.53% | 50.66% |
| Real | 20.84% | 44.03% | 22.91% | 63.23% | 43.83% |
| Total Moderately-Poor Income | | | | | |
| Nominal | 3.68% | 9.58% | 19.76% | 14.37% | 8.08% |
| Real | 1.46% | 3.89% | 14.70% | 5.87% | 3.24% |
| Total Non-Poor Income | | | | | |
| Nominal | 4.61% | 12.01% | 9.54% | 18.16% | 10.20% |
| Real | 2.31% | 6.03% | 4.77% | 9.07% | 5.11% |
| Total Production | 4.39% | 11.24% | 8.91% | 16.56% | 9.51% |
| Beneficiary Households | 11.92% | 32.19% | 9.73% | 48.97% | 27.06% |
| Non-Beneficiary Households | 3.88% | 7.57% | 8.56% | 10.88% | 8.33% |
| Ultra-Poor Households | 11.73% | 32.19% | 24.74% | 48.97% | 26.43% |
| Moderately-Poor Households | 2.91% | 7.09% | 5.75% | 10.13% | 6.12% |
| Non-Poor Households | 3.21% | 7.84% | 6.36% | 11.30% | 6.78% |
| Production by Sector | | | | | |
| crop | 5.74% | 15.36% | 11.87% | 22.97% | 12.64% |
| livestock | 2.35% | 6.04% | 4.80% | 8.76% | 5.02% |
| retail | 3.88% | 9.60% | 7.75% | 13.90% | 8.26% |
| services | 3.10% | 7.24% | 6.11% | 10.57% | 6.64% |
| non-agricultural production | 3.93% | 9.46% | 7.69% | 13.87% | 8.44% |
| Production by Sector Beneficiary HHs | | | | | |
| crop | 19.69% | 53.27% | 13.50% | 81.99% | 45.25% |
| livestock | 2.72% | 6.97% | 4.87% | 10.19% | 5.80% |
| retail | 5.99% | 14.87% | 10.17% | 21.79% | 12.89% |
| services | 3.10% | 7.23% | 6.14% | 10.64% | 6.64% |
| non-agricultural production | 4.31% | 10.41% | 8.03% | 15.38% | 9.26% |
| Production by Sector Non-Beneficiary HHs | | | | | |
| crop | 4.53% | 5.27% | 11.07% | 7.26% | 9.81% |
| livestock | 2.33% | 5.89% | 4.76% | 8.53% | 4.96% |
| retail | 3.86% | 9.39% | 7.58% | 13.58% | 8.20% |
| services | 3.10% | 7.24% | 6.10% | 10.56% | 6.64% |
| non-agricultural production | 3.91% | 9.38% | 7.62% | 13.74% | 8.39% |

Notes: SCT simulated options: (1) UP&LC – all ultra-poor and labour constrained households. (2) All UP – all ultra-poor households. (3) UP, P, & LC – all ultra-poor and moderately poor labour constrained households. (4) UP, higher amount – all ultra-poor households plus the value of the FISP. (5) UP&LC, higher amount - all utra-poor households who are labour constrained plus the value of the FISP.

### 7.1.3 Policy options for the PWP LEWIE

The stand-alone PWP LEWIE policy options are presented below and summarized in Table 10.

1) Maintain the status quo: PWP to category II (C, E) and IV (G, H) households at current coverage (12%) and transfer levels. [17]

This PWP policy option reflects the current implementation of the programme, which consists of providing 490 MK (US $0.68) per day, 4 hours per day, and 48 days per year. This corresponds to a transfer income of approximately US $33 per year.

2) Ultra-poor targeting: Target category IV (G, H) at current transfer levels.

Simulate the rural economy-wide impact of improved targeting of the PWP. In this scenario the public works to ALL ultra-poor households with labour capacity (assuming no exclusion errors).

3) Increased duration of public works: Target categories II (C, E) and IV (G, H), current coverage but higher number of days

The targeted group and the coverage are identical to the first PWP policy option but the total number of days increased by twelve days. This implies a total transfer income of approximately US $41.

**Table 10. PWP Policy Options: Targeting, Coverage and Level of Benefits**

| | Category | Description | Coverage as percentage of total number of households | Benefit per day in USD | Total transfer cost without administrative costs in 2016 MK |
|---|---|---|---|---|---|
| **Option 1 (status quo by end of 2017)** | II (C,E)<br>IV (G, H) | Wages paid to 55% of moderately poor and ultra-poor labour - unconstrained HH | Approx. 16 percent of the total number of HHs, about 450,000 HH | 0.90 per day, 48 days of work | 13 billion MK |
| **Option 2 (ultra-poor labour-unconstrained HHs)** | IV (G, H) | Wages paid to 92% of ultra-poor labour - unconstrained HH | Approx. 16 percent of the total number of HHs, about 450,000 HH | See option 1 | 13 billion MK |
| **Option 3 (all poor labour-unconstrained HHs with more days)** | II (C,E) | Wages paid to 55% of moderately poor and ultra-poor labour - unconstrained HH | Approx. 16 percent of the total number of HHs, about 450,000 HH | 0.90 per day, 96 days of work | 25.9 billion MK |

[17] Coverage levels were obtained from the Local Development Fund of the Government of Malawi, http://www.ldf.gov.mw.

These simulations are similar to what was done for the SCT, but some take into account productivity impacts of public works projects.[18] PWP impacts were simulated as a combination of cash transfers to PWP participants and an increase in crop productivity resulting from the creation of public goods . PWPs transfers increase incomes and thus expenditures in the targeted households, setting in motion local economy-wide impacts captured by the LEWIE model. PWPs also create public goods, which can increase productivity, in particular crop productivity in households with access to land. It unclear how PWPs affect crop productivity through the creation of public goods, because before-and-after data are not available.[19]

The only study the authors are aware of that estimates impacts of PWP on incomes and productivity was carried out for the Ethiopia Productive Safety Net Programme (PSNP).[20] It found an average productivity impact of approximately 5%, with large variations across types of public works projects and localities (kebeles) in which the public works projects were carried out. The LEWIE model was used to simulate the rural economy-wide impacts of PWP with cash transfers only (options 1a, 2a, and 3a). Simulations that combined this with an assumed 5% increase in crop productivity (Options 1b, 2b, and 3b) were also run. Implicitly, the "a" options assume no productivity impact of PWP, and the "b" options assume a 5% productivity impact. These are likely to bracket the extremes of PWP impacts.

### 7.1.4. Key findings for PWPs

The results are summarized in Tables 11 and 12. Table 11 presents income multipliers, which as for the SCT multipliers only reflect transfer costs under the different scenarios. When benefits are higher such as under Options 3a and 3b, so are costs, thus income multipliers may not change. Table 12 presents percentage changes. Detailed multiplier and percentage results are in Appendix B.

Overall, the nominal income multiplier effects of PWPs are similar to those of the SCT, except if one assumes that PWPs can increase productivity through asset creation and skills transfers. Total nominal income multipliers for options (Table 11) are on the order of 2.9, meaning that each MK invested in the PWP increases total nominal income by 2.9 MK. However, real multipliers diverge from the SCT when land productivity for programmes is increased as in Options 1b, 2b, and 3b. This is due to additional benefits per MK of transfer generated by land

[18] PWPs also transfer skills to beneficiary households which they may transfer to their own farms and/or businesses. Due to the inherent heterogeneity of this knowledge transfer, the potential impact is not modelled.

[19] Beegle et al. 2017 finds that PWPs in Malawi do not have an impact on beneficiary households and perhaps negative spillovers to non-beneficiaries in villages that receive PWP wages, however the study does not look at the impact of the rural assets (mainly road construction and irrigation) created.

[20] Mateusz Filipski, J. Edward Taylor, Getachew Ahmed Abegaz, Tadele Ferede, Alemayehu Seyoum Taffesse, and Xinshen Diao (2016). Economy-wide impacts of the Productive Safety Net Programme (PSNP). ESSP RESEARCH NOTE 57 (July); http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/130466/filename/130677.pdf

productivity increases. The total real (price-adjusted) income multipliers range from 1.89 (Option 1a) to 3.24 (Option 1b).

The largest income gains are for the targeted household groups, however income spillovers to other household groups are also large and widespread. Targeted households benefit from the PWP transfers as well as from the spillovers these transfers create. But spillovers also reach to non-beneficiary households, including the non-poor. For every MK transferred the incomes of non-beneficiaries increase in real terms by between 0.8 and 1.9 MK. Real income multipliers are larger for non-beneficiaries when PWP increases productivity (Options b) as non-beneficiaries also benefit directly from higher productivity results from community assets that may have been created.

Production multipliers are large for both beneficiaries and non-beneficiaries and concentrated in the retail and crop sector. The increase in retail production derives primarily from the increased demand stimulated by the wage component, and benefit mostly non-beneficiaries who are the owners of more retail assets. The increase in crop production involves beneficiaries as well as non-beneficiary households and is higher when PWP also bring increased productivity through assets and skills.

The direct transfer (through wage) and productivity increase (through the creation of rural assets and training) effects of PWP are mutually reinforcing. The biggest impact of productivity growth is to increase real income, because food prices fall when productivity rises. Public works, by increasing the productivity of crop production, mitigate upward pressure on prices caused by the cash transfers. Price increases from increased demand are offset by falling prices due to increased supply. Production increases are especially high for crops. This simulation demonstrates the importance of creating effective public work assets (and transferring skills and knowledge through PWPs) to increase production and mitigate price inflation caused by cash transfers.

The magnitude of income and production effects of PWPs depends on the quality of assets and skills transferred and their relevance to increasing productivity in agriculture. If productivity increases are smaller in Malawi than the 5% estimated in Ethiopia's PSNP - for example because the quality or type of asset produced is not adequate, or there is no sufficient focus on skills transfers - total income under each option increases by a percentage amount that is in between the "a" and "b" scenarios.

Income and production effects are larger if PWPs are available for a longer period and/or provide a more generous wage. The largest percentage impacts (Table 11) occur under Option 3b, in which the PWP targets all poor labour-unconstrained HHs with the highest number of days and productivity increases as a result. Total income increases by 6.6% in nominal terms and 5.9% in real terms. This is the most expensive PWP scenario (it has the highest transfer value), however, and because of this, the real income multipliers with productivity change are higher under Options 1b and 2b than under 3b.

A narrower targeting of PWPs to ultra-poor with labour capacity has similar local economy effects but different distributional implications. Options 1 and 2 deliver income and production multipliers of similar magnitude but Option 2, which targets only ultra-poor with labour capacity but leaving the total number of affected households unchanged, produces larger percentage increases of the income and production of the ultra-poor.

**Table 11. Multiplier Impacts of PWPs under Three Options**

| Household | Multipliers | | | | | |
|---|---|---|---|---|---|---|
| | Options | | | | | |
| | Option 1a (status quo by end of 2017) | Option 1b (Option 1a with 5% Crop Land Productivity Increase) | Option 2a (ultra-poor labour-unconstrained HHs) | Option 2b (Option 2a with 5% Crop Land Productivity Increase) | Option 3a (all poor labour-unconstrained HHs with more days) | Option 3b (Option 3a with 5% Crop Land Productivity Increase) |
| Total Income Multiplier | | | | | | |
| Nominal | 2.87 | 2.86 | 2.91 | 2.90 | 2.90 | 2.89 |
| (CI) | ( 2.74- 3.05) | ( 2.73- 3.04) | ( 2.78- 3.09) | ( 2.77- 3.09) | ( 2.76- 3.09) | ( 2.75- 3.08) |
| Real | 1.89 | 3.24 | 1.90 | 3.15 | 1.89 | 2.58 |
| (CI) | ( 1.80- 1.99) | ( 3.16- 3.35) | ( 1.82- 2.02) | ( 3.07- 3.26) | ( 1.80- 2.00) | ( 2.50- 2.69) |
| Total Beneficiary Income Multiplier | | | | | | |
| Nominal | 1.29 | 1.29 | 1.18 | 1.18 | 1.30 | 1.29 |
| Real | 1.13 | 1.41 | 1.08 | 1.24 | 1.12 | 1.27 |
| Total Non-Beneficiary Income Multiplier | | | | | | |
| Nominal | 1.58 | 1.57 | 1.73 | 1.72 | 1.60 | 1.60 |
| Real | 0.76 | 1.83 | 0.82 | 1.91 | 0.77 | 1.31 |
| Total Ultra-Poor Income Multiplier | | | | | | |
| Nominal | 0.88 | 0.88 | 1.29 | 1.29 | 0.89 | 0.89 |
| Real | 0.73 | 0.99 | 1.14 | 1.38 | 0.73 | 0.86 |
| Total Moderately-Poor Income Multiplier | | | | | | |
| Nominal | 0.85 | 0.85 | 0.46 | 0.46 | 0.86 | 0.86 |
| Real | 0.58 | 1.02 | 0.19 | 0.58 | 0.58 | 0.80 |
| Total Non-Poor Income Multiplier | | | | | | |
| Nominal | 1.14 | 1.13 | 1.15 | 1.15 | 1.15 | 1.15 |
| Real | 0.57 | 1.24 | 0.58 | 1.19 | 0.58 | 0.92 |
| Production Multipliers | | | | | | |
| Total | 1.94 | 3.26 | 1.96 | 3.17 | 1.95 | 2.62 |
| Beneficiary Households | 0.41 | 0.67 | 0.33 | 0.48 | 0.42 | 0.56 |
| Non-Beneficiary | 1.53 | 2.58 | 1.63 | 2.69 | 1.53 | 2.06 |
| Ultra-Poor | 0.51 | 0.76 | 0.52 | 0.76 | 0.52 | 0.66 |
| Moderately-Poor | 0.26 | 0.67 | 0.26 | 0.64 | 0.25 | 0.46 |
| Non-Poor | 1.18 | 1.83 | 1.18 | 1.77 | 1.17 | 1.50 |
| Production Multipliers by Sector | | | | | | |
| crop | 0.64 | 1.96 | 0.67 | 1.88 | 0.65 | 1.32 |
| livestock | 0.09 | 0.09 | 0.10 | 0.10 | 0.09 | 0.09 |
| retail | 0.95 | 0.95 | 0.95 | 0.96 | 0.95 | 0.95 |
| services | 0.19 | 0.19 | 0.18 | 0.18 | 0.19 | 0.19 |
| non-agricultural production | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Production Multipliers by Sector Beneficiary HHs | | | | | | |
| crop | 0.29 | 0.55 | 0.27 | 0.42 | 0.29 | 0.43 |
| livestock | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| retail | 0.07 | 0.07 | 0.03 | 0.03 | 0.07 | 0.07 |
| services | 0.03 | 0.03 | 0.01 | 0.01 | 0.03 | 0.03 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | | | | |
| crop | 0.36 | 1.41 | 0.39 | 1.45 | 0.36 | 0.89 |
| livestock | 0.07 | 0.07 | 0.08 | 0.08 | 0.07 | 0.07 |
| retail | 0.88 | 0.88 | 0.92 | 0.92 | 0.88 | 0.88 |
| services | 0.16 | 0.16 | 0.17 | 0.17 | 0.16 | 0.16 |
| non-agricultural production | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |

## Table 12. Percentage Impacts of PWPs under Three Options

| Household | Multipliers | | | | | |
|---|---|---|---|---|---|---|
| | Options | | | | | |
| | Option 1a (status quo by end of 2017) | Option 1b (Option 1a with 5% Crop Land Productivity Increase) | Option 2a (ultra-poor labour-unconstrained HHs) | Option 2b (Option 2a with 5% Crop Land Productivity Increase) | Option 3a (all poor labour-unconstrained HHs with more days) | Option 3b (Option 3a with 5% Crop Land Productivity Increase) |
| Total Income Multiplier | | | | | | |
| Nominal | 2.87 | 2.86 | 2.91 | 2.90 | 2.90 | 2.89 |
| (CI) | ( 2.74- 3.05) | ( 2.73- 3.04) | ( 2.78- 3.09) | ( 2.77- 3.09) | (2.76- 3.09) | ( 2.75- 3.08) |
| Real | 1.89 | 3.24 | 1.90 | 3.15 | 1.89 | 2.58 |
| (CI) | ( 1.80- 1.99) | ( 3.16- 3.35) | ( 1.82- 2.02) | ( 3.07- 3.26) | (1.80- 2.00) | ( 2.50- 2.69) |
| Total Beneficiary Income Multiplier | | | | | | |
| Nominal | 1.29 | 1.29 | 1.18 | 1.18 | 1.30 | 1.29 |
| Real | 1.13 | 1.41 | 1.08 | 1.24 | 1.12 | 1.27 |
| Total Non-Beneficiary Income Multiplier | | | | | | |
| Nominal | 1.58 | 1.57 | 1.73 | 1.72 | 1.60 | 1.60 |
| Real | 0.76 | 1.83 | 0.82 | 1.91 | 0.77 | 1.31 |
| Total Ultra-Poor Income Multiplier | | | | | | |
| Nominal | 0.88 | 0.88 | 1.29 | 1.29 | 0.89 | 0.89 |
| Real | 0.73 | 0.99 | 1.14 | 1.38 | 0.73 | 0.86 |
| Total Moderately-Poor Income Multiplier | | | | | | |
| Nominal | 0.85 | 0.85 | 0.46 | 0.46 | 0.86 | 0.86 |
| Real | 0.58 | 1.02 | 0.19 | 0.58 | 0.58 | 0.80 |
| Total Non-Poor Income Multiplier | | | | | | |
| Nominal | 1.14 | 1.13 | 1.15 | 1.15 | 1.15 | 1.15 |
| Real | 0.57 | 1.24 | 0.58 | 1.19 | 0.58 | 0.92 |
| Production Multipliers | | | | | | |
| Total | 1.94 | 3.26 | 1.96 | 3.17 | 1.95 | 2.62 |
| Beneficiary Households | 0.41 | 0.67 | 0.33 | 0.48 | 0.42 | 0.56 |
| Non-Beneficiary | 1.53 | 2.58 | 1.63 | 2.69 | 1.53 | 2.06 |
| Ultra-Poor | 0.51 | 0.76 | 0.52 | 0.76 | 0.52 | 0.66 |
| Moderately-Poor | 0.26 | 0.67 | 0.26 | 0.64 | 0.25 | 0.46 |
| Non-Poor | 1.18 | 1.83 | 1.18 | 1.77 | 1.17 | 1.50 |
| Production Multipliers by Sector | | | | | | |
| crop | 0.64 | 1.96 | 0.67 | 1.88 | 0.65 | 1.32 |
| livestock | 0.09 | 0.09 | 0.10 | 0.10 | 0.09 | 0.09 |
| retail | 0.95 | 0.95 | 0.95 | 0.96 | 0.95 | 0.95 |
| services | 0.19 | 0.19 | 0.18 | 0.18 | 0.19 | 0.19 |
| non-agricultural production | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Production Multipliers by Sector Beneficiary HHs | | | | | | |
| crop | 0.29 | 0.55 | 0.27 | 0.42 | 0.29 | 0.43 |
| livestock | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| retail | 0.07 | 0.07 | 0.03 | 0.03 | 0.07 | 0.07 |
| services | 0.03 | 0.03 | 0.01 | 0.01 | 0.03 | 0.03 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | | | | |
| crop | 0.36 | 1.41 | 0.39 | 1.45 | 0.36 | 0.89 |
| livestock | 0.07 | 0.07 | 0.08 | 0.08 | 0.07 | 0.07 |
| retail | 0.88 | 0.88 | 0.92 | 0.92 | 0.88 | 0.88 |
| services | 0.16 | 0.16 | 0.17 | 0.17 | 0.16 | 0.16 |
| non-agricultural production | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |

## 7.2. Agricultural interventions

In addition to social protection programmes, the study also uses the LEWIE model to simulate spillover effects of FISP, irrigation and extension. The impacts of FISP were simulated through a decrease in crop input prices equal to the FISP subsidy for eligible households. For the FISP[21], irrigation and extension simulations, we first econometrically estimated the impacts of both on predicted crop yields, then used the LEWIE model to estimate income and production spillovers from the higher yields.

Table 13 reports the results of using household micro-data to estimate the impacts of FISP, irrigation and extension on predicted crop yields for the households that benefit from FISP, irrigation and/or extension. We estimated the model using various specifications. The study's econometric model estimates a Cobb-Douglas production function like the one used to estimate the crop production parameters for the LEWIE model (Table 4), with household-group fixed effects (poor/non-poor), other household characteristics, regional fixed effects, and dummy variables indicating that a household received a FISP coupon, had access to irrigation and to extension services. The estimations obtain robust standard errors using the Huber-White sandwich estimator, to deal with potential problems related to heteroscedasticity and the possibility of influential outliers.

**Table 13. Econometric Estimates of Impacts of FISP, Irrigation and Extension on Yields**

| Variables | Estimated coefficients |
|---|---|
| Log of hired labour days per hectare | 0.196***<br>(0.0201) |
| Log of household labour days per hectare | 0.466***<br>(0.0267) |
| Log of purchased inputs per hectare | 0.0585***<br>(0.00778) |
| Log of crop assets per hectare | 0.0790***<br>(0.0131) |
| Household used irrigated land | 0.116***<br>(0.0370) |
| Household saw a government extension agent in the last 12 months | 0.116**<br>(0.0484) |
| Household received a FISP coupon | 0.239***<br>(0.0474) |
| Household is moderately or ultra-poor | -0.301***<br>(0.0403) |
| Household characteristics including dummies for language spoken at home | X |
| Household regional dummies | X |
| Observations | 7,212 |
| R-squared | 0.251 |

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. HH characteristics include: HH head has attended school, HH size, HH head is female, HH head has difficulties hearing, seeing, walking and/or chronically ill, dependency ratio, HH head is less than 15 years old, HH head is 65 or older, dummy variables for languages spoken at home.

[21] The reason the impact of the FISP on yields is simulated as well is that there may be an effect of the fertilizer subsidy beyond the impact on purchased inputs; e.g. the use of fertilizer may act as technology adoption for low yield farmers, making them more efficient. Throughout the text this effect is referred to as FISP with technology change.

The econometric findings indicate that there are large and significant positive correlations between FISP, irrigation, and extension interventions, on one hand, and crop yields, on the other. At the same levels of factor (labour, land, capital) use, receiving a FISP coupon is associated with a 23.9% increase in predicted yields – technology change increasing farmer efficiency, access to irrigated land is associated with a 11.6% increase, and access to extension raises crop yields by 11.6%.

### 7.2.1. Policy options for the FISP LEWIE

The stand-alone FISP LEWIE policy options are presented below and summarized in Table 14.

1) Maintain the status quo: FISP randomly provided to all household groups (A, B, C, D, E, F, G, H, I and J) with current coverage 30% of all rural households, and the same level of benefit (100kg bags of fertilizer with 80% subsidy).

This policy option aims to reflect the current implementation of FISP. It consists of providing 100kg bag of fertilizer to 900,000 households at a highly subsidized price.

2) Shift to "productive" farmers: FISP randomly provided to (above 1.5 acres) households with land above 1.5 acres (A, C, D, G, and I) with current coverage 30% of all rural households, and the same level of benefit (100kg bags of fertilizer with 80% subsidy).

This policy option aims to reflect Government of Malawi pilot studies that target FISP only to those farm households with land above a "productive" threshold, considered as having access to land above the median (above 1.5 acres). It consists of providing 100kg bag of fertilizer to 900,000 households with land above the median at a highly subsidized price.

3) Mixed pro-poor "productive" farmers targeting: Target moderately and ultra-poor households with land above 1.5 acres (groups C, D, and G), with the same level of benefits.

This policy provides an option to more narrowly target the FISP (hence reducing coverage and cost) with the main focus more vulnerable "productive" farmers. With respect to FISP policy option 2), this option excludes from FISP the two extreme categories of households with land above 1.5 acres (the non-poor and the ultra-poor labour constrained). It provides the same level of benefits, but to a smaller group of households (377,000 households): 100kg bags of fertilizer with 80% subsidy to all households C, D, and G.

4) Mixed less poor "productive" farmers targeting: Target non-poor and moderately poor households with land above 1.5 acres (groups A, C, and D), with the same level of benefits.

This policy provides an alternative option to narrow focus of the FISP, in this case toward better-off "productive" farmers. With respect to policy option 2), this option excludes from

FISP the poorest categories of households with land above 1.5 acres (ultra-poor with labour) and includes non-poor households. It provides the same levels of benefits: 100kg bags of fertilizer with 80% subsidy to all households A, C, and D.

5) Reduced subsidy level: Target non-poor and moderately poor households with land above 1.5 (groups A, C, and D), with a lower level of benefits.

With respect to policy option 4), this option provides a lower level of benefits: 100kg bags of fertilizer with 50% subsidy to all households A, C, and D. Coverage is left unchanged.

For each policy option we also generate a simulation that includes technology adoption due to FISP. This is a result of our econometric estimations (explained in more detail in the next section) which demonstrates that after controlling for a number of factors including the direct effect of the subsidy through purchased inputs, there may be an added technological benefit on yields of receiving FISP.

**Table 14. FISP Policy Options: Targeting, Coverage and Level of Benefits**

| | Category | Description | Coverage as % of total number of households | Transfer | Subsidy | Subsidy cost without administrative cost in 2016 MK |
|---|---|---|---|---|---|---|
| **Option 1 (status quo by end of 2017)** | All categories of households (A, B, C, D, E, F, G, H, I, J) | FISP given to all households | Approx. 32 percent of the total number of HHs, about 900,000 HH | 100 Kg bag of fertilizer | 80% | 26.5 billion MK |
| **Option 2 ("productive farmers")** | All categories of HHs with land above 1.5 acres (A, C, D, G, I) | FISP given to all households with land above the median | Approx. 32 percent of the total number of HHs, about 900,000 HH | 100 Kg bag of fertilizer | 80% | 26.5 billion MK |
| **Option 3 (mixed pro-poor targeting)** | More vulnerable "productive" farmers ( C, D, G) | FISP given to all households with land above the median excluding non-poor and ultra-poor labour-constrained | Approx. 13 percent of the total number of HHs, about 377,000 HH | 100 Kg bag of fertilizer | 80% | 11.1 billion MK |
| **Option 4 (mixed less-poor targeting)** | Less vulnerable "productive" farmers (A, C, D) | FISP given to all households with land above the median excluding ultra-poor | Approx. 24 percent of the total number of HHs, about 677,000 HH | 100 Kg bag of fertilizer | 80% | 19.9 billion MK |
| **Option 5 (mixed less-poor targeting, less subsidy)** | Less vulnerable "productive" farmers (A C, D) | A lower FISP subsidy given to all households with land above the median excluding ultra-poor | Approx. 24 percent of the total number of HHs, about 677,000 HH | 100 Kg bag of fertilizer | 50% | 12.4 billion MK |

### 7.2.2. Key Findings for the FISP

The LEWIE simulations of rural economy-wide impacts of the five FISP options are summarized in Tables 15 (multiplier effects, reflecting subsidy costs) and 16 (percentage changes).[22] Detailed multiplier and percentage results are in Appendix B.

Key lessons emerging from this analysis are presented below:

**The FISP stimulates crop production in all five scenarios, and it increases both nominal and real incomes of the targeted households.** Crop output increases by 0.6% to 8.9% (Table 15) if we consider only the direct effects of the subsidies (the first column under each option). However, when we include FISP in the regression reported in Table 15, we find that the FISP is significantly correlated with crop yields, independent of the direct subsidy effect.[23] This suggests that FISP beneficiaries use different technologies to produce their crops. When we consider the full effect, including technology change, crop output increases by 2% to 13.2% (see second column underneath each option in Table 15). Real income impacts diverge from nominal impacts because of changes in prices of local goods and services (including crop prices). All poor households with land end up having a real income increase except in Option's 4 and 5 when the poorest household groups are not recipients of the FISP.

**Redirecting FISP toward households with land above the median increases crop production and rural income.** Recently the MoAIWD has experimented with redirecting FISP toward more land rich farmers in a few districts. So far their studies have shown this to be more effective than the current version of FISP. Our simulations appear to confirm these results. Moving from Option 1 to Option 2, which keeps total coverage and subsidy level the same but targets FISP toward households with land above the median, increases both overall crop production and rural income. The impact of FISP without technology change increases from 15% to 8.2%. With technology change, the impact rises from 2.2% to 13.2%. Higher food production puts downward pressure on food prices, increasing real (price-adjusted) incomes for food consumers. Real income increases for all poverty groups (ultra-poor, moderately poor and non-poor) because of lower food prices. Only household group J, the ultra-poor labour constrained with land below the median, has a slightly lower real income under Option 2 than Option 1. Total real income in rural Malawi increases from 1.67% to 3.34% without technology change and from 2.49% to 5.14% with technology change under Option 2. *It is important to note that land rich households includes both ultra-poor and moderately poor households with access to land, and both groups show positive income and production multipliers across all scenarios.*

[22] These simulations, as in all of the simulations, include the effect of changes in crop production on crop prices. Ricker-Gilbert et al. (2013) confirm that increased crop production reduces crop prices when they found that roughly doubling the scale of FISP reduces maize prices by 1.8–2.8% on average.

[23] The coefficient on the FISP dummy is significant at the 1% level after controlling for the direct impact of purchased inputs on yields. Despite over a 24% impact on yields for FISP beneficiaries from our econometric estimates, these are not experimental results and may be the result of a spurious correlation driven by unobservables. Thus the study conservatively estimates only a 10% increase in yields, similar to irrigation and extension, outside of the direct subsidy effect.

**Targeting poor and ultra-poor farmers with access to land (the most vulnerable amongst the "productive" farmers) in FISP, rather than better off farmers, produces larger income and production multipliers for the economy as a whole.** Options 3 and 4 imply a more narrow coverage (and cost) of the FISP, comparing a more and less pro-poor targeting approach while maintaining the focus on productive farmers (with land above the 1.5 acres). Real income multipliers are larger across the board when FISP is maintained for ultra-poor and non-poor farmers are excluded (Option 3), both for direct beneficiaries (7 MK vs. 3 MK, with technological change) and for the rural economy as a whole (11.9 MK vs 2.8 MK with technological change, 4 times as much). FISP is found to increase the crop production capacity of the ultra-poor households with labour and land by between 66% and 117%. Instead when this group is excluded from the programme (Option 4) their production capacity falls between 50% and 55%. Interestingly, non-poor households with land see their income increase in real terms even when they do not directly receive FISP as they benefit from lower prices and increase their production in other sectors (e.g. retail).

Interestingly, from an aggregate production perspective, targeting FISP to the most vulnerable (ultra-poor and moderately poor) amongst the "productive" farmers with land (Option 3) delivers a three times higher increase in the total volume of crops produced in the economy, compared to a scenario (Option 4) where the subsidy is directed to better-off "productive" farmers (24% versus an 8% percentage change, with technological change). This somewhat surprising finding can primarily be explained by the different production functions of poor and non-poor farmers. Non-poor farmers with land use relatively more land and capital than labour, compared to the ultra-poor (with land). Since the model assumes that land and capital are fixed factors that cannot be expanded in the short-term, non-poor farmers are somewhat less affected by changes in input prices. Ultra-poor and poor farmers, on the other hand, respond to changes in input prices mainly by expanding hired labour and family labour, which are more flexible, thus increasing crop production. Moreover, as mentioned before ultra-poor households' crop production is negatively affected by the FISP when they are not directly targeted.

