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Do Agricultural Projects Help Smallholders Transition to Better Livelihood Strategies?

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ABSTRACT

Agricultural projects typically aim to promote the uptake of project components amongst targeted farm populations to improve their on-farm productivity within a "theory of change" that leads to improvements in their welfare. While this approach can be an important first step towards improving smallholder livelihoods, it ignores alternative and often superior livelihood options that might arise within the rural transformation process. These options can be particularly important for agricultural value chain projects that generate new market opportunities and secondary off-farm income and employment growth within the rural nonfarm economy. We argue that the design of smallholder projects implemented within regions already undergoing a dynamic transformation and/or on projects which have significant value chain components, should be broadened to assist smallholders make successful transitions to their best livelihood options. For such projects, M&E should also track livelihood transitions as well as the usual assessments of progress made, the achievement of expected goals, and the identification of bottlenecks in implementation. To help operationalize such an approach, we propose a typology of smallholder livelihood strategies that can track transitions over time and illustrate its use with an IFAD funded agricultural value chain project in Malawi. Using econometric methods and available household panel data, we find that the project helped some smallholders transition out of subsistence farming to market farming with a corresponding increase in their per capita incomes. The project also helped some households transition to, or remain with, an off-farm income diversification strategy with favorable per capita income outcomes. This may reflect new opportunities that arose as spillover benefits from the project along local agricultural value chains and within the rural nonfarm economy more broadly. We conclude with some lessons for the design, monitoring and evaluation of future agricultural projects.

Key words: Agricultural projects, impact assessments, typologies of small farms, small farm transitions.

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INTRODUCTION

Agricultural projects typically aim to promote the uptake of project components amongst targeted farm populations with the objectives of improving their on-farm production and productivity within a "theory of change" that leads to improvements in their welfare. While this approach can be an important first step towards improving smallholder livelihoods, it ignores the alternative livelihood options that smallholder farmers (SFs) may be able to adopt as new opportunities arise within the rural transformation process. These opportunities might offer better and more sustainable improvements to their welfare over the longer term. While some poorer SFs remain trapped in subsistence modes of farming, in transforming regions others are successfully emerging as commercial farmers and engaging with today's more urbanized and higher value markets, and others are successfully diversifying into off-farm sources of income (World Bank, 2007; Hazell and Rahman, 2014). In such dynamic contexts, project could usefully be designed and evaluated to take a longer-term perspective and assist SFs transition to their best livelihood options. This calls for relevant ways of segmenting SFs and targeting appropriate forms of assistance to each group. It also calls for broadening the scope of project impact assessments to look beyond immediate productivity and welfare gains to assess how successful a project has been in helping SFs transition to better livelihood options. This paper aims to: a) develop an appropriate typology of smallholder livelihood strategies that can usefully capture household transitions; b) illustrate its use through application to M&E data obtained from an IFAD funded agricultural value chain project in Malawi; and c) draw lessons for the design, monitoring and evaluation of future agricultural projects.

SMALLHOLDER FARM TYPOLOGIES

Many different SF typologies have been proposed in the literature. Some are based on the type of region in which SFs live and its connectivity to markets (e.g., Vorley 2002; Berdegué and Escobar 2002), others consider the scale of production, such as land size, technologies used, or the intensity of production, e.g., production per acre or animal (Kutcher and Scandizzo, 1981; Van der Ploeg, 2007; Christen and Anderson, 2013; Cortez-Arriola et al. 2015). Other typologies have been developed for specific situations using statistical clustering techniques (e.g., Bidogeza et al. 2009; Pacini et al. 2014; Berre et al. 2019; Kaur et al. 2021). Most of these typologies are motivated by the desire to target specific types of assistance, such as a new agricultural technology or farming practice, credit, or input subsidies, to increase on-farm production, productivity, and incomes.

