

Assessing the Local Economy-Wide Impacts of an Anchor Enterprise in Rural Malawi

Evidence from Tropha Estates' 2025 operations in TA Mtwalo

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Executive summary

Smallholder-centered agricultural strategies have had limited success in Malawi, prompting interest in anchor-enterprise models in which agribusinesses partner with surrounding smallholder farmers. This note examines whether the benefits of one such anchor enterprise — Tropha Estates, a Growth Poles Project partner that sources chili from smallholder farmers in Traditional Authority Mtwalo — reach beyond the farmers and workers it engages directly. Using a local economy-wide impact evaluation (LEWIE) model calibrated on 2025 household and business survey data together with firm administrative records, we trace the full circuit of income that Tropha's local spending sets in motion.

Tropha's 2025 injection of roughly MWK 1.28 billion — MWK 121 million in outgrower payments and MWK 1,160 million in wages — generated an estimated MWK 2.54 billion in real household income across the zone of influence (95% CI: 2.41–2.66), corresponding to a real income multiplier of 1.98. In other words, for every kwacha Tropha spent locally, a further MWK 0.98 of real income was created as that spending circulated through local markets, amounting to roughly MWK 1.26 billion in secondary or spillover income. Roughly 47 percent of this spillover accrued to households with no direct contractual relationship with the enterprise, reaching them through the wages and profits of local businesses that serve the Tropha workforce and outgrowers. The poorest 40 percent of households captured about 38 percent of the secondary income (MWK 480.7 million). Tropha's operations and spending also supported approximately 11,950 additional labor days beyond direct employment at Kaweche Estate. These gains came with only moderate price pressure: Tropha's operations raise non-tradable prices by approximately 7.8 percent and local wages by 4.9 percent.

The multiplier is large and statistically robust, falling only to 1.79 under the most conservative high-leakage assumption and otherwise close to the central estimate of 1.98. Its comparatively high level reflects

the specific conditions of the TA Mtwalo ZOI in northern Malawi: a relatively dense local market structure, low leakage rates, and labor-intensive chili production that distributes income broadly.

Ex-ante simulations map the levers available to Tropha and its partners to amplify its local economic impact further. Of the six scenarios modeled, irrigation-led productivity gains generate the highest total income relative to the direct (in this case, production) shock (MWK 82.4 million total from MWK 36.1 million direct), followed by a 50 percent chili price increase (MWK 116.0 million total from MWK 60.8 million direct impact on chili production value). Restored local procurement and the capital injection direct the highest shares of income gains to non-Tropha households (92 percent each), while seasonal wage employment expansion also reaches a substantial non-Tropha share (53 percent) — compared with 34–35 percent for the two agricultural channel simulations. The highest return on direct income shock comes from supply-side productivity investment in the tradable agricultural sector, which raises real output without generating the non-tradable price pressure of demand-side injections. Investments in local market infrastructure, business capacity, and supply-chain logistics could simultaneously amplify income gains and reduce leakage.

Introduction

Smallholder-centered agricultural development strategies have had limited success in Malawi over the past several decades. Land constraints and rising population pressure cast doubt on whether productivity gains among farmers alone can deliver sufficient income growth to lift farming households out of poverty (Benson and De Weerd, 2023). Policy makers are now increasingly looking for alternative ways to accelerate agricultural and rural development. One emerging approach involves larger farms or agri-business firms partnering with smallholder farming households, in what we refer to as an anchor enterprise model. Under this model, smallholders contribute land and/or labor to produce crops or live-stock products that serve as inputs for, or are marketed jointly with, the anchor enterprise. In return, the anchor enterprise provides support such as technical assistance, inputs (often on credit), transport, or storage. This partnership is intended to be commercial and mutually beneficial.

While support for such partnerships is growing and the anchor enterprise model is increasingly being used in development programming in Malawi, there is still little rigorous evaluation of its effectiveness. A key question is whether and how such anchor enterprise models can contribute to inclusive development. Previous research highlights that anchor enterprise models cannot be profitably and sustainably employed for many types of commercial agricultural production in Malawi. Consequently, only a small portion of farming households can directly participate, and the poorest and most vulnerable are generally less likely to be included (Benson, Cockx, and De Weerd, 2025). Nonetheless, where such models work well, they can deliver indirect benefits to the broader rural community, including its poorer and more vulnerable members, by stimulating local demand for labor, goods, and services.

This is part of the rationale for the Malawi Growth Poles Project, supported by the Embassy of Ireland¹, which works with well-established large enterprises to integrate smallholder farmers and other rural households more strongly into agricultural value chains with high growth potential. The Growth Pole approach rests on the premise that a strengthened anchor enterprise can act as an engine of sustainable, resilient, and inclusive economic growth, with effects that extend well beyond the farmers and workers it engages directly. Its explicit goal is therefore not only to create a pool of direct beneficiaries — through

¹ The United States Agency for International Development (USAID) initially provided 80 percent of the funding for the Growth Poles Project, scaling up an earlier USAID-funded project, the Agricultural Diversification (AgDiv) activity. However, in early 2025, USAID's financial support was canceled for reasons unrelated to the project.

smallholder supply partnerships and employment in the enterprises' production and processing operations — but also to generate indirect benefits, both upstream and downstream, within nearby communities by stimulating local demand for labor, goods and services.

This basic premise — that an anchor enterprise's purchases of local labor and agricultural products will generate income and employment beyond the wages and payments for the crops or livestock products themselves — is theoretically sound, rooted in the linkages literature that runs from Hirschman (1958) through Mellor (1976) to the modern computable general-equilibrium tradition. These expenditures create income for workers, farmers, and local businesses, which is then re-spent within the local economy, generating additional rounds of economic activity and employment. Yet, conventional impact evaluations measure only direct effects and typically concentrate on the impacts on participating farmers' incomes. Much less attention has been given to the indirect and induced effects that arise when these incomes circulate through local markets and supply chains. What has been missing is not simply an estimate of multiplier size, but a general-equilibrium accounting of the full circuit of income that a growth pole sets in motion. As a result, there is still limited evidence on the extent to which anchor enterprises contribute to wider income growth, employment creation, and poverty reduction in the communities where they operate.

This study aims to address that gap by examining the local economy-wide impacts of Tropha Estates' operations in Traditional Authority Mtwalo. Tropha Estates Limited, one of the Growth Poles Project's partners, is a Malawian agribusiness specializing in macadamia production and the aggregation and processing of bird's eye chili and paprika. Since 2017, the company has combined estate production with an outgrower model involving smallholder farmers in Mzimba and Rumphi districts. Through this model, Tropha purchases chili and paprika from contracted farmers while providing access to improved seeds and some extension support through a network of lead farmers. The company also operates what they refer to as a fully integrated outgrower model where farmers produce chili within two irrigation schemes and not only receive seed, but also pesticides, and much more comprehensive technical assistance. Although Tropha also purchases produce from farmers without formal contractual arrangements, contracted outgrowers account for the majority of their suppliers. The company's sourcing model therefore represents an important example of an anchor-enterprise arrangement in Malawi.

This evaluation focuses on the area surrounding Tropha's Kaweche Estate in Ekwendeni, located within Traditional Authority (TA) Mtwalo in Mzimba District. Kaweche Estate hosts Tropha's processing facilities and employs more than one thousand workers over the course of a year, including both permanent and seasonal workers.² As a result, TA Mtwalo is the area where the local economy is most directly linked to the company's operations. Because agroecological conditions in TA Mtwalo are relatively less suitable for cultivating paprika, resulting in limited production, the analysis focuses exclusively on chili outgrowers. While Tropha previously sourced chili from more than 1,700 farmers within TA Mtwalo, the number of suppliers declined to 494 farmers in 2025, the base year for the analysis presented here. Focus group discussions with chili outgrowers in 2026, however, suggest renewed interest in the outgrower program and indicate that price is the principal driver of fluctuations in participation.

Moreover, even in a year where fewer farmers supply chili, Tropha remains an important source of income within the local economy. In 2025, Tropha injected an estimated MWK 1.28 billion into the TA

² This headcount represents unique individuals across both year-round and seasonal contracts and therefore cannot be combined with the annual wage bill to infer a wage rate.

Mtwalo economy through wage payments and purchases from local chili outgrowers. These expenditures represent the initial income injection generated by the enterprise from which broader income and employment effects are generated through local economic linkages.

To measure Tropha's economic footprint in TA Mtwalo, the study applies the Local Economy-Wide Impact Evaluation (LEWIE) methodology developed by Taylor and Filipinski (2014). LEWIE combines household and local business survey data on production, consumption, and market linkages in a local general-equilibrium model that simulates how income circulates through a geographically defined local economy, or zone of influence (ZOI). The ZOI is treated as a small open economy in which tradable goods, such as agricultural products, face prices set in wider regional and national markets, while the prices of non-tradables, such as local services, are determined by supply and demand within the ZOI itself. As Taylor and Filipinski (2014) argue, general-equilibrium simulation is the appropriate tool for this kind of structural evaluation of interventions whose effects extend beyond direct beneficiaries, in this case those directly employed by or working with the enterprise. The LEWIE methodology has been applied in prior analyses of cash transfer programs in Malawi and Ghana (Filipinski and Taylor, 2012), refugee inflows in East Africa (Taylor et al., 2016), and agricultural value-chain investments in Africa and Latin America.

For this study, a LEWIE model was constructed for the local economy of TA Mtwalo. The model is parameterized using primary survey data collected from households and businesses within the ZOI and is used to estimate the local economy-wide impacts of Tropha's expenditures on wages and purchases of chili. In addition to estimating the effects of observed spending in 2025, the model is used to simulate how realistic changes in enterprise expenditures or additional interventions might affect the local economy.

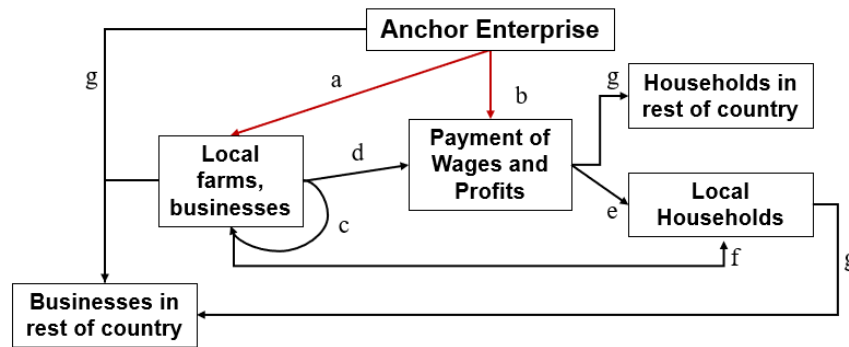
The report is organized as follows. Section 2 describes the theoretical pathways through which an anchor enterprise's spending affects local economies and frames our empirical strategy. Section 3 presents the survey design and summary statistics. Section 4 describes the LEWIE model, its parameterization from survey data, and the simulation design. Section 5 reports the main simulation results, including the ex-post multiplier for observed 2025 spending, the distribution of the resulting gains, and six ex-ante simulations of alternative scenarios. Section 6 presents the sensitivity analysis. Section 7 draws policy implications and concludes.