**The FISP creates income spillovers for non-targeted households, but can also make them worse off, which is problematic if the poorest farmers with land are excluded from the programme.** These income spillovers are large and positive in some cases, but frequently they are negative for households that do not receive FISP subsidies, due to the effect on food prices. Subsidized inputs stimulate crop production, and this drives down crop prices, which negatively affects farmers who do not receive the subsidy. In all scenarios non-beneficiaries reduce crop production and when poorest households are excluded from the programme (Options 4 and 5) their real income is negatively affected. In this case FISP causes a net welfare loss for the poor and can have potentially regressive distributional effects. When the FISP also impacts technology, all real income for each household group becomes positive or are not significantly different from zero.

**Prices play a very important role in shaping the rural economy-wide impacts of FISP subsidies.** By causing production in FISP-beneficiary households to rise, the subsidies decrease crop prices. Lower crop prices harm net sellers while benefiting net buyers, and they prevent the increase in labour demand from being as large as it would be without price changes,

reducing real income for some household groups. The results in the second panel under each option show that crop subsidies create benefits for some but negatively impact others in the rural economy, unless they are combined with an increase in crop yields. This result may shed light on the reasons why FISP has shown substantial impacts on yields in Malawi when the rains have been steady (2005-2011) (Pauw and Thurow 2014) but has had little to no affect during recent drought years when only the subsidy impact is present and the fertilizer induces very little yield increase. Studies that do not consider price impacts miss much of the effect of FISP subsidies.

# Table 15. Multiplier Impacts of FISP under Five Options

| Household | Multipliers | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Option 1 - Status quo | | Option 2 - "productive farmers" | | Option 3 - More vulnerable "productive" farmers | | Option 4 - Less vulnerable "productive farmers" | | Option 5 - Less vulnerable "productive farmers" and lower | |
| | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change |
| Total Income Multiplier | | | | | | | | | | |
| Nominal | -0.04 | -0.04 | 0.18 | 0.28 | 0.59 | 1.10 | -0.15 | -0.16 | -0.11 | -0.23 |
| (CI) | ( -0.10- 0.03) | ( -0.10- 0.03) | ( -0.04- 0.42) | ( 0.00- 0.66) | ( -0.07- 1.66) | ( -0.06- 2.81) | ( -0.35- 0.02) | ( -0.36- 0.01) | ( -0.23- 0.02) | ( -0.44- 0.00) |
| Real | 1.51 | 2.49 | 3.33 | 5.36 | 6.03 | 11.90 | 1.68 | 2.84 | 0.92 | 2.87 |
| (CI) | ( 1.31- 1.87) | ( 2.26- 2.85) | ( 2.15- 5.06) | ( 4.03- 7.64) | ( 2.28- 14.78) | ( 5.55- 22.80) | ( 1.28- 1.99) | ( 2.58- 3.20) | ( 0.59- 1.18) | ( 2.33- 3.43) |
| Total Beneficiary Income Multiplier | | | | | | | | | | |
| Nominal | -0.04 | -0.04 | 0.86 | 1.33 | 2.09 | 4.12 | 1.10 | 1.48 | 0.72 | 1.91 |
| Real | 1.51 | 2.49 | 2.67 | 4.26 | 3.52 | 7.03 | 2.01 | 3.01 | 1.22 | 3.45 |
| Total Non-Beneficiary Income Multiplier | | | | | | | | | | |
| Nominal | 0.00 | 0.00 | -0.68 | -1.05 | -1.49 | -3.01 | -1.25 | -1.64 | -0.82 | -2.13 |
| Real | 0.00 | 0.00 | 0.66 | 1.10 | 2.51 | 4.87 | -0.33 | -0.17 | -0.30 | -0.58 |
| Total Ultra-Poor Income Multiplier | | | | | | | | | | |
| Nominal | 0.03 | 0.03 | 0.24 | 0.34 | 0.97 | 1.63 | -0.41 | -0.47 | -0.28 | -0.69 |
| Real | 0.31 | 0.49 | 0.82 | 1.28 | 1.99 | 3.66 | -0.09 | 0.04 | -0.10 | -0.15 |
| Total Moderately-Poor Income Multiplier | | | | | | | | | | |
| Nominal | -0.11 | -0.11 | -0.28 | -0.23 | 0.70 | 1.73 | -0.28 | 0.30 | -0.16 | 0.05 |
| Real | 0.39 | 0.71 | 0.73 | 1.39 | 2.47 | 5.28 | 0.30 | 1.28 | 0.17 | 1.05 |
| Total Non-Poor Income Multiplier | | | | | | | | | | |
| Nominal | 0.04 | 0.04 | 0.22 | 0.17 | -1.07 | -2.25 | 0.54 | 0.01 | 0.33 | 0.41 |
| Real | 0.81 | 1.29 | 1.78 | 2.69 | 1.58 | 2.96 | 1.47 | 1.51 | 0.85 | 1.98 |
| Production Multipliers | | | | | | | | | | |
| Total | 1.47 | 2.47 | 3.38 | 5.69 | 5.96 | 12.21 | 1.62 | 2.87 | 0.86 | 2.76 |
| Beneficiary Households | 1.47 | 2.47 | 6.49 | 9.94 | 15.31 | 28.34 | 4.67 | 6.72 | 2.95 | 8.06 |
| Non-Beneficiary | 0.00 | 0.00 | -3.11 | -4.25 | -9.35 | -16.14 | -3.05 | -3.86 | -2.09 | -5.30 |
| Ultra-Poor | 0.57 | 0.76 | 2.69 | 4.02 | 7.90 | 14.25 | -2.22 | -2.55 | -1.61 | -3.87 |
| Moderately-Poor | 0.15 | 0.46 | -0.38 | 0.08 | 1.53 | 4.65 | 0.46 | 2.57 | 0.37 | 2.20 |
| Non-Poor | 0.75 | 1.25 | 1.07 | 1.59 | -3.47 | -6.69 | 3.37 | 2.85 | 2.10 | 4.43 |
| Production Multipliers by Sector | | | | | | | | | | |
| crop | 1.46 | 2.46 | 3.33 | 5.62 | 5.78 | 11.89 | 1.73 | 3.02 | 0.94 | 2.96 |
| livestock | 0.00 | 0.00 | 0.01 | 0.02 | 0.04 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| retail | 0.01 | 0.02 | 0.03 | 0.04 | 0.12 | 0.22 | -0.11 | -0.14 | -0.07 | -0.18 |
| services | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | -0.02 | 0.00 | -0.01 |
| non-agricultural production | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.00 | -0.01 | 0.00 | -0.01 |
| Production Multipliers by Sector Beneficiary HHs | | | | | | | | | | |
| crop | 1.46 | 2.46 | 6.47 | 9.92 | 15.29 | 28.31 | 4.69 | 6.75 | 2.96 | 8.10 |
| livestock | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| retail | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | -0.02 | -0.03 | -0.01 | -0.03 |
| services | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | | | | | | | | |
| crop | 0.00 | 0.00 | -3.14 | -4.30 | -9.51 | -16.41 | -2.96 | -3.73 | -2.03 | -5.14 |
| livestock | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| retail | 0.00 | 0.00 | 0.02 | 0.03 | 0.11 | 0.21 | -0.09 | -0.11 | -0.06 | -0.14 |
| services | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | -0.01 | 0.00 | -0.01 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | -0.01 |

## Table 16. Percentage Impacts of FISP under Five Options

| Percentage Changes | Option 1 - Status quo | | Option 2 - "productive farmers" | | Option 3 - More vulnerable "productive" farmers | | Option 4 - Less vulnerable "productive farmers" | | Option 5 - Less vulnerable "productive farmers" and lower subsidy | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change |
| Total Rural Income | | | | | | | | | | |
| Nominal | 0.19 | 0.18 | 0.26 | 0.19 | 0.17 | 0.06 | -0.06 | -0.34 | -0.05 | -0.39 |
| (CI) | ( -0.08, 0.45) | ( -0.08, 0.44) | ( -0.54, 1.15) | ( -0.91, 1.48) | ( -0.49, 0.94) | ( -0.90, 1.24) | ( -0.70, 0.52) | ( -1.08, 0.45) | ( -0.27, 0.13) | ( -0.67, -0.10) |
| Real | 1.67 | 2.61 | 3.34 | 5.14 | 1.74 | 3.16 | 1.61 | 2.62 | 0.53 | 1.35 |
| (CI) | ( 1.31, 2.12) | ( 2.24, 3.05) | ( 1.95, 5.28) | ( 3.48, 7.61) | ( 0.54, 4.38) | ( 1.10, 6.90) | ( 0.96, 2.24) | ( 1.91, 3.70) | ( 0.26, 0.77) | ( 0.95, 1.73) |
| Total Beneficiary Income | | | | | | | | | | |
| Nominal | 0.19 | 0.18 | 2.83 | 3.81 | 6.13 | 9.75 | 4.09 | 5.38 | 1.59 | 3.29 |
| Real | 1.67 | 2.61 | 6.59 | 9.92 | 8.19 | 13.94 | 6.13 | 9.09 | 2.28 | 5.41 |
| Total Non-Beneficiary Income | | | | | | | | | | |
| Nominal | NA | NA | -1.37 | -2.10 | -0.57 | -1.14 | -2.02 | -3.05 | -0.83 | -2.13 |
| Real | NA | NA | 1.28 | 2.12 | 0.95 | 1.83 | -0.53 | -0.44 | -0.30 | -0.57 |
| Total Ultra-Poor Income | | | | | | | | | | |
| Nominal | 0.32 | 0.31 | 1.51 | 2.21 | 1.78 | 2.99 | -2.58 | -3.55 | -1.12 | -2.69 |
| Real | 2.19 | 3.36 | 5.44 | 8.57 | 3.82 | 7.05 | -0.56 | 0.00 | -0.41 | -0.58 |
| Total Moderately-Poor Income | | | | | | | | | | |
| Nominal | 0.38 | 0.38 | -0.82 | -1.32 | 1.01 | 1.29 | -0.55 | -0.88 | -0.26 | -0.70 |
| Real | 2.15 | 3.27 | 2.81 | 4.50 | 2.91 | 5.05 | 1.40 | 2.59 | 0.43 | 1.34 |
| Total Non-Poor Income | | | | | | | | | | |
| Nominal | 0.09 | 0.08 | 0.32 | 0.20 | -0.54 | -1.12 | 0.75 | 0.66 | 0.29 | 0.30 |
| Real | 1.37 | 2.18 | 2.98 | 4.49 | 0.81 | 1.51 | 2.23 | 3.29 | 0.80 | 1.84 |
| Total Production | 1.03 | 2.20 | 8.24 | 13.18 | 5.01 | 9.92 | 1.71 | 4.06 | 0.56 | 2.47 |
| Beneficiary Households | 1.03 | 2.20 | 19.98 | 30.53 | 32.72 | 61.10 | 10.95 | 18.85 | 4.41 | 13.11 |
| Non-Beneficiary Households | NA | NA | -6.80 | -9.07 | -4.33 | -7.35 | -6.99 | -9.86 | -3.05 | -7.55 |
| Ultra-Poor Households | 4.36 | 6.17 | 47.05 | 67.34 | 35.47 | 62.41 | -20.58 | -27.93 | -9.26 | -22.30 |
| Moderately-Poor Households | -0.05 | 1.54 | -2.26 | 0.92 | 2.08 | 7.77 | 2.01 | 8.23 | 1.13 | 7.68 |
| Non-Poor Households | 0.73 | 1.49 | 3.49 | 5.23 | -1.64 | -3.17 | 7.60 | 10.46 | 2.92 | 6.32 |
| Production by Sector | | | | | | | | | | |
| crop | 4.94 | 8.44 | 17.68 | 28.42 | 12.86 | 24.33 | 3.74 | 8.35 | 1.09 | 4.39 |
| livestock | -0.05 | -0.05 | 0.10 | 0.18 | 0.12 | 0.25 | -0.05 | -0.02 | -0.02 | 0.00 |
| retail | 0.02 | 0.03 | 0.04 | 0.07 | 0.06 | 0.11 | -0.18 | -0.26 | -0.08 | -0.18 |
| services | 0.03 | 0.03 | 0.06 | 0.05 | 0.01 | -0.01 | 0.01 | -0.03 | 0.00 | -0.04 |
| non-agricultural production | -0.01 | -0.02 | 0.13 | 0.19 | 0.08 | 0.15 | -0.10 | -0.14 | -0.05 | -0.10 |
| Production by Sector Beneficiary HHs | | | | | | | | | | |
| crop | 4.94 | 8.44 | 49.09 | 74.27 | 76.13 | 137.98 | 30.36 | 49.92 | 11.98 | 33.41 |
| livestock | -0.05 | -0.05 | 0.10 | 0.18 | 0.11 | 0.24 | -0.05 | -0.02 | -0.02 | 0.00 |
| retail | 0.02 | 0.03 | 0.04 | 0.06 | 0.06 | 0.11 | -0.18 | -0.25 | -0.07 | -0.18 |
| services | 0.03 | 0.03 | 0.06 | 0.05 | 0.02 | -0.02 | 0.02 | -0.03 | 0.00 | -0.04 |
| non-agricultural production | -0.01 | -0.02 | 0.13 | 0.19 | 0.09 | 0.15 | -0.10 | -0.14 | -0.05 | -0.10 |
| Production by Sector Non-Beneficiary HHs | | | | | | | | | | |
| crop | NA | NA | -26.39 | -35.91 | -14.35 | -24.54 | -20.96 | -30.20 | -9.01 | -22.53 |
| livestock | NA | NA | 0.10 | 0.18 | 0.12 | 0.25 | -0.05 | -0.02 | -0.02 | 0.00 |
| retail | NA | NA | 0.04 | 0.07 | 0.06 | 0.11 | -0.18 | -0.26 | -0.08 | -0.18 |
| services | NA | NA | 0.06 | 0.05 | 0.01 | -0.01 | 0.01 | -0.03 | 0.00 | -0.04 |
| non-agricultural production | NA | NA | 0.13 | 0.19 | 0.08 | 0.15 | -0.10 | -0.14 | -0.05 | -0.11 |

### 7.2.3. Policy options for extension services and irrigation

Policy options for the stand-alone LEWIE on extension services are presented below and summarized in Table 17. Policy options for irrigation projects are summarized in Table 18.

1) **<u>Extension services provided to farmers with land above 1.5 acres (groups A, C, D, G, and I) with increased visits of extension workers.</u>**

According to IHS3 data, 4% of households report having had a government extension worker give them advice. This policy option consists of increasing the number of farmers accessing extension services to farmers. Thus, this study assumes that an increase of visits by 100% which implies a percentage of covered beneficiary farmers of 8%.

**Table 17. Extension Services Policy Option: Targeting, Coverage and Level of Benefits**

| Policy option | Category | Coverage | Benefits |
|---|---|---|---|
| Increase access to extension services for households with land above the median | I (A)<br>II (C)<br>III (D)<br>IV (G)<br>V (I) | Approx. 8% of rural households, about 225,000 HHs (not equal across the 5 HHs categories) | Visits by additional extension officers |

2) **Irrigation projects provided to farmers with land above 1.5 acres (groups A, C, D, G, I) but with an increase in percentage of total land equipped for irrigation.**

FAOSTAT states that 1.3% of the agricultural land in the country is equipped for irrigation. According to the IHS3 data, 17% of agricultural households reported having access to irrigation. One of the main aim of the draft National Agricultural Investment Plan (formally known as ASWAp) 2015-2035 is to achieve 210,000 ha of irrigated land, which corresponds approximately to 4% of total agricultural land. If the percentage of households with access to irrigation increases proportionally to the increase of irrigated land (approximately doubling), we should expect the percentage of households with access to irrigation to reach approximately 34% (from a current 17%) of agricultural households.

**Table 18 Irrigation Policy Option: Targeting, Coverage and Level of Benefits**

| Policy option | Category | Coverage | Benefits |
|---|---|---|---|
| Increase access to irrigated land for households with land above the median | I (A)<br>II (C)<br>III (D)<br>IV (G)<br>V (I) | Approx. 34% of rural HHs, about 960,000 HHs (not equally distributed across the 5 HHs groups) | Irrigated land: 4% of the total agricultural land |

### 7.2.4. Key findings for extension services and irrigation

We used the econometric estimates of direct effects of extension and irrigation (Table 13), together with the LEWIE model, to simulate the rural economy-wide impacts of an increase in access to extension services from 4% to 8% of rural households with land above 1.5 acres (A, C, D, G, and I), and an increase in access to irrigation from 17% to 34% of households with land above 1.5 acres. The simulations take into account impacts of increased productivity on crop prices. It also takes into account the amounts of money given to rural workers in the process of administrating the programme(s).

Experts from the FAO investment center estimate that for irrigation projects, generally 20% to 30% of the cost ends up as wages for rural workers.[24] We therefore used the estimate of 30% as a transfer, combined with the impact on land productivity. Since the costs of irrigation are high, and spread out over 20 years, we used two different estimates of costs. One is the full cost of increasing irrigation from 17% to 34% as well as the costs of rehabilitating and maintaining all irrigation projects, US$2,424 million but divided by the 20 year span envisioned for approximately doubling irrigation, and two is the annual cost of maintaining and operating irrigation once this project is fully completed, US$278 million (Chafuwa, 2017). 30% of these amounts are included as a transfer to rural households with land.

Extension services were estimated to cost approximately US$ 21 million for 2016/17 (GoM 2017). Even more extensively than for irrigation, much of the money spent on extension goes back to the rural local economy in the form of wages to extension workers. For Malawi, there

[24] Actual amounts vary by irrigation project, and by year, and are beyond the scope of this paper. This is merely to highlight the need to include, in the estimate of benefits, the cash given back to the rural community in the form of rural wages.

are no estimates of the percentage of wages for rural workers as opposed to money spent in urban areas. The study therefore uses percentages estimated from extension costs in nearby Zambia to estimate rural impacts. The wages amount to 92% of costs or US$ 19.2 million. The simulations include this amount as a transfer to rural households with land above 1.5 acres and include the direct effects of extension on yields.

The resulting multiplier changes in incomes and production appear in Table 19. The percentage counterpart to this table is in Table 20. These multipliers are also the cost-benefit multipliers since they include the administrative as well as transfer costs (they cannot be separated as in the case of the previous policy programmes). Detailed multiplier and percentage results are in Appendix B.

**Table 19. Multiplier Impacts and Cost-benefit Ratios of Extension Services and Irrigation**

| Multipliers | Irrigation (Full Cost) | Irrigation (Annual Cost) | Extension |
|---|---|---|---|
| Total Income Multiplier | | | |
| Nominal | 0.87 | 0.89 | 2.63 |
| (CI) | ( 0.83- 0.93) | ( 0.85- 0.96) | ( 2.51- 2.80) |
| Real | 0.85 | 0.69 | 2.07 |
| (CI) | ( 0.78- 0.96) | ( 0.65- 0.76) | ( 1.98- 2.24) |
| Total Beneficiary Income Multiplier | | | |
| Nominal | 0.67 | 0.62 | 1.86 |
| Real | 0.68 | 0.53 | 1.61 |
| Total Non-Beneficiary Income Multiplier | | | |
| Nominal | 0.20 | 0.27 | 0.77 |
| Real | 0.17 | 0.16 | 0.46 |
| Total Ultra-Poor Income Multiplier | | | |
| Nominal | 0.18 | 0.18 | 0.53 |
| Real | 0.18 | 0.16 | 0.46 |
| Total Moderately-Poor Income Multiplier | | | |
| Nominal | 0.21 | 0.21 | 0.63 |
| Real | 0.22 | 0.16 | 0.48 |
| Total Non-Poor Income Multiplier | | | |
| Nominal | 0.48 | 0.50 | 1.48 |
| Real | 0.45 | 0.38 | 1.12 |
| Production Multipliers | | | |
| Total | 0.86 | 0.71 | 2.10 |
| Beneficiary Households | 0.83 | 0.50 | 1.45 |
| Non-Beneficiary | 0.03 | 0.21 | 0.65 |
| Ultra-Poor | 0.18 | 0.17 | 0.41 |
| Moderately-Poor | 0.20 | 0.13 | 0.42 |
| Non-Poor | 0.48 | 0.41 | 1.27 |
| Production Multipliers by Sector | | | |
| crop | 0.47 | 0.32 | 0.91 |
| livestock | 0.03 | 0.03 | 0.09 |
| retail | 0.28 | 0.28 | 0.86 |
| services | 0.06 | 0.06 | 0.18 |
| non-agricultural production | 0.02 | 0.02 | 0.06 |
| Production Multipliers by Sector Beneficiary HHs | | | |
| crop | 0.73 | 0.40 | 1.14 |
| livestock | 0.02 | 0.02 | 0.05 |
| retail | 0.06 | 0.06 | 0.18 |
| services | 0.02 | 0.02 | 0.05 |
| non-agricultural production | 0.01 | 0.01 | 0.02 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | |
| crop | -0.25 | -0.08 | -0.23 |
| livestock | 0.01 | 0.01 | 0.04 |
| retail | 0.22 | 0.22 | 0.68 |
| services | 0.04 | 0.04 | 0.13 |
| non-agricultural production | 0.01 | 0.01 | 0.04 |

**Table 20. Percentage Impacts of Extension Services and Irrigation**

| Percentage Changes | Irrigation (Full Cost, annualized) | Irrigation (Annual Cost) | Extension |
|---|---|---|---|
| Total Rural Income | | | |
| Nominal | 6.09 | 14.66 | 3.18 |
| (CI) | ( 5.65, 6.65) | ( 13.75, 15.98) | ( 3.01, 3.41) |
| Real | 5.87 | 11.30 | 2.48 |
| (CI) | ( 5.33, 6.75) | ( 10.50, 12.62) | ( 2.33, 2.71) |
| Total Beneficiary Income | | | |
| Nominal | 11.28 | 24.09 | 5.33 |
| Real | 11.43 | 20.87 | 4.69 |
| Total Non-Beneficiary Income | | | |
| Nominal | 2.82 | 8.71 | 1.83 |
| Real | 2.37 | 5.27 | 1.09 |
| Total Ultra-Poor Income | | | |
| Nominal | 8.61 | 20.44 | 4.40 |
| Real | 8.91 | 17.46 | 3.80 |
| Total Moderately-Poor Income | | | |
| Nominal | 4.36 | 11.20 | 2.45 |
| Real | 4.55 | 8.43 | 1.85 |
| Total Non-Poor Income | | | |
| Nominal | 6.06 | 14.41 | 3.13 |
| Real | 5.57 | 10.76 | 2.37 |
| Total Production | 9.55 | 15.58 | 3.29 |
| Beneficiary Households | 18.09 | 25.05 | 5.25 |
| Non-Beneficiary Households | -1.41 | 3.44 | 0.78 |
| Ultra-Poor Households | 24.27 | 42.32 | 7.56 |
| Moderately-Poor Households | 8.84 | 12.61 | 2.96 |
| Non-Poor Households | 5.93 | 9.96 | 2.31 |
| Production by Sector | | | |
| crop | 15.75 | 24.10 | 4.89 |
| livestock | 2.43 | 5.43 | 1.23 |
| retail | 3.66 | 8.40 | 1.90 |
| services | 2.94 | 6.81 | 1.53 |
| non-agricultural production | 3.64 | 8.34 | 1.86 |
| Production by Sector Beneficiary HHs | | | |
| crop | 38.17 | 49.05 | 10.09 |
| livestock | 2.40 | 5.35 | 1.22 |
| retail | 3.67 | 8.43 | 1.91 |
| services | 2.94 | 6.81 | 1.53 |
| non-agricultural production | 3.69 | 8.46 | 1.89 |
| Production by Sector Non-Beneficiary HHs | | | |
| crop | -15.71 | -10.92 | -2.42 |
| livestock | 2.49 | 5.57 | 1.26 |
| retail | 3.66 | 8.39 | 1.90 |
| services | 2.94 | 6.81 | 1.53 |
| non-agricultural production | 3.61 | 8.29 | 1.85 |

**Doubling the share of households (with land above 1.5 acres) with access to irrigation results in an increase in crop production of 9.55% (full cost annualized)** and 15.58%

(annual cost once operational) as well as a 5.87% (full cost annualized) and 11.3% (annual cost once operational) increase in total real income that is significant at well above the 95% level. The nominal income effect due to the transfer and productivity increase is even higher (6.09% and 14.66% respectively). Households with irrigation benefit, however, by driving down the price of crops, non-beneficiaries decrease their crop production. Still, real incomes rise across households because the cost of food consumption decreases with larger crop output and spillovers benefit all households. Irrigation creates spillovers to other production sectors as well.

**Not surprisingly, there are large income increases for the household groups with land above 1.5 acres targeted by new irrigation projects, but the spillover effects on real income in households with land below 1.5 acres are also large.** Increases in real income exceed 14% for some groups (C, G, and I). For the groups with land below 1.5 acres, those who receive the spillovers but not the direct effects, the real income increases are smaller but still significant. For ultra-poor groups, both those with direct access to irrigation and those who receive only spillovers, real income gains range from 2.45% (J) to 34% (G, I, under the annual cost once operational simulation). This simulation demonstrates the potentially large and far-reaching impact of irrigation for the rural economy of Malawi.

**The real-income and production impacts of extension are smaller but positive.** Total real income rises by 2.48%, and this increase is statistically significant. There are only small spillovers to other production sectors; however, real incomes increase for all household groups. Real incomes rise by as much as 7% in the ultra-poor households (G and I). Access to extension services, like irrigation, creates real benefits that extend beyond crop production.

The multiplier table (Table 19) shows also the multipliers of irrigation and extension.

**Extension has both real income and production multipliers that are above 2 MK per MK spent.** Thus, even though the percentage increases in real income and production due to extension is lower than for irrigation, the benefit of 1 MK spent on extension is more than for 1 MK spent on irrigation. Even if costs are born by households with land above 1.5 acres (as is the case with those who receive extension services in this simulation), they still have positive income. Extension services is a programme that tends to benefit workers in rural areas (extension agents), who contribute to the local economy by spending their wage on products and services from those locations.

**Irrigation on the other hand has smaller multipliers and in fact a lower than one cost-benefit ratio for both real income and production.** The reason for this is the high capital cost of irrigation infrastructure purchased outside the local economy. However, the multipliers do not capture the benefits of lower crop prices that urban consumers receive due to irrigation improvements nor the resulting increase in food security and exports. This may be significant given crop production increases of 16% rising to 24% once completed (Table 20). Moreover, Malawi has seen a rise in smallholder irrigation schemes (Chafuwa, 2017). This may be a more cost-effective approach to expanding irrigation and increasing cost-benefit ratios.

## 7.3. Combined social protection and agricultural interventions

In addition to the stand-alone simulations of policy interventions presented above, the study uses the LEWIE model to simulate the rural economy-wide impacts of selected combined interventions. The combined simulations reveal ways in which interventions interact, sometimes reinforcing but other times counteracting the intended impacts of specific programmes. The combined policy options explored here are summarized below and in Table 21. They illustrate ways in which the LEWIE model can be utilized for more comprehensive and integrated policy analysis. The combined options below were designed to feed into a LEWIE cost-benefit analysis. Extension and irrigation programmes are maintained at their baseline.

**1) <u>Combined SCT and FISP to households with land above 1.5 acres</u>**

The rationale of this option is to simulate the LEWIE impact of the two programmes and their interaction for households with land above 1.5 acres. This policy option envisages an overlapping between the SCT and FISP only for ultra-poor and labour-constrained households with land above 1.5 acres.

The SCT would target the same ultra-poor and labour-constrained household groups as under SCT Option 1 in Table 6, which consists on regular transfers to all ultra-poor and labour-constrained households (100% coverage of these household groups or 12% of rural households).

The FISP would target 93% of all households in the household groups with land above 1.5 acres (A, C, D, G, and I), representing 32% coverage of all rural households, and a subsidy of 80% for a 100 Kg bag of fertilizer, as under FISP Option 2 in Table 14.

**2) <u>Reallocation of resources with non-overlapping targeting</u>**

The rationale of this option is to simulate the LEWIE impact of a reallocation of resources with non-overlapping targeting which follows one proposal for FISP reforms, i.e., FISP only to non-poor and moderately poor households with land above 1.5 acres,

The SCT would target ultra-poor households, including those with land above 1.5 acres and productive capacity, with an additional monetary compensation equivalent to the value of a FISP voucher. The SCT targets all ultra-poor households (groups G, H, I, and J), as under SCT Policy Option 4 (100% coverage of these household groups or 29% of rural households) in Table 6.

The FISP would target all non-poor and moderately-poor household with land above 1.5 acres (A, C, and D), representing 24% coverage of all rural households and a subsidy of 80% for a 100 Kg bag of fertilizer, as under FISP Policy Option 4 in Table 14.

**3) <u>Reallocation of resources with partial overlapping targeting</u>**

The rationale of this option is to simulate the local economy impacts of a reallocation of resources with partial overlapping targeting between SCT and FISP.

The SCT would target all ultra and moderately-poor households without labour capacity (groups D, F, I, and J), as under SCT Option 3 (100% coverage of these household groups or 20% of rural households) in Table 6.

The FISP would target more vulnerable "productive" farmers with land above 1.5 acres, including the ultra-poor (groups C, D, and G), representing 13% coverage of rural households and a subsidy of 80% for a 100 Kg bag of fertilizer, as under FISP Policy Option 4 in Table 14.

**4) <u>Reallocation of resources with fully overlapping targeting of vulnerable "productive" farmers</u>**

The rationale of this option is to simulate the local economy impacts of a reallocation of resources with fully overlapping targeting between SCT and FISP.

FISP would target more vulnerable "productive" farmers with land above 1.5 acres, including the ultra-poor (groups C, D, and G), representing 13% coverage of rural households and a subsidy of 80% for a 100 Kg bag of fertilizer, as under FISP Option 4 in Table 14.

The SCT would target the same household groups as those who received the FISP, in this case all C, D, and G households.

**5) <u>Reallocation of resources with fully overlapping targeting of ultra-poor households</u>**

The rationale of this option is to simulate the local economy impacts of a reallocation of resources with fully overlapping targeting between SCT and FISP, but to all ultra-poor households.

FISP would target the ultra-poor (groups G, H, I and J), representing 29% coverage of rural households and a subsidy of 80% for a 100 Kg bag of fertilizer.

The SCT would target the same household groups as those who received the FISP, in this case all ultra-poor households G, H, I, and J households, corresponding to SCT Option 2 (100% coverage of these household groups or 29% of rural households) in Table 6.

Two different variants to each option are simulated, a total of fifteen simulations. First, the FISP is simulated to directly impact yields by an amount equal to the estimated impact in Table 14 (called "With Tech Change" Options). Second, the PWP targeting groups C, E, G, and H, with 16% coverage of all rural households, as under PWP Option 1 in Table 9. ("W/ PWP No Tech Change") are added. Detailed results of these additional simulations are included in Appendix B.