An alternative approach takes a more dynamic view of the rural transformation process and classifies SFs based on the type of livelihood strategy they are pursuing. Urbanization, rising per capita incomes and the development of agricultural value chains (AVCs) can all help create new market opportunities for SFs to grow and market higher value crop and livestock products. Additionally, these same drivers of change can generate growth dynamics within secondary towns and the rural nonfarm economy, enabling some SFs to diversify into off-farm sources of income. These spillover benefits can be significant for projects that promote additional marketed production and the development of AVCs, creating substantial new employment and business opportunities amongst small and medium sized businesses in the midstream of the agri-food

system (Reardon 2015; Reardon et al. 2021). This midstream entails various economic activities, including sourcing, processing, packaging, transporting, and selling food and fiber to consumers. Supporting small-scale enterprise and entrepreneurship in the midstream and on the farm is essential for unlocking inclusive economic opportunities in the food system (IFAD, 2021). Additionally, projects that increase SF incomes can also generate powerful income and employment multipliers in many other sectors of the local nonfarm economy, primarily because SFs spend substantial shares of their income gains on local consumer goods and services (Haggblade et al., 2007).

Typologies that more explicitly address these dynamics include Dorward et al. (2009), who identified three types of SFs: ones that are "stepping up" as commercial farmers, ones that are "stepping out" by diversifying into off farm activities or leaving farming altogether, and ones "hanging in" as subsistence farmers. The World Bank (2007) in Chapter 3 of its WDR 2007 identified five smallholder groups: market-oriented, subsistence-oriented, off-farm labor-oriented, migration-oriented, and that are diversified into multiple income sources, and related the distribution of SFs across these types to the stage of economic transformation of a country (Table 1).

Table 1: World Bank Typology of Smallholders

Share of Off-farm Income in Total Household Income	*Share of Agricultural Output that is Marketed*	
	Low (≤50%)	*High (>50%)*
Low (≤25%)	Subsistence oriented	Market oriented
High (>75%) - local employment	Labor oriented	
High (>75%) - transfers	Migration oriented	
No income share exceeds 75%	Diversified	

Note: Transfers include remittances from family members living elsewhere, pensions, safety net transfers, etc.

Fan et al. (2013) differentiate small farms according to their profitability within the agricultural sector (subsistence farmers without profit potential, subsistence farmers with profit potential, and commercial smallholder farmers), and relate these to the different stages of economic transformation (agriculture-based, transforming, and transformed economies). AGRA proposed a typology in Chapter 1 of its African Agriculture Status Report 2017 on "The Business of Smallholder Agriculture in Sub-Saharan Africa" (Table 2).

Table 2: AGRA Typology of Smallholders

Share of Nonfarm Income in Total Household Income	*Share of Agricultural Output that is Marketed*		
	Low (≤5%)	*Medium (5-50%)*	*High (>50%)*
Low (≤33%)	Subsistence farms	Pre-commercial farms	Specialized commercial farms
High (>33%)	Transitioning farms		Diversified commercial farms

Selection of a Typology

We fitted the World Bank (2007) and the AGRA (2017) typologies to available SF panel survey data in Malawi that had been collected by the Project Management Unit (PMU) and the Research and Impact Assessment Division (RIA) of IFAD[1]. An appealing feature of the AGRA typology is its distinction between "pre-commercial" (sometimes called "emerging" farmers) from "subsistence" farmers, a group that some aid agencies, including IFAD, see as a most promising target group for transitioning to commercial farming. However, because of the low (5%) boundary value for the share of agricultural output sold which distinguishes between pre-commercial and subsistence farmers, the composition of the two groups is very sensitive over time to any shocks in agricultural production. For example, even a modest loss in seasonal production for pre-commercial smallholders can reduce the share of output they sell, leading them to be reclassified as subsistence farmers. This can lead to a lot of instability in the results in household panel data with many rather meaningless household transitions between types over a short period of time. The World Bank typology has fewer boundary values, and they are set at higher values leading to greater stability in the results over years. On the other hand, we found that having three off-farm livelihood groups led to sample size problems with the World Bank typology, especially as there were very few "diversified" households in our data. This led us to collapse the three off-farm livelihood types into one group and call them "off-farm diversified" households. Our simplified World Bank typology is summarized in Table 3. This closely parallels the typology proposed by Dorward et al. (2006) but is operationalized using the boundary conditions for the shares of off-farm income and marketed surplus provided by the World Bank's typology.