How anchor enterprise spending affects local economies

When an anchor enterprise such as Tropha injects income into a rural economy, primarily through payments to contracted farmers and wages to workers, that income does not remain with those who receive it directly. It is re-spent — at local retailers and service providers, and on goods supplied by other farms and businesses — and each round of expenditure generates income for others, who in turn spend a portion of it locally. The total income generated per unit of Tropha's spending — the local income multiplier — depends not on the size of the injections alone, but on how this income circulates within the local economy and on the extent to which local markets can respond without relying heavily on imports from outside the ZOI.

The mechanisms through which anchor-enterprise income injections propagate through the local economy are illustrated in Figure 1, with direct impacts in Figure 1 **Error! Reference source not found.** and indirect impacts in black.

Figure 1. Pathways from anchor enterprise spending to local economic impacts



Note: Red arrows denote the anchor enterprise's direct linkages (channels a and b); black arrows denote the subsequent circular flow through local markets (c-f) and leakages outside the local economy (g).

The direct pathways (a and b) are the firm's own expenditures on purchases of chili from contracted outgrowers, together with limited procurement of intermediate inputs from local suppliers³ (channel a), and wage payments (channel b). Wages are by far the dominant channel for Tropha, accounting for MWK 1,160 million — roughly 91 percent — of the 2025 injection.

The indirect channels (c–f) trace the recirculation of this income earned by Tropha workers and chili outgrowers within the local economy as they spend their income buying goods and services. Local farms and businesses purchase inputs from one another (c) and earn revenues, which in turn pay wages, and generate profits (d). These accrue to households across the ZOI — including those with no direct relationship with Tropha (e) — which spend a further portion locally (f). This is where the income effect becomes tangible at the household level: the farmer who sells tomatoes to a chili outgrower earns a margin, which in turn allows him to hire a casual laborer to help with the harvest; the bicycle taxi operator who carries workers to Kaweche Estate earns a fare and uses that for groceries at a local corner shop. All these earnings are local income attributable to Tropha's initial injections.

These effects are bound by leakage (g): at each round, part of the income exits the ZOI through formal savings, remittances, or the purchase of goods sourced from outside the local economy. The size of the multiplier thus reflects the balance between locally retained spending and leakage; a high local expenditure share and low leakage yield a high multiplier. In contrast, if outgrowers and workers were to save all their money or spend it all outside the local economy, there would be no indirect effects and the total income generated in the local economy would be exactly equal to Tropha's local spending resulting in a multiplier of one.

Finally, these channels do not operate in isolation but interact through the price system. As Tropha's spending raises demand for local labor and for non-tradable goods and services, local wages and prices adjust upward, increasing production costs and the cost of living. The net effect on real incomes therefore depends on the relative strength of these quantity and price responses. The LEWIE model described in Section 4 captures these adjustments jointly within a consistent general-equilibrium framework.

³ While in the past, Tropha had significant expenditures on goods and services from local businesses including, for example, local procurement of welded products, construction services, the company reports minimal purchases from local suppliers in 2025 as some production was moved in-house and other products and services were sourced outside the local economy.

Data and summary statistics

The analysis primarily draws on data from a survey fielded in June–July 2025 aimed at characterizing households and businesses within Tropha’s zone of influence and estimating the behavioral parameters required for the LEWIE model.

The fieldwork was purposely conducted shortly after the main harvesting period to ensure that agricultural production and income are well-captured. Consumption in rural Malawi is, however, highly seasonal. Because the food expenditure module used a 30-day recall period, reported food expenditures reflect conditions of relative post-harvest abundance rather than the leaner months later in the year. Annualized household consumption and expenditure estimates derived from these data are therefore likely to be biased upward. Salience and recall effects may also impact on information derived from questions referring to longer periods (i.e. non-food expenditures) or a typical month (i.e. non-farm businesses).

Household survey

The primary data for this study derive from a survey of households in TA Mtwalo in Mzimba district, conducted in June–July 2025. The survey was designed to capture economic linkages associated with Tropha as an anchor enterprise and the survey therefore targeted three groups: i) Tropha outgrowers supplying Tropha with chili, ii) permanent and seasonal workers of Kaweche Estate, iii) households without direct contractual or employment relationships with Tropha, who may nonetheless be affected indirectly through local market linkages. The survey captures information for the 12 months preceding the interview and provides detailed information on household sociodemographic characteristics, expenditures, agricultural production and sales, and other income earning activities including household-operated non-farm enterprises.

A total of 701 households were interviewed across these three groups. The analytical sample used for all parameter estimation is 637 households: 189 outgrowers, 199 firm workers, and 249 non-linked households. Among the 246 households sampled as outgrowers, only 204 still grew chili in the 12 months preceding the interview, consistent with the sharp recent decline in chili supply to Tropha noted earlier. Of those who grew chili, an additional 15 reported no chili sales to Tropha and no harvested chili intended for sale and were therefore also excluded from the analysis. The analysis further excluded 6 households with missing data. In addition, one household sampled as part of the non-linked comparison group reported selling to Tropha during the reference period; because treatment status was defined by the sampling frame rather than ex-post marketing behavior, this observation was excluded rather than reclassified.

Sampling weights were constructed using Tropha administrative wage records and national population estimates (NSO, 2019) to ensure that results are representative of the ZOI population and are applied to the estimation of all model parameters. The original stratified sampling design intentionally oversampled Tropha-linked households to ensure sufficient precision for estimating expenditure and production parameters for outgrowers and workers. As a result, non-linked households receive substantially larger sampling weights because they represent the majority of the ZOI population (see Table 1). Additional details on the construction and application of sampling weights are provided in the Technical Appendix.

Table 1. Analytical sample and weights

Household group	N	Share of sample (%)	Avg. weight	Weighted N	Weighted share (%)
Outgrower	189	29.7	2.61	494	1.2
Worker	199	31.2	6.37	1,268	3.1
Non-Tropha	249	39.1	156.75	39,031	95.7
Total	637	100.0	—	40,793	100.0

Note: Share of sample is calculated on unweighted counts. Average weight reflects post-stratification. Non-Tropha households were sampled from two strata: villages where chili outgrowers reside and local trading centers. Trading center households (75 of 249) are overrepresented relative to their share of the ZOI population and tend to have higher and more market-oriented expenditures than village households. While the sampling weights partially correct for this, readers should bear it in mind when interpreting non-Tropha household averages.

Table 2 summarizes key socio-demographic and economic characteristics of Tropha and non-Tropha households in TA Mtwalo. Households rely on a mix of crop sales, casual labor (*ganyu*), non-farm activities, and transfers, reflecting the diversified livelihood strategies common in Malawian smallholder settings. Outgrower households are the largest on average (6.2 members) and are headed by older heads (average age 57 years), reflecting more established farming households. These households cultivate over one hectare on average and consider crop cultivation as their primary source of income. Worker households are smaller (4.6 members) and considerably younger (average head age 38 years).

Only 35 percent of worker households own the dwelling they occupy. While some reside in employer-provided housing on the Estate, most rent their accommodation (often in Ekwendeni). Likely reflecting the difference in their location of residence, with outgrowers living in more remote areas, workers have greater electricity coverage and near-universal access to improved water sources.⁴ A quarter of worker households do not engage in any crop cultivation and those who do cultivate a smaller area. They are also least likely to operate any non-farm business.

Table 2. Socio-demographic and economic characteristics by household group

Variable	Outgrower (189)	Worker (199)	Non-Tropha (249)
Household size	6.2 (0.2)	4.6 (0.1)	5.7 (0.2)
Female-headed household (%)	29 (3)	39 (3)	27 (3)
Head age (years)	56.9 (0.9)	38.4 (0.8)	46.6 (1.2)
Head without formal education (%)	8 (2)	4 (1)	3 (1)
Own home (%)	93 (2)	35 (3)	88 (2)
Electricity (%)	25 (3)	35 (3)	28 (3)
Improved water source (%)	85 (3)	95 (1)	87 (3)
Cultivated land (hectares)	1.6 (0.1)	0.5 (0.1)	1.3 (0.1)

Note: Weighted means and robust standard errors in parentheses.

⁴ A drinking water source is considered improved when it is protected from outside contamination, particularly fecal contamination.

Non-linked households fall between outgrowers and workers in demographic characteristics, with household size averaging 5.7 members, the average age of the household head about 47 years, the average land area cultivated of 1.3 hectares, but they are most likely to operate a business.

Table 3 compares monthly expenditures on food purchases⁵ and budget shares across Tropha worker, outgrower, and non-linked households. Panel A shows that Tropha worker households have the highest total monthly food expenditures, averaging MWK 106,721, compared with MWK 93,049 for non-linked households and MWK 87,001 for Tropha outgrowers. Workers, who can rely less on own-produced food, spend more across most food categories, particularly staples. On protein-rich foods—including meat, eggs, milk, and legumes—worker spending reaches MWK 31,129, compared with MWK 26,137 for outgrowers and MWK 32,164 for non-linked households. Workers also report higher spending on prepared foods and food away from home. This is likely related to the fact that they work away from home and many commute from villages at quite some distance from Ekwendeni, resulting in less time for acquiring and preparing food. In contrast, Tropha outgrowers – who rely more on own production – have the lowest overall food expenditures, with consistently lower spending across staples, fruits and vegetables, and prepared foods. Non-linked households generally fall between workers and outgrowers in total spending, although they report the highest expenditure on protein-rich foods and alcohol.

Panel B highlights differences in expenditure composition. Tropha workers allocate the largest share of their food purchase expenditures to staples (33.6%). Tropha outgrowers devote smaller shares to staples (26.1%) and larger shares to protein-rich foods—meat, eggs, milk, and legumes (30.8%)—as well as oils and sugar (23.1%). Non-linked households display a similar distribution to outgrowers, allocating about 24 percent to staples, 31 percent to protein-rich foods, and 23 percent to oils and sugar. Fruits and vegetables account for roughly 11–12 percent of food budgets across all groups, while prepared food and food away from home remains relatively small but is notably higher for workers. Similarly, alcohol represents a small share overall but is highest among non-linked households.