**Table 21. Summary of Combined Simulations of Social Protection and Agricultural Interventions**

| COMBINED POLICIES | | SCT | FISP | PWP |
|---|---|---|---|---|
| **OPTION 1: combined SCT and FISP HHs with land above 1.5 acres** | **Specific policy** | **SCT policy 1** | **FISP policy 2** | **PWP policy 1** |
| | **Targeting** | I | A | C |
| | | J | C | E |
| | | | D | G |
| | | | G | H |
| | | | I | |
| | **Coverage as a % of total number of HHs** | Approx. 12% of the total number of HHs, about 330,000 HH. | Approx. 32% of the total number of HHs, about 900,000 HH | Approx. 16% of the total number of HHs, about 450,000 HH |
| | **Benefits** | Weighted average of current transfers | 100 Kg bag of fertilizer (80% subsidy) | 0.90 per day, 48 days of work |
| | **Total Cost** | 62.7 billion MWK (SCT: 27.7 billion, FISP: 26.5 billion, PWP: 8.6 billion) | | |
| **OPTION 2: reallocation of resources with non-overlapping targeting** | **Specific policy** | **SCT policy 4** | **FISP policy 4** | **PWP Policy 1** |
| | **Targeting** | G | A | C |
| | | H | C | E |
| | | I | D | G |
| | | J | | H |
| | **Coverage as a % of total number of HHs** | Approx. 29% of the total number of HHs, about 820,000 HHs | Approx. 24% of the total number of HHs, about 677,000 HHs | Approx. 16% of the total number of HHs, about 450,000 HHs |
| | **Benefits** | Weighted average of current transfers + monetary value of FISP | 100 Kg bag of fertilizer (80% subsidy) | 0.90 per day, 48 days of work |
| | **Total Cost** | 128.8 billion MWK (SCT: 100.3 billion, FISP: 19.9 billion, PWP: 8.6 billion) | | |
| **OPTION 3: reallocation of resources with partial overlapping targeting** | **Specific policy** | **SCT policy 3** | **FISP policy 3** | **PWP Policy 1** |
| | **Targeting** | D | C | C |
| | | F | D | E |
| | | I | G | G |
| | | J | | H |
| | **Coverage as a % of total number of HHs** | Approx. 20% of the total number of HHs, about 560,000 HHs | Approx. 13% of the total number of HHs, about 377,000 HHs | Approx. 16% of the total number of HHs, about 450,000 HHs |
| | **Benefits** | Weighted average of current transfers | 100 Kg bag of fertilizer (80% subsidy) | 0.90 per day, 48 days of work |
| | **Total Cost** | 75.8 billion MWK (SCT: 56.1 billion, FISP: 11.1 billion, PWP: 8.6 billion | | |
| **OPTION 4: Fully overlapping targeting of vulnerable "productive " farmers** | **Specific policy** | **SCT overlapping with FISP** | **FISP policy 3** | **PWP Policy 1** |
| | **Targeting** | C | C | C |
| | | D | D | E |
| | | G | G | G |
| | | | | H |
| | **Coverage as a % of total number of HHs** | Approx. 13% of the total number of HHs, about 377,000 HHs | Approx. 13% of the total number of HHs, about 377,000 HHs | Approx. 16% of the total number of HHs, about 450,000 HHs |
| | **Benefits** | Weighted average of current transfers | 100 Kg bag of fertilizer (80% subsidy) | 0.90 per day, 48 days of work |
| | **Total Cost** | 51.3 billion MWK (SCT: 31.6 billion, FISP: 11.1 billion, PWP: 8.6 billion) | | |
| **OPTION 5: Fully overlapping targeting to ultra-poor households** | **Specific policy** | **SCT Policy 2** | **FISP overlapping with SCT** | **PWP Policy 1** |
| | **Targeting** | H | H | C |
| | | I | I | E |
| | | J | J | G |
| | | | | H |
| | **Coverage as a % of total number of HHs** | Approx. 29% of the total number of HHs, about 820,000 HHs | Approx. 29% of the total number of HHs, about 820,000 HHs | Approx. 16% of the total number of HHs, about 450,000 HHs |
| | **Benefits** | Weighted average of current transfers | 100 Kg bag of fertilizer (80% subsidy) | 0.90 per day, 48 days of work |
| | **Total Cost** | 94 billion MWK (SCT: 68.8 billion, FISP: 16.6 billion, PWP: 8.6 billion) | | |

### 7.3.1. Key findings for combined social protection and agricultural interventions

Four important lessons emerge from this analysis of combined policy options.

**The SCT mitigates negative impacts of FISP on food prices.** In the stand-alone simulations that consider crop price impacts, the FISP stimulates crop production and puts downward pressure on crop prices. This results in increases in real income, but a slight decrease in nominal incomes for some groups that earn income from growing crops, either as farm operators or agricultural workers. The SCT raises incomes in SCT-targeted households, and this stimulates the demand for food and other goods in the rural economy. The positive income spillovers that this new demand creates counteract all of the negative nominal income impacts of FISP. The impacts on total nominal incomes range from 7.4% (option 4 with technological change) to around 30% (option 2 with PWP).

**The FISP enhances the real-income effects of the SCT.** Without FISP, the demand stimulus created by the SCT puts upward pressure on crop prices, which raises consumption costs in SCT beneficiary and non-beneficiary households. With FISP, there is an increased food supply to meet the demand, and this mitigates the impact of the SCT on food costs. Other interventions that stimulate food production, e.g., irrigation and extension, have a similarly complementary influence on the real-income impacts of the SCT[25], so this finding does not necessarily mean that FISP is the best productive interaction to raise the impact of the SCT. The real (inflation-adjusted) total income impacts range from 6.6% (Option 4 without technological change) to 20.2% (Option 2 with PWP).

**Technology change induced by the FISP considerably enhances the impacts of other policy interventions.** This becomes evident by comparing the real income impacts of each option with and without the technology changes from FISP reported in Table 15, which were estimated econometrically then fed through the LEWIE model. Technological change raises the real-income impact for each option while increasing crop production, sometimes by more than 10 percentage points such as in Option 3 (from 26.6% to 37.65%).

**Policy options with the SCT and FISP partially or fully overlapping have higher real income and production multipliers compared to when programmes are implemented in isolation.** Real income and production multipliers in simulations where the targeting of the SCT and FISP does not overlap (Option 2) are lower than those of partially overlapping simulations (Option 3), which again are lower than the fully overlapping simulations (Option 4 and Option 5). A full overlap of FISP and SCT targeting to the ultra-poor not only produces higher multipliers for the whole economy compared to partial and non-overlapping targeting, but also has a better distributional impact, with larger increases in incomes and production amongst the poorest households. These findings highlight the existence of synergies that could enhance

[25] Simulations for SCT + PWP + Irrigation and SCT + PWP + Extension for option 1 instead of FISP produce similar results as with the FISP. They are not reported but available upon request.

programmes' effectiveness through the deliberate targeting of productive and protective interventions to the same household groups.

## Table 22. Multiplier Results of LEWIE Simulations of Combined Policy Interventions

| Household | Multipliers | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Option 1: SCT + FISP to HHs with more than 1.5 acres | | | Option 2: Reallocation of resources with non-overlapping targeting | | | Option 3: Reallocation of resources with partial overlapping targeting | | | Option 4: Reallocation of resources with fully overlapping targeting | | | Option 5: Reallocation of resources with fully overlapping targeting to ultra-poor | | |
| | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change |
| Total Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 2.07 | 2.10 | 2.30 | 2.73 | 2.71 | 2.77 | 2.79 | 2.82 | 2.85 | 2.70 | 2.74 | 2.77 | 2.93 | 2.98 | 2.95 |
| (CI) | ( 1.92- 2.24) | ( 1.93- 2.29) | ( 2.13- 2.48) | ( 2.57- 2.95) | ( 2.55- 2.90) | ( 2.61- 3.01) | ( 2.62- 3.00) | ( 2.61- 3.06) | ( 2.67- 3.06) | ( 2.54- 2.92) | ( 2.55- 2.99) | ( 2.59- 2.97) | ( 2.77- 3.15) | ( 2.78- 3.24) | ( 2.76- 3.16) |
| Real | 2.38 | 3.01 | 2.25 | 1.83 | 1.97 | 1.84 | 2.15 | 2.47 | 2.09 | 2.36 | 3.01 | 2.20 | 2.23 | 2.66 | 2.19 |
| (CI) | ( 1.96- 3.01) | ( 2.51- 3.70) | ( 1.93- 2.79) | ( 1.79- 1.89) | ( 1.92- 2.02) | ( 1.79- 1.89) | ( 1.84- 2.77) | ( 2.01- 3.29) | ( 1.83- 2.62) | ( 1.92- 3.36) | ( 2.23- 4.26) | ( 1.87- 2.87) | ( 2.01- 2.48) | ( 2.37- 2.95) | ( 1.99- 2.41) |
| Total Beneficiary Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 1.60 | 1.74 | 1.78 | 1.96 | 2.02 | 2.04 | 1.61 | 1.74 | 1.77 | 1.49 | 1.70 | 1.60 | 1.35 | 1.44 | 1.46 |
| Real | 1.85 | 2.36 | 1.83 | 1.45 | 1.61 | 1.46 | 1.4 | 1.65 | 1.45 | 1.42 | 1.81 | 1.43 | 1.23 | 1.41 | 1.28 |
| Total Non-Beneficiary Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 0.47 | 0.35 | 0.52 | 0.76 | 0.69 | 0.74 | 1.18 | 1.08 | 1.08 | 1.22 | 1.04 | 1.17 | 1.58 | 1.54 | 1.5 |
| Real | 0.53 | 0.65 | 0.42 | 0.39 | 0.36 | 0.38 | 0.75 | 0.82 | 0.64 | 0.94 | 1.20 | 0.76 | 1 | 1.24 | 0.9 |
| Total Ultra-Poor Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 0.98 | 1.00 | 0.96 | 1.13 | 1.09 | 1.11 | 0.81 | 0.85 | 0.83 | 0.79 | 0.86 | 0.82 | 1.35 | 1.44 | 1.29 |
| Real | 1.07 | 1.22 | 0.98 | 0.96 | 0.96 | 0.92 | 0.72 | 0.82 | 0.71 | 0.76 | 0.95 | 0.74 | 1.23 | 1.41 | 1.15 |
| Total Moderately-Poor Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 0.23 | 0.24 | 0.39 | 0.41 | 0.42 | 0.46 | 0.95 | 1.02 | 0.94 | 0.98 | 1.08 | 0.95 | 0.44 | 0.42 | 0.5 |
| Real | 0.35 | 0.55 | 0.41 | 0.19 | 0.25 | 0.23 | 0.79 | 0.95 | 0.74 | 0.91 | 1.22 | 0.80 | 0.27 | 0.36 | 0.32 |
| Total Non-Poor Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 0.86 | 0.86 | 0.95 | 1.19 | 1.20 | 1.21 | 1.03 | 0.95 | 1.08 | 0.94 | 0.80 | 1.01 | 1.15 | 1.13 | 1.16 |
| Real | 0.95 | 1.24 | 0.86 | 0.68 | 0.77 | 0.68 | 0.65 | 0.71 | 0.64 | 0.70 | 0.85 | 0.65 | 0.73 | 0.88 | 0.71 |
| Production Multipliers | | | | | | | | | | | | | | | |
| Total | 2.45 | 3.19 | 2.33 | 1.89 | 2.03 | 1.90 | 2.21 | 2.56 | 2.15 | 2.41 | 3.13 | 2.25 | 2.29 | 2.78 | 2.26 |
| Beneficiary Households | 2.48 | 3.56 | 1.87 | 1.08 | 1.29 | 1.12 | 1.33 | 1.99 | 1.22 | 2.02 | 3.49 | 1.45 | 1.3 | 2.13 | 1.27 |
| Non-Beneficiary | -0.03 | -0.37 | 0.46 | 0.81 | 0.74 | 0.78 | 0.88 | 0.57 | 0.93 | 0.39 | -0.36 | 0.80 | 0.99 | 0.65 | 0.99 |
| Ultra-Poor | 1.26 | 1.68 | 1.06 | 0.18 | -0.05 | 0.20 | 1.03 | 1.33 | 0.91 | 1.36 | 2.11 | 1.08 | 1.3 | 2.13 | 1.22 |
| Moderately-Poor | 0.05 | 0.19 | 0.10 | 0.30 | 0.44 | 0.29 | 0.31 | 0.54 | 0.31 | 0.38 | 0.69 | 0.35 | 0.1 | -0.04 | 0.12 |
| Non-Poor | 1.14 | 1.32 | 1.16 | 1.42 | 1.64 | 1.40 | 0.87 | 0.69 | 0.93 | 0.67 | 0.33 | 0.83 | 0.89 | 0.69 | 0.92 |
| Production Multipliers by Sector | | | | | | | | | | | | | | | |
| crop | 1.52 | 2.25 | 1.31 | 0.75 | 0.91 | 0.75 | 0.99 | 1.34 | 0.92 | 1.23 | 1.93 | 1.04 | 1.04 | 1.5 | 1 |
| livestock | 0.06 | 0.07 | 0.07 | 0.08 | 0.08 | 0.08 | 0.09 | 0.09 | 0.09 | 0.09 | 0.10 | 0.09 | 0.09 | 0.09 | 0.09 |
| retail | 0.67 | 0.68 | 0.74 | 0.83 | 0.82 | 0.84 | 0.89 | 0.89 | 0.89 | 0.86 | 0.87 | 0.88 | 0.92 | 0.94 | 0.92 |
| services | 0.14 | 0.14 | 0.15 | 0.17 | 0.17 | 0.17 | 0.18 | 0.18 | 0.18 | 0.17 | 0.17 | 0.18 | 0.18 | 0.18 | 0.18 |
| non-agricultural production | 0.05 | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 | 0.07 | 0.06 | 0.06 | 0.06 | 0.07 | 0.07 | 0.07 |
| Production Multipliers by Sector Beneficiary HHs | | | | | | | | | | | | | | | |
| crop | 2.23 | 3.31 | 1.52 | 0.73 | 0.94 | 0.73 | 1.17 | 1.83 | 0.98 | 1.93 | 3.40 | 1.28 | 1.21 | 2.04 | 1.12 |
| livestock | 0.04 | 0.04 | 0.05 | 0.06 | 0.06 | 0.06 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 |
| retail | 0.15 | 0.15 | 0.20 | 0.21 | 0.21 | 0.23 | 0.09 | 0.09 | 0.14 | 0.04 | 0.04 | 0.09 | 0.05 | 0.05 | 0.09 |
| services | 0.04 | 0.05 | 0.07 | 0.06 | 0.06 | 0.08 | 0.02 | 0.02 | 0.05 | 0.01 | 0.01 | 0.04 | 0.02 | 0.02 | 0.04 |
| non-agricultural production | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | | | | | | | | | | | | | |
| crop | -0.71 | -1.06 | -0.21 | 0.02 | -0.04 | 0.02 | -0.18 | -0.49 | -0.05 | -0.70 | -1.47 | -0.24 | -0.17 | -0.54 | -0.11 |
| livestock | 0.02 | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.05 | 0.05 | 0.04 | 0.06 | 0.07 | 0.06 | 0.07 | 0.07 | 0.07 |
| retail | 0.53 | 0.53 | 0.53 | 0.62 | 0.61 | 0.60 | 0.8 | 0.8 | 0.76 | 0.81 | 0.83 | 0.79 | 0.87 | 0.89 | 0.83 |
| services | 0.09 | 0.09 | 0.08 | 0.11 | 0.11 | 0.09 | 0.16 | 0.16 | 0.13 | 0.16 | 0.16 | 0.14 | 0.16 | 0.16 | 0.14 |
| non-agricultural production | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.05 | 0.06 | 0.06 | 0.06 |

## Table 23. Percentage Results of LEWIE Simulations of Combined Policy Interventions

| Percentage Changes | Option 1: SCT + FISP to HHs with more than 1.5 acres | | | Option 2: Reallocation of resources with non-overlapping targeting | | |
|---|---|---|---|---|---|---|
| | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change |
| Total Rural Income | | | | | | |
| Nominal | 7.62 | 7.54 | 11.05 | 26.32 | 25.92 | 29.99 |
| (CI) | ( 6.59%, 8.82%) | ( 6.25%, 9.12%) | ( 9.86%, 12.51%) | ( 24.60%, 28.86%) | ( 24.15%, 27.98%) | ( 28.01%, 32.80%) |
| Real | 8.59 | 10.47 | 10.82 | 18.04 | 19.02 | 20.24 |
| (CI) | ( 7.00%, 11.09%) | ( 8.52%, 13.30%) | ( 9.11%, 13.38%) | ( 17.06%, 19.34%) | ( 17.95%, 20.21%) | ( 19.15%, 21.73%) |
| Total Beneficiary Income | | | | | | |
| Nominal | 13.83 | 14.74 | 15.69 | 37.65 | 38.54 | 39.34 |
| Real | 15.49 | 18.89 | 16.15 | 28.97 | 31.58 | 29.30 |
| Total Non-Beneficiary Income | | | | | | |
| Nominal | 3.04 | 2.21 | 5.60 | 15.91 | 14.32 | 19.00 |
| Real | 3.49 | 4.24 | 4.54 | 8.00 | 7.48 | 9.59 |
| Total Ultra-Poor Income | | | | | | |
| Nominal | 25.15 | 25.70 | 31.28 | 72.73 | 70.23 | 79.01 |
| Real | 27.20 | 30.64 | 31.96 | 61.88 | 61.80 | 66.11 |
| Total Moderately-Poor Income | | | | | | |
| Nominal | 2.81 | 2.19 | 7.47 | 13.86 | 13.43 | 18.67 |
| Real | 4.36 | 5.96 | 7.90 | 6.77 | 7.79 | 10.19 |
| Total Non-Poor Income | | | | | | |
| Nominal | 4.87 | 4.81 | 7.18 | 18.93 | 19.07 | 21.54 |
| Real | 5.35 | 6.94 | 6.47 | 10.88 | 12.12 | 12.14 |
| Total Production | 13.45 | 18.70 | 15.62 | 17.37 | 19.46 | 19.42 |
| Beneficiary Households | 24.32 | 34.85 | 22.10 | 21.04 | 25.00 | 22.82 |
| Non-Beneficiary Households | -2.01 | -4.25 | 2.63 | 11.00 | 9.87 | 12.60 |
| Ultra-Poor Households | 64.79 | 86.15 | 70.25 | 16.23 | -4.58 | 20.73 |
| Moderately-Poor Households | 0.46 | 3.68 | 1.85 | 13.61 | 21.44 | 14.87 |
| Non-Poor Households | 6.67 | 8.66 | 8.37 | 19.75 | 24.90 | 21.58 |
| Production by Sector | | | | | | |
| crop | 25.25 | 36.49 | 28.16 | 24.44 | 28.10 | 27.24 |
| livestock | 2.43 | 2.53 | 3.54 | 8.64 | 8.67 | 9.65 |
| retail | 3.94 | 3.96 | 5.74 | 13.65 | 13.48 | 15.38 |
| services | 3.12 | 3.13 | 4.54 | 10.58 | 10.52 | 11.97 |
| non-agricultural production | 4.06 | 4.10 | 5.82 | 13.62 | 13.60 | 15.44 |
| Production by Sector Beneficiary HHs | | | | | | |
| crop | 53.68 | 78.09 | 42.15 | 34.48 | 42.29 | 35.82 |
| livestock | 2.42 | 2.53 | 3.60 | 8.71 | 8.75 | 9.67 |
| retail | 3.98 | 3.98 | 6.31 | 14.64 | 14.53 | 17.11 |
| services | 3.17 | 3.22 | 4.59 | 10.69 | 10.70 | 11.96 |
| non-agricultural production | 4.10 | 4.16 | 5.89 | 13.95 | 13.85 | 15.89 |
| Production by Sector Non-Beneficiary HHs | | | | | | |
| crop | -20.81 | -30.89 | -11.51 | 1.94 | -3.70 | 2.93 |
| livestock | 2.44 | 2.53 | 3.39 | 8.46 | 8.48 | 9.58 |
| retail | 3.93 | 3.95 | 5.54 | 13.34 | 13.14 | 14.78 |
| services | 3.10 | 3.09 | 4.50 | 10.52 | 10.42 | 11.99 |
| non-agricultural production | 4.04 | 4.07 | 5.79 | 13.45 | 13.47 | 15.19 |

| Percentage Changes | Option 3: Reallocation of resources with partial overlapping targeting | | | Option 4: Reallocation of resources with fully overlapping targeting | | | Option 5: Reallocation of resources with fully overlapping targeting to ultra-poor | | |
|---|---|---|---|---|---|---|---|---|---|
| | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change |
| Total Rural Income | | | | | | | | | |
| Nominal | 14.88 | 14.73 | 18.45 | 7.57 | 7.40 | 10.95 | 18.29 | 18.66 | 21.84 |
| (CI) | ( 13.62%, 16.49%) | ( 13.08%, 16.82%) | ( 16.85%, 20.52%) | ( 6.66%, 8.67%) | ( 6.20%, 8.91%) | ( 9.78%, 12.44%) | ( 17.09%, 19.93%) | ( 17.14%, 20.84%) | ( 20.19%, 23.77%) |
| Real | 11.71 | 12.97 | 13.85 | 6.56 | 8.13 | 8.65 | 14.05 | 16.64 | 16.37 |
| (CI) | ( 10.04%, 14.89%) | ( 10.51%, 17.24%) | ( 12.16%, 17.19%) | ( 5.13%, 9.59%) | ( 5.62%, 12.07%) | ( 7.27%, 11.54%) | ( 12.53%, 15.85%) | ( 14.57%, 19.02%) | ( 14.70%, 18.31%) |
| Total Beneficiary Income | | | | | | | | | |
| Nominal | 27.51 | 28.40 | 30.19 | 32.48 | 36.28 | 17.45 | 56.08 | 59.85 | 45.61 |
| Real | 24.41 | 27.15 | 25.62 | 31.64 | 38.09 | 15.42 | 51.24 | 58.68 | 39.87 |
| Total Non-Beneficiary Income | | | | | | | | | |
| Nominal | 8.83 | 8.19 | 11.32 | 4.50 | 3.83 | 7.02 | 11.20 | 10.93 | 13.68 |
| Real | 5.63 | 6.18 | 6.70 | 3.47 | 4.43 | 4.54 | 7.07 | 8.74 | 8.30 |
| Total Ultra-Poor Income | | | | | | | | | |
| Nominal | 30.36 | 31.52 | 36.67 | 14.85 | 16.15 | 20.98 | 56.08 | 59.85 | 62.63 |
| Real | 27.28 | 30.45 | 31.88 | 14.24 | 17.89 | 18.92 | 51.24 | 58.68 | 56.14 |
| Total Moderately-Poor Income | | | | | | | | | |
| Nominal | 20.70 | 21.03 | 25.52 | 10.26 | 10.46 | 14.90 | 9.03 | 8.49 | 13.78 |
| Real | 17.81 | 19.91 | 21.11 | 9.62 | 11.95 | 12.91 | 5.61 | 7.50 | 9.21 |
| Total Non-Poor Income | | | | | | | | | |
| Nominal | 8.90 | 8.24 | 11.32 | 4.78 | 4.09 | 7.02 | 11.96 | 11.79 | 14.32 |
| Real | 5.60 | 6.08 | 6.70 | 3.54 | 4.31 | 4.54 | 7.59 | 9.18 | 8.79 |
| Total Production | 14.67 | 19.44 | 16.62 | 10.70 | 16.26 | 12.44 | 16.03 | 21.14 | 18.05 |
| Beneficiary Households | 30.25 | 45.39 | 29.23 | 42.99 | 75.03 | 23.26 | 81.05 | 131.73 | 61.86 |
| Non-Beneficiary Households | 4.05 | 1.77 | 6.22 | -0.20 | -3.57 | 3.52 | 4.65 | 1.78 | 6.00 |
| Ultra-Poor Households | 65.93 | 88.77 | 70.02 | 53.89 | 85.38 | 56.68 | 81.05 | 131.73 | 87.09 |
| Moderately-Poor Households | 7.52 | 14.54 | 9.17 | 5.38 | 11.19 | 6.82 | 2.54 | -1.97 | 3.70 |
| Non-Poor Households | 4.68 | 3.30 | 6.22 | 1.90 | 0.28 | 3.52 | 5.81 | 3.86 | 7.21 |
| Production by Sector | | | | | | | | | |
| crop | 26.63 | 37.60 | 29.11 | 21.20 | 34.26 | 23.13 | 27.29 | 40.79 | 30.28 |
| livestock | 4.87 | 5.03 | 5.96 | 3.11 | 3.20 | 4.13 | 6.18 | 6.33 | 7.23 |
| retail | 7.85 | 7.84 | 9.60 | 4.45 | 4.52 | 6.24 | 9.78 | 9.99 | 11.55 |
| services | 6.08 | 6.08 | 7.53 | 3.43 | 3.38 | 4.83 | 7.34 | 7.39 | 8.73 |
| non-agricultural production | 7.76 | 7.79 | 9.52 | 4.33 | 4.39 | 6.07 | 9.70 | 9.89 | 11.43 |
| Production by Sector Beneficiary HHs | | | | | | | | | |
| crop | 61.35 | 94.12 | 54.47 | 94.96 | 164.77 | 44.96 | 146.96 | 247.12 | 107.85 |
| livestock | 4.94 | 5.07 | 6.11 | 3.05 | 3.19 | 4.23 | 7.16 | 7.29 | 7.93 |
| retail | 10.03 | 10.26 | 13.00 | 4.62 | 4.53 | 8.40 | 15.19 | 15.18 | 16.45 |
| services | 6.13 | 6.04 | 7.50 | 3.42 | 3.41 | 4.81 | 7.35 | 7.52 | 8.85 |
| non-agricultural production | 8.15 | 8.31 | 10.18 | 4.39 | 4.43 | 6.48 | 10.69 | 10.84 | 12.50 |
| Production by Sector Non-Beneficiary | | | | | | | | | |
| crop | -5.48 | -14.67 | -2.35 | -10.52 | -21.88 | -3.95 | -4.56 | -14.12 | -3.95 |
| livestock | 4.81 | 4.99 | 5.83 | 3.13 | 3.20 | 4.04 | 6.02 | 6.17 | 7.06 |
| retail | 7.61 | 7.57 | 9.12 | 4.44 | 4.52 | 5.94 | 9.56 | 9.78 | 11.17 |
| services | 6.07 | 6.09 | 7.54 | 3.43 | 3.38 | 4.84 | 7.34 | 7.37 | 8.70 |
| non-agricultural production | 7.65 | 7.65 | 9.32 | 4.32 | 4.39 | 5.94 | 9.61 | 9.81 | 11.30 |

# 8. Local economy-wide cost-benefit analysis

Cost-benefit analysis (CBA) entails summing up the future stream of discounted benefits from a project and comparing it with project costs. The formula for calculating the discounted net benefits of a project, relative to the baseline without the project, is:

$$NPV = \sum_{t=0}^{T} \left( \frac{Y_t^p - Y_t^{np} - I_t}{(1+r)^t} \right)$$

where $Y_t^p (Y_t^{np})$ denote benefits with (without) the project, $r$ is the discount rate, and $I_t$ is the project cost in year t.

The potential benefits of social protection and productive programmes are complex, encompassing income gains (derived from a variety of channels) to beneficiary households, income spillovers to non-beneficiary households, as well as other impacts to which it is difficult to assign economic values (e.g., optimism about the future and happiness). Development interventions potentially have a medium and long term impact on income in beneficiary households. In the case of a SCT, the short-run income impact for beneficiaries equals the amount of the transfer. For a PWP, it is the income spent on the project, which includes payments to workers and other project inputs. Other interventions may increase income in the short run by enhancing productivity in agricultural and/or nonagricultural activities. Long-run impacts include the effects of human capital investments on productivity and incomes (e.g., once newly educated children grow up, farmers implement what they learn from agricultural extension agents, new irrigation projects come on line, etc.). The study focusses only on the economic benefits, specifically, income gains. Although income is a subset of all potential benefits, it is the component that lends itself to CBA.

A critical difference between this and conventional CBA is that it incorporates the local economy-wide benefits of the project, including income spillovers to non-beneficiaries. Income spillovers to non-beneficiaries can be simulated with the use of a LEWIE model. $Y^p$ is the output from our LEWIE model. The study compares these local-economy benefits, appropriately discounted, to the cost of the programme. This local-economy CBA allows us to calculate the net present value of the project, taking into account the programme's impacts on income and local economy-wide spillovers. If desired, it can be compared to the results of a CBA that ignores spillovers.

To sum up, the CBA consists of annually calculating the benefits (total income benefits to beneficiaries and non-beneficiaries including spillovers) over a time horizon, discounting these benefits, adding up the discounted future stream of benefits and comparing it to the discounted stream of project costs. The discounted stream of benefits is the present value (PV) of local-economy benefits from the programmes mentioned. The discounted stream of programme costs over this period (C) is the total amount transferred in the base year continuing on over the time period, plus administrative costs. We subtract C from PV to obtain the net present value (NPV) of a programme. The net benefit ratio (PV/C) gives the economic return per MK invested.

## 8.1. Cost-benefit ratios of the SCT

Table 24 presents a LEWIE CBA for SCT Option 1, using the real income multipliers reported in Table 8 and shown in Figure 4. All numbers in this table are millions of 2016 MK.

The total amount of cash transferred to eligible households per year under Option 1 (assuming full coverage of ultra-poor and labour-constrained groups I and J) is MK 27,656 million (Column A). Column B gives the discounted value of the programme cost in each of the next 10 years, including administrative costs, using a discount rate of 10%. The costs, used above when calculating the denominators of the multipliers in Table 23 include only transfer costs, for the cost-benefit analysis we also include operation costs. For irrigation and extension part of these costs include salaries paid to rural households. For the SCT, the study conservatively estimates implementation costs equal to 26% of the value of the transfer. [26]

The indirect income spillover effects of the transfers are given in Column C. Recovering the multiplier from Table 8, under Option 1, each MK of the SCT increases total real income by 1.88 MK - that is, by the MK transferred plus an additional 0.88 MK of spillover. The indirect spillover, then, is the 0.88 spillover times the total amount transferred, or MK 24,338 million per year. This spillover is reported in Column C of Table 24.

Total discounted real-income benefits of the SCT under Option 1 are reported in Column D. They include the amount transferred (Column A) plus the spillovers (Column C), discounted each year at the discount rate of 10%. Their sum over ten years is MK 351,427 million.

One can compare these discounted benefits to the total discounted cost of the transfers over 10 years, which is MK 235,531 million. The differences between discounted benefits and costs each year are given in Column E. Over the ten-year period, the SCT programme under option 1 creates total discounted benefits, net of transfer and admin costs, equal to MK 115,896 million. This represents a return of MK 1.49 per MK transferred to eligible households.

**Table 24. LEWIE Cost-benefit Analysis of SCT Option 1**

| Years | *A* | *B* | *C* | *D* | *E* |
|---|---|---|---|---|---|
| | **Amount transferred to eligible households** | **Discounted SCT cost, including administration** | **Real income spillover** | **Discounted benefits including spillovers** | **Discounted net benefit** |
| 1 | 27,656 | 34,847 | 24,338 | 51,994 | 17,147 |
| 2 | 27,656 | 31,679 | 24,338 | 47,267 | 15,588 |
| 3 | 27,656 | 28,799 | 24,338 | 42,970 | 14,171 |
| 4 | 27,656 | 26,181 | 24,338 | 39,064 | 12,883 |
| 5 | 27,656 | 23,801 | 24,338 | 35,512 | 11,712 |
| 6 | 27,656 | 21,637 | 24,338 | 32,284 | 10,647 |
| 7 | 27,656 | 19,670 | 24,338 | 29,349 | 9,679 |
| 8 | 27,656 | 17,882 | 24,338 | 26,681 | 8,799 |
| 9 | 27,656 | 16,256 | 24,338 | 24,255 | 7,999 |
| 10 | 27,656 | 14,778 | 24,338 | 22,050 | 7,272 |
| Total | 276,563 | 235,531 | 243,375 | 351,427 | 115,896 |
| Ratio of Discounted Benefits to Discounted Costs: | | | | 351,427 / 235,531: | 1.49 |

Notes: All figures are in millions of 2016 MK. This analysis assumes an annual discount rate of 10%, 26% administrative cost, and a ten-year time horizon, with no changes in SCT transfers (in nominal terms) over the period.