Table 3: Modified World Bank Typology of Smallholders

Off-farm income share	*Marketed share agricultural output*	
	Low (≤50%)	*High (>50%)*
Low (≤75%)	Subsistence oriented ("hanging in")	Market oriented ("stepping up")
High (>75%)	Off-farm diversified ("stepping out")	

Household transitions between livelihood types can take several years to achieve. For example, the transition from subsistence to market-oriented farming might first involve creating the conditions for productivity growth, such as providing secure property or tenancy rights over land so that SFs can access credit and invest in new technologies. This in turn may lead to increased market shares of agriculture outputs, a key step towards becoming market-oriented farmers. However, this is not an assured step because small scale producers may have trouble accessing credit and modern inputs or may be unable to monetize their increased production because of market constraints (e.g., small, marketed surpluses or ones of poor quality may not be attractive to traders). Solving these problems requires parallel development of the relevant AVCs and their upstream and downstream linkages to SFs. To achieve the longer-term goal of sustainably increased incomes, many SFs may also need to diversify into off-farm sources of income, and this in turn may require they acquire new employment skills or establish a nonfarm business of

[1] See next section for details

their own. Achieving these transformations requires a holistic approach to agriculture and rural development and one that is sustained over a sufficiently long period of time for household transitions to occur and take root.

A MALAWIAN CASE STUDY

In the following sections we apply our typology to an evaluation of the SF livelihood transitions that occurred over the life of the Sustainable Agricultural Production Program (SAPP) in Malawi, a joint project financed by IFAD and the Government of Malawi. We selected this project because a) it is an AVC project that may have created new commercial farming and off-farm income earning opportunities for SFs, and b) it was subjected to a rigorous monitoring and evaluation (M&E) design that involved the collection of a panel of household survey for project participants and a control group that is very suitable for our purposes.

About SAPP

SAPP is an AVC project that was implemented in Malawi during 2011-2020. SAPP's main target group was defined as "smallholder food security" households comprising productive men and women who have the potential to achieve household food security, but due to limited resources find it difficult to produce a surplus for market. This is a good example of targeting a "pre-commercial" or "emerging" farmer group. The target group comprised about 80% of all the smallholders in the project area and they were also a prime target group for the public extension service. It was expected that the project would increase the farm productivity and welfare of the targeted SFs.

The main thrust of the project was the development and dissemination of simple and affordable agricultural technologies suitable for SFs that would help bridge the large gap between actual and potential yields. The technologies were called Good Agricultural Practices (GAPs) and included improved seeds and a range of natural resource management practices. The project supported adaptive research to identify and develop suitable GAPs and undertook extension and other activities to assist SFs learn about and obtain access to the inputs needed to utilize GAPs, including tools, equipment, improved seeds, fertilizers, financial services, post-harvest facilities, and improved market infrastructure. This support was leveraged through project engagement with private seed companies, agrodealers, and micro-finance institutions to link them commercially with groups of SFs. To promote livestock ownership and better nutrition, the project provided some SFs with breeding goats and chickens.

The project interventions covered 46 Extension Planning Areas (EPAs) within six districts in Malawi (Blantyre, Chiradzulu, Balaka, Nkhotakota, Lilongwe, and Chitipa). The selection of intervention districts was based on four main characteristics: i) the potential for available GAPs to have an impact on productivity, food security and incomes, ii) the prevalence of poverty and food insecurity, iii) the absence of other programs or projects working in similar areas; and (iv) the level of interest by the District Council.