Overall, the results indicate that Tropha workers have the highest total and per capita food expenditures. This largely reflects their greater reliance on markets for sourcing foods, rather than greater or more diverse food consumption or improved food security. Outgrowers and non-linked households allocate relatively larger shares toward protein and other higher-value foods, resulting in broadly comparable but slightly more diversified expenditure patterns.

Table 3. Monthly food expenditures and budget shares by household group

Panel A: Monthly food expenditure (MWK)			
Food group	Worker (199)	Outgrower (189)	Non-Tropha (249)
Staples	38,946 (2,840)	32,084 (5,686)	26,203 (3,519)
Protein-rich foods	31,129 (1,939)	26,137 (2,752)	32,164 (3,288)
Fruits and vegetables	9,948 (642)	7,929 (721)	8,938 (820)
Oils and sugar	18,540 (1,111)	16,043 (1,166)	18,213 (1,431)
Condiments and beverages	2,208 (267)	1,763 (325)	2,288 (371)
Prepared food / FAFH	5,102 (1,459)	1,442 (263)	2,590 (503)
Alcohol	847 (294)	1,604 (790)	2,653 (780)

⁵ The value of consumption of own produced foods is not included.

Total	106,721 (4,735)	87,001 (7,933)	93,049 (6,742)
Total per capita	28,147 (1,863)	15,459 (1,491)	18,362 (1,447)
Panel B. Budget shares of monthly food expenditure			
Staples	33.6 (1.8)	26.1 (2.2)	24.1 (2.1)
Protein-rich foods	27.7 (1.2)	30.8 (1.6)	31.0 (1.5)
Fruits and vegetables	11.3 (0.9)	12.3 (1.2)	12.4 (1.1)
Oils and sugar	18.7 (1.0)	23.1 (1.4)	23.0 (1.5)
Condiments and beverages	2.4 (0.3)	4.0 (0.8)	3.4 (0.7)
Prepared food / FAFH	5.6 (1.1)	1.9 (0.4)	4.0 (1.0)
Alcohol	0.6 (0.2)	1.8 (0.7)	2.1 (0.6)

Note: Budget shares are food group expenditure divided by total monthly food expenditure. Shares are undefined for households with zero total food spending. Weighted means and robust standard errors in parentheses.

Table 4 reports annual non-food expenditures and budget shares for Tropha worker, outgrower, and non-linked households. Panel A shows that Tropha non-linked households have the highest total non-food expenditures, averaging about MWK 1.6 million annually, followed by Tropha workers at MWK 1.5 million. The latter, however, have the highest per capita non-food expenditure. Tropha outgrowers report lower overall non-food spending of roughly MWK 1.1 million.

For worker households, of whom 56 percent report renting the dwelling they live in, the largest categories include housing (rent), utilities, and home maintenance (MWK 386,758), energy and lighting (MWK 274,399), and personal care and appearance (MWK 228,787), indicating relatively higher spending on rent and household energy. Tropha outgrowers spend less overall but allocate notable amounts to entertainment and travel (MWK 185,238), personal care (MWK 169,064), and milling/processing (MWK 132,589). Non-linked households, mainly in trading centers, record higher spending than both Tropha-linked groups in several categories, including education and household services (MWK 204,243), clothing and personal goods (MWK 196,636), and entertainment and travel (MWK 187,091), contributing to their higher total non-food expenditures and non-food expenditures per capita.

Panel B indicates that expenditure composition differs somewhat across groups. Tropha workers devote relatively large shares of non-food budgets to housing and utilities (23.9%), energy and lighting (18.4%), and personal care (18.3%), reflecting a concentration in core household consumption needs. Tropha outgrowers allocate smaller shares to housing (9.9%) and energy (7.1%) but devote relatively larger shares to entertainment and travel (14.7%), milling and processing (16.4%), and education and household services (7.6%), suggesting greater emphasis on production-related costs and discretionary spending. Non-linked households allocate comparatively larger shares to personal care and appearance (20.9%), entertainment and travel (13.1%), and milling/processing (13.2%), while maintaining moderate shares across housing and communications. Overall, the results indicate that Tropha workers spend more on housing and energy-related needs, outgrowers devote relatively more resources to production and discretionary categories, and non-linked households exhibit the highest overall non-food spending with a more diversified allocation across consumption categories.

Table 4. Annual non-food expenditures and budget shares by household group

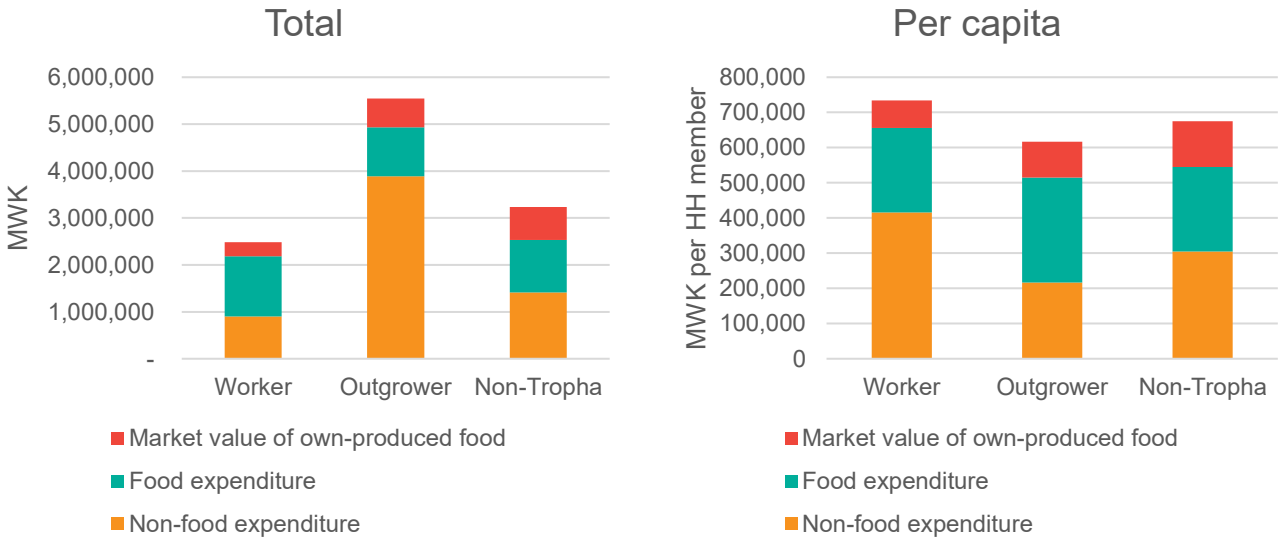
Panel A. Annual non-food expenditure (MWK)			
Non-food group	Worker (199)	Outgrower (189)	Non-Tropha (249)
Energy and lighting	274,399 (20,019)	68,222 (9,320)	83,379 (9,997)
Housing, utilities and home maintenance	386,758 (31,228)	192,113 (67,507)	327,400 (58,423)
Transport and vehicle costs	17,494 (10,001)	22,513 (10,784)	55,141 (20,841)
Communications and charging	88,397 (7,070)	79,232 (8,036)	104,824 (14,502)
Personal care and appearance	228,787 (12,977)	169,064 (11,279)	195,639 (14,386)
Health care	37,518 (6,023)	47,291 (6,817)	49,145 (7,940)
Clothing and personal goods	98,208 (10,909)	85,022 (11,348)	196,636 (44,451)
Education and household services	79,635 (16,092)	115,181 (25,905)	204,243 (66,925)
Ceremonies	8,048 (2,259)	10,811 (2,682)	23,187 (9,647)
Tobacco / gambling	2,352 (1,724)	6,635 (4,486)	3,963 (2,070)
Entertainment / travel	120,089 (14,339)	185,238 (21,262)	187,091 (24,221)
Milling / processing	96,750 (4,276)	132,589 (9,466)	111,717 (6,766)
Other non-food	49,590 (9,235)	29,713 (4,561)	48,204 (13,985)
Total non-food expenditure	1,488,027 (71,641)	1,143,626 (92,087)	1,590,568 (160,147)
Non-food expenditure per capita	415,598 (35,207)	216,879 (22,239)	305,015 (30,446)
Panel B. Budget shares of annual non-food expenditure			
Energy and lighting	18.4 (1.1)	7.1 (0.9)	6.2 (0.7)
Housing, utilities and home maintenance	23.9 (1.2)	9.9 (1.2)	14.3 (1.5)
Transport and vehicle costs	0.6 (0.3)	0.6 (0.2)	1.4 (0.5)
Communications and charging	6.7 (0.5)	7.5 (0.6)	8.5 (0.7)
Personal care and appearance	18.3 (0.9)	20.0 (1.1)	20.9 (1.2)
Health care	2.5 (0.4)	4.4 (0.6)	3.3 (0.5)
Clothing and personal goods	6.3 (0.7)	7.2 (0.8)	9.5 (1.1)
Education and household services	4.3 (0.6)	7.6 (0.9)	6.0 (0.9)
Ceremonies	0.5 (0.1)	1.1 (0.3)	1.0 (0.4)
Tobacco / gambling	0.2 (0.1)	0.4 (0.3)	0.2 (0.1)
Entertainment / travel	7.1 (0.6)	14.7 (1.3)	13.1 (1.1)
Milling / processing	8.4 (0.5)	16.4 (1.0)	13.2 (1.0)
Other non-food	2.7 (0.3)	3.0 (0.4)	2.6 (0.4)

Note: 2-week expenditures are annualized by multiplying by 26, 1-month expenditures by 12, and 12-month expenditures are used as reported. Budget shares are category expenditure divided by total annual non-food expenditure. Shares are undefined for households with zero total non-food spending. Weighted means and robust standard errors in parentheses.

Combining annualized expenditures on food and non-food purchases, total household spending averages approximately MWK 2.8 million for Tropha workers, MWK 2.2 million for Tropha outgrowers, and MWK 2.7 million for Tropha non-linked households (see Figure 2).⁶ Food expenditures account for roughly 46 percent, 48 percent, and 41 percent of total spending for workers, outgrowers, and non-linked households, respectively. The higher non-food share of non-linked households is consistent with their higher overall annual expenditures.

Including the market value of own-produced food consumption — MWK 297,000 per worker household, MWK 610,000 per outgrower household, and MWK 705,000 per non-Tropha household — raises total resources available for consumption substantially, particularly for outgrower and non-Tropha households who grow a larger share of their own food. Workers, by contrast, are more dependent on purchased food, which explains why their food expenditure share appears high relative to the other groups despite lower total resources.