[26] Administrative costs given from 2015/2016 data from the Ministry of Gender, Children, Disability, and Social Welfare (MoGCDSW).

This LEWIE CBA has been repeated for each of the other SCT options. Because the real income multipliers in Table 24 are similar across the five SCT options, there is little difference in cost-benefit ratios across the options. All are on the order of 1.49 to 1.52.

Nominal cost-benefit ratios, those based on the nominal SCT multipliers from Table 8 are higher - on the order of 2.29 MK per MK of programme cost. This suggests that complementary interventions targeted at raising productivity in rural areas and limiting price increases can enhance the economic returns to SCT investments. This would cause real multipliers to converge to higher nominal multipliers.

## 8.2. Cost-benefit ratios of PWPs

Table 25 presents results of a LEWIE CBA of the PWP Option 1. This option also includes administrative costs and costs of tools and planning associated with this programme.[27] Under this option the total amount transferred to eligible households, in the form of wages for PWPs, is MK 12,960 million. Administrative costs and tools add 67% to this amount. The LEWIE analysis reveals real income spillovers of 0.89 MK per MK of programme cost, or a total of MK 11,534 million per year. Total discounted benefits, including spillovers, equal MK 165,558 over the 10-year period. Dividing this by the total discounted programme costs yields a net return of 1.13 per MK invested in PWPs.

**Table 25. LEWIE Cost-benefit Analysis of PWP Option 1**

| Years | *A* | *B* | *C* | *D* | *E* |
|---|---|---|---|---|---|
| | **Amount transferred to eligible households** | **Discounted PWP cost, including administration** | **Real income spillover** | **Discounted benefits including spillovers** | **Discounted net benefit** |
| 1 | 12,960 | 21,643 | 11,534 | 24,494 | 2,851 |
| 2 | 12,960 | 19,676 | 11,534 | 22,268 | 2,592 |
| 3 | 12,960 | 17,887 | 11,534 | 20,243 | 2,356 |
| 4 | 12,960 | 16,261 | 11,534 | 18,403 | 2,142 |
| 5 | 12,960 | 14,783 | 11,534 | 16,730 | 1,947 |
| 6 | 12,960 | 13,439 | 11,534 | 15,209 | 1,770 |
| 7 | 12,960 | 12,217 | 11,534 | 13,826 | 1,609 |
| 8 | 12,960 | 11,106 | 11,534 | 12,570 | 1,463 |
| 9 | 12,960 | 10,097 | 11,534 | 11,427 | 1,330 |
| 10 | 12,960 | 9,179 | 11,534 | 10,388 | 1,209 |
| Total | 129,600 | 146,287 | 115,344 | 165,558 | 19,271 |
| Ratio of Discounted Benefits to Discounted Costs: | | | | 165,558 / 146,287 | 1.13 |

Notes: All figures are in millions of 2016 MK. This analysis assumes an annual discount rate of 10%, 67% of the transfer on administrative and cost of tools, and a ten-year time horizon, with no changes in PWP transfers (in nominal terms) over the period.

These results highlight a number of relevant findings:

**PWP policy options that assume the programme increases agriculture productivity have significantly larger cost-benefit ratio.** The highest cost-benefit ratios in the table, 1.94 and

[27] Administrative costs plus the costs of tools for construction of the assets are assumed to be 67% of transfer costs. This is typically the cost of the PWP however reforms are in process that may reduce this amount (Local Development Fund of the Republic of Malawi).

1.89, correspond to projects resulting in an increase in land productivity and highest LEWIE income multipliers. It is critical that PWP prioritize the creation of quality assets and transfer skills that can lead to productivity gains, or otherwise the discounted benefits of PWP barely exceed the costs of the programme (1.13 MK discounted benefit for 1 MK spent).

**There are large overhead costs to PWPs, and because of this the cost-benefit ratios are smaller for PWP than for the SCT with similar income multipliers**. PWPs in general is less efficient than the SCT at allocating transfers to poor households. Thus, the need for the creation of quality agricultural assets and transfer skills through PWPs, is even more important given the PWPs inherent inefficiencies in providing transfers.

**Table 26. LEWIE Cost-benefit Analysis of PWP Options**

| PWP options | Real income multiplier | Cost-benefit ratio |
|---|---|---|
| Option 1a (status quo by end of 2017) | 1.89 | 1.13 |
| *Option 1b (Option 1a w 5% increase in land productivity)* | *3.24* | *1.94* |
| Option 2a (ultra-poor labour-unconstrained HHs) | 1.90 | 1.14 |
| *Option 2b (Option 2a w 5% increase in land productivity)* | *3.15* | *1.89* |
| Option 3a (all poor labour-unconstrained HHs with more days) | 1.89 | 1.13 |
| *Option 3b (Option 3a w 5% increase in land productivity)* | *2.58* | *1.54* |

## 8.3. Cost-benefit ratios of the FISP

Table 27 presents the results of a LEWIE CBA for FISP Option 1, including the increase in predicted productivity in FISP-beneficiary households. The total amount of FISP subsidy per year to eligible households under Option 1 is MK 26,460 million (Column A). Column B gives the discounted cost of the programme in each of the next 10 years, including administrative costs estimated at 25% of the subsidy[28], using a discount rate of 10%. The total discounted FISP cost over 10 years is MK 223,555 million.

Real income multiplier without administration costs from Table 14 under Option 1 with technology change are used, which is 2.49 MK per MK of subsidy. The spillover benefits to non-beneficiaries in presented in Column C.

Total discounted benefits of the FISP under Option 1 are reported in Column D. They include the change in income of both FISP beneficiaries (Column A) and non-beneficiaries (Column C), discounted each year at the discount rate of 10%. Their sum over ten years is MK 445,321.

This allows for the comparison of these discounted benefits to the total discounted cost of FISP over the 10 years, which is MK 223,555. The differences between discounted benefits and costs each year are given in Column E. Over the ten-year period, the FISP under option 1 with FISP-

[28] Administrative costs are assumed to be 25% of transfer costs or approximately 20% of total costs. This is based on studies by Asfaw et al (2016) and the World Bank Public Expenditure Review which place admin and other costs at 15.43% and 17.6% of total FISP costs respectively.

induced technology change creates total discounted benefits, net of transfer plus admin costs, equal to MK 221,766. This represents a real income return of MK 1.99 per MK of FISP cost.

**Table 27. LEWIE Cost-benefit Analysis of FISP Option 1 Including FISP-induced Technology Change**

| Years | *A* | *B* | *C* | *D* | *E* |
|---|---|---|---|---|---|
| | **Amount of FISP subsidy** | **Discounted FISP cost, including administration** | **Real income spillover** | **Discounted benefits including spillovers** | **Discounted net benefit** |
| 1 | 26,460 | 33,075 | 39,425 | 65,885 | 32,810 |
| 2 | 26,460 | 30,068 | 39,425 | 59,896 | 29,828 |
| 3 | 26,460 | 27,335 | 39,425 | 54,451 | 27,116 |
| 4 | 26,460 | 24,850 | 39,425 | 49,501 | 24,651 |
| 5 | 26,460 | 22,591 | 39,425 | 45,001 | 22,410 |
| 6 | 26,460 | 20,537 | 39,425 | 40,910 | 20,373 |
| 7 | 26,460 | 18,670 | 39,425 | 37,191 | 18,521 |
| 8 | 26,460 | 16,973 | 39,425 | 33,810 | 16,837 |
| 9 | 26,460 | 15,430 | 39,425 | 30,736 | 15,306 |
| 10 | 26,460 | 14,027 | 39,425 | 27,942 | 13,915 |
| Total | 264,600 | 223,555 | 394,254 | 445,321 | 221,766 |
| Ratio of Discounted Benefits to Discounted Costs: | | | | 445,321 / 223,555: | 1.99 |

Notes: All figures are in millions of MK. This analysis assumes an annual discount rate of 10%, administration costs equal to 25% of the FISP subsidy, and a ten-year time horizon, with no changes in FISP subsidies over the period.

**Net benefits, and therefore the cost-benefit ratio, are much lower if we do not take into account changes in predicted productivity associated with household participation in the FISP**. If one ignores the econometric estimates of technology change and uses the LEWIE model to simulate impacts of FISP subsidies assuming no change in productivity, the cost-benefit ratio falls to 1.21.

Summary Table 28 reports the cost-benefit ratio for each of the ten FISP policy options.

**The patterns are consistent with ratios presented in Table 26, where the cost-benefit ratio for policy options with estimates of productivity change are larger than those without.** The highest cost-benefit ratios are found for Option 3, with mixed pro-poor targeting, where the FISP is targeted to the ultra-poor and poor households with land in excess of 1.5 acres. Overall, poorer households have expenditure patterns that tend to favor goods with a larger potential to create local income spillovers.

**Remarkably, targeting ultra-poor farmers with land and excluding non-poor farmers with land from FISP increases the cost-effectiveness of the programme by between 3 and 4 times.** As discussed in Section 7.2.2 on the stand-alone FISP, these striking findings can primarily be explained by the different production functions of the poor and non-poor, which assume that the ultra-poor and poor are more responsive to changes in input prices as they rely more on hired and family labour in their production, which are more easily expanded than capital and land. In addition, the relatively high cost-effectiveness of targeting ultra-poor and poor households with land seems to be driven by the fact that when the ultra-poor and poor (with or without land) are not targeted by the FISP, these groups suffer from negative income

and production effects and do not expand their production in response to the subsidy. However, if the ultra-poor and poor (with land) are targeted they expand their production relatively more than the non-poor, as their production function is more flexible in its response to input price changes.

In the case of Option 5, where the subsidy is reduced to 50% and only given to the less poor farmers, without the technology change, the cost-benefit ratio is 0.74. In other words, without induced technology change for Option 5, the discounted stream of benefits from FISP does not cover the programme costs.

**Table 28. LEWIE Cost-benefit Analysis of FISP Options**

| FISP options | Real income multiplier without administrative costs | Cost-benefit ratio |
|---|---|---|
| Option 1 (status quo by end of 2017-all HHs) | 1.51 | 1.21 |
| *Option 1 with tech change* | *2.49* | *1.99* |
| Option 2 (all households with land above 1.5 acres – "productive" farmers) | 3.33 | 2.66 |
| *Option 2 with tech change* | *5.36* | *4.29* |
| Option 3 (more vulnerable "productive" farmers) | 6.03 | 4.82 |
| *Option 3 with tech change* | *11.90* | *9.52* |
| Option 4 (less vulnerable "productive" farmers) | 1.68 | 1.34 |
| *Option 4 with tech change* | *2.84* | *2.27* |
| Option 5 (less vulnerable "productive" farmers- lower subsidy) | 0.92 | 0.74 |
| *Option 5 with tech change* | *2.87* | *2.30* |

## 8.4. Cost-benefit ratios of extension services and irrigation

As reported in section 7.2.3, irrigation and extension multipliers include administrative costs (as it is not possible to separate the operational costs from the transfer cost) and thus represent already cost-benefit ratios as well. Those numbers are summarized below (Table 29) and it should be noted again that low cost-benefit ratios for irrigation do not reflect the policy's positive impact on urban consumers through lower crop prices as well as increasing food security and export value. Also, the inclusion of more low cost smallholder irrigation schemes could increase the cost-benefit ratio as well. This appears to be where many of the private sector small farmers are heading and government incentives for small holder irrigation schemes could increase cost-benefit ratios.

Extension cost-benefit ratios indicate more than double the impact of 1 MK spent. This is due to not only the crop productivity increases associated with the knowledge and skills transfer but also because a high percentage of the costs of extension are actually plowed back into the local economy through cash transfers, in the form of wages, to rural extension agents. Taking into account the technology transfer plus rural spending by extension workers and the resulting spillovers more than justifies expanding and strengthening extension in Malawi.

**Table 29. LEWIE Cost-benefit Analysis of Extension and Irrigation**

| Extension and irrigation | Cost-benefit ratios |
|---|---|
| (1) Irrigation - Full Cost - Annual over 20 years | 0.89 |
| (2) Irrigation - Annual Cost upon Completion | 0.69 |
| (3) Extension | 2.07 |

## 8.5. Cost-benefit ratios of combining the SCT and FISP

Table 30 presents the results of a LEWIE CBA of a combined SCT and FISP (Option 1, including FISP-induced technology change). In combination, the FISP raises the cost-benefit ratio of the SCT alone: 2.4 MK per MK of combined programme cost (1.9 without FISP technology change), compared with 1.49 for the stand-alone SCT programme. Rising consumption costs limit the real income benefits from the SCT alone, but the FISP with and without technology change increases the local food supply and lowers food prices.

**Table 30. LEWIE Cost-benefit Analysis of Combined Option A with FISP-Induced Technology Change**

| Years | *A* | *B* | *C* | *D* | *E* | *F* | *G* |
|---|---|---|---|---|---|---|---|
| | **Amount transferred to eligible households** | **Amount of FISP subsidy** | **Discounted SCT cost, including admin.** | **Discounted FISP cost, including admin.** | **Real income spillover** | **Discounted benefits including spillovers** | **Discounted net benefit** |
| 1 | 27,656 | 26,460 | 34,847 | 33,075 | 108,774 | 162,890 | 94,968 |
| 2 | 27,656 | 26,460 | 31,679 | 30,068 | 108,774 | 148,082 | 86,335 |
| 3 | 27,656 | 26,460 | 28,799 | 27,335 | 108,774 | 134,620 | 78,486 |
| 4 | 27,656 | 26,460 | 26,181 | 24,850 | 108,774 | 122,382 | 71,351 |
| 5 | 27,656 | 26,460 | 23,801 | 22,591 | 108,774 | 111,256 | 64,864 |
| 6 | 27,656 | 26,460 | 21,637 | 20,537 | 108,774 | 101,142 | 58,968 |
| 7 | 27,656 | 26,460 | 19,670 | 18,670 | 108,774 | 91,947 | 53,607 |
| 8 | 27,656 | 26,460 | 17,882 | 16,973 | 108,774 | 83,588 | 48,734 |
| 9 | 27,656 | 26,460 | 16,256 | 15,430 | 108,774 | 75,989 | 44,303 |
| 10 | 27,656 | 26,460 | 14,778 | 14,027 | 108,774 | 69,081 | 40,276 |
| Total | 276,563 | 264,600 | 235,531 | 223,555 | 1,087,737 | 1,100,977 | 641,892 |
| Ratio of Discounted Benefits to Discounted Costs: | | | | | 1,100,977 / (235,521+223,555): | | 2.40 |

Notes: All figures are in millions of MK. This analysis assumes an annual discount rate of 10%, the same implementation costs as in the stand-alone experiments, and a ten-year time horizon, with no changes in the SCT or FISP subsidies over the period.

This cost-benefit ratio is compared with the cost-benefit ratios for the other combined options in Table 31.

**The simulations presented confirm previous findings that the largest cost-benefit ratios correspond to options that combine the SCT with interventions that raise productivity through FISP technological change.** The largest cost-benefit ratios are for Option 1 with technological change (2.40) and Option 4 with technological change (2.40). PWPs without the creation of rural assets and skills, on the other hand, appear to bring down cost-benefit ratios. The reason is that they bring high added administrative and tool costs without bringing much

additional benefits. If PWPs were to create effective rural assets and/or skills training cost-benefit ratios would improve.

**Partial and fully overlapping scenarios have higher cost-benefit ratios than the non-overlapping simulation.** Option 2 is the only non-overlapping simulation, and each cost-benefit ratio is lower than the partial overlapping simulations in Option 3, which in turn are lower than the fully overlapping simulations of Option 4 and Option 5. This points to efficiencies that can be gained by targeting the same groups for interventions rather than separate groups, even when taking local economy spillovers into account.

Other simulations that combine the SCT with agricultural productivity increases through irrigation or extension are not shown here. However, based on the LEWIE simulations presented in the previous section, one would expect these other productive interventions to also increase the cost-benefit ratio of the SCT[29].

**Table 31. LEWIE Cost-benefit Analysis of Combined Options**

| Combined options | Real income multiplier | Cost-benefit ratios |
|---|---|---|
| Option 1: SCT + FISP to HHs with more than 1.5 acres no tech change | 2.38 | 1.90 |
| *with tech change* | *3.01* | *2.40* |
| *+PWP - no tech change* | *2.25* | *1.66* |
| Option 2: Reallocation of resources with non-overlapping targeting - no tech change | 1.83 | 1.46 |
| *with tech change* | *1.97* | *1.57* |
| *+PWP no tech change* | *1.84* | *1.23* |
| Option 3: Reallocation of resources with partial overlapping targeting - no tech change | 2.15 | 1.71 |
| *with tech change* | *2.47* | *1.97* |
| *+PWP no tech change* | *2.09* | *1.40* |
| Option 4: Reallocation of resources with fully overlapping targeting - no tech change | 2.36 | 1.88 |
| *with tech change* | *3.01* | *2.40* |
| *+PWP no tech change* | *2.20* | *1.42* |
| Option 5: Reallocation of resources with fully overlapping targeting to ultra-poor - no tech change | 2.23 | 1.78 |
| *with tech change* | *2.66* | *2.12* |
| *+PWP no tech change* | *2.19* | *1.41* |

[29] A simulation with the SCT combined with extension and yielded a cost-benefit ratio of 1.6.

# 9. Conclusion

**There are inherent policy tradeoffs between the goals of raising agricultural productivity and achieving social protection of the Malawi's poor and vulnerable households.** The study shows that the SCT has the largest direct impact on incomes and poverty amongst targeted ultra-poor and labour-constrained households, while the FISP, PWPs, irrigation and, to a smaller degree, extension services have larger impacts on agricultural production.

**However, the simulations further reveal that there are important synergies between productive agricultural programmes and social protection.** Interventions that raise agricultural productivity are found to lower food costs, and this has positive real-income effects for poor households. Conversely, the SCT, which increases food demand create new markets for food production. *If the policy goal is to raise rural incomes and also increase crop production, the study finds that combining social protection and productive agricultural interventions is a more effective strategy than doing either one of these alone.*

**The economy-wide impact evaluations and cost-benefit analyses show that all selected programmes have direct impacts on beneficiary households and can also generate positive or negative income and production spillovers affecting non-targeted household groups.** Programmes can create positive income and production spillovers if they raise the demand for goods and services, creating income generating opportunities for non-beneficiaries engaged in the production of those goods and services. However, they can also create negative spillovers, for example, by pushing up the prices of food and raising costs for food consumers, or by depressing prices for food producers.

**In most cases, spillovers result in large positive indirect impacts on incomes of non-beneficiaries in rural Malawi and create considerable income multipliers.** *In most cases***,** each MK invested in the programmes studied increases income in rural Malawi by more than 1 MK. For example, each MK transferred through the SCT increases total real income by 1.88 MK - that is, by the MK transferred plus an additional 0.88 MK of income spillover. Impact evaluations that do not consider income and production spillovers miss many, and in some cases most of the benefits created by these programmes.

**Income spillovers from social protection and agricultural interventions have important implications for equity, as some household groups are in a better position to benefit from income spillovers, whatever their cause.** For example, non-poor households benefit significantly from the SCT - even though the transfers go only to ultra-poor households. So do moderately-poor labour-constrained households with land. These ineligible groups benefit from the transfers as they have the resources to expand production in response to rising local demand, thus capturing positive income and production spillovers. Asset-poor households do not have this capacity to respond and income gains of such households depend mostly upon whether or not they are direct beneficiaries of the SCT, highlighting the need to ensure that the most poor are benefiting directly from transfers.

**Income spillovers are an important part of cost-benefit analyses and strengthen the argument of the effectiveness of social protection and productive interventions by**

**capturing the full impact of interventions in rural economies.** The study demonstrates that for all SCT options, income spillovers tip the cost-benefit scale in favor of SCT programmes, as total discounted benefits, including spillovers, always exceed programme costs, including administrative costs. The same is true for nearly all productive interventions, as well as for all considered combined social protection plus productive interventions.

**Ignoring production and income spillovers not only misses programme benefits, it also creates the risk of missing negative indirect impacts that could be avoided with well-designed complementary policies.** For instance, if the FISP raises the market supply of food crops and pushes down food prices, any food producer who does not receive the FISP subsidies could suffer. Also, the FISP could be regressive if it does not lower food costs, or if it is not combined with cash transfers to poor farm households. In fact, the study finds that the FISP reduces income in some household groups that do not receive the subsidies. Policies that increase local demand or connect producers with outside markets could alleviate this. Similarly, if the SCT pushes up food prices by raising the demand for food, any household that does not receive the SCT could suffer. The study finds that the SCT increases income for all household groups, but some groups benefit far less from spillovers than others. Asset-poor households that do not receive the transfer and have limited capacities to expand production are found to benefit the least. Again, policies that simulate local production or connect consumers with outside markets could alleviate this.

**For PWPs and the FISP, benefits depend critically on whether or not they have productive impacts beyond the immediate direct impacts.** For example, the FISP makes inputs cheaper, thus stimulating input use, but increased use of fertilizer and other inputs may not be enough to justify programme costs. Likewise, PWPs are inefficient cash transfers if they do not lead to the creation of productive rural assets and improve productivity through transfers of skills. The simulations show that the FISP does not pass the cost-benefit test (having ratio of benefits to costs of larger than 1) if it does not lead to technological change - that is, if it does not make farmers more productive.

**Directing the FISP towards households with some land could improve the productivity of the subsidy but risks creating negative impacts on poor farming households that are excluded from the FISP.** The FISP can be regressive if it does not lower food prices, or if it is not combined with cash transfers to poor farming households, which do not receive the subsidy. Should the Government decide to reform the FISP, it should be directed to households with land above the median, while those who no longer receive the FISP should be supported with the SCT. This should create larger productive effects while limiting the adverse consequences on the real incomes of former FISP beneficiaries. The resulting SCT targeted toward the poorer households should have a greater impact on poverty. Still, careful attention should be paid to the marginal farm household with low amounts of land who lose the FISP and may also be impacted by the negative price effects from increased production by farmers with land above 1.5 acres that receive the FISP.

**While irrigation and extension interventions do not directly target the most poor, they nonetheless have significant impacts on income, food prices and poverty.** The study simulates the impacts of scaled-up irrigation and extension services on households with land above the median (1.5 acres) and finds that in addition to creating direct impacts on beneficiary households, such productive agricultural interventions have significant impacts on (ultra-)poverty levels, primarily due to lower food prices resulting from more substantive harvests.

**Reducing poverty is the single most important goal of rural development programmes and social and productive interventions can directly reduce poverty by targeting poor households as well as indirectly by creating real-income spillovers**. The simulation confirms that social protection interventions, the SCT and PWPs, are cost-effective (benefits exceeding costs) and have stronger direct and indirect impacts on poverty reduction than any of the productive programmes studied.

**Nevertheless, the largest decrease in poverty results from combined interventions that target ultra-poor households with the SCT, while raising crop productivity, thus reducing food prices.** Increasing crop productivity can be done through FISP or through other productive interventions such as irrigation and extension. Even creating effective rural assets with the PWPs could raise crop productivity and complement the SCT. Lower food prices have a disproportionately large impact on welfare in poor households, which allocate most of their budgets to food.

**In fact, ensuring overlapping targeting between the SCT and FISP should increase the cost-effectiveness of both programmes, as partially and fully overlapping policy options of the SCT and FISP have consistently higher cost-benefit ratios than non-overlapping options**. For the SCT and FISP, non-overlapping policy options have the lowest cost-benefit ratios and fully overlapping options have consistently the highest ratios. This points to efficiencies that can be gained by targeting the same groups for interventions rather than separate groups, even when taking local economy spillovers into account.

**Overall, the findings from this study underline the importance of coordinating social protection with interventions to increase crop productivity**. This appears to be critical in order to create positive real-income multipliers and stimulate agricultural production while alleviating rural poverty.

## References


Abdoulayi, S., Angeles, G., Barrington, C., Brugh, K., Handa, S., Hill, M.J., Kilburn, K., Otchere, F., Mvula, P., Tsoka, M., and Natali, L. 2014. Malawi Social Cash Transfer Programme Baseline Evaluation Report. University of North Carolina, Carolina Population Center (March 29).

Asfaw, S., Cattaneo, A., and Pallante, G. 2016. Welfare and productivity effects of switching from existing FISP to a universal fertilizer subsidy in Malawi. Rome: Agriculture Organization of the United Nations (FAO).

Asfaw, S., Pickmans, R., and Davis, B. 2016. Productive impact of Malawi's Social Cash Transfer Programme – midterm report. Protection to Production (PtoP) report. Rome: Agriculture Organization of the United Nations (FAO).

Beegle, K., Galasso, E., and Goldberg, J. 2015. *Direct and Indirect Effects of Malawi's Public Works Programme on Food Security*. Policy Research Working Paper 7505, Washington, DC: World Bank.

Chafuwa, C. 2017. *Priorities for Irrigation Investment in Malawi*. Strategy Support Programme: Policy Note 28. Washington, D.C.: International Food Policy Research Institute (IFPRI).

Chirwa, E. and Dorward, A. 2013. Targeting in the Farm Input Subsidy Programme in Malawi: Issues and Options. Working Paper 066, Future Agricultures Consortium.

Daidone, S., Pace, N., Davis, B., Handa, S., Knowles, M., Pickmans, R. 2017. The Social Cash Transfer Programme and Farm Input Subsidy Programme in Malawi: complementary instruments for increasing consumption and productive activities. Protection to Production (PtoP) report. Rome: Agriculture Organization of the United Nations (FAO).

D'Souza, A., Jolliffe, D. 2014. Food Insecurity in Vulnerable Populations: Coping with Food Price Shocks in Afghanistan. *American Journal of Agricultural Economics*, 96 (3): 790-812.

Filipski, M., Taylor, J.E., Thome, K. and Davis, B. Effects of Treatment Beyond the Treated: A General Equilibrium Impact Evaluation of Lesotho's cash Granst Programme. *Agricultural Economics*, 46 (2): 227-243.

Filipski, M., Taylor, J.E., Abegaz, G.A., Ferede, T., Taffesse, A.S., and Diao, X. 2016. Synopsis: Economy-wide impacts of the Productive Safety Net Programme (PSNP). ESSP II Research Note 57. Washington, D.C. and Addis Ababa, Ethiopia: International Food Policy Research Institute (IFPRI) and Ethiopian Development Research Institute (EDRI). http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/130466

Kagin, J., Taylor, J.E. 2016. Local Economy and Social Capital Impacts of the SCTPP in Tigray, Ethiopia. Addis Abeba: United Nations Children's Fund.

Kagin, J., Taylor, J.E., Alfani, F., and Davis, B. 2014. Local Economy-wide Impact Evaluation (LEWIE) of Ethiopia's social cash transfer pilot programme. Protection to Production (PtoP) report. Rome: Agriculture Organization of the United Nations (FAO).

Logistics Unit, Government of Malawi. 2017. Final Report on the Implementation of the Farm Input Subsidy Programme (2016-7).

Meerendonk, A., Cunha, N., Juegens, F. 2015. Towards a Malawian Social Protection Floor: Assessment of Social Protection Programmes and Costing of Policy Options. International Labour Office.

N. Pace, S. Daidone, B. Davis, S. Handa, M. Knowles, R. Pickmans. 2017. One plus one can be greater than two: evaluating synergies of development Programmes in Malawi. *Journal of Development Studies*, 54 (11): 2023-2060.

Pauw, K., and Thurow, J. 2014. *Malawi's Farm Input Subsidy Programme: Where Do We Go From Here?* Policy Note 18, Washington, DC: International Food Policy Research Institute.

PSIConsult. 2017. Consultancy Services for the Development of Agriculture Extension and Advisory Services Strategy for the Ministry of Agriculture, Irrigation and Water Development (MOAIWD). Kent: UK. Final Issues Paper.

Ricker-Gilbert, J., Mason, N.M., Darko, F.A. and Tembo, S.T., 2013. What are the effects of input subsidy programmes on maize prices? Evidence from Malawi and Zambia. *Agricultural Economics*, *44*(6), pp.671-686.

Singh, I., Squire, L. and Strauss, J. 1986. *Agricultural household models: Extensions, applications, and policy*. The World Bank.

Taylor, J.E., and Filipski, M. 2014. Beyond Experiments in Development Economics: Local Economy-wide Impact Evaluation. Oxford: Oxford University Press.

Taylor, J.E., Filipski, M., Alloush, M., Gupta, A., Rojas Valdes, R.I., and Gonzalez-Estrada, E. 2016. Economic impact of refugees. Proceedings of the National Academy of Sciences

Taylor, J.E., Gupta, A., Davis, B., Pellerano, L., and Niang, O. 2016. Long-term Impacts of SCTs: A Local-economy Cost-benefit Analysis. UN FAO and UC Davis, March 19, 2016.

The Agriculture Sector Wide Approach (ASWAp): Malawi's prioritized and harmonized Agricultural Development Agenda: 2010-2014. Review of Achievements and Implementation Draft Final Report. Rome: United Nations Food and Agriculture Organization, 2016.

Thome, K., Taylor, J.E., Tsoka, M., Mvula, P., Davis, B., and Handa, S. 2015. Local Economy-wide Impact Evaluation (LEWIE) of Malawi's Social Cash Transfer (SCT) Programme. Protection to Production (PtoP) report. Rome: Agriculture Organization of the United Nations (FAO).

Thome, K., Taylor, J.E., Kagin, J., Davis, B., Osei, R.D., and Osei-Akoto, I. 2014. *Local Economy-wide Impact Evaluation (LEWIE) of Ghana's Livelihood Empowerment Against Poverty (LEAP) Programme.* Protection to Production (PtoP) report. Rome: Agriculture Organization of the United Nations (FAO).

Thome, K., Filipski, M., Kagin, J., Taylor, J.E., and Davis, B. 2013. Agricultural Spillover Effects of Cash Transfers: What Does LEWIE Have to Say. *American Journal of Agricultural Economics*, 95 (5): 1338-1344.

University of North Carolina. 2016. Malawi Social Cash Transfer Programme Endline Impact Evaluation Report. Chapel Hill. University of North Carolina, Chapel Hill, Carolina Population Center.

## Appendix A: Impacts on poverty and inequality of policy options

Table 32 presents the simulated impacts of social protection and agricultural production interventions on poverty and inequality in rural Malawi. Contrary to typical analyses, the effects simulated are not only the effects on poverty and inequality of direct transfer effects on beneficiaries under each policy options. Instead, the distributional implications of the overall income effects that are driven by spillover production and consumption linkages, including on non-beneficiary households are simulated.

The top three horizontal panels give impacts of the SCT, PWPs, and FISP. The bottom horizontal panel presents poverty impacts of the combined interventions. For each policy or policy combination, the first two columns give the impact on the number of people (headcount) in moderate poverty; the second two columns, on the number of people in severe (ultra) poverty; the third two, on the total number of people in poverty; and the last two, on the Gini coefficient of income inequality. The Gini coefficient ranges from a low of 0 (perfect equity) to a high of 1 (perfect inequality). A decrease in the index indicates lower inequality.