Sampling and Data

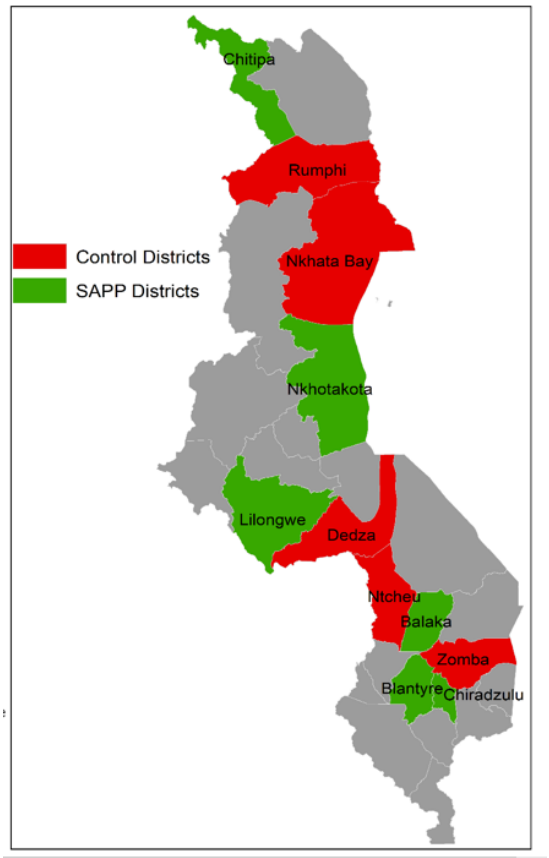
The project was monitored using a rigorous system with well-designed baseline, midline, and endline household surveys (Cavatassi and Maggio, 2022). Sampling was conducted at the ward level[2]. All six districts in the project intervention area were included in the survey. To identify controls, five adjacent districts (Rumphi, Nkhata Bay, Dedza, Nicheu, and Zomba) were randomly selected for inclusion in the survey. The control districts share similar geographic, climatic, socio-economic, and market conditions with the intervention districts. The location of the treated and control districts is mapped in Figure 1. A total of 120 wards were surveyed in both the control and treated districts. A minimum of 15 and maximum of 20 households from each ward were randomly selected to be included in the survey.

Baseline data were collected from 1,800 households in 2014 and follow-on surveys of the same households were conducted in 2018 and 2020. After allowing for attrition rates between surveys, a balanced three-wave panel data set of 1,391 households is available, of which 575 are controls and 816 are treated (project beneficiaries). The questionnaires used at baseline and endline have a structure very similar to typical living standard measurement surveys (LSMS) of the World Bank. However, unlike most LSMS, the data collected are not nationally representative but are representative of the households in the project and control areas. In each round of survey, households were asked about: i) demographic characteristics like age, sex, health, educational level, livelihood activities and income levels of household members; ii) information on agricultural production; including livestock ownership, land under crop cultivation, land area under irrigation, type of crop cultivated, input usage, and total harvest in the previous cropping season; iii) market participation proxied by the amount and share of crop sold in the various market outlets; iv) information on household welfare such as food consumption, exposure to natural shocks, durable and productive assets owned, and type of housing; and v) information on the various types of interventions received from SAPP by the treated households.

Household level data was complemented with community level data on various social and economic aspects like local demographics, employment rates, economic activities, access to social amenities and in 2020, the impacts of COVID-19. Data on weather conditions were also compiled using rainfall data from Funk *et. al.*, (2015).

[2] Smaller administrative units within districts

Figure 1: Map of the SAPP study area



Source: Authors

The data have been used by Cavatasi and Maggio (2022) to conduct a standard IFAD impact assessment that measured and attributed SAPP's impacts using a quasi-experimental approach. This involved analysis of differences in the uptake of GAPs between project and control households, and associated differences in their crop yields, household income and other welfare measures at the end of the project. In this paper we ask the more dynamic questions: did SAPP also help its target group of subsistence-oriented farmers either "step up" into commercial farming or "step out" into off farm income diversification, and if so, did those transitions lead to better welfare outcomes? Our analysis goes beyond the objectives of SAPP and the impact evaluation that was undertaken and is undertaken only to illustrate our household livelihood transition approach.