Figure 2. Annualized total expenditures by household group



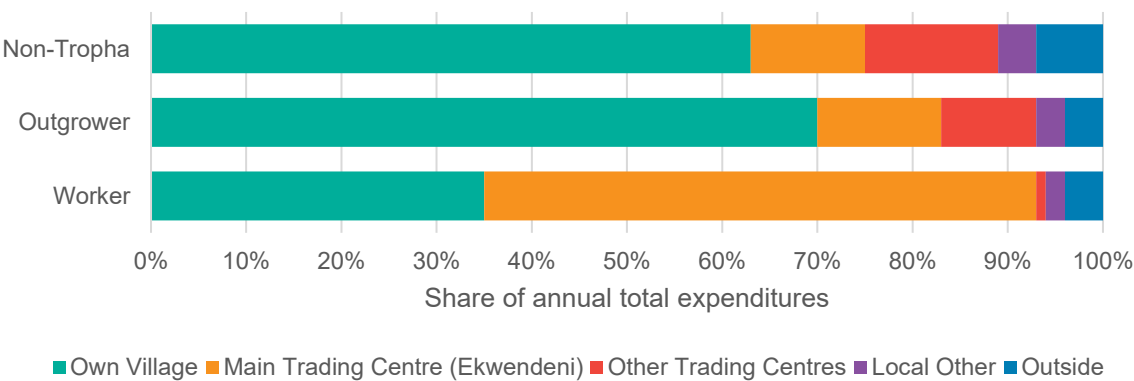
Note: This figure represents the weighted mean annualized expenditures.

Figure 3 shows further disaggregates where the households are spending and illustrates the centrality of local spending for households. Spending in households' own villages accounts for the largest share across all groups, increasing from roughly one-third of total expenditures for Tropha worker households to about two-thirds for outgrowers and slightly above three-fifths for non-linked households. Purchases in the main trading center of Ekwendeni are particularly important for worker households, representing the largest off-village spending destination, but are not nearly as important for outgrowers and especially for non-linked households. This is likely to reflect that many workers reside in or near Ekwendeni and therefore rely less on smaller surrounding trading centers for their purchases. Outgrowers and non-linked households are more geographically dispersed, and their spending shifts toward other nearby trading centers, which appear to meet most of their needs beyond their own villages. Across all groups, spending categorized as local other remains small, and expenditures outside the ZOI are limited, partic-

⁶ These estimates of total annual expenditure should be interpreted with some caution. Malawi experienced very high inflation—on the order of 25–30 percent year-on-year—during the 12-month recall period covered by the June–July 2025 survey. This may affect the comparability of expenditures reported for different recall periods. In addition, the standard limitations associated with recall-based expenditure data apply, particularly for items reported over periods longer than one month.

ularly for workers and outgrowers. Overall, the figure indicates that most household consumption occurs within villages and nearby trading centers, suggesting strong local circulation of income and reinforcing the potential for Tropha-related spending to generate meaningful local economic spillovers within the surrounding rural economy.

Figure 3. Expenditure shares by household group and location



Note: This figure represents the weighted mean shares in total annual expenditure including the market value of own-produced food consumption.

Business survey

Many businesses are directly connected to households and thus picked up by the household survey. Alongside the 187 non-farm businesses covered in the household survey, enumerators surveyed 82 targeted businesses operating in the ZOI across six sectors: retail and trade, services, small-scale manufacturing and processing, agriculture-related services, food preparation, and transport. The business survey collected revenue, cost structure, and input-sourcing information needed to parameterize the production side of the LEWIE model, using a questionnaire identical to that used for household businesses. Businesses in Ekwendeni, the main trading center, were sampled stratified by sector based on a complete enumeration of commercial establishments during the fieldwork. In the other much smaller trading centers, a random walk strategy was employed.

Table 5 presents key characteristics of the businesses captured in the household and business survey. Businesses in the ZOI are predominantly small-scale and mostly reliant on family labor, with average annual revenues ranging from MWK 7 to 20 million. A defining feature of the local business sector is the high reliance on inputs sourced from outside the ZOI — between 42 and 73 percent of intermediate inputs are purchased externally across the three business categories. This structural characteristic — high external sourcing — represents the primary leakage mechanism in the non-farm sector and limits the extent to which household spending on local goods and services recirculates within the ZOI. Local businesses’ direct sales to Tropha are negligible across all business types (0–3 percent of revenues), confirming that local procurement by the anchor enterprise is not currently a meaningful channel for economic linkage.

Table 5. Business characteristics by sector

Variable	Retail (n=91)	Services (n=62)	Production (n=116)
Annual revenue (MWK million)	18.4 (112.3)	19.7 (48.5)	7.2 (12.4)

Annual profits (MWK million)	4.6 (23.1)	3.9 (12.7)	2.1 (4.8)
Family labor days / year	245 (198)	262 (172)	231 (215)
Hired labor days / year	72 (312)	139 (238)	89 (182)
Intermediate inputs from outside ZOI (%)	73 (37)	72 (36)	42 (43)
Sales to local households (%)	69	75	54
Sales to other ZOI businesses (%)	16	13	21
Sales to Tropha (%)	2.4 (2.1)	2.9 (3.5)	0.0 (0.0)

Note: Weighted means and robust standard errors in parentheses. Sales shares to local households and other ZOI businesses were reported by respondents only as approximate ranges; exact numeric percentages are not available in the survey data. Sales to Tropha were reported numerically and are shown with mean and standard deviation

Tropha administrative data

Tropha provided administrative data on its 2025 payments for chili sales to outgrowers organized in five zones in the ZOI and wages to permanent and seasonal workers of Kaweche Estate. Tropha paid over MWK 121 million to local outgrowers who supplied them with chili in 2025.⁷ Total wage expenditures amounted to nearly MWK 1,160 million. These data were reconciled with household survey reports on receipts from Tropha to ensure consistency between the two sources. The administrative totals represent the direct injections that anchor the LEWIE simulations.

Local Economy-Wide Impact Evaluation modeling approach

Model structure and transmission channels

The LEWIE model of the TA Mtwalo ZOI in northern Malawi is a general-equilibrium system that represents three household groups (outgrowers, workers, non-Tropha households), six production activities (anchor crops, other crops, livestock, retail and trade, services, small-scale production), and three factor markets (family labor, hired labor, and a composite of capital and land specific to each activity). The theoretical foundation is the LEWIE methodology of Taylor and Filipinski (2014), which in turn builds on the computable general equilibrium (CGE) tradition pioneered for developing-country settings by Adelman and Robinson (1978) and extended to local economies by Taylor and Adelman (1996).

Each household group maximizes utility subject to a budget constraint. Expenditure shares, estimated from the survey data reported in Table 6, govern the allocation of income across local goods, outside-ZOI purchases, and savings. Production activities combine intermediate inputs and primary factors — family labor, hired labor, capital — according to fixed coefficient technologies estimated from the business survey (Table 7). Factor markets clear within the model: when Tropha increases its demand for hired labor, the local wage rate adjusts until supply equals demand, and the resulting wage increase flows through to all activities that employ hired labor, generating economy-wide price effects.

Non-tradable goods — locally produced food, services, and retail goods sourced from within the ZOI — are priced endogenously by supply-demand clearing within the zone. Tradable goods — inputs and consumer goods sourced from outside — are available at fixed world prices, so demand shocks in the

⁷ The year 2025 is used as the base year throughout this report because 2023/2024 was an unusually poor agricultural season characterized by severe droughts due to El Niño and 2025 injections align more with data from the 2025 household survey; results based on the 2024 injections are available on request and show proportionally lower absolute totals but a similar multiplier structure.

ZOI cannot affect their prices. This distinction, standard in small-open-economy CGE models, is important for interpreting the reported price effects: the model predicts increases in non-tradable prices precisely because local supply cannot easily expand in the short run, while tradable prices remain fixed.

Finally, the social accounting matrix (SAM) that underlies the LEWIE model is constructed from the survey data to be internally consistent: each account's total receipts equal total expenditures, and the ZOI accounts balance with the rest of the world through a current-account identity. The SAM construction involves reconciling household survey data, business survey data, and Tropha administrative records using cross-entropy methods that minimize deviations from all three data sources while maintaining accounting consistency. More details on the LEWIE model appear in the Technical Appendix.

Parameter estimation

Model parameters are estimated directly from the survey data using maximum likelihood and generalized method of moments estimators. Expenditure share parameters, summarized in Table 6, are estimated as Engel system parameters allowing heterogeneity across household groups. Table 6

These shares are fundamental parameters governing how income recirculates through the local economy. The most striking feature is the high rate of local retention across all three groups: household purchases outside the ZOI account for only 3 to 5 percent of total expenditures, depending on the group. Local agricultural goods, including consumption of own-produced food, absorb the largest single share for outgrower households (42.7%), reflecting their relatively larger farms, while workers direct their largest share to local retail and traded goods (50.4%). Non-Tropha households fall between these patterns, with 36.5 percent on local agricultural goods and 36.7 percent on retail. Local services absorb a further 17.2 to 19.8 percent across all groups. Small-scale locally produced goods account for 3.5 to 5.6 percent. These patterns of predominantly local spending are the micro-economic foundation of the high multiplier we estimate.⁸

Table 6. Household expenditure shares by household group and category

Expenditure category	Outgrower	Worker	Non-Tropha	ZOI average
Local agricultural goods	42.7 (1.7)	22.9 (1.8)	36.5 (1.7)	34.0
Local retail and traded goods	31.4 (1.3)	50.4 (1.5)	36.7 (1.3)	39.5
Local services	17.2 (0.9)	19.8 (0.9)	17.8 (0.9)	18.3
Local small-scale production	5.6 (0.4)	3.5 (0.3)	4.1 (0.3)	4.4
Purchases outside ZOI	3.1 (0.4)	3.4 (0.5)	4.9 (0.7)	3.8

Note: Weighted mean shares of total annualized expenditure including the market value of own-produced food and robust standard errors in parentheses.

Production cost shares (Table 7) are estimated from the household and business survey information on farming and non-farm enterprises using cost-function methods that impose homogeneity and symmetry restrictions consistent with neoclassical theory. Labor supply elasticities are calibrated using micro-econometric estimates from the household survey's data on wage employment and self-employment

⁸ While shares in **Error! Reference source not found.** are based on location-of-purchase questions and use purchased expenditures only as the denominator, the shares in **Error! Reference source not found.** use total expenditure including the market value of own-produced food, which is classified as inside the ZOI by definition. This difference in denominator explains the small discrepancy in outside-ZOI shares between the two.

hours. The production of chili, the crop at the center of the anchor enterprise arrangement with Tropha, is highly labor-intensive, with 57 percent of costs attributable to family labor and an additional 4 percent to hired labor, and only 11 percent to intermediate inputs — a structure that maximizes the local income effect per unit of output.⁹ Retail and trade, by contrast, is intermediate-input intensive (75%), reflecting the working capital required to stock shelves, but also generates significant local employment through hired labor (6%) and self-employment. Services fall between these extremes.