**It is clear from both the table and the figures that SCT stand-alone programmes have the largest impacts on ultra-poverty and inequality of all of the (standalone) interventions we considered.** SCT reduces the total ultra-poverty headcount by 10 percentage points (Option 1) to 21 percentage points (option 4). The impact on overall poverty reduction are much smaller, a reflection of the fact that the progamme lifts households of rural ultra-poor into moderate poverty – hence the increase in moderate poverty rates – but not above the poverty line. Yet, the SCT has one of the largest impacts on overall poverty, which falls by 1 point (Option 1) to 5 points (Option 5).[30] Besides reducing poverty, the SCT also lowers income inequality in rural Malawi. The Gini coefficient of inequality falls by between 2 and 4 percentage points. These are considered large decreases in inequality by international standards.

**Effects on poverty and inequality reduction are obviously large when the SCT transfer value is higher** (Options 4 and 5), but this also comes with higher programme costs. Targeting SCT based on poverty or based on labour capacity (the difference between option 4 and 5) yields similar results in terms of overall poverty and inequality reduction.

**PWPs also reduces poverty** ranging from 0.3 percentage points (Option 1a) to 5 percentage points (Option 3a and Option 3b). Its impact on overall poverty is actually larger than its impact on ultra-poverty when a larger number of paid days is modelled (Option 3a and option 3b). That is because, unlike the SCT, PWPs does not target the most severely impoverished households (the ultra-poor) rather those that are moderately poor and ultra-poor with available labour. PWPs also marginally reduces inequality, but only by 1 percentage point.

**FISP has less of an impact on ultra-poverty, a minimal impact on poverty overall and a possibly negative effect on overall inequality, when ultra-poor "productive" farmers with**

[30] The overall poverty impact of the SCT is less than it's ultra-poverty impact because many ultra-poor households that are targeted "graduate" to become moderately poor but do not exit poverty entirely. This is also why there is an increase in moderate poverty for the SCT programmes.

**land are excluded from the programme**. Our simulations show that FISP reduces poverty by 1 to 3 percentage points, depending on the option. Most of the FISP options do not affect inequality at all. One (Option 3 with technological change) reduces it by 1 point, and two others (and option 4 with and without technological change) increases inequality by 1 point.

**Irrigation and extension do not target the poorest rural households, those with land below the median, and yet in the case of irrigation, it the model predicts a significant impact on ultra-poverty**. Irrigation reduces ultra-poverty by 5 percentage points under the full cost simulation and 9 percentage points under the annual cost simulation; primarily due to lower food prices resulting from bigger harvests. Irrigation also produces the largest reductions in the overall headcount (6 percentage point), however associated with highest interventions costs as well. Irrigation, has a marginal effect on inequality, reduces inequality by 1 point. Extension has no effect on inequality and a relatively small effect on poverty reduction.

**Table 32. Moderate, Ultra, Overall Poverty Headcount, and Inequality Level and Percentage Point Changes for Each Programme (Appendix)**

| | | Moderate poverty | | Ultra poverty | | Overall poverty | | Inequality | |
|---|---|---|---|---|---|---|---|---|---|
| | | Headcount | PP Change | Headcount | PP Change | Headcount | PP Change | Gini | Change in Gini |
| Baseline | | 26% | - | 37% | - | 63% | - | 0.47 | - |
| SCT | Option 1 | 35% | 9 | 27% | -10 | 62% | -1 | 0.45 | -0.02 |
| | Option 2 | 41% | 15 | 20% | -17 | 61% | -2 | 0.43 | -0.03 |
| | Option 3 | 32% | 6 | 26% | -11 | 58% | -4 | 0.45 | -0.02 |
| | Option 4 | 43% | 17 | 15% | -21 | 59% | -4 | 0.42 | -0.04 |
| | Option 5 | 37% | 11 | 21% | -16 | 57% | -5 | 0.43 | -0.04 |
| PWP | Option 1a | 26% | 0 | 35% | -2 | 60% | -2 | 0.46 | -0.01 |
| | Option 1b | 26% | 0 | 34% | -3 | 60% | -3 | 0.46 | -0.01 |
| | Option 2a | 29% | 3 | 34% | -3 | 62% | 0 | 0.46 | -0.01 |
| | Option 2b | 29% | 3 | 33% | -4 | 62% | -1 | 0.46 | -0.01 |
| | Option 3a | 25% | -1 | 33% | -4 | 58% | -5 | 0.46 | -0.01 |
| | Option 3b | 25% | -1 | 33% | -4 | 57% | -5 | 0.46 | -0.01 |
| FISP | Option 1 no tech change | 26% | 0 | 36% | -1 | 62% | -1 | 0.47 | 0.00 |
| | Option 1 with tech change | 26% | 0 | 35% | -2 | 61% | -2 | 0.47 | 0.00 |
| | Option 2 no tech change | 27% | -1 | 34% | -1 | 61% | -1 | 0.47 | 0.00 |
| | Option 2 with tech change | 28% | -1 | 32% | -2 | 60% | -2 | 0.46 | 0.00 |
| | Option 3 no tech change | 26% | -1 | 35% | -3 | 61% | -2 | 0.46 | 0.00 |
| | Option 3 with tech change | 26% | -1 | 33% | -5 | 59% | -3 | 0.46 | -0.01 |
| | Option 4 no tech change | 24% | -1 | 37% | 0 | 61% | -1 | 0.47 | 0.01 |
| | Option 4 with tech change | 24% | -2 | 37% | 0 | 61% | -2 | 0.48 | 0.01 |
| | Option 5 no tech change | 25% | -1 | 37% | 0 | 62% | -1 | 0.47 | 0.00 |
| | Option 5 with tech change | 25% | -1 | 37% | 0 | 62% | -1 | 0.47 | 0.00 |
| IRS | Double access to irrigation, full cost | 28% | 0 | 32% | -5 | 60% | -1 | 0.46 | 0.00 |
| | Double access to irrigation, annual cost | 30% | 0 | 28% | -9 | 57% | 0 | 0.46 | -0.01 |
| E | Double access to extension | 27% | 0 | 35% | -2 | 62% | 0 | 0.47 | 0.00 |
| COMBINED | Option 1 | 36% | 9 | 24% | -13 | 60% | -2 | 0.44 | -0.02 |
| | Option 1 with tech change | 36% | 9 | 23% | -14 | 59% | -3 | 0.44 | -0.03 |
| | Option 1 +PWP - no tech change | 35% | 8 | 23% | -14 | 58% | -4 | 0.44 | -0.03 |
| | Option 2 | 42% | 16 | 16% | -21 | 57% | -5 | 0.43 | -0.04 |
| | Option 2 with tech change | 41% | 15 | 16% | -21 | 57% | -6 | 0.43 | -0.04 |
| | Option 2 +PWP - no tech change | 40% | 14 | 15% | -22 | 55% | -8 | 0.43 | -0.04 |
| | Option 3 | 32% | 16 | 25% | -5 | 56% | -6 | 0.44 | -0.03 |
| | Option 3 with tech change | 32% | 15 | 23% | -6 | 55% | -7 | 0.44 | -0.03 |
| | Option 3 +PWP - no tech change | 31% | 14 | 23% | -7 | 54% | -8 | 0.44 | -0.03 |
| | Option 4 | 25% | 16 | 31% | 0 | 56% | 0 | 0.46 | -0.01 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Option 4 with tech change** | 25% | 15 | 30% | 0 | 55% | 0 | 0.45 | -0.01 |
| | **Option 4 +PWP - no tech change** | 24% | 14 | 30% | 0 | 54% | 0 | 0.45 | -0.02 |
| | **Option 5** | 23% | 5 | 32% | -5 | 55% | -6 | 0.46 | -0.01 |
| | **Option 5 with tech change** | 23% | 5 | 31% | -6 | 54% | -7 | 0.45 | -0.02 |
| | **Option 5 +PWP - no tech change** | 23% | 5 | 30% | -7 | 53% | -8 | 0.45 | -0.02 |

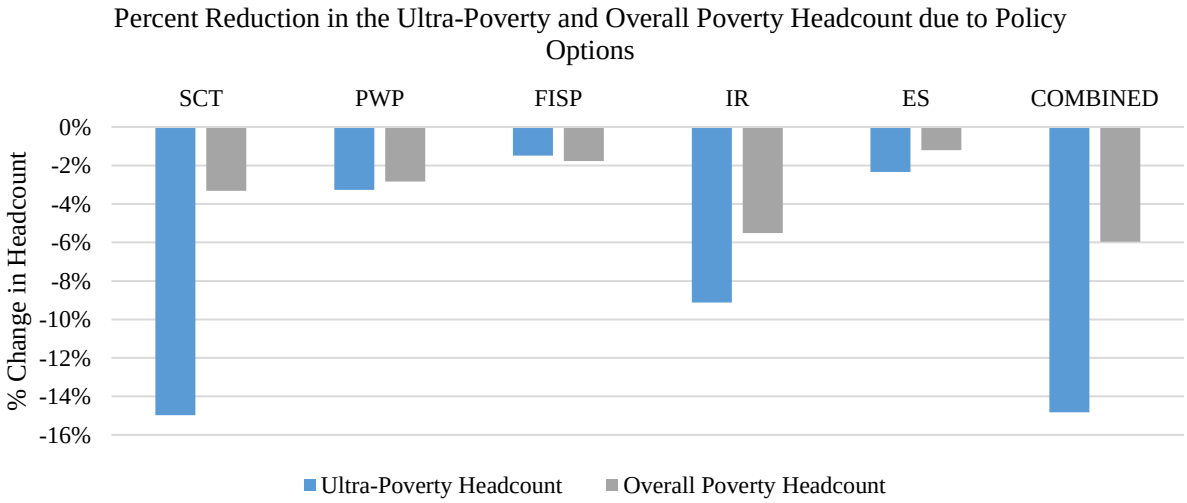
**The largest impacts on poverty occurs with combined options, when SCT id delivered in combination with FISP and PWPs**. As previously discussed demand and production side interventions have mutually reinforcing effects on income multipliers, hence on poverty. The total poverty headcount falls by 3 percentage points to 8 percentage points in combined simulations, and ultra-poverty drops by 6 to 22 percentage points.

The largest impact on ultra-poverty and inequality – respectively 22 and 4 percentage points – occurs under Option 2, with non-overlapping targeting between SCT and FISP (SCT is targeting the ultra-poor and FISP is targeting moderately poor and non-poor with land above 1.5 acres). The effects on ultra-poverty reduction and inequality are larger than in the case of the SCT alone (see option 2 SCT), because ultra-poor also indirectly benefit of spillovers (particularly price reduction) induced by productive interventions (PWPs and FISP) they are not directly beneficiaries of. The magnitude of the combined effect is also larger than the sum of the effects of standalone options.

The decreases in ultra-poverty are about half as big under the option 3 (reallocation of resources with partial overlapping targeting SCT+FISP), but the effect on overall poverty headcount are higher in this case.

Option 4, fully overlapping SCT+FISP, have large effects on overall poverty reduction. Option 5, on the other hand, is fully overlapping but targets the ultra-poor for SCT+FISP. It has a large impact on the ultra-poor but not enough to have a large impact on overall poverty – much of the ultra-poor become moderately poor but not non-poor. If the goal is to reduce not only the ultra-poor headcount but also the overall headcount, interventions must be targeted to the moderately poor as well.

**Figure 5. Percentage Point Reduction in the Ultra-Poverty and Overall Poverty Headcount due to Policy Options (Appendix)**




Notes: SCT, PWPs, FISP and Combined averages are average percentage reduction across all policy options.

# Appendix B: Detailed tables

## Table 33. Summary Statistics of Key Variables

| | Descriptive Statistics | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J |
| | Non-poor HH with land >= 1.5 acres | Non-poor HH with land < 1.5 acres | Moderately poor HH with unconstrained labour and land >= 1.5 acres | Moderately poor HH with constrained labour and land >= 1.5 acres | Moderately poor HH with unconstrained labour and land < 1.5 acres | Moderately poor HH with constrained labour and land < 1.5 acres | Ultrapoor HH with unconstrained labour and land >= 1.5 acres | Ultrapoor HH with unconstrained labour and land < 1.5 acres | Ultrapoor HH with constrained labour and land >= 1.5 acres | Ultrapoor HH with constrained labour and land < 1.5 acres |
| **Socio-demographics** | | | | | | | | | | |
| HH size | 4.28 | 3.33 | 4.87 | 6.04 | 4.04 | 4.83 | 5.42 | 4.68 | 6.70 | 5.56 |
| Percent of total rural households | 17% | 30% | 4% | 3% | 8% | 9% | 6% | 11% | 5% | 7% |
| Percent of HH where the head attended school | 25% | 31% | 19% | 16% | 20% | 15% | 11% | 16% | 7% | 12% |
| Percent of HH that are female headed | 23% | 30% | 12% | 30% | 18% | 49% | 14% | 18% | 30% | 50% |
| Percent of HH where the head is unfit SHWR and/or chronically ill | 10% | 12% | 3% | 21% | 3% | 28% | 2% | 2% | 14% | 18% |
| Percent of HH that are child (<15) headed | 0% | 1% | 0% | 0% | 0% | 2% | 0% | 0% | 0% | 1% |
| Percent of HH that are elderly (>=65) headed | 16% | 15% | 5% | 27% | 3% | 30% | 5% | 4% | 23% | 26% |
| Dependency ratio | 2.62 | 2.36 | 2.29 | 4.17 | 2.19 | 4.00 | 2.43 | 2.38 | 4.37 | 4.23 |
| **Crops** | | | | | | | | | | |
| Total value of crop harvest | 142,725 | 68,618 | 136,109 | 139,210 | 61,779 | 62,096 | 95,129 | 47,521 | 97,174 | 49,396 |
| Yields (output value per acre) | 57,859 | 76,644 | 55,262 | 53,849 | 69,377 | 68,890 | 40,695 | 54,663 | 40,849 | 57,578 |
| Total value of maize harvest | 62,689 | 34,556 | 57,468 | 57,565 | 31,344 | 31,571 | 45,149 | 27,574 | 46,673 | 23,958 |
| Land owned in acres | 3.26 | 1.10 | 2.81 | 3.53 | 1.00 | 1.12 | 2.80 | 0.98 | 2.82 | 1.02 |
| Land cultivated in acres | 2.50 | 0.93 | 2.50 | 2.63 | 0.92 | 0.97 | 2.40 | 0.94 | 2.44 | 0.94 |
| Number of hired labor days for crop production | 1.76 | 0.91 | 0.90 | 1.08 | 0.53 | 0.78 | 0.47 | 0.19 | 0.37 | 0.25 |
| HH labor days in crop production | 159 | 81 | 174 | 179 | 93 | 101 | 175 | 91 | 176 | 102 |
| Total costs of seeds, fertilizer and pesticides | 36,054 | 20,272 | 31,785 | 31,946 | 17,858 | 19,262 | 23,245 | 14,572 | 23,981 | 13,738 |
| HH size | 4.00 | 3.14 | 4.72 | 5.69 | 3.99 | 4.86 | 5.37 | 4.74 | 6.55 | 5.57 |
| Percent of land that is of good soil quality | 50% | 39% | 45% | 44% | 39% | 45% | 40% | 34% | 43% | 39% |
| Percent of land that is on flat land | 54% | 45% | 57% | 57% | 55% | 55% | 67% | 58% | 66% | 60% |
| Percent of land that has no erosion | 59% | 52% | 64% | 58% | 60% | 60% | 73% | 66% | 68% | 65% |
| Percent of land that is irrigated | 15% | 11% | 15% | 15% | 13% | 12% | 14% | 12% | 14% | 14% |
| Percent of households that had a visit or visited gov. extension services | 5% | 3% | 5% | 8% | 6% | 4% | 6% | 3% | 6% | 4% |
| Percent of households that harvested crops in the dry season as well as the rainy season | 14% | 10% | 18% | 16% | 9% | 8% | 14% | 6% | 14% | 8% |
| Percent of households who harvested pemanent crops | 41% | 38% | 34% | 39% | 35% | 38% | 29% | 26% | 36% | 37% |
| **Livestock** | | | | | | | | | | |
| Value of livestock owned now and livestock byproducts produced in the last 12 months | 267,216 | 45,530 | 93,609 | 26,312 | 210,068 | 75,429 | 61,837 | 15,471 | 98,410 | 22,540 |
| Value of livestock owned 12 months ago and livestock assets | 217,705 | 34,340 | 85,585 | 22,824 | 165,920 | 72,482 | 54,548 | 14,869 | 97,100 | 22,471 |
| HH expenditures on hired labor for livestock | 1,905 | 127 | 526 | 23 | 305 | 5 | 127 | 6 | 361 | 33 |
| Purchased inputs for livestock: feed, vet and medicine costs, livestock equipment | 3,167 | 812 | 414 | 366 | 728 | 105 | 204 | 123 | 608 | 358 |
| **Household Enterprise** | | | | | | | | | | |
| HH annual own business sales | 176,946 | 329,225 | 66,197 | 41,427 | 59,407 | 65,659 | 25,109 | 27,495 | 35,788 | 25,781 |
| HH annual own business days of family labor | 45.91 | 35.14 | 23.62 | 24.91 | 27.46 | 32.87 | 15.40 | 13.27 | 12.99 | 11.44 |
| HH annual own business days of hired labor | 8.87 | 10.55 | 6.01 | 0.75 | 1.47 | 1.43 | 0.56 | 1.44 | 0.97 | 0.58 |
| HH annual own business expenditures (excl. goods for resale and hired labor) | 54,649 | 86,515 | 10,334 | 10,242 | 17,716 | 19,850 | 5,369 | 3,817 | 7,043 | 7,020 |
| HH annual own business profits | 65,493 | 151,708 | 28,217 | 18,226 | 24,174 | 28,632 | 11,556 | 11,381 | 20,972 | 13,207 |
| HH annual own business expenditures on goods for resale (MWK) | 122,822 | 207,814 | 33,107 | 14,416 | 30,981 | 26,970 | 4,552 | 14,271 | 8,743 | 8,058 |
| **Expenditures** | | | | | | | | | | |
| HH annual expenditures on own/received as gifts crops | 400,783 | 289,313 | 167,708 | 204,256 | 116,878 | 167,341 | 101,840 | 85,766 | 130,639 | 97,303 |
| HH annual expenditures on own/received as gifts meat and livestock byproducts | 51,918 | 45,035 | 22,239 | 36,786 | 13,891 | 22,609 | 7,420 | 2,858 | 9,619 | 4,582 |
| HH annual expenditures on food from retail stores and traders | 308,290 | 304,370 | 149,829 | 172,775 | 152,870 | 147,566 | 97,456 | 89,155 | 102,130 | 97,517 |
| HH annual expenditures on non-food from retail stores and traders | 84,878 | 83,254 | 41,626 | 51,615 | 35,045 | 40,508 | 25,585 | 23,672 | 31,785 | 26,636 |
| HH annual expenditures from services | 66,826 | 58,683 | 17,463 | 23,232 | 10,991 | 15,798 | 3,806 | 4,101 | 5,907 | 5,234 |
| HH annual expenditures from production goods | 32,800 | 27,744 | 13,983 | 20,176 | 12,293 | 13,588 | 5,358 | 3,569 | 7,859 | 6,510 |
| HH annual expenditures on goods and services from outside the local economy | 84,450 | 49,050 | 21,165 | 25,513 | 14,240 | 23,422 | 8,339 | 6,293 | 12,346 | 7,910 |
| HH annual expenditures on food | 787,094 | 658,818 | 352,185 | 433,464 | 293,401 | 350,364 | 211,723 | 180,881 | 249,983 | 205,462 |
| HH annual expenditures | 1,029,945 | 857,447 | 434,014 | 534,353 | 356,207 | 430,831 | 249,805 | 215,415 | 300,283 | 245,691 |
| **Income** | | | | | | | | | | |
| HH annual income from remittances | 27,271 | 16,565 | 6,975 | 17,146 | 5,180 | 12,654 | 3,655 | 1,411 | 7,721 | 9,963 |
| HH annual labor income | 76,120 | 170,373 | 63,391 | 46,459 | 87,404 | 76,185 | 74,030 | 67,371 | 49,294 | 58,052 |
| HH annual income | 962,455 | 1,194,584 | 627,862 | 670,878 | 492,604 | 482,230 | 512,174 | 343,268 | 466,474 | 351,133 |

Notes: All values are in 2016 MK yearly averages

## Table 34. Local and Outside Input Linkages, by Sector and Household Group

| Purchasing/Supplying Sector | Non-poor | | Moderately Poor | | | | Ultrapoor | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Unconstrained Labor | | Unconstrained Labour | Constrained Labour | Unconstrained Labour | Constrained Labour | Unconstrained Labor | | Constrained Labor | |
| | 1.5 acres or more | < 1.5 acres | Land >= 1.5 acres | Constrained labour and land >= 1.5 acres | Unconstrained labour and land < 1.5 acres | Constrained labour and land < 1.5 acres | Land >= 1.5 acres | Land < 1.5 acres | Land >= 1.5 acres | Land < 1.5 acres |
| | A | B | C | D | E | F | G | H | I | J |
| **Crops** | | | | | | | | | | |
| Total Value-added | 10501.12 | 6855.07 | 2441.58 | 8710.03 | 1904.46 | 2425.76 | 3105.05 | 2970.58 | 3026.78 | 1865.02 |
| OUTSIDE | 1192.47 | 778.44 | 277.26 | 1078.16 | 216.26 | 275.46 | 251.56 | 260.96 | 245.22 | 151.10 |
| **Livestock** | | | | | | | | | | |
| Total Value-added | 25003.12 | 10829.73 | 2635.46 | 16375.86 | 1923.97 | 5868.60 | 3661.96 | 2918.79 | 4882.72 | 2337.11 |
| OUTSIDE | 1369.02 | 592.97 | 144.30 | 896.64 | 105.34 | 321.33 | 353.34 | 281.64 | 471.14 | 225.51 |
| **Retail** | | | | | | | | | | |
| Total Value-added | 2593.33 | 9229.34 | 284.39 | 459.41 | 279.49 | 451.80 | 77.5228 | 377.2729 | 121.7633 | 175.07 |
| OUTSIDE | 2.15 | 1.13 | 1.37 | 1.98 | 3.15 | 2.71 | 1.30 | 2.19 | 2.09 | 1.70 |
| crop | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| live | 0.19 | 0.10 | 0.12 | 0.17 | 0.28 | 0.24 | 0.11 | 0.19 | 0.18 | 0.15 |
| ser | 0.16 | 0.08 | 0.10 | 0.14 | 0.23 | 0.20 | 0.09 | 0.16 | 0.15 | 0.12 |
| ret | 0.16 | 0.08 | 0.10 | 0.15 | 0.23 | 0.20 | 0.10 | 0.16 | 0.15 | 0.12 |
| Local | 0.51 | 0.27 | 0.33 | 0.47 | 0.75 | 0.65 | 0.31 | 0.52 | 0.50 | 0.41 |
| **Services** | | | | | | | | | | |
| Total Value-added | 377.88 | 673.77 | 14.10 | 72.22 | 184.64 | 36.08 | 27.27 | 69.77 | 36.51 | 48.17 |
| OUTSIDE | 0.95 | 1.04 | 0.81 | 0.15 | 0.29 | 0.28 | 0.85 | 0.44 | 0.36 | 0.21 |
| crop | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| live | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 |
| prod | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ser | 0.13 | 0.14 | 0.11 | 0.02 | 0.04 | 0.04 | 0.11 | 0.06 | 0.05 | 0.03 |
| ret | 0.02 | 0.02 | 0.02 | 0.00 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.00 |
| Local | 0.16 | 0.18 | 0.14 | 0.03 | 0.05 | 0.05 | 0.14 | 0.08 | 0.06 | 0.04 |
| **Non-agricultural Production** | | | | | | | | | | |
| Total Value-added | 1415.18 | 3708.49 | 108.84 | 629.27 | 132.41 | 400.28 | 177.64 | 116.48 | 385.58 | 172.51 |
| OUTSIDE | 1.11 | 0.62 | 1.27 | 0.66 | 1.38 | 0.65 | 0.50 | 1.47 | 0.20 | 0.57 |
| crop | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| prod | 0.06 | 0.03 | 0.07 | 0.04 | 0.07 | 0.03 | 0.03 | 0.08 | 0.01 | 0.03 |
| ser | 0.03 | 0.02 | 0.04 | 0.02 | 0.04 | 0.02 | 0.02 | 0.04 | 0.01 | 0.02 |
| ret | 0.10 | 0.05 | 0.11 | 0.06 | 0.12 | 0.06 | 0.04 | 0.13 | 0.02 | 0.05 |
| Local | 0.19 | 0.11 | 0.22 | 0.11 | 0.24 | 0.11 | 0.09 | 0.25 | 0.03 | 0.10 |

## Table 35. Detailed SCT Simulation Multipliers

| Household | Multipliers | | | | |
|---|---|---|---|---|---|
| | Option | | | | |
| | (1) UP&LC | (2)All UP | (3) UP, P, & LC | (4) UP, higher amount | (5) UP&LC, higher amount |
| Total Income Multiplier | | | | | |
| Nominal | 2.90 | 2.99 | 2.93 | 3.06 | 2.96 |
| (CI) | ( 2.76- 3.09) | ( 2.84- 3.21) | ( 2.78- 3.14) | ( 2.88- 3.30) | ( 2.80- 3.17) |
| Real | 1.88 | 1.90 | 1.88 | 1.91 | 1.89 |
| (CI) | ( 1.80- 1.99) | ( 1.81- 2.03) | ( 1.79- 2.00) | ( 1.81- 2.04) | ( 1.80- 2.01 |
| Total Beneficiary Income Multiplier | | | | | |
| Nominal | 1.11 | 1.31 | 1.46 | 1.32 | 1.11 |
| Real | 1.03 | 1.10 | 1.15 | 1.09 | 1.01 |
| Total Non-Beneficiary Income Multiplier | | | | | |
| Nominal | 1.79 | 1.69 | 1.48 | 1.74 | 1.85 |
| Real | 0.85 | 0.80 | 0.73 | 0.82 | 0.88 |
| Total Ultra-Poor Income Multiplier | | | | | |
| Nominal | 1.29 | 1.31 | 0.79 | 1.32 | 1.30 |
| Real | 1.12 | 1.10 | 0.62 | 1.09 | 1.11 |
| Total Moderately-Poor Income Multiplier | | | | | |
| Nominal | 0.45 | 0.48 | 0.97 | 0.49 | 0.47 |
| Real | 0.18 | 0.19 | 0.67 | 0.20 | 0.19 |
| Total Non-Poor Income Multiplier | | | | | |
| Nominal | 1.15 | 1.21 | 1.18 | 1.25 | 1.19 |
| Real | 0.58 | 0.60 | 0.59 | 0.62 | 0.60 |
| HH Income Multipliers | | | | | |
| A nominal | 0.42 | 0.44 | 0.42 | 0.45 | 0.43 |
| real | 0.19 | 0.20 | 0.19 | 0.20 | 0.19 |
| B nominal | 0.74 | 0.77 | 0.75 | 0.80 | 0.76 |
| real | 0.39 | 0.41 | 0.40 | 0.42 | 0.40 |
| C nominal | 0.05 | 0.06 | 0.05 | 0.06 | 0.05 |
| real | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 |
| D nominal | 0.26 | 0.27 | 0.41 | 0.28 | 0.26 |
| real | 0.10 | 0.11 | 0.24 | 0.11 | 0.10 |
| E nominal | 0.06 | 0.06 | 0.06 | 0.07 | 0.06 |
| real | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| F nominal | 0.08 | 0.09 | 0.45 | 0.09 | 0.08 |
| real | 0.03 | 0.03 | 0.38 | 0.03 | 0.03 |
| G nominal | 0.07 | 0.29 | 0.08 | 0.29 | 0.08 |
| real | 0.04 | 0.24 | 0.04 | 0.24 | 0.04 |
| H nominal | 0.11 | 0.50 | 0.11 | 0.50 | 0.11 |
| real | 0.05 | 0.42 | 0.05 | 0.42 | 0.05 |
| I nominal | 0.47 | 0.23 | 0.26 | 0.23 | 0.47 |
| real | 0.43 | 0.19 | 0.22 | 0.19 | 0.42 |
| J nominal | 0.64 | 0.29 | 0.34 | 0.29 | 0.65 |
| real | 0.60 | 0.25 | 0.30 | 0.25 | 0.59 |
| Production Multipliers | | | | | |
| Total | 1.94 | 1.96 | 1.93 | 1.98 | 1.95 |
| Beneficiary Households | 0.19 | 0.56 | 0.36 | 0.59 | 0.20 |
| Non-Beneficiary | 1.75 | 1.41 | 1.57 | 1.39 | 1.75 |
| Ultra-Poor | 0.51 | 0.56 | 0.53 | 0.59 | 0.53 |
| Moderately-Poor | 0.25 | 0.25 | 0.25 | 0.24 | 0.25 |
| Non-Poor | 1.18 | 1.16 | 1.15 | 1.14 | 1.16 |
| Production Multipliers by Sector | | | | | |
| crop | 0.63 | 0.67 | 0.64 | 0.69 | 0.65 |
| livestock | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| retail | 0.95 | 0.94 | 0.93 | 0.94 | 0.94 |
| services | 0.20 | 0.18 | 0.19 | 0.18 | 0.20 |
| non-agricultural production | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Production Multipliers by Sector Beneficiary HHs | | | | | |
| crop | 0.15 | 0.46 | 0.22 | 0.49 | 0.17 |
| livestock | 0.01 | 0.02 | 0.03 | 0.02 | 0.01 |
| retail | 0.02 | 0.05 | 0.07 | 0.05 | 0.02 |
| services | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 |
| non-agricultural production | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | | | |
| crop | 0.48 | 0.21 | 0.42 | 0.20 | 0.48 |
| livestock | 0.08 | 0.07 | 0.06 | 0.07 | 0.08 |
| retail | 0.93 | 0.89 | 0.86 | 0.89 | 0.93 |
| services | 0.19 | 0.17 | 0.17 | 0.17 | 0.19 |
| non-agricultural production | 0.07 | 0.06 | 0.06 | 0.06 | 0.07 |
| Production Multipliers by Sector Ultra-Poor HHs | | | | | |
| crop | 0.42 | 0.46 | 0.44 | 0.49 | 0.44 |
| livestock | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| retail | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| services | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| non-agricultural production | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Production Multipliers by Sector Moderately-Poor HHs | | | | | |
| crop | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| livestock | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| retail | 0.10 | 0.09 | 0.09 | 0.09 | 0.10 |
| services | 0.04 | 0.03 | 0.04 | 0.03 | 0.04 |
| non-agricultural production | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Production Multipliers by Sector Non-Poor HHs | | | | | |
| crop | 0.13 | 0.13 | 0.13 | 0.12 | 0.13 |
| livestock | 0.04 | 0.05 | 0.04 | 0.04 | 0.04 |
| retail | 0.80 | 0.80 | 0.79 | 0.79 | 0.80 |
| services | 0.14 | 0.13 | 0.14 | 0.13 | 0.14 |
| non-agricultural production | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |

## For all following tables:

- Shaded areas are beneficiary households.
- A-Non-poor with land >= 1.5 acres,
- B- Non-poor with land < 1.5 acres,
- C- Moderately poor with unconstrained labour and land >= 1.5 acres,
- D- Moderately poor with constrained labour and land >= 1.5 acres,
- E- Moderately poor with unconstrained labour and land < 1.5 acres,
- F- Moderately poor with constrained labour and land < 1.5 acres,
- G-Ultra-poor HH with unconstrained labour and land >= 1.5 acres,
- H-Ultra-poor HH with unconstrained labour and land < 1.5 acres,
- I-Ultra-poor HH with constrained labour and land >= 1.5 acres,
- J-Ultra-poor HH with constrained labour and land < 1.5 acres.