HOUSEHOLD TRANSITIONS

Table 4 shows the distribution of households according to the modified World Bank typology for 2014, 2018 and 2020 for the pooled, treated and control samples. In the pooled sample, there was a 25% reduction in the share of subsistence-oriented households between 2014 and 2020, and most of the transitioning households seem to have switched to an off-farm diversified livelihood strategy (up 31%) rather than to market-oriented farming. These patterns were slightly more pronounced amongst the treated than untreated households, but not enough to suggest that SAPP

had helped many subsistence farmers transition into commercial farming. However, the average trends in Table 4 could be misleading because they may conceal more diverse and offsetting patterns of movement between types that can occur at individual household levels. For example, if some households transitioned from subsistence to market-oriented farming while a similar number of market-oriented farmers transitioned from market oriented to subsistence farming, then the two would cancel out and not be captured in Table 4. To track all movements, we calculated the transition matrices in Table 5 using the household panel data for 2014 and 2020.

Table 4: Distribution of households by type, 2014, 2018 and 2020, Percent

	Pooled sample			*Treated*		*Controls*	
Type of smallholder	*2014*	*2018*	*2020*	*2018*	*2020*	*2018*	*2020*
Subsistence oriented	54	43	40	40	37	48	44
Market oriented	11	9	14	9	15	10	13
Off-farm diversified	35	47	46	51	48	42	43
Total	100	100	100	100	100	100	100
Number of observations	1391	1391	1391	814	808	577	583

Table 5 shows much greater household mobility between household types than Table 4 suggests. For the pooled sample, only 43% of the households that were subsistence oriented in 2014 were still subsistence oriented in 2020, while 17% had successfully transitioned to market-oriented farming, and 40% had diversified into an off-farm diversification strategy. This pattern was more marked for the treated than control households; only 39% of the treated subsistence-oriented households remained as such in 2020 compared to 48% for the controls. Unlike the aggregate distributional data in Table 4, the household level transitions in Table 5 suggest that SAPP did have some success in helping many subsistence-oriented households transition to commercial farming.

Table 5: Household transitions between 2014 and 2020

	Post-Intervention Type (2020)			
Pre-intervention Type (2014)	*Subsistence oriented*	*Market oriented*	*Off-farm diversified*	*Total*
Pooled sample				
Subsistence oriented	43	17	40	100
Market oriented	42	22	36	100
Off-farm diversified	35	7	58	100
Number observations	562	193	636	1,391
Control households				
Subsistence oriented	48	15	37	100
Market oriented small	42	20	38	100
Off-farm diversified	39	8	53	100
Number observations	257	75	243	575
Treated sample				
Subsistence oriented	39	18	42	100
Market oriented	43	23	34	100
Off-farm diversified	33	6	61	100
Number observations	305	118	393	816

A surprisingly small share (22%) of the market-oriented farms in 2014 remained as such in 2020, while 42% transitioned to subsistence-oriented farming and 36% diversified into an off-farm diversification strategy (Table 5). These transitions were only slightly moderated by the project. About one third (35%) of the off-farm diversified households in 2014 had also transitioned to subsistence farming by 2020, 7% into commercial farming, while 58% remained as off-farm diversified.

So far, we have only looked at the household transitions between 2014 and 2020, but the panel data provide information on transitions for each household between 2014 to 2018 and again between 2018 to 2020. The availability of midline data in 2018 can help capture any intermediate transitions households may have made in response to changes in project design and implementation, weather shocks or changes in their economic and demographic situation. Altogether there are 27 possible transition pathways, of which nine are relevant for each household given its livelihood type in 2014 (Table 6). As shown in Table 6, 29% of all the households in the pooled sample did not make any livelihood transitions over the two periods while 44.6% made one transition and the remaining 26.4% made two transitions[3]. The households making only one transition obviously ended up in a different livelihood type than the one from which they started, but of the households making two transitions, about two thirds (16.1% of the total sample) reverted to their initial livelihood strategy while one third (8.3% of the total sample) ended up in a different livelihood strategy. There is no obvious pattern to the intermediate transitions, with significant shares passing through all three livelihood types.