Table 7. Production cost shares by activity

Activity	Intermediate inputs	Family labor	Hired labor	Capital / land	Value-added share
Anchor crop (chili)	11	57	4	28	89
Other crops	18	62	6	14	82
Livestock	22	55	3	20	78
Retail and trade	75	13	6	6	25
Services	62	14	12	12	38
Small-scale production	41	38	8	13	59

Note: Intermediate inputs have large shares coming from outside the local economy, reducing multiplier effects.

Together, Table 6 and Table 7 and Figure 1 define the basic mechanics of the local multiplier: income enters through Tropha's payments, is spent predominantly in local markets, generating revenues for local businesses that in turn pay local factors, and the cycle repeats until income has been distributed and the residual has leaked outside the ZOI. The LEWIE model formalizes this process in a general-equilibrium framework that captures simultaneous price adjustments across all markets.

General-equilibrium solution and price adjustment

The model is solved numerically using a Newton-Raphson algorithm that finds the vector of prices and quantities that simultaneously clears all markets in the ZOI. The general-equilibrium solution is the key distinction between the LEWIE approach and simpler partial-equilibrium multiplier methods: while partial equilibrium assumes that prices are fixed and quantities adjust, the full GE solution allows both prices and quantities to adjust simultaneously, capturing the crowding-out and price-transmission effects that partially offset the income gains in the long run. The net effect — the real income multiplier reported— is a welfare-consistent measure that accounts for both sides of the price adjustment.

Real income is measured as the Laspeyres-weighted sum of nominal incomes deflated by household-group-specific price indices constructed from the price changes generated by the model. This welfare measure is conservative relative to the Paasche and equivalent-variation measures.

Simulation design

Two classes of simulations are implemented:

⁹ While family labor does not receive explicit wage payments, it is compensated through the labor share of value added generated in production.

- ▶ *Ex-post* simulations, which introduce observed 2025 injections reflecting Tropha's total spending — over MWK 121 million in outgrower payments and MWK 1,160 million in wages — into the calibrated model simultaneously and computes the resulting change in real income, employment, and prices relative to a counterfactual in which Tropha is absent.¹⁰
- ▶ *Ex-ante* simulations, which assess hypothetical changes — such as an expansion of outgrower payments or wages — to evaluate the potential economy-wide impacts of changes in Tropha's operations or complementary interventions in the wider local economy.

Multipliers are calculated as the ratio of total real income generated to the size of the initial injection. A multiplier of, say, 1.5 tells us that each MWK of outgrower or wage payments creates an additional 0.5 kwacha of real income growth in the local economy, through its stimulus to local demand and production to satisfy this demand. Indirect effects are referred to as spillovers.

The model decomposes effects across household groups and sectors, showing how benefits accrue directly to recipients and indirectly to non-linked households and businesses. All structural equations follow the specifications documented in Taylor and Filipinski (2014). Production functions are Constant Elasticity of Substitution (CES); household demand follows a linear expenditure system; and market-clearing conditions ensure that non-tradable prices adjust endogenously.

All confidence intervals are computed using a bootstrap procedure with 2,000 replications, stratified by household group and clustered at the village level to account for within-cluster correlation in survey responses. Bootstrap replications preserve the internal consistency of the SAM by re-estimating all parameters from bootstrap samples and re-solving the full GE system for each replication. Model code (Python), parameter files, and Stata do-files can be made available to analysts wishing to replicate or extend the analysis.

Results

As mentioned above, the LEWIE model is used to estimate both the realized impacts of Tropha's 2025 operations (*ex-post* simulations) and the expected effects of hypothetical changes (*ex-ante* simulations) within the zone of influence. All results reported here are in real terms, meaning they incorporate the price adjustments that occur in non-tradable markets as increased demand puts upward pressure on local prices and wages.

"Additional total real spillover income" refers to the secondary (indirect + induced) real income generated through the multiplier process (i.e., total real income minus the direct injection or payment from Tropha to outgrowers and workers itself). It includes spillovers to all three household groups. Outgrower and worker households receive both their direct payment and spillover; non-Tropha households receive only spillover.

Multipliers are calculated as the cumulative sum of direct, indirect, and induced effects across successive rounds of local transactions until leakages cause convergence. These are expressed in real, or price-adjusted, terms. Employment effects are reported in labor days, reflecting seasonal and part-time labor patterns. Employment days are derived by converting the additional labor value generated — using a hired-labor share applied to induced output — into labor days at a rural daily wage of MWK

¹⁰ In reality, the absence of Tropha would not imply that outgrowers receive no income from chili and workers have no income from employment — they may find substitutes, it is not possible to estimate the appropriate mix, and this simulation is hence an upper-bound estimate of Tropha's impact.

5,000.¹¹ Employment figures refer to additional hired-labor days induced through multiplier effects in local businesses and farms, on top of direct employment by Tropha at Kaweche Estate.

Ex-post simulation

The ex-post simulation asks: what is the total real income in the ZOI that is attributable to Tropha's actual 2025 operations? This simulation compares observed outcomes with the counterfactual without any Tropha outgrower or wage payments in 2025.

Based on the simulation, we estimate that the MWK 1.28 billion in payments by Tropha added roughly MWK 2.54 billion (95% CI: MWK 2.41–2.66 billion) to the local economy. This implies a real income multiplier of 1.98; that is, each MWK of local spending by the firm created MWK 1.98 of price-adjusted income increases to local households, which implies that the secondary circulation of income through local markets generated MWK 0.98 in additional real income (value-added). This secondary effect amounts to roughly MWK 1.26 billion.

Table 8. Ex-post impacts of Tropha's 2025 operations

Impact category	Tropha payment	Total impact	95% CI	Outgrower	Worker	Non-Tropha
Total real income (MWK billion)	1.28	2.54	[2.41, 2.66]	0.76	1.19	0.59
Real income multiplier	1	1.98	[1.88, 2.08]	0.59	0.93	0.46
Total real spillover income (MWK billion)	—	1.26	[1.19, 1.32]	0.64	0.03	0.59
Total real spillover income per HH (MWK thousand)		30.76	[29.17, 32.36]	1,289.47	23.66	15.06
Total employment (thousand days)	—	11.95	[10.7, 13.2]	8.15	0.36	3.44
Total employment per HH (days)		0.29	[0.26, 0.32]	16.50	0.28	0.09
Non-farm share of additional real income (%)	—	27	[24, 30]	—	—	—
Non-tradable price change (%)	—	7.8	[6.9, 8.7]	—	—	—
Wage change (%)	—	4.9	—	—	—	—

Note: Confidence intervals are based on 2,000 clustered bootstrap replications.

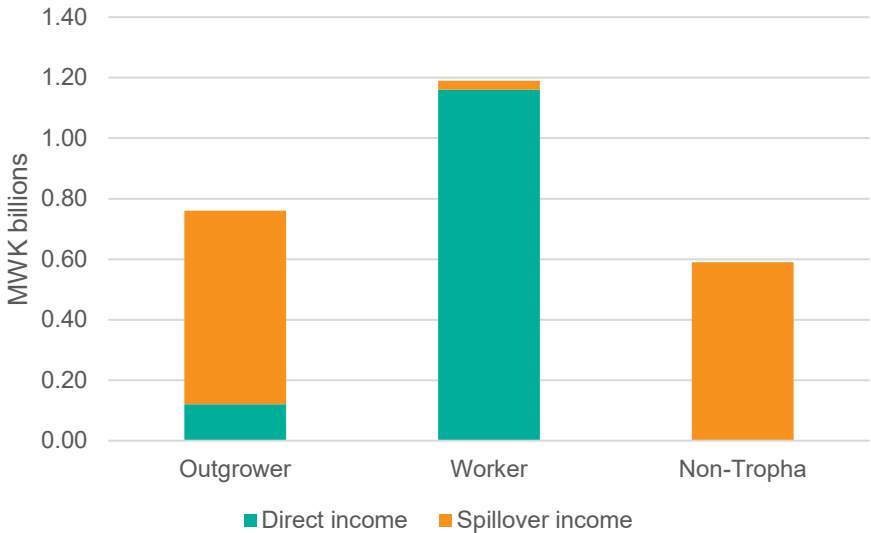
Outgrower households, despite comprising just 1.2 percent of the ZOI population, receive approximately 51 percent of the secondary real income generated by the multiplier. This reflects their unusually high local spending propensities and stronger participation in local non-farm markets compared with worker and non-Tropha households. Approximately MWK 590 million (47%) went to non-Tropha households. These households do not receive any outgrower or wage payments from Tropha, but they nonetheless benefit indirectly from Tropha's presence through local labor and product market linkages. However, the distribution of gains within the non-Tropha group is not uniform: households nearest to local markets and with the most diversified activity portfolios capture the largest secondary benefits.

Worker households receive the bulk of Tropha payments but very little of the real-income spillovers they create. Policy interventions that reduce barriers to market participation for remote or asset-poor

¹¹ The daily wage of MWK 5,000 used to convert induced labor value into labor days is the median reported ganyu (casual labor) wage from the household survey. While the mean ganyu wage is higher and current casual rates in the area can reach up to MWK 15,000, the median provides a conservative and standard benchmark for valuing additional hired labor days.

worker and non-Tropha households — improved feeder roads, local savings groups, health and nutrition programs that raise labor productivity — would increase the inclusivity of the multiplier without requiring any change in Tropha’s own operations.

Figure 4. Direct and spillover real income generated by Tropha's 2025 operations



Note: Direct income refers to Tropha’s 2025 payments on chili sales and wages. Spillover income refers to additional real income generated through the local market multiplier circuit.

The full cash injection generates an estimated 11,950 days of employment in the ZOI through multiplier effects, on top of direct employment by Tropha. Converting to full-time equivalents at a 250-day working year yields approximately 48 person-years of indirect employment sustained by Tropha’s operations. This additional employment consists entirely of hired labor in other crops, retail, services, and small-scale production; family labor supplied by households is not included in the employment count. The simulations hence suggest that for every MWK 107,205 Tropha spends, one additional hired-labor day is generated in the local economy. This implied average cost is typical of rural Malawi settings, where many local activities have low hired-labor shares (family labor or casual *ganyu* labor dominates).¹²

The non-farm share of the value-added boost (27%) reflects how broadly the secondary income circulates outside the agricultural sector (for outgrower payments) and outside worker households (wage payments) before it leaks out of the local economy. Retail and trade absorb the largest share of this non-farm value-added, followed by services and small-scale production. The implication is that a comprehensive assessment of Tropha’s contribution to local prosperity must look beyond the farm gate; the real-economy benefits in this rural area are substantially broader than the agricultural sector alone.