# Table 36. Detailed SCT Simulation Percentages

| Percentage Changes | (1) UP&LC | (2)All UP | (3) UP, P, & LC | (4) UP, higher amount | (5) UP&LC, higher amount |
|---|---|---|---|---|---|
| Total Rural Income | | | | | |
| Nominal | 7.39 | 17.80 | 14.76 | 26.55 | 16.13 |
| (CI) | ( 7.04, 7.86) | ( 16.83, 19.10) | ( 13.99, 15.81) | ( 24.91, 28.65) | ( 15.30, 17.26) |
| Real | 5.06 | 11.57 | 9.82 | 16.93 | 10.82 |
| (CI) | ( 4.81, 5.37) | ( 10.88, 12.43) | ( 9.28, 10.49) | ( 15.84, 18.22) | ( 10.24, 11.54) |
| Total Beneficiary Income | | | | | |
| Nominal | 47.29 | 52.04 | 37.57 | 76.53 | 101.54 |
| Real | 44.11 | 44.03 | 31.66 | 63.23 | 92.41 |
| Total Non-Beneficiary Income | | | | | |
| Nominal | 4.38 | 11.38 | 9.34 | 17.17 | 9.69 |
| Real | 2.11 | 5.47 | 4.62 | 8.24 | 4.67 |
| Total Ultra-Poor Income | | | | | |
| Nominal | 23.51 | 52.04 | 28.40 | 76.53 | 50.66 |
| Real | 20.84 | 44.03 | 22.91 | 63.23 | 43.83 |
| Total Moderately-Poor Income | | | | | |
| Nominal | 3.68 | 9.58 | 19.76 | 14.37 | 8.08 |
| Real | 1.46 | 3.89 | 14.70 | 5.87 | 3.24 |
| Total Non-Poor Income | | | | | |
| Nominal | 4.61 | 12.01 | 9.54 | 18.16 | 10.20 |
| Real | 2.31 | 6.03 | 4.77 | 9.07 | 5.11 |
| Household Income | | | | | |
| A nominal | 4.03 | 10.50 | 8.30 | 15.77 | 8.87 |
| real | 1.78 | 4.71 | 3.69 | 7.08 | 3.94 |
| B nominal | 4.99 | 12.99 | 10.33 | 19.70 | 11.07 |
| real | 2.66 | 6.88 | 5.47 | 10.36 | 5.87 |
| C nominal | 4.13 | 10.81 | 8.51 | 16.20 | 9.07 |
| real | 1.90 | 5.07 | 3.94 | 7.61 | 4.20 |
| D nominal | 3.82 | 10.02 | 12.24 | 15.00 | 8.39 |
| real | 1.50 | 4.03 | 7.28 | 6.05 | 3.32 |
| E nominal | 3.71 | 9.56 | 7.62 | 14.38 | 8.18 |
| real | 1.60 | 4.15 | 3.29 | 6.27 | 3.54 |
| F nominal | 3.38 | 8.84 | 37.46 | 13.25 | 7.42 |
| real | 1.15 | 3.12 | 31.59 | 4.74 | 2.56 |
| G nominal | 4.90 | 48.15 | 10.20 | 70.88 | 10.87 |
| real | 2.53 | 39.98 | 5.27 | 57.41 | 5.62 |
| H nominal | 4.34 | 51.00 | 9.02 | 74.99 | 9.63 |
| real | 2.14 | 43.24 | 4.47 | 62.15 | 4.78 |
| I nominal | 36.34 | 44.20 | 41.46 | 65.12 | 78.12 |
| real | 33.40 | 36.63 | 35.43 | 52.71 | 70.06 |
| J nominal | 56.46 | 63.55 | 61.09 | 93.30 | 121.15 |
| real | 53.09 | 54.97 | 54.23 | 78.79 | 111.14 |
| Production by Sector | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| crop | 4.39 | 11.24 | 8.91 | 16.56 | 9.51 |
| livestock | 11.92 | 32.19 | 9.73 | 48.97 | 27.06 |
| retail | 3.88 | 7.57 | 8.56 | 10.88 | 8.33 |
| services | 11.73 | 32.19 | 24.74 | 48.97 | 26.43 |
| non-agricultural production | 2.91 | 7.09 | 5.75 | 10.13 | 6.12 |
| Beneficiary Households Only | 3.21 | 7.84 | 6.36 | 11.30 | 6.78 |
| Production by Sector | | | | | |
| crop | 5.74 | 15.36 | 11.87 | 22.97 | 12.64 |
| livestock | 2.35 | 6.04 | 4.80 | 8.76 | 5.02 |
| retail | 3.88 | 9.60 | 7.75 | 13.90 | 8.26 |
| services | 3.10 | 7.24 | 6.11 | 10.57 | 6.64 |
| non-agricultural production | 3.93 | 9.46 | 7.69 | 13.87 | 8.44 |
| Production by Sector Beneficiary HHs | | | | | |
| crop | 19.69 | 53.27 | 13.50 | 81.99 | 45.25 |
| livestock | 2.72 | 6.97 | 4.87 | 10.19 | 5.80 |
| retail | 5.99 | 14.87 | 10.17 | 21.79 | 12.89 |
| services | 3.10 | 7.23 | 6.14 | 10.64 | 6.64 |
| non-agricultural production | 4.31 | 10.41 | 8.03 | 15.38 | 9.26 |
| Production by Sector Non-Beneficiary HHs | | | | | |
| crop | 4.53 | 5.27 | 11.07 | 7.26 | 9.81 |
| livestock | 2.33 | 5.89 | 4.76 | 8.53 | 4.96 |
| retail | 3.86 | 9.39 | 7.58 | 13.58 | 8.20 |
| services | 3.10 | 7.24 | 6.10 | 10.56 | 6.64 |
| non-agricultural production | 3.91 | 9.38 | 7.62 | 13.74 | 8.39 |
| Ultra-Poor HHs Only | | | | | |
| crop | 19.10 | 53.27 | 40.62 | 81.99 | 43.39 |
| livestock | 2.70 | 6.97 | 5.52 | 10.19 | 5.77 |
| retail | 5.97 | 14.87 | 12.03 | 21.79 | 12.83 |
| services | 3.11 | 7.23 | 6.13 | 10.64 | 6.66 |
| non-agricultural production | 4.31 | 10.41 | 8.45 | 15.38 | 9.27 |
| Moderately-Poor HHs Only | | | | | |
| crop | 2.19 | 5.28 | 4.22 | 7.26 | 4.46 |
| livestock | 2.31 | 5.89 | 4.71 | 8.55 | 4.93 |
| retail | 4.88 | 12.03 | 9.79 | 17.54 | 10.43 |
| services | 3.12 | 7.28 | 6.15 | 10.63 | 6.68 |
| non-agricultural production | 4.05 | 9.77 | 7.91 | 14.36 | 8.69 |
| Non-Poor HHs Only | | | | | |
| crop | 2.18 | 5.26 | 4.21 | 7.27 | 4.45 |
| livestock | 2.29 | 5.89 | 4.66 | 8.51 | 4.87 |
| retail | 3.69 | 9.13 | 7.36 | 13.20 | 7.84 |
| services | 3.09 | 7.22 | 6.09 | 10.54 | 6.62 |
| non-agricultural production | 3.87 | 9.30 | 7.56 | 13.62 | 8.30 |

# Table 37. Detailed PWPs Simulation Multipliers

| Household | Multipliers | | | | | |
|---|---|---|---|---|---|---|
| | Options | | | | | |
| | Option 1a (status quo by end of 2017) | Option 1b (Option 1a with 5% Crop Land Productivity Increase) | Option 2a (ultra-poor labour-unconstrained HHs) | Option 2b (Option 2a with 5% Crop Land Productivity Increase) | Option 3a (all poor labour-unconstrained HHs with more days) | Option 3b (Option 3a with 5% Crop Land Productivity Increase) |
| Total Income Multiplier | | | | | | |
| Nominal | 2.87 | 2.86 | 2.91 | 2.90 | 2.90 | 2.89 |
| (CI) | ( 2.74- 3.05) | ( 2.73- 3.04) | ( 2.78- 3.09) | ( 2.77- 3.09) | ( 2.76- 3.09) | ( 2.75- 3.08) |
| Real | 1.89 | 3.24 | 1.90 | 3.15 | 1.89 | 2.58 |
| (CI) | ( 1.80- 1.99) | ( 3.16- 3.35) | ( 1.82- 2.02) | ( 3.07- 3.26) | ( 1.80- 2.00) | ( 2.50- 2.69) |
| Total Beneficiary Income Multiplier | | | | | | |
| Nominal | 1.29 | 1.29 | 1.18 | 1.18 | 1.30 | 1.29 |
| Real | 1.13 | 1.41 | 1.08 | 1.24 | 1.12 | 1.27 |
| Total Non-Beneficiary Income Multiplier | | | | | | |
| Nominal | 1.58 | 1.57 | 1.73 | 1.72 | 1.60 | 1.60 |
| Real | 0.76 | 1.83 | 0.82 | 1.91 | 0.77 | 1.31 |
| Total Ultra-Poor Income Multiplier | | | | | | |
| Nominal | 0.88 | 0.88 | 1.29 | 1.29 | 0.89 | 0.89 |
| Real | 0.73 | 0.99 | 1.14 | 1.38 | 0.73 | 0.86 |
| Total Moderately-Poor Income Multiplier | | | | | | |
| Nominal | 0.85 | 0.85 | 0.46 | 0.46 | 0.86 | 0.86 |
| Real | 0.58 | 1.02 | 0.19 | 0.58 | 0.58 | 0.80 |
| Total Non-Poor Income Multiplier | | | | | | |
| Nominal | 1.14 | 1.13 | 1.15 | 1.15 | 1.15 | 1.15 |
| Real | 0.57 | 1.24 | 0.58 | 1.19 | 0.58 | 0.92 |
| HH Income Multipliers | | | | | | |
| A nominal | 0.41 | 0.41 | 0.42 | 0.42 | 0.42 | 0.42 |
| real | 0.18 | 0.55 | 0.19 | 0.53 | 0.19 | 0.37 |
| B nominal | 0.72 | 0.72 | 0.73 | 0.73 | 0.73 | 0.73 |
| real | 0.39 | 0.69 | 0.39 | 0.67 | 0.39 | 0.54 |
| C nominal | 0.18 | 0.18 | 0.05 | 0.05 | 0.18 | 0.18 |
| real | 0.15 | 0.21 | 0.03 | 0.07 | 0.15 | 0.18 |
| D nominal | 0.26 | 0.25 | 0.26 | 0.26 | 0.26 | 0.26 |
| real | 0.10 | 0.34 | 0.11 | 0.32 | 0.10 | 0.22 |
| E nominal | 0.33 | 0.33 | 0.06 | 0.06 | 0.34 | 0.34 |
| real | 0.30 | 0.36 | 0.03 | 0.08 | 0.29 | 0.33 |
| F nominal | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| real | 0.03 | 0.12 | 0.03 | 0.11 | 0.03 | 0.07 |
| G nominal | 0.28 | 0.28 | 0.43 | 0.43 | 0.28 | 0.28 |
| real | 0.25 | 0.30 | 0.39 | 0.44 | 0.24 | 0.28 |
| H nominal | 0.49 | 0.49 | 0.75 | 0.75 | 0.49 | 0.49 |
| real | 0.43 | 0.54 | 0.69 | 0.80 | 0.43 | 0.49 |
| I nominal | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| real | 0.03 | 0.08 | 0.03 | 0.07 | 0.03 | 0.06 |
| J nominal | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| real | 0.02 | 0.06 | 0.02 | 0.06 | 0.02 | 0.04 |
| Production Multipliers | | | | | | |
| Total | 1.94 | 3.26 | 1.96 | 3.17 | 1.95 | 2.62 |
| Beneficiary Households | 0.41 | 0.67 | 0.33 | 0.48 | 0.42 | 0.56 |
| Non-Beneficiary | 1.53 | 2.58 | 1.63 | 2.69 | 1.53 | 2.06 |
| Ultra-Poor | 0.51 | 0.76 | 0.52 | 0.76 | 0.52 | 0.66 |
| Moderately-Poor | 0.26 | 0.67 | 0.26 | 0.64 | 0.25 | 0.46 |
| Non-Poor | 1.18 | 1.83 | 1.18 | 1.77 | 1.17 | 1.50 |
| Production Multipliers by Sector | | | | | | |
| crop | 0.64 | 1.96 | 0.67 | 1.88 | 0.65 | 1.32 |
| livestock | 0.09 | 0.09 | 0.10 | 0.10 | 0.09 | 0.09 |
| retail | 0.95 | 0.95 | 0.95 | 0.96 | 0.95 | 0.95 |
| services | 0.19 | 0.19 | 0.18 | 0.18 | 0.19 | 0.19 |
| non-agricultural production | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Production Multipliers by Sector Beneficiary HHs | | | | | | |
| crop | 0.29 | 0.55 | 0.27 | 0.42 | 0.29 | 0.43 |
| livestock | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| retail | 0.07 | 0.07 | 0.03 | 0.03 | 0.07 | 0.07 |
| services | 0.03 | 0.03 | 0.01 | 0.01 | 0.03 | 0.03 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | | | | |
| crop | 0.36 | 1.41 | 0.39 | 1.45 | 0.36 | 0.89 |
| livestock | 0.07 | 0.07 | 0.08 | 0.08 | 0.07 | 0.07 |
| retail | 0.88 | 0.88 | 0.92 | 0.92 | 0.88 | 0.88 |
| services | 0.16 | 0.16 | 0.17 | 0.17 | 0.16 | 0.16 |
| non-agricultural production | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| Production Multipliers by Sector Ultra-Poor HHs | | | | | | |
| crop | 0.42 | 0.67 | 0.43 | 0.66 | 0.43 | 0.56 |
| livestock | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| retail | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| services | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| non-agricultural production | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Production Multipliers by Sector Moderately-Poor HHs | | | | | | |
| crop | 0.09 | 0.50 | 0.09 | 0.47 | 0.09 | 0.30 |
| livestock | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| retail | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| services | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| non-agricultural production | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Production Multipliers by Sector Non-Poor HHs | | | | | | |
| crop | 0.14 | 0.79 | 0.14 | 0.74 | 0.14 | 0.46 |
| livestock | 0.04 | 0.04 | 0.05 | 0.05 | 0.04 | 0.04 |
| retail | 0.81 | 0.81 | 0.81 | 0.81 | 0.80 | 0.80 |
| services | 0.14 | 0.14 | 0.13 | 0.13 | 0.14 | 0.14 |
| non-agricultural production | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |

# Table 38. Detailed PWPs Simulation Percentages

| Percentage Changes | Option 1a (status quo by end of 2017) | Option 1b (Option 1a with 5% Crop Land Productivity Increase) | Option 2a (ultra-poor labour-unconstrained HHs) | Option 2b (Option 2a with 5% Crop Land Productivity Increase) | Option 3a (all poor labour-unconstrained HHs with more days) | Option 3b (Option 3a with 5% Crop Land Productivity Increase) |
|---|---|---|---|---|---|---|
| Total Rural Income | | | | | | |
| Nominal | 3.29 | 3.28 | 3.39 | 3.38 | 6.64 | 6.63 |
| (CI) | ( 3.14%, 3.50%) | ( 3.13%, 3.49%) | ( 3.22%, 3.62%) | ( 3.21%, 3.61%) | ( 6.32%, 7.08%) | ( 6.30%, 7.07%) |
| Real | 2.24 | 3.67 | 2.22 | 3.65 | 4.48 | 5.94 |
| (CI) | ( 2.13%, 2.38%) | ( 3.55%, 3.82%) | ( 2.10%, 2.38%) | ( 3.52%, 3.82%) | ( 4.25%, 4.77%) | ( 5.70%, 6.24%) |
| Total Beneficiary Income | | | | | | |
| Nominal | 8.75 | 8.74 | 15.33 | 15.31 | 17.56 | 17.55 |
| Real | 7.67 | 9.54 | 14.01 | 16.11 | 15.23 | 17.23 |
| Total Non-Beneficiary Income | | | | | | |
| Nominal | 2.05 | 2.04 | 2.24 | 2.23 | 4.16 | 4.15 |
| Real | 1.00 | 2.33 | 1.08 | 2.45 | 2.03 | 3.37 |
| Total Ultra-Poor Income | | | | | | |
| Nominal | 6.05 | 6.04 | 9.56 | 9.55 | 12.17 | 12.15 |
| Real | 4.97 | 6.81 | 8.32 | 10.22 | 9.90 | 11.83 |
| Total Moderately-Poor Income | | | | | | |
| Nominal | 4.61 | 4.60 | 1.90 | 1.89 | 9.26 | 9.25 |
| Real | 3.56 | 5.28 | 0.76 | 2.44 | 7.09 | 8.86 |
| Total Non-Poor Income | | | | | | |
| Nominal | 2.13 | 2.12 | 2.35 | 2.34 | 4.31 | 4.31 |
| Real | 1.07 | 2.30 | 1.19 | 2.41 | 2.18 | 3.41 |
| Household Income | | | | | | |
| A nominal | 1.87 | 1.86 | 2.08 | 2.07 | 3.78 | 3.77 |
| real | 0.83 | 2.49 | 0.93 | 2.59 | 1.69 | 3.35 |
| B nominal | 2.29 | 2.29 | 2.53 | 2.52 | 4.66 | 4.65 |
| real | 1.23 | 2.18 | 1.35 | 2.30 | 2.50 | 3.45 |
| C nominal | 6.67 | 6.66 | 2.15 | 2.14 | 13.38 | 13.37 |
| real | 5.59 | 7.53 | 1.01 | 2.86 | 11.12 | 13.15 |
| D nominal | 1.78 | 1.77 | 2.00 | 1.99 | 3.60 | 3.58 |
| real | 0.71 | 2.37 | 0.80 | 2.46 | 1.43 | 3.10 |
| E nominal | 9.31 | 9.30 | 1.87 | 1.86 | 18.66 | 18.65 |
| real | 8.26 | 9.92 | 0.80 | 2.35 | 16.39 | 18.18 |
| F nominal | 1.57 | 1.56 | 1.76 | 1.75 | 3.18 | 3.17 |
| real | 0.54 | 2.24 | 0.61 | 2.31 | 1.09 | 2.80 |
| G nominal | 8.87 | 8.85 | 14.60 | 14.58 | 17.81 | 17.79 |
| real | 7.71 | 9.49 | 13.23 | 15.10 | 15.32 | 17.22 |
| H nominal | 9.43 | 9.42 | 15.79 | 15.78 | 18.93 | 18.92 |
| real | 8.34 | 10.47 | 14.50 | 16.75 | 16.57 | 18.86 |
| I nominal | 2.20 | 2.19 | 2.47 | 2.45 | 4.48 | 4.46 |
| real | 1.16 | 2.83 | 1.31 | 2.98 | 2.37 | 4.05 |
| J nominal | 1.98 | 1.97 | 2.22 | 2.20 | 4.03 | 4.02 |
| real | 0.95 | 2.60 | 1.06 | 2.72 | 1.93 | 3.60 |
| | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total Production | 2.06 | 3.80 | 2.28 | 4.02 | 4.14 | 5.93 |
| Beneficiary Households | 3.72 | 6.08 | 6.10 | 8.85 | 7.55 | 10.05 |
| Non-Beneficiary Households | 1.76 | 3.38 | 1.92 | 3.56 | 3.53 | 5.18 |
| Ultra-Poor Households | 5.47 | 8.17 | 6.15 | 8.88 | 11.21 | 14.15 |
| Moderately-Poor Households | 1.38 | 3.77 | 1.52 | 3.92 | 2.73 | 5.15 |
| Non-Poor Households | 1.51 | 2.62 | 1.64 | 2.75 | 3.00 | 4.12 |
| Production by Sector | | | | | | |
| crop | 2.73 | 7.83 | 3.08 | 8.20 | 5.53 | 10.77 |
| livestock | 1.08 | 1.07 | 1.28 | 1.28 | 2.15 | 2.15 |
| retail | 1.82 | 1.83 | 1.99 | 2.00 | 3.64 | 3.64 |
| services | 1.40 | 1.40 | 1.41 | 1.41 | 2.81 | 2.80 |
| non-agricultural production | 1.76 | 1.75 | 1.89 | 1.88 | 3.53 | 3.52 |
| Production by Sector Beneficiary HHs | | | | | | |
| crop | 5.53 | 10.73 | 9.94 | 15.31 | 11.28 | 16.76 |
| livestock | 1.15 | 1.15 | 1.46 | 1.46 | 2.31 | 2.30 |
| retail | 2.52 | 2.53 | 3.04 | 3.04 | 5.05 | 5.06 |
| services | 1.41 | 1.41 | 1.42 | 1.42 | 2.82 | 2.82 |
| non-agricultural production | 1.89 | 1.88 | 2.07 | 2.07 | 3.79 | 3.78 |
| Production by Sector Non-Beneficiary HHs | | | | | | |
| crop | 1.91 | 6.98 | 2.05 | 7.13 | 3.84 | 9.01 |
| livestock | 1.06 | 1.06 | 1.27 | 1.26 | 2.13 | 2.12 |
| retail | 1.78 | 1.78 | 1.96 | 1.97 | 3.55 | 3.55 |
| services | 1.40 | 1.40 | 1.41 | 1.41 | 2.80 | 2.80 |
| non-agricultural production | 1.75 | 1.75 | 1.88 | 1.88 | 3.51 | 3.50 |
| Ultra-Poor HHs Only | | | | | | |
| crop | 8.93 | 14.26 | 10.09 | 15.48 | 18.37 | 24.16 |
| livestock | 1.23 | 1.23 | 1.47 | 1.47 | 2.47 | 2.46 |
| retail | 2.79 | 2.79 | 3.04 | 3.05 | 5.59 | 5.60 |
| services | 1.41 | 1.40 | 1.42 | 1.41 | 2.82 | 2.81 |
| non-agricultural production | 1.93 | 1.92 | 2.07 | 2.06 | 3.86 | 3.86 |
| Moderately-Poor HHs Only | | | | | | |
| crop | 1.08 | 6.12 | 1.21 | 6.26 | 2.11 | 7.20 |
| livestock | 1.06 | 1.06 | 1.26 | 1.26 | 2.11 | 2.11 |
| retail | 2.28 | 2.29 | 2.49 | 2.50 | 4.57 | 4.57 |
| services | 1.41 | 1.41 | 1.42 | 1.42 | 2.82 | 2.82 |
| non-agricultural production | 1.81 | 1.80 | 1.94 | 1.94 | 3.63 | 3.62 |
| Non-Poor HHs Only | | | | | | |
| crop | 1.08 | 6.12 | 1.21 | 6.26 | 2.11 | 7.20 |
| livestock | 1.05 | 1.04 | 1.24 | 1.24 | 2.09 | 2.09 |
| retail | 1.74 | 1.74 | 1.90 | 1.90 | 3.46 | 3.47 |
| services | 1.40 | 1.40 | 1.41 | 1.41 | 2.80 | 2.80 |
| non-agricultural production | 1.73 | 1.73 | 1.86 | 1.85 | 3.47 | 3.46 |

# Table 39. Detailed FISP Simulation Multipliers

| Household | Multipliers | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Option 1 - Status quo | | Option 2 - "productive farmers" | | Option 3 - More vulnerable "productive" farmers | | Option 4 - Less vulnerable "productive farmers" | | Option 5 - Less vulnerable "productive farmers" and lower | |
| | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change |
| Total Income Multiplier | | | | | | | | | | |
| Nominal | -0.04 | -0.04 | 0.18 | 0.28 | 0.59 | 1.10 | -0.15 | -0.16 | -0.11 | -0.23 |
| (CI) | ( -0.10- 0.03) | ( -0.10- 0.03) | ( -0.04- 0.42) | ( 0.00- 0.66) | ( -0.07- 1.66) | ( -0.06- 2.81) | ( -0.35- 0.02) | ( -0.36- 0.01) | ( -0.23- 0.02) | ( -0.44- 0.00) |
| Real | 1.51 | 2.49 | 3.33 | 5.36 | 6.03 | 11.90 | 1.68 | 2.84 | 0.92 | 2.87 |
| (CI) | ( 1.31- 1.87) | ( 2.26- 2.85) | ( 2.15- 5.06) | ( 4.03- 7.64) | ( 2.28- 14.78) | ( 5.55- 22.80) | ( 1.28- 1.99) | ( 2.58- 3.20) | ( 0.59- 1.18) | ( 2.33- 3.43) |
| Total Beneficiary Income Multiplier | | | | | | | | | | |
| Nominal | -0.04 | -0.04 | 0.86 | 1.33 | 2.09 | 4.12 | 1.10 | 1.48 | 0.72 | 1.91 |
| Real | 1.51 | 2.49 | 2.67 | 4.26 | 3.52 | 7.03 | 2.01 | 3.01 | 1.22 | 3.45 |
| Total Non-Beneficiary Income Multiplier | | | | | | | | | | |
| Nominal | 0.00 | 0.00 | -0.68 | -1.05 | -1.49 | -3.01 | -1.25 | -1.64 | -0.82 | -2.13 |
| Real | 0.00 | 0.00 | 0.66 | 1.10 | 2.51 | 4.87 | -0.33 | -0.17 | -0.30 | -0.58 |
| Total Ultra-Poor Income Multiplier | | | | | | | | | | |
| Nominal | 0.03 | 0.03 | 0.24 | 0.34 | 0.97 | 1.63 | -0.41 | -0.47 | -0.28 | -0.69 |
| Real | 0.31 | 0.49 | 0.82 | 1.28 | 1.99 | 3.66 | -0.09 | 0.04 | -0.10 | -0.15 |
| Total Moderately-Poor Income Multiplier | | | | | | | | | | |
| Nominal | -0.11 | -0.11 | -0.28 | -0.23 | 0.70 | 1.73 | -0.28 | 0.30 | -0.16 | 0.05 |
| Real | 0.39 | 0.71 | 0.73 | 1.39 | 2.47 | 5.28 | 0.30 | 1.28 | 0.17 | 1.05 |
| Total Non-Poor Income Multiplier | | | | | | | | | | |
| Nominal | 0.04 | 0.04 | 0.22 | 0.17 | -1.07 | -2.25 | 0.54 | 0.01 | 0.33 | 0.41 |
| Real | 0.81 | 1.29 | 1.78 | 2.69 | 1.58 | 2.96 | 1.47 | 1.51 | 0.85 | 1.98 |
| HH Income Multipliers | | | | | | | | | | |
| A nominal | -0.11 | -0.11 | 0.59 | 0.76 | -0.72 | -1.45 | 1.15 | 0.84 | 0.72 | 1.45 |
| real | 0.31 | 0.58 | 1.47 | 2.19 | 0.76 | 1.45 | 1.66 | 1.69 | 1.01 | 2.32 |
| B nominal | 0.15 | 0.15 | -0.36 | -0.58 | -0.36 | -0.80 | -0.61 | -0.83 | -0.39 | -1.04 |
| real | 0.50 | 0.72 | 0.32 | 0.50 | 0.82 | 1.51 | -0.20 | -0.18 | -0.16 | -0.35 |
| C nominal | -0.01 | -0.01 | 0.17 | 0.20 | 1.02 | 1.36 | 0.26 | 0.12 | 0.14 | 0.25 |
| real | 0.05 | 0.09 | 0.30 | 0.41 | 1.24 | 1.82 | 0.34 | 0.23 | 0.18 | 0.37 |
| D nominal | -0.20 | -0.20 | -0.23 | -0.10 | -0.02 | 0.97 | -0.31 | 0.52 | -0.15 | 0.21 |
| real | 0.08 | 0.25 | 0.32 | 0.79 | 0.94 | 2.92 | 0.01 | 1.08 | 0.03 | 0.76 |
| E nominal | 0.05 | 0.05 | -0.08 | -0.13 | -0.11 | -0.23 | -0.10 | -0.14 | -0.06 | -0.16 |
| real | 0.11 | 0.15 | 0.05 | 0.07 | 0.11 | 0.21 | -0.02 | -0.02 | -0.02 | -0.04 |
| F nominal | 0.05 | 0.05 | -0.13 | -0.20 | -0.18 | -0.37 | -0.14 | -0.20 | -0.09 | -0.24 |
| real | 0.15 | 0.22 | 0.07 | 0.12 | 0.17 | 0.33 | -0.03 | -0.01 | -0.02 | -0.05 |
| G nominal | -0.01 | -0.01 | 0.18 | 0.25 | 1.09 | 1.79 | -0.10 | -0.11 | -0.07 | -0.16 |
| real | 0.05 | 0.09 | 0.31 | 0.47 | 1.33 | 2.29 | -0.03 | 0.00 | -0.03 | -0.04 |
| H nominal | -0.01 | -0.01 | -0.08 | -0.10 | -0.10 | -0.15 | -0.16 | -0.19 | -0.11 | -0.27 |
| real | 0.11 | 0.19 | 0.16 | 0.29 | 0.32 | 0.69 | -0.02 | 0.03 | -0.03 | -0.04 |
| I nominal | -0.01 | -0.01 | 0.16 | 0.22 | 0.00 | 0.01 | -0.08 | -0.10 | -0.06 | -0.14 |
| real | 0.05 | 0.08 | 0.27 | 0.41 | 0.18 | 0.38 | -0.02 | 0.00 | -0.02 | -0.04 |
| J nominal | 0.05 | 0.05 | -0.03 | -0.03 | -0.02 | -0.03 | -0.07 | -0.08 | -0.05 | -0.11 |
| real | 0.10 | 0.13 | 0.07 | 0.12 | 0.14 | 0.29 | -0.01 | 0.01 | -0.02 | -0.02 |
| Production Multipliers | | | | | | | | | | |
| Total | 1.47 | 2.47 | 3.38 | 5.69 | 5.96 | 12.21 | 1.62 | 2.87 | 0.86 | 2.76 |
| Beneficiary Households | 1.47 | 2.47 | 6.49 | 9.94 | 15.31 | 28.34 | 4.67 | 6.72 | 2.95 | 8.06 |
| Non-Beneficiary | 0.00 | 0.00 | -3.11 | -4.25 | -9.35 | -16.14 | -3.05 | -3.86 | -2.09 | -5.30 |
| Ultra-Poor | 0.57 | 0.76 | 2.69 | 4.02 | 7.90 | 14.25 | -2.22 | -2.55 | -1.61 | -3.87 |
| Moderately-Poor | 0.15 | 0.46 | -0.38 | 0.08 | 1.53 | 4.65 | 0.46 | 2.57 | 0.37 | 2.20 |
| Non-Poor | 0.75 | 1.25 | 1.07 | 1.59 | -3.47 | -6.69 | 3.37 | 2.85 | 2.10 | 4.43 |
| Production Multipliers by Sector | | | | | | | | | | |
| crop | 1.46 | 2.46 | 3.33 | 5.62 | 5.78 | 11.89 | 1.73 | 3.02 | 0.94 | 2.96 |
| livestock | 0.00 | 0.00 | 0.01 | 0.02 | 0.04 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 |
| retail | 0.01 | 0.02 | 0.03 | 0.04 | 0.12 | 0.22 | -0.11 | -0.14 | -0.07 | -0.18 |
| services | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | -0.02 | 0.00 | -0.01 |
| non-agricultural production | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.00 | -0.01 | 0.00 | -0.01 |
| Production Multipliers by Sector Beneficiary HHs | | | | | | | | | | |
| crop | 1.46 | 2.46 | 6.47 | 9.92 | 15.29 | 28.31 | 4.69 | 6.75 | 2.96 | 8.10 |
| livestock | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| retail | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | -0.02 | -0.03 | -0.01 | -0.03 |
| services | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | | | | | | | | |
| crop | 0.00 | 0.00 | -3.14 | -4.30 | -9.51 | -16.41 | -2.96 | -3.73 | -2.03 | -5.14 |
| livestock | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| retail | 0.00 | 0.00 | 0.02 | 0.03 | 0.11 | 0.21 | -0.09 | -0.11 | -0.06 | -0.14 |
| services | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | -0.01 | 0.00 | -0.01 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | -0.01 |
| Production Multipliers by Sector Ultra-Poor HHs | | | | | | | | | | |
| crop | 0.57 | 0.76 | 2.69 | 4.02 | 7.88 | 14.22 | -2.21 | -2.54 | -1.60 | -3.85 |
| livestock | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| retail | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | -0.01 | -0.01 | 0.00 | -0.01 |
| services | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Production Multipliers by Sector Moderately-Poor HHs | | | | | | | | | | |
| crop | 0.15 | 0.46 | -0.39 | 0.07 | 1.51 | 4.60 | 0.48 | 2.58 | 0.38 | 2.22 |
| livestock | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| retail | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | -0.01 | -0.01 | -0.01 | -0.02 |
| services | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Production Multipliers by Sector Non-Poor HHs | | | | | | | | | | |
| crop | 0.74 | 1.24 | 1.03 | 1.54 | -3.61 | -6.93 | 3.47 | 2.98 | 2.16 | 4.60 |
| livestock | 0.00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| retail | 0.01 | 0.01 | 0.02 | 0.03 | 0.10 | 0.19 | -0.09 | -0.12 | -0.06 | -0.15 |
| services | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | -0.01 | 0.00 | -0.01 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | -0.01 |