[3] Calculated as follows: zero transitions: 14 + 0.9 + 14.1 = 29%; one transition: 4.7 + 8.8 + 2.0 + 11.4 + 2.4 + 0.8 + 0.2 + 2.0 + 4.3 + 0.4 + 6.7 + 0.9 = 44.6%; two transitions: 100 – 29 - 44.6 = 26.4%.

Table 6: Household transitions during 2014 to 2018 and 2018 to 2020, pooled sample (expressed as percent distribution of households by type and year)

2014		2018		2020		Number transitions
Subsistence-oriented (S)	54	S	27.5	S	14.0	0
				M	4.7	1
				D	8.8	1
		M	4.9	S	1.5	2*
				M	2.0	1
				D	1.4	2
		D	21.6	S	7.8	2*
				M	2.4	2
				D	11.4	1
Market oriented (M)	11	S	5.4	S	2.4	1
				M	1.2	2*
				D	1.8	2
		M	1.9	S	0.8	1
				M	0.9	0
				D	0.2	1
		D	3.7	S	1.5	2
				M	0.2	2*
				D	2.0	1
Off-farm diversified (D)	35	S	10.5	S	4.3	1
				M	1.2	2
				D	5.0	2*
		M	2.8	S	1.4	2
				M	0.4	1
				D	1.0	2*
		D	21.7	S	6.7	1
				M	0.9	1
				D	14.1	0
	100		100		100	

Note: An asterisk denotes a pathway in which a household made two transitions and reverted to its original type by 2020.

EXPLAINING THE TRANSITIONS

In this section we use an econometric model and the household panel data to identify some of the factors driving the household transitions over 2014 to 2020, including the role of the project. For this purpose, we pool the panel data on household transitions between 2014 to 2018 and 2018 to 2020 to capture all the intermediate as well as final transitions each household made over 2014 to 2020.

Econometric model

We divide the pooled sample into three groups according to their initial household type in 2014 and estimate reduced form equations to explain the transitions achieved in 2018 and 2020. Following Kirui et al. (2022), we apply a dynamic multinomial probit model to determine farmer transitions from one typology to another. More formally, for each household of type = 1, 2, 3 in

2014, we formulate a multivariate model with three dependent binary variables based on type = 1, 2, 3 in 2018 and 2020 such that:

(1) $T_{mnt} = \alpha + \beta X_i + \gamma P_{it} + \mu_t + \varepsilon_{it}$ for all households of type m (m=1, 2, 3) in 2014, where:

- T_{mnt} is a binary variable representing a household transition from type m in 2014 to type n in time t (t=2018 or 2020),
- α is an intercept term,
- X_i is a vector of independent variables that are thought to influence household transitions,
- β is a vector of coefficients relating to X,
- P_{it} is a binary variable indicating whether household had been treated or not by 2020, i.e., received any component of the SAPP project,
- γ is a vector of coefficients relating to P,
- μ_t is a year dummy to capture possible market, weather or other shocks that might lead a household to make more than one transition between 2014 and 2020,
- $\varepsilon_{it.}$ is an error term.

Table 7 lists key household characteristics and their 2014 means and standard deviations, many of which were included as independent variables X in the model. The table also shows any significant differences between market oriented or off-farm diversified households and subsistence-oriented households, based on the coefficients estimated from a regression of the shown variable on dummies for market oriented (equal to one if market oriented) and off-farm diversified (equal to one if off-farm diversified)), respectively, controlling for district fixed effects. Focusing on statistically significant differences between the groups, subsistence farmers are older and located further from a daily market than the other two groups, but they are less likely to have severely sloped land. Market oriented farmers live closer to a daily market and have the highest average rainfall. Off-farm diversified households have the least land, agricultural wealth, and livestock, and are least likely to own a cell phone, or be members of a farmers' club.