Price adjustments are an important component of general-equilibrium modeling and results. Non-tradable prices rise by 7.8 percent (95% CI: 6.9–8.7%) and local wages rise by 4.9 percent in response to the demand stimulus. Effects on goods prices are real costs for all households, especially those whose incomes do not rise substantially; while higher wages can benefit workers. The LEWIE model accounts for inflation by computing real income net of price effects.

¹² MWK 107,205 is obtained by dividing total Tropha payments (1,281.1 million) by the number of person-days of employment created indirectly by this spending (11,950).

A multiplier of 1.98 tells us how much total income Tropha's operations generate, but it does not immediately answer the question that matters most for development policy: does that income reach the households that need it most? To examine the distribution of benefits across the income spectrum, we link the aggregate income gains produced by the LEWIE model to individual households through a micro-simulation. Gains in each factor income category (hired labor wages, agricultural value added, non-farm business profits, and transfers) are allocated across households in the microdata source-by-source rather than uniformly or proportionally to total baseline income. For each income source, the total increase generated by the LEWIE model is distributed across households in proportion to each household's baseline share of that specific source. This method reflects realistic differences in livelihood portfolios: poorer and non-linked households, which rely more heavily on ganyu (casual labor) and transfers, capture a larger share of gains from those channels.

The detailed quintile breakdown is shown in Table 9. The bottom two quintiles together capture 38.3 percent of the secondary value-added boost, with Q1 (the poorest) accounting for 19.5 percent of the boost. This pro-poor incidence reflects the importance of the hired labor channel: households in the bottom quintile participate disproportionately in casual wage labor, both on the firm and in the local businesses that the multiplier circuit activates. These findings confirm that Tropha's local economy impact is broadly inclusive, reaching well beyond the directly linked outgrower and worker households.

Table 9. Distribution of spillover income by expenditure quintile

Expenditure quintile	Share of secondary spillover (%)	Amount (MWK million)
Q1 (poorest)	19.5	244.7
Q2	18.8	236.0
Q3	18.2	228.4
Q4	19.5	244.7
Q5 (richest)	24.0	301.2
Total	100.0	1,255.0

Ex-ante simulations

A multiplier of 1.98 is already high by the standards of rural African development interventions — the median cash transfer multiplier in the LEWIE literature is approximately 1.50, and most infrastructure investments generate multipliers in the range of 1.3 to 1.7. Tropha's high multiplier reflects the specific institutional and economic conditions of the TA Mtwalo ZOI in northern Malawi: a relatively dense local market structure, low leakage rates, and a labor-intensive production that distributes income broadly.

These conditions can be reinforced by policy. The primary leakage channel is the sourcing of intermediate inputs by local non-farm businesses from outside the ZOI. If Growth Poles partners can support local supply chain development — for agricultural inputs, packaging, and transport services — a larger share of this spending could be retained within the ZOI, amplifying the local income effect of Tropha's injection.

To provide further insights, this section presents the results of six ex-ante simulations modeled on top of the 2025 baseline injection. Because the direct injection differs in size and channel across scenarios,

results are presented as direct injection alongside total income gain, making the local income effect of each scenario directly legible without requiring a common multiplier ratio.

Irrigation-led productivity enhancement among chili outgrowers

Under current rainfed conditions, the average number of chili production cycles or flushes is approximately two per season, and yields are relatively low with outgrowers on average harvesting 210 kg of dried chili per hectare. Chili is highly responsive to irrigation, with irrigated production not only increasing yields per production cycle but also enabling an additional flush, thereby significantly raising productivity. This scenario therefore models the introduction of irrigation among Tropha's chili outgrowers in TA Mtwalo. This could be delivered through a combination of large-scale gravity-fed schemes and decentralized mini drip-kit distribution

Irrigation is expected to increase chili yields by approximately 80–100 percent per irrigated farmer, reflecting both higher yields per flush and the potential for additional production cycles under irrigated conditions. For this simulation, this is operationalized as a 40 percent average total factor productivity increase across chili outgrowers, assuming that half of the outgrowers would be able to access irrigation. Because chili is modeled as tradable, its market price remains fixed externally; the productivity shock increases local crop output for the same level of inputs, generating higher real income with lower inflationary pressure on non-tradable goods and services than an equivalent demand-side cash injection. The simulation assumes that Tropha purchases all additional chili output at the existing contracted price, and that irrigation infrastructure costs are borne outside the ZOI.

Table 10. Marginal impacts of irrigation for outgrowers

Impact category	Estimate	95% CI	Outgrower	Worker	Non-Tropha
Direct outgrower payment injection (MWK million)	36.1	—	36.1	0	0
Total additional real income (MWK million)	82.4	[78.0, 86.8]	50.1	4.2	28.1
Total additional real spillover income (MWK million)	46.3	[41.9, 50.7]	14.0	4.2	28.1
Total additional employment (days)	522	[494, 550]	318	26	178
Non-farm spillover share (%)	24	[21, 27]	N/A	N/A	N/A

Note: Results are from a marginal simulation on top of the 2025 baseline injection. Confidence intervals are based on 2,000 bootstrap replications. Total additional real income includes both direct and indirect effects. The direct gain from the total factor productivity increase for chili accrues entirely to outgrowers; workers and non-Tropha households receive only indirect gains through local market circulation. No multiplier is reported because the cost of irrigation is unknown.

The 40 percent total factor productivity increase would result in an increase in payments to outgrowers of over MWK 36 million, generating MWK 82 million in total additional real income (95% CI: 78.0–86.8 million) in the ZOI — more than double the outgrowers' direct gain from the productivity increase. Over MWK 28 million or 34 percent of this income generated by the productivity increase accrues to non-Tropha households. It would create approximately 522 additional labor days. The high ratio of total to direct income (2.28) reflects the supply-side nature of the shock: productivity gains in a tradable sector raise real output without generating the non-tradable price pressure that erodes demand-side injections.

Producer price increase for chili outgrowers

Faced with increased competition from other buyers and declining numbers of outgrowers from whom they can source chili, Tropha raised the farmgate buying price for chili from 7,500 MWK/kg in 2025 to 11,250 in 2026. In a second scenario, we therefore model the local economic impacts of this 50 percent farmgate price increase.

The baseline outgrower payment is over MWK 121 million, so the additional injection is close to MWK 61 million. This is modeled as a marginal demand-side shock to the activity of growing the crop at the center of the anchor enterprise arrangement, passing through the outgrower channel. A key assumption is that the contracted quantity of chili remains unchanged — Tropha pays more per unit for the same volume. This ensures the simulation is a pure price transfer to existing outgrowers rather than a supply-side response; if outgrowers were to expand production in response to the higher price, the simulation would need to incorporate a supply-side component.

Table 11. Marginal impacts of a 50 percent increase in chili buying price

Impact category	Estimate	95% CI	Outgrower	Worker	Non-Tropha
Direct outgrower payment injection (MWK million)	60.8	—	60.8	0	0
Total additional real income (MWK million)	116.0	[109.9, 122.1]	70.3	5.6	40.1
Total additional real spillover income (MWK million)	55.2	[49.2, 61.4]	9.5	5.6	40.1
Total additional employment (days)	725	[687, 763]	439	35	251
Non-farm spillover share (%)	24	[21, 27]	N/A	N/A	N/A

Note: Results are from a marginal simulation on top of the 2025 baseline injection. Confidence intervals are based on 2,000 bootstrap replications. Total additional real income includes both direct and indirect effects. The direct price injection goes entirely to outgrowers; workers and non-Tropha households receive only indirect gains through local market circulation.

A 50 percent increase in the chili buying price resulting in close to MWK 61 million additional payment to outgrowers would generate MWK 116 million in total real income in the ZOI (95% CI: 109.9–122.1 million). This is close to double (1.91) the outgrowers' direct gain or injection. Over MWK 40 million or close to 35 percent of this income accrues to non-Tropha households. It would create approximately 725 additional labor days, with the large majority going to outgrower (61%) and non-Tropha (35%) households through expanded local crop demand.

While both the irrigation-led productivity increase and the raised chili buying price operate through the agricultural sector, they represent different types of shock. While the irrigation simulation is a supply-side productivity shock in a tradable sector, the chili price increase is a demand-side injection through the outgrower channel. The irrigation-productivity shock generates more total income per unit of direct gain because it is a pure supply-side efficiency gain in a tradable sector. It generates extra physical output sold at the fixed external market price without requiring proportional additional local inputs. The resulting income gain therefore creates less additional demand pressure on local non-tradable goods and services. In contrast, the price increase simulation transfers additional income to outgrowers for the same contracted quantity, with that income then spent on local goods and services. Because the income enters as a direct cash transfer rather than as a real output gain, it generates proportionally more demand pressure on local non-tradable prices, compressing real income gains at the margin. Both shocks ultimately increase outgrower income, but the productivity shock is more efficient from the perspective of the local economy.

Expansion of seasonal employment at Kaweche Estate

Trophia employs both permanent and seasonal workers at Kaweche Estate. In 2025, over 500 seasonal workers were employed on contracts of varying lengths, accounting for 41 percent of the total wage bill amounting to over MWK 474 million.¹³ To be able to accommodate increased production volumes, Tropha anticipates a 30 – 40 percent expansion in their seasonal labor demand. A 35 percent expansion of seasonal labor demand would result in an additional wage employment injection of roughly MWK 166 million. This is modeled as a proportional expansion of the existing seasonal workforce at existing wage rates — a wage employment scale-up, not a wage rate change. The simulation assumes that all additional seasonal workers are drawn from the local ZOI labor pool at existing wage rates, with no in-migration from outside the ZOI.

Table 12. Marginal impacts of 35 percent increase in seasonal wage employment

Impact category	Estimate	95% CI	Outgrower	Worker	Non-Trophia
Direct wage injection (MWK million, nominal)	166.1	—	0	166.1	0
Total additional real income (MWK million)	290.6	[275.5, 305.7]	5.0	131.2	154.4
Total additional real spillover income (MWK million)	124.5	[109.5, 139.7]	5.0	-34.9	154.4
Total additional employment (days)	1,590	[1,506, 1,674]	27	642	921
Non-farm spillover share (%)	27	[24, 30]	N/A	N/A	N/A

Note: Results are from a marginal simulation on top of the 2025 baseline injection. Confidence intervals are based on 2,000 bootstrap replications. Total additional real income includes both direct and indirect effects. Workers' total real income gain (MWK 131.2 million) is less than the nominal wage injection (MWK 166.1 million) because endogenous price adjustment compresses real purchasing power. This also means the per-group spillover for worker households is negative (-34.9 million): price effects erode more real purchasing power than the indirect circuit income they receive.