# Table 40. Detailed FISP Simulation Percentages

| Percentage Changes | Option 1 - Status quo | | Option 2 - "productive farmers" | | Option 3 - More vulnerable "productive" farmers | | Option 4 - Less vulnerable "productive farmers" | | Option 5 - Less vulnerable "productive farmers" and lower subsidy | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change | No Tech Change | With Tech Change |
| Total Rural Income | | | | | | | | | | |
| Nominal | 0.19 | 0.18 | 0.26 | 0.19 | 0.17 | 0.06 | -0.06 | -0.34 | -0.05 | -0.39 |
| (CI) | ( -0.08, 0.45) | ( -0.08, 0.44) | ( -0.54, 1.15) | ( -0.91, 1.48) | ( -0.49, 0.94) | ( -0.90, 1.24) | ( -0.70, 0.52) | ( -1.08, 0.45) | ( -0.27, 0.13) | ( -0.67, -0.10) |
| Real | 1.67 | 2.61 | 3.34 | 5.14 | 1.74 | 3.16 | 1.61 | 2.62 | 0.53 | 1.35 |
| (CI) | ( 1.31, 2.12) | ( 2.24, 3.05) | ( 1.95, 5.28) | ( 3.48, 7.61) | ( 0.54, 4.38) | ( 1.10, 6.90) | ( 0.96, 2.24) | ( 1.91, 3.70) | ( 0.26, 0.77) | ( 0.95, 1.73) |
| Total Beneficiary Income | | | | | | | | | | |
| Nominal | 0.19 | 0.18 | 2.83 | 3.81 | 6.13 | 9.75 | 4.09 | 5.38 | 1.59 | 3.29 |
| Real | 1.67 | 2.61 | 6.59 | 9.92 | 8.19 | 13.94 | 6.13 | 9.09 | 2.28 | 5.41 |
| Total Non-Beneficiary Income | | | | | | | | | | |
| Nominal | NA | NA | -1.37 | -2.10 | -0.57 | -1.14 | -2.02 | -3.05 | -0.83 | -2.13 |
| Real | NA | NA | 1.28 | 2.12 | 0.95 | 1.83 | -0.53 | -0.44 | -0.30 | -0.57 |
| Total Ultra-Poor Income | | | | | | | | | | |
| Nominal | 0.32 | 0.31 | 1.51 | 2.21 | 1.78 | 2.99 | -2.58 | -3.55 | -1.12 | -2.69 |
| Real | 2.19 | 3.36 | 5.44 | 8.57 | 3.82 | 7.05 | -0.56 | 0.00 | -0.41 | -0.58 |
| Total Moderately-Poor Income | | | | | | | | | | |
| Nominal | 0.38 | 0.38 | -0.82 | -1.32 | 1.01 | 1.29 | -0.55 | -0.88 | -0.26 | -0.70 |
| Real | 2.15 | 3.27 | 2.81 | 4.50 | 2.91 | 5.05 | 1.40 | 2.59 | 0.43 | 1.34 |
| Total Non-Poor Income | | | | | | | | | | |
| Nominal | 0.09 | 0.08 | 0.32 | 0.20 | -0.54 | -1.12 | 0.75 | 0.66 | 0.29 | 0.30 |
| Real | 1.37 | 2.18 | 2.98 | 4.49 | 0.81 | 1.51 | 2.23 | 3.29 | 0.80 | 1.84 |
| Household Income | | | | | | | | | | |
| A nominal | -0.46 | -0.46 | 2.45 | 3.16 | -0.88 | -1.79 | 4.47 | 5.64 | 1.76 | 3.48 |
| real | 1.27 | 2.37 | 6.15 | 9.15 | 0.95 | 1.80 | 6.49 | 9.32 | 2.45 | 5.58 |
| B nominal | 0.44 | 0.44 | -1.07 | -1.71 | -0.31 | -0.69 | -1.66 | -2.57 | -0.67 | -1.76 |
| real | 1.44 | 2.06 | 0.93 | 1.46 | 0.72 | 1.32 | -0.54 | -0.63 | -0.27 | -0.58 |
| C nominal | -0.27 | -0.27 | 5.68 | 6.68 | 9.98 | 13.34 | 8.12 | 10.20 | 2.77 | 4.80 |
| real | 1.67 | 2.89 | 9.96 | 13.64 | 12.25 | 17.98 | 10.45 | 14.48 | 3.54 | 7.17 |
| D nominal | -1.23 | -1.24 | -1.52 | -0.66 | -0.05 | 1.81 | -1.85 | -0.54 | -0.57 | 0.77 |
| real | 0.50 | 1.59 | 2.06 | 5.12 | 1.79 | 5.55 | 0.06 | 2.89 | 0.11 | 2.82 |
| E nominal | 1.17 | 1.17 | -2.13 | -3.33 | -0.87 | -1.76 | -2.29 | -3.64 | -0.90 | -2.44 |
| real | 2.81 | 3.84 | 1.17 | 1.93 | 0.85 | 1.61 | -0.52 | -0.53 | -0.28 | -0.58 |
| F nominal | 0.86 | 0.86 | -2.34 | -3.62 | -0.97 | -1.94 | -2.40 | -3.80 | -0.94 | -2.52 |
| real | 2.67 | 3.81 | 1.29 | 2.14 | 0.92 | 1.76 | -0.45 | -0.40 | -0.25 | -0.48 |
| G nominal | -0.20 | -0.21 | 5.17 | 7.25 | 9.34 | 15.28 | -2.65 | -3.61 | -1.16 | -2.73 |
| real | 1.56 | 2.66 | 9.01 | 13.51 | 11.41 | 19.55 | -0.73 | -0.26 | -0.48 | -0.73 |
| H nominal | -0.12 | -0.13 | -1.39 | -1.77 | -0.51 | -0.75 | -2.62 | -3.66 | -1.14 | -2.75 |
| real | 1.96 | 3.28 | 2.91 | 5.14 | 1.72 | 3.68 | -0.38 | 0.30 | -0.34 | -0.41 |
| I nominal | -0.22 | -0.23 | 5.45 | 7.52 | -0.01 | 0.11 | -2.65 | -3.59 | -1.16 | -2.75 |
| real | 1.53 | 2.63 | 9.29 | 13.79 | 1.86 | 3.82 | -0.75 | -0.26 | -0.48 | -0.76 |
| J nominal | 1.84 | 1.83 | -0.97 | -1.14 | -0.23 | -0.34 | -2.38 | -3.30 | -1.03 | -2.51 |
| real | 3.61 | 4.73 | 2.61 | 4.60 | 1.62 | 3.33 | -0.48 | 0.03 | -0.36 | -0.53 |
| Total Production | 1.03 | 2.20 | 8.24 | 13.18 | 5.01 | 9.92 | 1.71 | 4.06 | 0.56 | 2.47 |
| Beneficiary Households | 1.03 | 2.20 | 19.98 | 30.53 | 32.72 | 61.10 | 10.95 | 18.85 | 4.41 | 13.11 |
| Non-Beneficiary Households | NA | NA | -6.80 | -9.07 | -4.33 | -7.35 | -6.99 | -9.86 | -3.05 | -7.55 |
| Ultra-Poor Households | 4.36 | 6.17 | 47.05 | 67.34 | 35.47 | 62.41 | -20.58 | -27.93 | -9.26 | -22.30 |
| Moderately-Poor Households | -0.05 | 1.54 | -2.26 | 0.92 | 2.08 | 7.77 | 2.01 | 8.23 | 1.13 | 7.68 |
| Non-Poor Households | 0.73 | 1.49 | 3.49 | 5.23 | -1.64 | -3.17 | 7.60 | 10.46 | 2.92 | 6.32 |
| Production by Sector | | | | | | | | | | |
| crop | 4.94 | 8.44 | 17.68 | 28.42 | 12.86 | 24.33 | 3.74 | 8.35 | 1.09 | 4.39 |
| livestock | -0.05 | -0.05 | 0.10 | 0.18 | 0.12 | 0.25 | -0.05 | -0.02 | -0.02 | 0.00 |
| retail | 0.02 | 0.03 | 0.04 | 0.07 | 0.06 | 0.11 | -0.18 | -0.26 | -0.08 | -0.18 |
| services | 0.03 | 0.03 | 0.06 | 0.05 | 0.01 | -0.01 | 0.01 | -0.03 | 0.00 | -0.04 |
| non-agricultural production | -0.01 | -0.02 | 0.13 | 0.19 | 0.08 | 0.15 | -0.10 | -0.14 | -0.05 | -0.10 |
| Production by Sector Beneficiary HHs | | | | | | | | | | |
| crop | 4.94 | 8.44 | 49.09 | 74.27 | 76.13 | 137.98 | 30.36 | 49.92 | 11.98 | 33.41 |
| livestock | -0.05 | -0.05 | 0.10 | 0.18 | 0.11 | 0.24 | -0.05 | -0.02 | -0.02 | 0.00 |
| retail | 0.02 | 0.03 | 0.04 | 0.06 | 0.06 | 0.11 | -0.18 | -0.25 | -0.07 | -0.18 |
| services | 0.03 | 0.03 | 0.06 | 0.05 | 0.02 | -0.02 | 0.02 | -0.03 | 0.00 | -0.04 |
| non-agricultural production | -0.01 | -0.02 | 0.13 | 0.19 | 0.09 | 0.15 | -0.10 | -0.14 | -0.05 | -0.10 |
| Production by Sector Non-Beneficiary HHs | | | | | | | | | | |
| crop | NA | NA | -26.39 | -35.91 | -14.35 | -24.54 | -20.96 | -30.20 | -9.01 | -22.53 |
| livestock | NA | NA | 0.10 | 0.18 | 0.12 | 0.25 | -0.05 | -0.02 | -0.02 | 0.00 |
| retail | NA | NA | 0.04 | 0.07 | 0.06 | 0.11 | -0.18 | -0.26 | -0.08 | -0.18 |
| services | NA | NA | 0.06 | 0.05 | 0.01 | -0.01 | 0.01 | -0.03 | 0.00 | -0.04 |
| non-agricultural production | NA | NA | 0.13 | 0.19 | 0.08 | 0.15 | -0.10 | -0.14 | -0.05 | -0.11 |
| Ultra-Poor HHs Only | | | | | | | | | | |
| crop | 10.23 | 13.85 | 74.79 | 109.37 | 66.46 | 117.28 | -40.55 | -55.18 | -18.28 | -43.79 |
| livestock | -0.06 | -0.06 | 0.11 | 0.21 | 0.14 | 0.29 | -0.06 | -0.02 | -0.02 | 0.00 |
| retail | 0.04 | 0.04 | 0.07 | 0.10 | 0.09 | 0.17 | -0.27 | -0.39 | -0.11 | -0.27 |
| services | 0.03 | 0.03 | 0.06 | 0.05 | 0.02 | -0.01 | 0.01 | -0.03 | 0.00 | -0.04 |
| non-agricultural production | -0.01 | -0.02 | 0.14 | 0.21 | 0.09 | 0.17 | -0.11 | -0.15 | -0.05 | -0.12 |
| Moderately-Poor HHs Only | | | | | | | | | | |
| crop | 1.10 | 4.49 | -2.93 | 3.08 | 6.76 | 18.23 | 6.83 | 19.31 | 3.15 | 16.15 |
| livestock | -0.05 | -0.05 | 0.09 | 0.18 | 0.11 | 0.24 | -0.05 | -0.02 | -0.02 | 0.00 |
| retail | 0.03 | 0.03 | 0.06 | 0.08 | 0.08 | 0.14 | -0.23 | -0.32 | -0.09 | -0.23 |
| services | 0.03 | 0.03 | 0.06 | 0.05 | 0.01 | -0.01 | 0.02 | -0.03 | 0.00 | -0.04 |
| non-agricultural production | -0.01 | -0.02 | 0.13 | 0.19 | 0.09 | 0.16 | -0.11 | -0.15 | -0.05 | -0.11 |
| Non-Poor HHs Only | | | | | | | | | | |
| crop | 5.41 | 8.93 | 6.65 | 9.80 | -7.68 | -14.72 | 22.21 | 29.84 | 8.63 | 18.04 |
| livestock | -0.05 | -0.05 | 0.10 | 0.17 | 0.11 | 0.24 | -0.05 | -0.02 | -0.02 | 0.00 |
| retail | 0.02 | 0.03 | 0.04 | 0.06 | 0.06 | 0.10 | -0.17 | -0.25 | -0.07 | -0.17 |
| services | 0.03 | 0.03 | 0.06 | 0.05 | 0.01 | -0.01 | 0.01 | -0.03 | 0.00 | -0.04 |
| non-agricultural production | -0.01 | -0.02 | 0.13 | 0.19 | 0.08 | 0.15 | -0.10 | -0.14 | -0.05 | -0.10 |

# Table 41. Detailed Irrigation and Extension Simulation Multipliers

| Multipliers | Irrigation (Full Cost) | Irrigation (Annual Cost) | Extension |
|---|---|---|---|
| Total Income Multiplier | | | |
| Nominal | 0.87 | 0.89 | 2.63 |
| (CI) | ( 0.83- 0.93) | ( 0.85- 0.96) | ( 2.51- 2.80) |
| Real | 0.85 | 0.69 | 2.07 |
| (CI) | ( 0.78- 0.96) | ( 0.65- 0.76) | ( 1.98- 2.24) |
| Total Beneficiary Income Multiplier | | | |
| Nominal | 0.67 | 0.62 | 1.86 |
| Real | 0.68 | 0.53 | 1.61 |
| Total Non-Beneficiary Income Multiplier | | | |
| Nominal | 0.20 | 0.27 | 0.77 |
| Real | 0.17 | 0.16 | 0.46 |
| Total Ultra-Poor Income Multiplier | | | |
| Nominal | 0.18 | 0.18 | 0.53 |
| Real | 0.18 | 0.16 | 0.46 |
| Total Moderately-Poor Income Multiplier | | | |
| Nominal | 0.21 | 0.21 | 0.63 |
| Real | 0.22 | 0.16 | 0.48 |
| Total Non-Poor Income Multiplier | | | |
| Nominal | 0.48 | 0.50 | 1.48 |
| Real | 0.45 | 0.38 | 1.12 |
| HH Income Multipliers | | | |
| A nominal | 0.32 | 0.30 | 0.90 |
| real | 0.33 | 0.25 | 0.78 |
| B nominal | 0.16 | 0.20 | 0.58 |
| real | 0.12 | 0.12 | 0.35 |
| C nominal | 0.06 | 0.05 | 0.16 |
| real | 0.06 | 0.05 | 0.15 |
| D nominal | 0.14 | 0.12 | 0.37 |
| real | 0.14 | 0.10 | 0.29 |
| E nominal | 0.01 | 0.01 | 0.04 |
| real | 0.01 | 0.01 | 0.02 |
| F nominal | 0.01 | 0.02 | 0.05 |
| real | 0.01 | 0.01 | 0.03 |
| G nominal | 0.09 | 0.08 | 0.24 |
| real | 0.09 | 0.07 | 0.22 |
| H nominal | 0.02 | 0.02 | 0.07 |
| real | 0.02 | 0.02 | 0.05 |
| I nominal | 0.07 | 0.06 | 0.19 |
| real | 0.07 | 0.06 | 0.17 |
| J nominal | 0.01 | 0.01 | 0.03 |
| real | 0.01 | 0.01 | 0.02 |
| Production Multipliers | | | |
| Total | 0.86 | 0.71 | 2.10 |
| Beneficiary Households | 0.83 | 0.50 | 1.45 |
| Non-Beneficiary | 0.03 | 0.21 | 0.65 |
| Ultra-Poor | 0.18 | 0.17 | 0.41 |
| Moderately-Poor | 0.20 | 0.13 | 0.42 |
| Non-Poor | 0.48 | 0.41 | 1.27 |
| Production Multipliers by Sector | | | |
| crop | 0.47 | 0.32 | 0.91 |
| livestock | 0.03 | 0.03 | 0.09 |
| retail | 0.28 | 0.28 | 0.86 |
| services | 0.06 | 0.06 | 0.18 |
| non-agricultural production | 0.02 | 0.02 | 0.06 |
| Production Multipliers by Sector Beneficiary HHs | | | |
| crop | 0.73 | 0.40 | 1.14 |
| livestock | 0.02 | 0.02 | 0.05 |
| retail | 0.06 | 0.06 | 0.18 |
| services | 0.02 | 0.02 | 0.05 |
| non-agricultural production | 0.01 | 0.01 | 0.02 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | |
| crop | -0.25 | -0.08 | -0.23 |
| livestock | 0.01 | 0.01 | 0.04 |
| retail | 0.22 | 0.22 | 0.68 |
| services | 0.04 | 0.04 | 0.13 |
| non-agricultural production | 0.01 | 0.01 | 0.04 |
| Production Multipliers by Sector Ultra-Poor HHs | | | |
| crop | 0.16 | 0.14 | 0.32 |
| livestock | 0.01 | 0.01 | 0.02 |
| retail | 0.01 | 0.02 | 0.05 |
| services | 0.01 | 0.01 | 0.02 |
| non-agricultural production | 0.00 | 0.00 | 0.01 |
| Production Multipliers by Sector Moderately-Poor HHs | | | |
| crop | 0.15 | 0.08 | 0.26 |
| livestock | 0.01 | 0.01 | 0.03 |
| retail | 0.03 | 0.03 | 0.09 |
| services | 0.01 | 0.01 | 0.03 |
| non-agricultural production | 0.00 | 0.00 | 0.01 |
| Production Multipliers by Sector Non-Poor HHs | | | |
| crop | 0.17 | 0.10 | 0.33 |
| livestock | 0.01 | 0.01 | 0.04 |
| retail | 0.24 | 0.24 | 0.73 |
| services | 0.04 | 0.04 | 0.13 |
| non-agricultural production | 0.02 | 0.02 | 0.05 |

# Table 42. Detailed Irrigation and Extension Simulation Percentages

| Percentage Changes | Irrigation (Full Cost, annualized) | Irrigation (Annual Cost) | Extension |
|---|---|---|---|
| Total Rural Income | | | |
| Nominal | 6.09 | 14.66 | 3.18 |
| (CI) | ( 5.65, 6.65) | ( 13.75, 15.98) | ( 3.01, 3.41) |
| Real | 5.87 | 11.30 | 2.48 |
| (CI) | ( 5.33, 6.75) | ( 10.50, 12.62) | ( 2.33, 2.71) |
| Total Beneficiary Income | | | |
| Nominal | 11.28 | 24.09 | 5.33 |
| Real | 11.43 | 20.87 | 4.69 |
| Total Non-Beneficiary Income | | | |
| Nominal | 2.82 | 8.71 | 1.83 |
| Real | 2.37 | 5.27 | 1.09 |
| Total Ultra-Poor Income | | | |
| Nominal | 8.61 | 20.44 | 4.40 |
| Real | 8.91 | 17.46 | 3.80 |
| Total Moderately-Poor Income | | | |
| Nominal | 4.36 | 11.20 | 2.45 |
| Real | 4.55 | 8.43 | 1.85 |
| Total Non-Poor Income | | | |
| Nominal | 6.06 | 14.41 | 3.13 |
| Real | 5.57 | 10.76 | 2.37 |
| Household Income | | | |
| A nominal | 9.94 | 21.08 | 4.69 |
| real | 10.08 | 17.95 | 4.06 |
| B nominal | 3.54 | 10.08 | 2.12 |
| real | 2.64 | 6.09 | 1.27 |
| C nominal | 13.87 | 29.91 | 6.68 |
| real | 14.33 | 26.94 | 6.10 |
| D nominal | 6.68 | 13.58 | 3.01 |
| real | 6.72 | 10.44 | 2.34 |
| E nominal | 1.57 | 6.36 | 1.34 |
| real | 1.70 | 3.78 | 0.77 |
| F nominal | 1.16 | 5.52 | 1.17 |
| real | 1.36 | 2.86 | 0.57 |
| G nominal | 18.25 | 39.88 | 8.70 |
| real | 18.30 | 35.96 | 7.99 |
| H nominal | 2.02 | 7.39 | 1.52 |
| real | 2.65 | 5.19 | 1.02 |
| I nominal | 16.95 | 36.91 | 8.03 |
| real | 17.11 | 33.39 | 7.38 |
| J nominal | 2.32 | 7.65 | 1.58 |
| real | 2.45 | 4.88 | 0.97 |
| Total Production | 9.55 | 15.58 | 3.29 |
| Beneficiary Households | 18.09 | 25.05 | 5.25 |
| Non-Beneficiary Households | -1.41 | 3.44 | 0.78 |
| Ultra-Poor Households | 24.27 | 42.32 | 7.56 |
| Moderately-Poor Households | 8.84 | 12.61 | 2.96 |
| Non-Poor Households | 5.93 | 9.96 | 2.31 |
| Production by Sector | | | |
| crop | 15.75 | 24.10 | 4.89 |
| livestock | 2.43 | 5.43 | 1.23 |
| retail | 3.66 | 8.40 | 1.90 |
| services | 2.94 | 6.81 | 1.53 |
| non-agricultural production | 3.64 | 8.34 | 1.86 |
| Production by Sector Beneficiary HHs | | | |
| crop | 38.17 | 49.05 | 10.09 |
| livestock | 2.40 | 5.35 | 1.22 |
| retail | 3.67 | 8.43 | 1.91 |
| services | 2.94 | 6.81 | 1.53 |
| non-agricultural production | 3.69 | 8.46 | 1.89 |
| Production by Sector Non-Beneficiary HHs | | | |
| crop | -15.71 | -10.92 | -2.42 |
| livestock | 2.49 | 5.57 | 1.26 |
| retail | 3.66 | 8.39 | 1.90 |
| services | 2.94 | 6.81 | 1.53 |
| non-agricultural production | 3.61 | 8.29 | 1.85 |
| Ultra-Poor HHs Only | | | |
| crop | 34.77 | 63.29 | 10.77 |
| livestock | 2.82 | 6.32 | 1.43 |
| retail | 5.56 | 12.92 | 2.88 |
| services | 2.93 | 6.78 | 1.52 |
| non-agricultural production | 4.05 | 9.31 | 2.07 |
| Moderately-Poor HHs Only | | | |
| crop | 13.62 | 16.67 | 4.01 |
| livestock | 2.35 | 5.24 | 1.19 |
| retail | 4.59 | 10.61 | 2.38 |
| services | 2.93 | 6.78 | 1.52 |
| non-agricultural production | 3.80 | 8.72 | 1.95 |
| Non-Poor HHs Only | | | |
| crop | 8.44 | 11.36 | 2.79 |
| livestock | 2.38 | 5.30 | 1.21 |
| retail | 3.48 | 7.98 | 1.81 |
| services | 2.95 | 6.82 | 1.53 |
| non-agricultural production | 3.56 | 8.17 | 1.83 |

# Table 43. Detailed Combined Intervention Simulation Multipliers

| Household | Multipliers | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Option 1: SCT + FISP to HHs with more than 1.5 acres | | | Option 2: Reallocation of resources with non-overlapping targeting | | | Option 3: Reallocation of resources with partial overlapping targeting | | | Option 4: Reallocation of resources with fully overlapping targeting | | | Option 5: Reallocation of resources with fully overlapping targeting to ultra-poor | | |
| | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change |
| Total Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 2.07 | 2.10 | 2.30 | 2.73 | 2.71 | 2.77 | 2.79 | 2.82 | 2.85 | 2.70 | 2.74 | 2.77 | 2.93 | 2.98 | 2.95 |
| (CI) | ( 1.92- 2.24) | ( 1.93- 2.29) | ( 2.13- 2.48) | ( 2.57- 2.95) | ( 2.55- 2.90) | ( 2.61- 3.01) | ( 2.62- 3.00) | ( 2.61- 3.06) | ( 2.67- 3.06) | ( 2.54- 2.92) | ( 2.55- 2.99) | ( 2.59- 2.97) | ( 2.77- 3.15) | ( 2.78- 3.24) | ( 2.76- 3.16) |
| Real | 2.38 | 3.01 | 2.25 | 1.83 | 1.97 | 1.84 | 2.15 | 2.47 | 2.09 | 2.36 | 3.01 | 2.20 | 2.23 | 2.66 | 2.19 |
| (CI) | ( 1.96- 3.01) | ( 2.51- 3.70) | ( 1.93- 2.79) | ( 1.79- 1.89) | ( 1.92- 2.02) | ( 1.79- 1.89) | ( 1.84- 2.77) | ( 2.01- 3.29) | ( 1.83- 2.62) | ( 1.92- 3.36) | ( 2.23- 4.26) | ( 1.87- 2.87) | ( 2.01- 2.48) | ( 2.37- 2.95) | ( 1.99- 2.41) |
| Total Beneficiary Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 1.60 | 1.74 | 1.78 | 1.96 | 2.02 | 2.04 | 1.61 | 1.74 | 1.77 | 1.49 | 1.70 | 1.60 | 1.35 | 1.44 | 1.46 |
| Real | 1.85 | 2.36 | 1.83 | 1.45 | 1.61 | 1.46 | 1.4 | 1.65 | 1.45 | 1.42 | 1.81 | 1.43 | 1.23 | 1.41 | 1.28 |
| Total Non-Beneficiary Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 0.47 | 0.35 | 0.52 | 0.76 | 0.69 | 0.74 | 1.18 | 1.08 | 1.08 | 1.22 | 1.04 | 1.17 | 1.58 | 1.54 | 1.5 |
| Real | 0.53 | 0.65 | 0.42 | 0.39 | 0.36 | 0.38 | 0.75 | 0.82 | 0.64 | 0.94 | 1.20 | 0.76 | 1 | 1.24 | 0.9 |
| Total Ultra-Poor Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 0.98 | 1.00 | 0.96 | 1.13 | 1.09 | 1.11 | 0.81 | 0.85 | 0.83 | 0.79 | 0.86 | 0.82 | 1.35 | 1.44 | 1.29 |
| Real | 1.07 | 1.22 | 0.98 | 0.96 | 0.96 | 0.92 | 0.72 | 0.82 | 0.71 | 0.76 | 0.95 | 0.74 | 1.23 | 1.41 | 1.15 |
| Total Moderately-Poor Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 0.23 | 0.24 | 0.39 | 0.41 | 0.42 | 0.46 | 0.95 | 1.02 | 0.94 | 0.98 | 1.08 | 0.95 | 0.44 | 0.42 | 0.5 |
| Real | 0.35 | 0.55 | 0.41 | 0.19 | 0.25 | 0.23 | 0.79 | 0.95 | 0.74 | 0.91 | 1.22 | 0.80 | 0.27 | 0.36 | 0.32 |
| Total Non-Poor Income Multiplier | | | | | | | | | | | | | | | |
| Nominal | 0.86 | 0.86 | 0.95 | 1.19 | 1.20 | 1.21 | 1.03 | 0.95 | 1.08 | 0.94 | 0.80 | 1.01 | 1.15 | 1.13 | 1.16 |
| Real | 0.95 | 1.24 | 0.86 | 0.68 | 0.77 | 0.68 | 0.65 | 0.71 | 0.64 | 0.70 | 0.85 | 0.65 | 0.73 | 0.88 | 0.71 |
| HH Income Multipliers | | | | | | | | | | | | | | | |
| A nominal | 0.47 | 0.54 | 0.47 | 0.54 | 0.60 | 0.54 | 0.35 | 0.31 | 0.37 | 0.31 | 0.23 | 0.34 | 0.4 | 0.38 | 0.41 |
| real | 0.58 | 0.81 | 0.49 | 0.34 | 0.44 | 0.33 | 0.23 | 0.25 | 0.22 | 0.25 | 0.33 | 0.23 | 0.26 | 0.33 | 0.25 |
| B nominal | 0.39 | 0.32 | 0.49 | 0.65 | 0.60 | 0.67 | 0.68 | 0.65 | 0.71 | 0.63 | 0.58 | 0.67 | 0.75 | 0.75 | 0.76 |
| real | 0.37 | 0.43 | 0.38 | 0.34 | 0.33 | 0.35 | 0.42 | 0.45 | 0.42 | 0.44 | 0.52 | 0.42 | 0.47 | 0.55 | 0.46 |
| C nominal | 0.09 | 0.10 | 0.11 | 0.08 | 0.09 | 0.09 | 0.11 | 0.13 | 0.12 | 0.41 | 0.44 | 0.35 | 0.05 | 0.05 | 0.07 |
| real | 0.11 | 0.14 | 0.12 | 0.06 | 0.08 | 0.07 | 0.09 | 0.13 | 0.1 | 0.41 | 0.47 | 0.33 | 0.04 | 0.05 | 0.05 |
| D nominal | 0.11 | 0.14 | 0.14 | 0.22 | 0.23 | 0.22 | 0.38 | 0.45 | 0.36 | 0.47 | 0.57 | 0.41 | 0.25 | 0.24 | 0.25 |
| real | 0.17 | 0.31 | 0.15 | 0.09 | 0.13 | 0.09 | 0.29 | 0.4 | 0.25 | 0.42 | 0.64 | 0.33 | 0.15 | 0.21 | 0.15 |
| E nominal | 0.02 | 0.00 | 0.10 | 0.05 | 0.04 | 0.08 | 0.05 | 0.04 | 0.1 | 0.04 | 0.03 | 0.12 | 0.06 | 0.05 | 0.1 |
| real | 0.03 | 0.04 | 0.10 | 0.02 | 0.02 | 0.05 | 0.03 | 0.04 | 0.08 | 0.04 | 0.05 | 0.11 | 0.04 | 0.05 | 0.08 |
| F nominal | 0.02 | -0.01 | 0.03 | 0.06 | 0.05 | 0.07 | 0.41 | 0.4 | 0.35 | 0.06 | 0.04 | 0.06 | 0.08 | 0.07 | 0.08 |
| real | 0.04 | 0.06 | 0.04 | 0.02 | 0.02 | 0.02 | 0.37 | 0.38 | 0.31 | 0.04 | 0.06 | 0.04 | 0.04 | 0.06 | 0.04 |
| G nominal | 0.11 | 0.13 | 0.16 | 0.25 | 0.24 | 0.25 | 0.15 | 0.2 | 0.18 | 0.61 | 0.69 | 0.52 | 0.3 | 0.32 | 0.3 |
| real | 0.13 | 0.17 | 0.16 | 0.21 | 0.21 | 0.21 | 0.13 | 0.19 | 0.15 | 0.60 | 0.71 | 0.50 | 0.27 | 0.31 | 0.27 |
| H nominal | 0.04 | 0.04 | 0.15 | 0.43 | 0.42 | 0.44 | 0.09 | 0.08 | 0.16 | 0.08 | 0.08 | 0.19 | 0.51 | 0.54 | 0.51 |
| real | 0.08 | 0.12 | 0.17 | 0.37 | 0.37 | 0.37 | 0.07 | 0.08 | 0.13 | 0.08 | 0.12 | 0.17 | 0.47 | 0.54 | 0.47 |
| I nominal | 0.38 | 0.40 | 0.30 | 0.19 | 0.19 | 0.18 | 0.25 | 0.24 | 0.21 | 0.05 | 0.06 | 0.06 | 0.24 | 0.26 | 0.21 |
| real | 0.40 | 0.44 | 0.31 | 0.16 | 0.16 | 0.15 | 0.22 | 0.23 | 0.19 | 0.05 | 0.07 | 0.04 | 0.22 | 0.25 | 0.19 |
| J nominal | 0.44 | 0.44 | 0.34 | 0.25 | 0.25 | 0.23 | 0.32 | 0.32 | 0.27 | 0.04 | 0.04 | 0.04 | 0.29 | 0.31 | 0.26 |
| real | 0.46 | 0.48 | 0.34 | 0.22 | 0.22 | 0.20 | 0.3 | 0.31 | 0.25 | 0.04 | 0.05 | 0.03 | 0.27 | 0.3 | 0.23 |
| Production Multipliers | | | | | | | | | | | | | | | |
| Total | 2.45 | 3.19 | 2.33 | 1.89 | 2.03 | 1.90 | 2.21 | 2.56 | 2.15 | 2.41 | 3.13 | 2.25 | 2.29 | 2.78 | 2.26 |
| Beneficiary Households | 2.48 | 3.56 | 1.87 | 1.08 | 1.29 | 1.12 | 1.33 | 1.99 | 1.22 | 2.02 | 3.49 | 1.45 | 1.3 | 2.13 | 1.27 |
| Non-Beneficiary | -0.03 | -0.37 | 0.46 | 0.81 | 0.74 | 0.78 | 0.88 | 0.57 | 0.93 | 0.39 | -0.36 | 0.80 | 0.99 | 0.65 | 0.99 |
| Ultra-Poor | 1.26 | 1.68 | 1.06 | 0.18 | -0.05 | 0.20 | 1.03 | 1.33 | 0.91 | 1.36 | 2.11 | 1.08 | 1.3 | 2.13 | 1.22 |
| Moderately-Poor | 0.05 | 0.19 | 0.10 | 0.30 | 0.44 | 0.29 | 0.31 | 0.54 | 0.31 | 0.38 | 0.69 | 0.35 | 0.1 | -0.04 | 0.12 |
| Non-Poor | 1.14 | 1.32 | 1.16 | 1.42 | 1.64 | 1.40 | 0.87 | 0.69 | 0.93 | 0.67 | 0.33 | 0.83 | 0.89 | 0.69 | 0.92 |
| Production Multipliers by Sector | | | | | | | | | | | | | | | |
| crop | 1.52 | 2.25 | 1.31 | 0.75 | 0.91 | 0.75 | 0.99 | 1.34 | 0.92 | 1.23 | 1.93 | 1.04 | 1.04 | 1.5 | 1 |
| livestock | 0.06 | 0.07 | 0.07 | 0.08 | 0.08 | 0.08 | 0.09 | 0.09 | 0.09 | 0.09 | 0.10 | 0.09 | 0.09 | 0.09 | 0.09 |
| retail | 0.67 | 0.68 | 0.74 | 0.83 | 0.82 | 0.84 | 0.89 | 0.89 | 0.89 | 0.86 | 0.87 | 0.88 | 0.92 | 0.94 | 0.92 |
| services | 0.14 | 0.14 | 0.15 | 0.17 | 0.17 | 0.17 | 0.18 | 0.18 | 0.18 | 0.17 | 0.17 | 0.18 | 0.18 | 0.18 | 0.18 |
| non-agricultural production | 0.05 | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 | 0.07 | 0.06 | 0.06 | 0.06 | 0.07 | 0.07 | 0.07 |
| Production Multipliers by Sector Beneficiary HHs | | | | | | | | | | | | | | | |
| crop | 2.23 | 3.31 | 1.52 | 0.73 | 0.94 | 0.73 | 1.17 | 1.83 | 0.98 | 1.93 | 3.40 | 1.28 | 1.21 | 2.04 | 1.12 |
| livestock | 0.04 | 0.04 | 0.05 | 0.06 | 0.06 | 0.06 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 |
| retail | 0.15 | 0.15 | 0.20 | 0.21 | 0.21 | 0.23 | 0.09 | 0.09 | 0.14 | 0.04 | 0.04 | 0.09 | 0.05 | 0.05 | 0.09 |
| services | 0.04 | 0.05 | 0.07 | 0.06 | 0.06 | 0.08 | 0.02 | 0.02 | 0.05 | 0.01 | 0.01 | 0.04 | 0.02 | 0.02 | 0.04 |
| non-agricultural production | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Production Multipliers by Sector Non-Beneficiary HHs | | | | | | | | | | | | | | | |
| crop | -0.71 | -1.06 | -0.21 | 0.02 | -0.04 | 0.02 | -0.18 | -0.49 | -0.05 | -0.70 | -1.47 | -0.24 | -0.17 | -0.54 | -0.11 |
| livestock | 0.02 | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.05 | 0.05 | 0.04 | 0.06 | 0.07 | 0.06 | 0.07 | 0.07 | 0.07 |
| retail | 0.53 | 0.53 | 0.53 | 0.62 | 0.61 | 0.60 | 0.8 | 0.8 | 0.76 | 0.81 | 0.83 | 0.79 | 0.87 | 0.89 | 0.83 |
| services | 0.09 | 0.09 | 0.08 | 0.11 | 0.11 | 0.09 | 0.16 | 0.16 | 0.13 | 0.16 | 0.16 | 0.14 | 0.16 | 0.16 | 0.14 |
| non-agricultural production | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.05 | 0.06 | 0.06 | 0.06 |
| Production Multipliers by Sector Ultra-Poor HHs | | | | | | | | | | | | | | | |
| crop | 1.20 | 1.61 | 0.99 | 0.09 | -0.13 | 0.12 | 0.94 | 1.24 | 0.83 | 1.27 | 2.02 | 0.99 | 1.21 | 2.04 | 1.13 |
| livestock | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| retail | 0.04 | 0.04 | 0.04 | 0.05 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| services | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| non-agricultural production | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Production Multipliers by Sector Moderately-Poor HHs | | | | | | | | | | | | | | | |
| crop | -0.07 | 0.07 | -0.03 | 0.15 | 0.29 | 0.14 | 0.15 | 0.38 | 0.15 | 0.22 | 0.53 | 0.19 | -0.07 | -0.21 | -0.05 |
| livestock | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| retail | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.08 | 0.09 | 0.09 | 0.09 | 0.09 |
| services | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| non-agricultural production | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Production Multipliers by Sector Non-Poor HHs | | | | | | | | | | | | | | | |
| crop | 0.39 | 0.57 | 0.35 | 0.51 | 0.75 | 0.49 | -0.1 | -0.28 | -0.05 | -0.27 | -0.62 | -0.14 | -0.11 | -0.33 | -0.08 |
| livestock | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.04 | 0.04 | 0.04 | 0.04 |
| retail | 0.57 | 0.58 | 0.62 | 0.70 | 0.69 | 0.70 | 0.76 | 0.75 | 0.76 | 0.72 | 0.74 | 0.74 | 0.77 | 0.79 | 0.78 |
| services | 0.10 | 0.10 | 0.11 | 0.12 | 0.12 | 0.12 | 0.13 | 0.13 | 0.13 | 0.12 | 0.12 | 0.13 | 0.13 | 0.13 | 0.13 |
| non-agricultural production | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |

# Table 44. Detailed Combined Intervention Simulation Percentages

| Percentage Changes | Option 1: SCT + FISP to HHs with more than 1.5 acres | | | Option 2: Reallocation of resources with non-overlapping targeting | | | Option 3: Reallocation of resources with partial overlapping targeting | | | Option 4: Reallocation of resources with fully overlapping targeting | | | Option 5: Reallocation of resources with fully overlapping targeting to ultra-poor | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change | No Tech Change | With Tech Change | W/ PWP No Tech Change |
| Total Rural Income | | | | | | | | | | | | | | | |
| Nominal | 7.62 | 7.54 | 11.05 | 26.32 | 25.92 | 29.99 | 14.88 | 14.73 | 18.45 | 7.57 | 7.40 | 10.95 | 18.29 | 18.66 | 21.84 |
| (CI) | ( 6.59%, 8.82%) | ( 6.25%, 9.12%) | ( 9.86%, 12.51%) | ( 24.60%, 28.86%) | ( 24.15%, 27.98%) | ( 28.01%, 32.80%) | ( 13.62%, 16.49%) | ( 13.08%, 16.82%) | ( 16.85%, 20.52%) | ( 6.66%, 8.67%) | ( 6.20%, 8.91%) | ( 9.78%, 12.44%) | ( 17.09%, 19.93%) | ( 17.14%, 20.84%) | ( 20.19%, 23.77%) |
| Real | 8.59 | 10.47 | 10.82 | 18.04 | 19.02 | 20.24 | 11.71 | 12.97 | 13.85 | 6.56 | 8.13 | 8.65 | 14.05 | 16.64 | 16.37 |
| (CI) | ( 7.00%, 11.09%) | ( 8.52%, 13.30%) | ( 9.11%, 13.38%) | ( 17.06%, 19.34%) | ( 17.95%, 20.21%) | ( 19.15%, 21.73%) | ( 10.04%, 14.89%) | ( 10.51%, 17.24%) | ( 12.16%, 17.19%) | ( 5.13%, 9.59%) | ( 5.62%, 12.07%) | ( 7.27%, 11.54%) | ( 12.53%, 15.85%) | ( 14.57%, 19.02%) | ( 14.70%, 18.31%) |
| Total Beneficiary Income | | | | | | | | | | | | | | | |
| Nominal | 13.83 | 14.74 | 15.69 | 37.65 | 38.54 | 39.34 | 27.51 | 28.40 | 30.19 | 32.48 | 36.28 | 17.45 | 56.08 | 59.85 | 45.61 |
| Real | 15.49 | 18.89 | 16.15 | 28.97 | 31.58 | 29.30 | 24.41 | 27.15 | 25.62 | 31.64 | 38.09 | 15.42 | 51.24 | 58.68 | 39.87 |
| Total Non-Beneficiary Income | | | | | | | | | | | | | | | |
| Nominal | 3.04 | 2.21 | 5.60 | 15.91 | 14.32 | 19.00 | 8.83 | 8.19 | 11.32 | 4.50 | 3.83 | 7.02 | 11.20 | 10.93 | 13.68 |
| Real | 3.49 | 4.24 | 4.54 | 8.00 | 7.48 | 9.59 | 5.63 | 6.18 | 6.70 | 3.47 | 4.43 | 4.54 | 7.07 | 8.74 | 8.30 |
| Total Ultra-Poor Income | | | | | | | | | | | | | | | |
| Nominal | 25.15 | 25.70 | 31.28 | 72.73 | 70.23 | 79.01 | 30.36 | 31.52 | 36.67 | 14.85 | 16.15 | 20.98 | 56.08 | 59.85 | 62.63 |
| Real | 27.20 | 30.64 | 31.96 | 61.88 | 61.80 | 66.11 | 27.28 | 30.45 | 31.88 | 14.24 | 17.89 | 18.92 | 51.24 | 58.68 | 56.14 |
| Total Moderately-Poor Income | | | | | | | | | | | | | | | |
| Nominal | 2.81 | 2.19 | 7.47 | 13.86 | 13.43 | 18.67 | 20.70 | 21.03 | 25.52 | 10.26 | 10.46 | 14.90 | 9.03 | 8.49 | 13.78 |
| Real | 4.36 | 5.96 | 7.90 | 6.77 | 7.79 | 10.19 | 17.81 | 19.91 | 21.11 | 9.62 | 11.95 | 12.91 | 5.61 | 7.50 | 9.21 |
| Total Non-Poor Income | | | | | | | | | | | | | | | |
| Nominal | 4.87 | 4.81 | 7.18 | 18.93 | 19.07 | 21.54 | 8.90 | 8.24 | 11.32 | 4.78 | 4.09 | 7.02 | 11.96 | 11.79 | 14.32 |
| Real | 5.35 | 6.94 | 6.47 | 10.88 | 12.12 | 12.14 | 5.60 | 6.08 | 6.70 | 3.54 | 4.31 | 4.54 | 7.59 | 9.18 | 8.79 |
| Household Income | | | | | | | | | | | | | | | |
| A nominal | 6.50 | 7.40 | 8.59 | 20.82 | 23.39 | 23.26 | 7.34 | 6.34 | 9.42 | 3.77 | 2.77 | 5.75 | 9.99 | 9.45 | 12.01 |
| real | 8.02 | 11.23 | 8.92 | 13.18 | 17.12 | 14.31 | 4.69 | 5.25 | 5.48 | 3.10 | 4.06 | 3.83 | 6.44 | 8.32 | 7.40 |
| B nominal | 3.82 | 3.12 | 6.26 | 17.70 | 16.26 | 20.42 | 9.91 | 9.48 | 12.56 | 5.43 | 4.95 | 7.84 | 13.24 | 13.31 | 15.82 |
| real | 3.62 | 4.15 | 4.88 | 9.38 | 8.87 | 10.73 | 6.19 | 6.62 | 7.50 | 3.82 | 4.46 | 5.01 | 8.33 | 9.73 | 9.69 |
| C nominal | 10.02 | 10.63 | 16.74 | 25.44 | 29.62 | 32.35 | 18.29 | 22.00 | 25.35 | 40.58 | 43.62 | 46.85 | 10.38 | 9.91 | 17.19 |
| real | 12.07 | 15.39 | 17.62 | 17.81 | 23.52 | 23.07 | 15.69 | 21.30 | 21.18 | 40.03 | 46.07 | 44.56 | 7.18 | 9.44 | 12.77 |
| D nominal | 2.24 | 3.08 | 4.07 | 12.98 | 14.08 | 14.93 | 12.20 | 14.36 | 14.14 | 8.80 | 10.84 | 10.68 | 9.73 | 9.42 | 11.64 |
| real | 3.63 | 6.68 | 4.28 | 5.53 | 7.97 | 6.23 | 9.24 | 12.97 | 9.81 | 7.99 | 12.09 | 8.52 | 5.98 | 8.07 | 6.79 |
| E nominal | 1.48 | 0.20 | 10.86 | 11.87 | 9.91 | 21.40 | 6.68 | 5.70 | 16.18 | 3.34 | 2.37 | 12.76 | 9.01 | 8.48 | 18.48 |
| real | 2.84 | 3.55 | 11.17 | 5.19 | 4.62 | 13.06 | 4.21 | 4.67 | 12.22 | 2.74 | 3.61 | 10.86 | 5.69 | 7.42 | 13.87 |
| F nominal | 0.93 | -0.44 | 2.55 | 10.72 | 8.68 | 12.47 | 36.42 | 35.38 | 38.17 | 2.93 | 1.88 | 4.61 | 8.12 | 7.42 | 9.81 |
| real | 2.48 | 3.30 | 2.97 | 3.74 | 3.22 | 4.33 | 33.12 | 34.12 | 33.26 | 2.32 | 3.26 | 2.77 | 4.69 | 6.45 | 5.34 |
| G nominal | 10.89 | 12.72 | 20.08 | 66.95 | 64.34 | 76.02 | 21.63 | 28.80 | 31.11 | 51.72 | 58.40 | 60.88 | 52.47 | 56.48 | 61.62 |
| real | 12.39 | 16.67 | 20.29 | 55.73 | 55.37 | 62.55 | 18.42 | 27.31 | 26.13 | 50.56 | 60.20 | 57.74 | 47.15 | 54.44 | 54.47 |
| H nominal | 2.56 | 2.16 | 11.88 | 71.21 | 68.69 | 80.89 | 8.10 | 7.51 | 17.72 | 4.37 | 3.97 | 13.82 | 54.83 | 58.36 | 64.77 |
| real | 4.84 | 7.09 | 13.11 | 61.03 | 61.18 | 68.49 | 5.93 | 7.28 | 14.03 | 4.15 | 6.16 | 12.25 | 50.67 | 58.37 | 58.92 |
| I nominal | 42.47 | 44.33 | 45.06 | 61.16 | 58.59 | 63.59 | 41.16 | 40.76 | 43.48 | 5.41 | 5.47 | 7.60 | 48.66 | 52.62 | 51.15 |
| real | 44.57 | 49.57 | 45.55 | 50.96 | 50.52 | 51.69 | 37.70 | 39.37 | 38.33 | 4.75 | 6.86 | 5.68 | 43.86 | 51.08 | 44.93 |
| J nominal | 55.24 | 54.94 | 57.13 | 89.73 | 87.41 | 91.94 | 60.54 | 60.06 | 62.65 | 4.58 | 4.48 | 6.60 | 67.28 | 71.03 | 70.12 |
| real | 57.47 | 60.51 | 57.62 | 77.73 | 77.88 | 78.02 | 56.58 | 58.46 | 56.82 | 3.91 | 5.81 | 4.69 | 61.89 | 69.28 | 63.11 |
| Total Production | 13.45 | 18.70 | 15.62 | 17.37 | 19.46 | 19.42 | 14.67 | 19.44 | 16.62 | 10.70 | 16.26 | 12.44 | 16.03 | 21.14 | 18.05 |
| Beneficiary Households | 24.32 | 34.85 | 22.10 | 21.04 | 25.00 | 22.82 | 30.25 | 45.39 | 29.23 | 42.99 | 75.03 | 23.26 | 81.05 | 131.73 | 61.86 |
| Non-Beneficiary Households | -2.01 | -4.25 | 2.63 | 11.00 | 9.87 | 12.60 | 4.05 | 1.77 | 6.22 | -0.20 | -3.57 | 3.52 | 4.65 | 1.78 | 6.00 |
| Ultra-Poor Households | 64.79 | 86.15 | 70.25 | 16.23 | -4.58 | 20.73 | 65.93 | 88.77 | 70.02 | 53.89 | 85.38 | 56.68 | 81.05 | 131.73 | 87.09 |
| Moderately-Poor Households | 0.46 | 3.68 | 1.85 | 13.61 | 21.44 | 14.87 | 7.52 | 14.54 | 9.17 | 5.38 | 11.19 | 6.82 | 2.54 | -1.97 | 3.70 |
| Non-Poor Households | 6.67 | 8.66 | 8.37 | 19.75 | 24.90 | 21.58 | 4.68 | 3.30 | 6.22 | 1.90 | 0.28 | 3.52 | 5.81 | 3.86 | 7.21 |
| Production by Sector | | | | | | | | | | | | | | | |
| crop | 25.25 | 36.49 | 28.16 | 24.44 | 28.10 | 27.24 | 26.63 | 37.60 | 29.11 | 21.20 | 34.26 | 23.13 | 27.29 | 40.79 | 30.28 |
| livestock | 2.43 | 2.53 | 3.54 | 8.64 | 8.67 | 9.65 | 4.87 | 5.03 | 5.96 | 3.11 | 3.20 | 4.13 | 6.18 | 6.33 | 7.23 |
| retail | 3.94 | 3.96 | 5.74 | 13.65 | 13.48 | 15.38 | 7.85 | 7.84 | 9.60 | 4.45 | 4.52 | 6.24 | 9.78 | 9.99 | 11.55 |
| services | 3.12 | 3.13 | 4.54 | 10.58 | 10.52 | 11.97 | 6.08 | 6.08 | 7.53 | 3.43 | 3.38 | 4.83 | 7.34 | 7.39 | 8.73 |
| non-agricultural production | 4.06 | 4.10 | 5.82 | 13.62 | 13.60 | 15.44 | 7.76 | 7.79 | 9.52 | 4.33 | 4.39 | 6.07 | 9.70 | 9.89 | 11.43 |
| Production by Sector Beneficiary HHs | | | | | | | | | | | | | | | |
| crop | 53.68 | 78.09 | 42.15 | 34.48 | 42.29 | 35.82 | 61.35 | 94.12 | 54.47 | 94.96 | 164.77 | 44.96 | 146.96 | 247.12 | 107.85 |
| livestock | 2.42 | 2.53 | 3.60 | 8.71 | 8.75 | 9.67 | 4.94 | 5.07 | 6.11 | 3.05 | 3.19 | 4.23 | 7.16 | 7.29 | 7.93 |
| retail | 3.98 | 3.98 | 6.31 | 14.64 | 14.53 | 17.11 | 10.03 | 10.26 | 13.00 | 4.62 | 4.53 | 8.40 | 15.19 | 15.18 | 16.45 |
| services | 3.17 | 3.22 | 4.59 | 10.69 | 10.70 | 11.96 | 6.13 | 6.04 | 7.50 | 3.42 | 3.41 | 4.81 | 7.35 | 7.52 | 8.85 |
| non-agricultural production | 4.10 | 4.16 | 5.89 | 13.95 | 13.85 | 15.89 | 8.15 | 8.31 | 10.18 | 4.39 | 4.43 | 6.48 | 10.69 | 10.84 | 12.50 |
| Production by Sector Non-Beneficiary HHs | | | | | | | | | | | | | | | |
| crop | -20.81 | -30.89 | -11.51 | 1.94 | -3.70 | 2.93 | -5.48 | -14.67 | -2.35 | -10.52 | -21.88 | -3.95 | -4.56 | -14.12 | -3.95 |
| livestock | 2.44 | 2.53 | 3.39 | 8.46 | 8.48 | 9.58 | 4.81 | 4.99 | 5.83 | 3.13 | 3.20 | 4.04 | 6.02 | 6.17 | 7.06 |
| retail | 3.93 | 3.95 | 5.54 | 13.34 | 13.14 | 14.78 | 7.61 | 7.57 | 9.12 | 4.44 | 4.52 | 5.94 | 9.56 | 9.78 | 11.17 |
| services | 3.10 | 3.09 | 4.50 | 10.52 | 10.42 | 11.99 | 6.07 | 6.09 | 7.54 | 3.43 | 3.38 | 4.84 | 7.34 | 7.37 | 8.70 |
| non-agricultural production | 4.04 | 4.07 | 5.79 | 13.45 | 13.47 | 15.19 | 7.65 | 7.65 | 9.32 | 4.32 | 4.39 | 5.94 | 9.61 | 9.81 | 11.30 |
| Ultra-Poor HHs Only | | | | | | | | | | | | | | | |
| crop | 103.69 | 139.22 | 112.00 | 17.71 | -23.30 | 24.89 | 117.73 | 160.37 | 123.92 | 97.65 | 156.91 | 101.43 | 146.96 | 247.12 | 158.90 |
| livestock | 2.83 | 2.91 | 4.08 | 10.28 | 10.05 | 11.27 | 5.69 | 5.86 | 6.95 | 3.59 | 3.73 | 4.81 | 7.16 | 7.29 | 8.36 |
| retail | 5.91 | 5.95 | 8.63 | 21.38 | 21.12 | 24.08 | 11.89 | 12.05 | 14.82 | 6.81 | 6.78 | 9.55 | 15.19 | 15.18 | 17.78 |
| services | 3.17 | 3.18 | 4.62 | 10.62 | 10.54 | 11.92 | 6.17 | 6.05 | 7.50 | 3.44 | 3.42 | 4.81 | 7.35 | 7.52 | 8.82 |
| non-agricultural production | 4.44 | 4.48 | 6.37 | 15.30 | 15.02 | 17.30 | 8.51 | 8.69 | 10.63 | 4.76 | 4.81 | 6.76 | 10.69 | 10.84 | 12.73 |
| Moderately-Poor HHs Only | | | | | | | | | | | | | | | |
| crop | -1.04 | 4.98 | 0.02 | 17.32 | 33.69 | 18.27 | 10.33 | 24.40 | 11.97 | 9.29 | 20.82 | 10.39 | -4.52 | -14.18 | -3.92 |
| livestock | 2.36 | 2.44 | 3.50 | 8.32 | 8.32 | 9.30 | 4.73 | 4.86 | 5.76 | 2.99 | 3.11 | 3.99 | 5.94 | 6.24 | 7.16 |
| retail | 4.82 | 4.83 | 7.19 | 17.44 | 17.17 | 19.65 | 9.66 | 9.91 | 12.16 | 5.59 | 5.53 | 7.86 | 12.40 | 12.60 | 14.62 |
| services | 3.14 | 3.16 | 4.51 | 10.46 | 10.50 | 11.92 | 6.12 | 6.05 | 7.50 | 3.42 | 3.40 | 4.81 | 7.32 | 7.34 | 8.83 |
| non-agricultural production | 4.18 | 4.23 | 5.95 | 14.17 | 14.21 | 16.17 | 8.00 | 8.15 | 9.95 | 4.51 | 4.53 | 6.34 | 10.12 | 10.11 | 11.88 |
| Non-Poor HHs Only | | | | | | | | | | | | | | | |
| crop | 8.54 | 12.35 | 10.32 | 33.08 | 47.99 | 35.25 | -3.72 | -10.05 | -2.35 | -5.63 | -13.15 | -3.95 | -4.59 | -14.07 | -3.97 |
| livestock | 2.37 | 2.48 | 3.43 | 8.39 | 8.53 | 9.43 | 4.74 | 4.92 | 5.83 | 3.06 | 3.11 | 4.04 | 6.08 | 6.12 | 6.97 |
| retail | 3.77 | 3.79 | 5.47 | 12.93 | 12.77 | 14.57 | 7.50 | 7.45 | 9.12 | 4.23 | 4.32 | 5.94 | 9.29 | 9.51 | 10.97 |
| services | 3.11 | 3.12 | 4.54 | 10.61 | 10.53 | 11.99 | 6.06 | 6.09 | 7.54 | 3.43 | 3.37 | 4.84 | 7.34 | 7.38 | 8.70 |
| non-agricultural production | 4.00 | 4.03 | 5.74 | 13.34 | 13.33 | 15.11 | 7.63 | 7.63 | 9.32 | 4.25 | 4.32 | 5.94 | 9.51 | 9.75 | 11.20 |

## Appendix C: LEWIE methodology

The LEWIE methodology is designed to understand the full impact of policies like cash transfers, input and output price supports for agriculture, and other agricultural and non-agricultural policies on local economies, including on the production activities of both beneficiary and non-beneficiary groups; how these effects change when programmes are scaled up to larger regions; and why these effects happen. All of these aspects are important for designing projects and explaining their likely impacts to governments and other sponsoring agencies.

The traditional starting point for constructing GE simulation models for project impact evaluation is to build social accounting matrices (SAMs). The LEWIE method bypasses this step; the simulation model is built directly from the data. An advantage of LEWIE over traditional GE models is that by using data to directly parameterize the model, it also allows for the construction of confidence bands based on the distribution of the econometrically estimated parameters.

A LEWIE begins by nesting household-farm models for eligible and ineligible households within a region of interest. The household models describe each group's productive activities, income sources, and expenditure patterns. In a typical model, households participate in activities such as crop and livestock production, retail, service, and other production activities, as well as in the labour market. Productive activities use different factors (e.g. hired labour, family labour, land, capital), as well as intermediate inputs; the production functions for each activity are estimated econometrically. Household groups can purchase goods and services locally or outside the region; their expenditure can also be modeled econometrically.

Household groups in a given village are linked by local trade, and villages are linked by regional trade. The whole region also interacts with the rest of the country, importing and exporting goods and selling labour. Weaker interactions with outside markets mean fewer leakages, making it more likely to detect impacts within the local economy.

Survey data have two main purposes in the construction of LEWIE models: they provide initial values for all variables in the model as well as the data to econometrically estimate model parameters for each household group and sector, together with standard errors. The initial values and parameter estimates are organized into a data input spreadsheet designed to interface with GAMS, where the LEWIE model resides.

**LEWIE: Markets and Assumptions**

Validation is always a concern in GE modeling. Econometrics provides us with a way to validate the model's parameters: significance tests provide a means to establish confidence in the estimated parameters and functions used in our simulation model. If the structural relationships in the simulation model are properly specified and precisely estimated, this should lend credence to simulation results. Econometric estimation of model parameters opens up a new and interesting possibility in regard to validation: The estimated standard errors for all parameters in the model can be used together with Monte Carlo methods to perform significance tests and construct confidence intervals around project impact simulation results.

The LEWIE also takes into account nonlinearities and local price effects in the region of interest. Simulations require making assumptions about where and how prices are determined (that is, market closure, which is usually not known). Sensitivity analysis, combined with the Monte Carlo method described above, allow us to test the robustness of simulated impacts to market-closure assumptions.

**LEWIE and Randomized Control Trials**

Evaluating project impacts with a randomized control trial (RCT) may be difficult if GE effects are present, because these effects can transmit impacts from treated to non-treated, including control, households. Effects of programmes on control groups frequently confound experimental research in the social sciences. If GE linkages are strong and positive, and if they extend to control households, it may be difficult to identify the income impact of the programme, because income will rise in both the treated and non-treated households. This is a form of control-group contamination.

Well-designed RCTs can capture some of the spillover impacts of programmes (i.e., on the ineligible households at the programme sites). However, they generally do not tell us why these spillovers occur (e.g., through local price effects), how we might be able to influence them, or how GE effects are may alter impacts once a programme is scaled up. Experimental economists often ignore the effects of programmes on ineligible groups, instead focusing on the average effects of treatments on the treated. Ignoring general-equilibrium effects can give an incomplete and often biased picture of how cash transfers affect local economies, including production activities.

ISBN 978-92-5-131414-2

9 789251 314142

CA4312EN/1/05.19