This expansion in seasonal wage employment would generate nearly MWK 291 million in total real income (95% CI: 275.5–305.7 million) of which MWK 154 million (53%) accrues to non-Trophia households. In this scenario, approximately 1,590 additional labor days would be created, with the large majority going to worker (40%) and non-Trophia (58%) households through expanded demand for casual labor.

The total additional real income generated within the ZOI is 1.75 times as large as the direct (nominal) additional wage injection of roughly MWK 166 million. These results therefore suggest that the wage employment channel generates somewhat less additional income per kwacha of direct injection than the agricultural channels. This difference arises because worker households allocate a large share of their additional income (approximately 50%) to local retail, an activity with a low value-added share and high dependence on inputs sourced from external suppliers outside the ZOI. As a result, wage payments generate fewer rounds of local production and employment than outgrower payments, which are spent more heavily on locally produced agricultural goods with higher value-added and labor content.

Increased local non-agricultural procurements

Trophia previously procured construction services, welded products, stationery, and other non-agricultural goods and services from local suppliers. In recent years, this local procurement was dramatically reduced and substituted by imports from outside the ZOI or moved in-house. This scenario models a

¹³ The more than 500 seasonal workers represent unique individuals employed during the year on contracts of varying lengths. The MWK 474 million wage bill therefore cannot be divided by the number of workers to infer an average wage rate.

restoration of that procurement level, modeled as a marginal demand-side shock of roughly MWK 499 million distributed across the non-tradable sectors (retail, services, and small-scale production). The simulation assumes 100 percent local sourcing within the ZOI; if a portion of these goods were sourced from outside the ZOI (e.g., imported construction materials), the actual multiplier would be correspondingly lower.

Table 13. Marginal impacts of increased local non-agricultural procurement

Impact category	Estimate	95% CI	Outgrower	Worker	Non-Tropha
Direct procurement injection (MWK million)	499.4	—	—	—	—
Total additional real income (MWK million)	712.3	[674.8, 749.8]	34.2	22.1	656.0
Total additional real spillover income (MWK million)	212.9	[175.4, 250.4]	—	—	—
Total additional employment (days)	2,850	[2,700, 3,000]	137	89	2,624
Non-farm spillover share (%)	68	[64, 72]	N/A	N/A	N/A

Note: Results are from a marginal simulation on top of the 2025 baseline injection. Confidence intervals are based on 2,000 bootstrap replications. Total additional real income includes both direct and indirect effects. Procurement flows to ZOI business owners; exact per-group breakdown is not available, but non-Tropha households own the majority of ZOI non-tradable businesses.

Restoring local non-agricultural procurement to roughly MWK 499 million per year would generate MWK 712 million in total real income in the ZOI (95% CI: 674.8–749.8 million) — MWK 213 million more than the direct injection — of which MWK 656 million (92%) accrues to non-Tropha households. It would create approximately 2,850 additional labor days, the largest employment effect among the six simulations, almost entirely in non-Tropha households through expanded local business activity. Because non-tradable prices are endogenous, a large shock to these sectors, in this case increased demand from Tropha, generates proportionally more price adjustment than an equivalent injection through the agricultural channel, limiting the local income generated per kwacha of procurement (1.43).

An economy-wide capital injection

Beyond changes to Tropha’s own operations and local expenditures, we also consider a complementary intervention that relaxes the capital constraints facing local households and businesses. This scenario models a 10 percent exogenous increase in capital income (profits and family labor returns) distributed proportionally across all three household groups. In practice this would most plausibly reflect improved access to credit — particularly for non-Tropha households, who hold the bulk of non-farm capital assets in the ZOI — but could also include additional productive investment at the Tropha estate and among outgrowers.

Table 14. Marginal impacts of 10 percent capital injection across all household groups

Impact category	Estimate	95% CI	Outgrower	Worker	Non-Tropha
Direct capital income injection (MWK million)	172.6	—	11.2	2.6	158.8
Total additional real income (MWK million)	290.0	[274.5, 305.5]	14.0	9.0	267.0
Total additional real spillover income (MWK million)	117.4	[101.9, 132.9]	2.8	6.4	108.2
Total additional employment (days)	820	[777, 863]	40	26	754
Non-farm spillover share (%)	32	[29, 35]	N/A	N/A	N/A

Note: Results are from a marginal simulation on top of the 2025 baseline injection. Confidence intervals are based on 2,000 bootstrap replications. Total additional real income includes both direct and indirect effects. The capital injection is distributed across all groups in proportion to their capital holdings. Non-Tropha households hold approximately 92 percent of ZOI non-farm capital.

A 10 percent capital injection of nearly MWK 173 million would generate MWK 290 million in total real income (95% CI: 274.5–305.5 million) — MWK 117 million more than the direct injection — of which MWK 267 million (92%) accrues to non-Tropha households. It would create approximately 820 additional labor days. The extraordinary non-Tropha share (92%) reflects the concentration of non-farm capital assets among non-linked households in the ZOI.

The capital injection generates less total real income per MWK injected (1.68) than the scenarios operating through the wage or outgrower channels because it disproportionately benefits non-Tropha households, who have higher expenditure leakage outside the ZOI. In addition, these households also allocate a larger share of their income to tradables and savings rather than locally retained non-tradables.

A productivity increase among local businesses

Finally, we model a stylized 10 percent increase in productivity among local non-tradable businesses, such as retail and service enterprises, alongside Tropha’s 2025 injections. In practice, such gains might come from investments in market or transport infrastructure, support for upgrading processing equipment such as maize mills, or business- and financial-management training. This scenario is motivated by the recognition that such complementary interventions can substantially alter the inflationary consequences of the initial income injections, thereby increasing the real or inflation-adjusted multiplier. More specifically, by improving the productivity of local businesses, local supply can better keep pace with increased demand thereby preventing upward pressure on prices.

Because we do not know the cost of achieving this productivity gain, we cannot compute a net multiplier on productivity itself. We therefore report the total multiplier on Tropha’s spending under both scenarios and highlight the inflation-mitigating effect on local non-tradable prices. Table 15 compares the results of the impact simulations with and without an accompanying productivity improvement.

Table 15. Marginal impacts of 10% productivity increase in non-tradable sectors combined with Tropha’s 2025 spending

Scenario	Income multiplier (95% CI)	Total real income (MWK million)	Spillover (MWK million)	Non-tradable price rise	Employment (days)
Tropha spending	1.98 (1.88–2.08)	2,536	1,255	7.8%	11,950
Tropha spending + 10% non-tradable productivity	2.17 (2.06–2.28)	2,780	1,499	4.7%	13,400

Note: The 10% productivity increase is applied simultaneously to retail, services, and small-scale production. Confidence intervals from 2,000 bootstrap replications. Spillover refers to secondary (multiplier) real income generated beyond the direct Tropha injection of MWK 1.28 billion. The 10% productivity increase is applied simultaneously to Retail, Services, and Small-scale Production. This format avoids reporting a multiplier on productivity itself because the cost of achieving the gain is unknown.

The combined effect of Tropha’s spending and a 10 percent productivity increase in non-tradable sectors raises the total multiplier to 2.17 while reducing inflationary pressure on local retail, services, and small-scale production. Non-tradable price inflation falls sharply from 7.8 percent to 4.7 percent — a reduction of more than three percentage points — because the productivity improvement in supply keeps pace with the demand stimulus. Employment rises from 11,950 to 13,400 days of labor, reflect-

ing the additional economic activity supported when price pressures are contained. This result illustrates the complementarity between demand-side (income injection) and supply-side (productivity) interventions: productivity gains both amplify and stabilize local economic impacts.

Sensitivity analysis

Most parameters in the LEWIE model were estimated directly from the 2025 household and business surveys conducted in the Tropha ZOI. Expenditure shares, production cost structures, income sources, and population weights all come from the micro-data. However, three key parameters cannot be reliably estimated from a single cross-sectional survey and must be set by judgment or external evidence: the precise definition of the ZOI boundary (which determines the leakage rate to outside markets), the degree of tradability of anchor-crop output (which determines the price elasticity of demand facing local producers), and the labor supply elasticity (which determines how wages respond to demand shocks). These choices carry uncertainty. Table 16 reports the multiplier under a range of alternative assumptions for each.

Table 16. Sensitivity analysis: multiplier under alternative assumptions

Assumption	Multiplier	95% CI	Description
Baseline (2025 clean data)	1.98	1.88 – 2.08	Central estimate
2024/2025 average injection	1.98	1.88 – 2.08	Same multiplier; lower absolute totals
High leakage (10% higher outside-ZOI share)	1.79	1.77 – 1.96	Tests sensitivity to ZOI boundary
Tradable anchor crop (Armington elasticity)	1.96	1.80 – 1.98	Moderate price competition from imports
Elastic labor supply ($\sigma = 2.0$)	2.04	2.02 – 2.22	More responsive hired labor market
Inelastic labor supply ($\sigma = 0.5$)	1.98	1.88 – 2.08	Wage pressure crowds out some spillover

Note: Each row changes one assumption while holding all others at baseline values. Confidence intervals from 2,000 bootstrap replications.

The 2024/2025 average injection scenario uses the same multiplier structure but applies it to an average of the two years' injection values. Because the multiplier is estimated from the 2025 survey data and reflects long-run economic structure rather than year-to-year variation in injection volumes, the multiplier itself does not change; only the absolute income and employment figures change in proportion to the lower average injection. This scenario confirms that our choice to use 2025 as the base year does not affect the structural finding, only the scale.

The baseline multiplier of 1.98 is robust across all specifications considered. Under the most pessimistic scenario — a uniform 10 percent increase in the outside-ZOI expenditure share applied proportionally across all local spending categories (local agriculture, retail, and services), simulating a larger leakage rate — the multiplier falls to 1.79 but remains well above unity and well above the break-even threshold. This robustness matters: it means that even if the survey evidence overestimates local retention rates, or if the ZOI boundary is drawn too narrowly to capture some outside spending, the main conclusion stands.

The alternative trade specification, which allows chili to face import competition in the domestic market (an Armington composite specification with an elasticity of substitution of 2.0), reduces the multiplier to 1.96 — a modest reduction that reflects the price dampening effect of tradable substitutes but leaves the qualitative conclusion unchanged.

The labor supply elasticity alternatives, ranging from 0.5 (inelastic, implying strong wage pressure) to 2.0 (elastic, implying a flat labor supply curve), produce a multiplier range of 1.98 to 2.04. The inelastic case is conservative: it posits that the ZOI labor market tightens significantly in response to Tropha's demand, crowding out some of the multiplier-generating spending. The elastic case is more optimistic, positing that Tropha's demand is met by workers who enter employment from leisure or subsistence activities at the margin, generating more secondary income. The central estimate of 1.98 lies comfortably in the middle of this range.

Conclusions and policy implications

In addition to engaging in large-scale macadamia production, Tropha Estates Limited, one of the Growth Poles Project's partners, acts as an anchor enterprise by sourcing paprika and chili from a large network of smallholder farmers in Mzimba and Rumphu to be aggregated and processed at their Kaweche Estate. This study set out to measure how Tropha's operations in and around its Kaweche Estate affect the wider local economy in TA Mtwalo in Mzimba, and whether the benefits reach beyond the farmers and workers the enterprise engages directly.

Using a micro-general equilibrium model (LEWIE), calibrated using detailed 2025 household and business survey data together with firm administrative records, we estimate that Tropha's over MWK 121.5 million in payments to farmers for chili sales and MWK 1,160 million in wages to workers generated MWK 2.54 billion in real household income across the ZOI, corresponding to a real multiplier of 1.98. In other words, for every kwacha Tropha spent locally, a further MWK 0.98 of real income is created as that spending circulated through local markets, after adjusting for modest increases in local prices and wages. This secondary or spillover effect thus amounts to MWK 1.26 billion. This local income multiplier is large and statistically robust, falling only to 1.79 in the most conservative sensitivity-analysis scenario.

Approximately 47 percent of this additional real income flows to households with no direct relationship with the firm, reaching them through the wages and profits earned by local businesses that serve the Tropha workforce and outgrower community. Income thus rises across the ZOI, not just among Tropha-linked households. Expenditure quintile analysis further shows that the bottom two quintiles representing the poorest 40 percent of households capture around 38 percent of the secondary income (MWK 480.7 million).

A multiplier of 1.98 is already high by the standards of rural African development interventions — the median cash transfer multiplier in the LEWIE literature is approximately 1.50, and most infrastructure investments generate multipliers in the range of 1.3 to 1.7. Tropha's high multiplier reflects the specific institutional and economic conditions of the TA Mtwalo ZOI in northern Malawi: a relatively dense local market structure, low leakage rates, and a labor-intensive production that distributes income broadly. These conditions can, however, be reinforced and this study identifies several pathways to amplify Tropha's local economic impacts.

The primary constraint on multiplier size is leakage through non-farm intermediate inputs. While households are overwhelmingly locally oriented in their spending, local non-farm businesses primarily source their intermediate inputs from suppliers outside the ZOI thereby limiting the size of the local multiplier. The results also show that Tropha's current operations raise non-tradable prices by approximately 7.8 percent and local wages by 4.9 percent. While these are moderate effects, suggesting that current operations are not generating severe inflationary pressure in the ZOI, additional simulations illustrate that increasing productivity in non-tradable sectors substantially dampens price pressures while increasing

real income and employment effects. This result identifies a practical pathway for development partners to amplify the local economic impacts of Tropha's operations. Investments in local market infrastructure, business capacity, and supply-chain logistics in the Tropha ZOI could simultaneously amplify income gains and protect the real purchasing power of the households who receive them.

Additional ex-ante simulations reinforce these conclusions. Irrigation-led productivity increases, chili price increases, seasonal employment expansion, capital injection, restoration of local procurement, and productivity improvements in non-tradable businesses all generate total income well above the direct injection; together they map out the range of levers available to Tropha and its partners to amplify the firm's local development impact. While all of these levers generate meaningful local income well above the amounts directly injected, the highest return per kwacha of direct injection comes from supply-side productivity investments in the tradable agricultural sector.

Raising chili productivity through irrigation, for example, generates over MWK 82 million in total income from a direct shock of MWK 36 million, with 34 percent accruing to non-Tropha households; a 50 percent chili price increase, resulting in a direct income gain for outgrowers of close to MWK 61 million, generates MWK 116 million total additional real income in TA Mtwalo, with 35 percent flowing to non-Tropha households. Expanding wage employment at Kaweche Estate generates less total income per kwacha of direct injection but more broadly distributed benefits than scenarios operating through the outgrower channel. A 35 percent expansion in seasonal wage employment at Kaweche Estate, for example, generates nearly MWK 291 million from a direct injection of MWK 166 million, directing a larger share — 53 percent — to non-Tropha households.

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Technical Appendix: LEWIE Model

A.1 Household Income and Expenditure

Household income for group h is the sum of factor earnings across all activities in which the household participates. Let Y^h denote total nominal income for group h , w^f denote the price of factor f , and l^{hfa} denote household h 's supply of factor f to activity a . Then:

$$Y_h = \sum_{a,f} w_f \cdot l_{hfa} + T_h$$

where T^h is any exogenous transfer income (including Tropha outgrower payments received by outgrower households). Household real income is Y^h deflated by a Laspeyres price index P^h :

$$RY_h = \frac{Y_h}{P_h}$$

Household expenditure is allocated across goods g according to fixed budget shares θ^{hg} estimated from the survey:

$$C_{hg} = \frac{\theta_{hg} \cdot Y_h}{p_g}$$

where p_g is the price of good g . For locally produced non-tradable goods, p_g is determined endogenously by market clearing; for tradable goods, p_g is fixed at the outside-ZOI price.

A.2 Production

Output of activity a (Q^a) is produced according to a fixed-coefficient technology. Let io^{ag} denote the intermediate input coefficient (units of good g per unit of output a), and let v^{af} denote the primary factor input coefficient (units of factor f per unit of output a). Unit costs are:

$$c_a = \sum_g io_{ag} \cdot p_g + \sum_f v_{af} \cdot w_f$$

Zero-profit conditions determine output quantities in the short run, given that capital and land are activity-specific and supplied inelastically. The model is therefore cost-push for non-tradable activities: a demand shock raises the price of the non-tradable good, which raises revenue until the zero-profit condition is restored.

A.3 Factor Markets

Hired labor is mobile across all activities within the ZOI. The hired labor market clears when total demand equals total supply:

$$\sum_a v_{a,HL} \cdot Q_a = LS(w_{HL})$$

where $LS(w^{HL})$ is the aggregate labor supply function. In the baseline specification, labor supply is semi-elastic:

$$LS = \bar{L} \cdot \frac{w_{HL}^\sigma}{\bar{w}}$$

Family labor is household-specific and supplied inelastically within the simulation horizon.

A.4 Market Clearing and Equilibrium

$$\sum_h c_{hg} + \sum_a io_{ag} \cdot Q_a = Q_g + M_g$$

where M_g is imports from outside the ZOI (exogenous for non-tradables under the small-ZOI assumption). The equilibrium vector of prices and quantities (p^* , w^* , Q^*) is found by Newton–Raphson iteration on this system of market-clearing conditions.

A.5 Multiplier Computation

The real income multiplier for injection channel j is:

$$m_j = \frac{\Delta RY_{ZOI}}{\Delta I_j}$$

Where $\Delta RY_{ZOI} = \sum_h \Delta RY_h$ is the change in total ZOI real income and ΔI_j is the size of the injection through channel j , expressed as:

$$\Delta RY_{ZOI} = \sum_h \Delta RY_h$$

Bootstrap confidence intervals for the multipliers m^s are obtained by repeating the full estimation and simulation procedure for 2,000 stratified, clustered bootstrap samples drawn from the survey data.

A.6 Calibration and Parameter Estimation

All structural parameters are estimated directly from the 2025 Tropha ZOI surveys and anchor-firm administrative data.

Household weights for the Tropha Zone of Influence (ZOI) were constructed using a post-stratification approach that integrates the 2025 household survey data, administrative records, and 2018 Malawi Population Census data for TA Mtwalo. Three household groups were defined (Tropha workers, Tropha outgrowers, and Tropha non-linked households), with administrative firm data used to set population targets for linked groups and residual census totals used to determine targets for non-linked households. Base weights were computed as the ratio of each group's population target to its sample size.

175 of the non-Tropha households were randomly selected from a subset of the villages where the outgrowers reside while the remaining 75 were selected randomly in the local trading centers: Ekwendeni (45), Engucwini (10), Madise (10), and Kafukule (10). Because the survey design intentionally oversampled trading centers and communities in TA Mtwalo, additional post-stratification adjustments were applied to non-linked households to align their geographic distribution with census shares. The resulting weights ensure that total weighted households match census-based population estimates for the Tropha ZOI, linked groups match firm records, and the spatial distribution of non-linked households reflects underlying population shares despite intentional oversampling.

The final weighted population shares are: Outgrower 0.0121, Worker 0.0311, and Non-linked 0.9568 — reflecting that non-linked households constitute approximately 95.7 percent of the weighted ZOI population. All model parameters (expenditure shares, production parameters, income sources) were estimated using these final weights.

Household expenditure data are used to estimate budget shares via weighted ordinary least squares regressions of expenditure shares on the logarithm of total expenditure. These provide: marginal propensities to consume by category; location-specific expenditure shares (inside versus outside the ZOI); and subsistence parameters for the LES.

Businesses in the business survey were stratified according to “industry” shares as identified by the census – retail/trade (53%), production/manufacturing (14%), services/other (33%).

Production cost shares are estimated using a revenue-based cost-share approach. For each activity: intermediate input share = intermediate expenditures divided by gross revenue; hired labor share = wage payments divided by gross revenue; value-added share = residual. These parameters supply the model's behavioral response to demand changes and determine how injections translate into income and output across activities.

A.7 Labor Supply

An upward-sloping rural labor supply curve with elasticity 0.5 is used, consistent with LEWIE implementations in similar contexts. This allows wages to respond modestly to demand increases.

A.8 Standard Errors and Uncertainty

All estimates incorporate 2,000 clustered bootstrap replications, with villages serving as the clustering unit. This approach captures sampling variability and spatial correlation in the data and produces the 95 percent confidence intervals reported in the main text.

A.9 Model Closure

The model uses a standard short-run closure appropriate for rural African settings. Tradable goods prices are fixed externally (small open economy assumption). Non-tradable prices adjust to clear local markets. Labor supply is upward-sloping and wages are endogenous. Capital and land are activity-specific and fixed. The consumer price index of tradable goods serves as the numéraire. This closure allows the model to capture price effects in non-tradable sectors while keeping the tradable sector insulated from local shocks.

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