Table 7: Household characteristics, 2014

	Subsistence oriented	*Market oriented*	*Off-farm diversified*	*Pooled*
Received treatment	0.562	0.623	0.635***	0.595
	(0.496)	(0.486)	(0.482)	(0.491)
Household size	5.060	5.099	4.998	5.042
	(2.185)	(2.410)	(2.111)	(2.184)
Education level (years)	5.427	5.550	5.422	5.439
	(3.993)	(4.026)	(3.910)	(3.964)
Female headed household = 1	0.279	0.258	0.270	0.273
	(0.449)	(0.439)	(0.444)	(0.446)
Dependency ratio	1.257	1.330	1.227	1.254
	(0.968)	(1.088)	(0.896)	(0.957)
Age in years	46.68	40.75***	40.85***	43.95
	(15.98)	(14.85)	(15.17)	(15.83)
Land owned (Ha)	0.735	0.729	0.556***	0.671
	(0.422)	(0.384)	(0.356)	(0.404)
Agricultural wealth index	0.0775	0.0798	0.066***	0.0735
	(0.0471)	(0.0493)	(0.062)	(0.0533)
Own cell phone =1	0.495	0.583	0.430***	0.482
	(0.500)	(0.495)	(0.496)	(0.500)
Tropical Livestock Units (TLUs)	0.531	0.652	0.261***	0.449
	(1.070)	(1.345)	(0.745)	(1.015)
Distance to the nearest ag. ext. office (km)	2.654	2.672	2.570	2.626
	(5.435)	(6.282)	(5.571)	(5.580)
Distance to the nearest daily market (km)	3.113	2.374**	2.703	2.885
	(4.053)	(3.370)	(3.700)	(3.865)
Access to credit = 1	0.0837	0.086	0.0759	0.0812
	(0.277)	(0.281)	(0.265)	(0.273)
Member of a farmers' club = 1	0.206	0.265**	0.158*	0.196
	(0.405)	(0.443)	(0.365)	(0.397)
Log of mean rainfall (1981-2014)	38.91	41.01***	38.09**	38.86
	(7.044)	(7.685)	(6.327)	(6.924)
Production on irrigated land (Ha)	0.0112	0.00662	0.00844	0.00969
	(0.105)	(0.0814)	(0.0916)	(0.0980)
Farming on severely sloped land =1	0.0823	0.132*	0.116*	0.0999
	(0.275)	(0.340)	(0.321)	(0.300)
Number of observations	742	154	495	1391

Notes:
a/ Standard deviations in parentheses.
b/ The agricultural wealth index is defined as composite indices constructed using principal components analysis for agricultural items like hoes and treadle pumps (Filmer and Pritchett, 2001).
c/ Asterisks denote significant differences between market oriented or off-farm diversified households and subsistence-oriented households, $*$ $p < 0.10$, $**$ $p < 0.05$, $***$ $p < 0.01$.).

Land size, agricultural wealth, and livestock ownership are all highly correlated, so we represented these variables by agricultural wealth in the regressions. To avoid potential endogeneity problem in estimating the model we used lagged (2014) values for all the household explanatory variables. Potential selection bias for project treatment is not an issue because all

farmers in the pre-selected project districts were treated to some extent, where treatment is defined to include any one or more of the proffered project components, while the control households were selected in districts that did not receive any treatment.

Results

Appendix A reports the estimated coefficients from the dynamic multinomial probit regressions. We focus here on the derived marginal coefficients, as reported in Tables 8 to10 for the three household groups. For households that were subsistence oriented in 2014, the project intervention had a significant impact in helping them transition to either market-oriented or off-farm diversification livelihood options – by 7.6% and 5.4% respectively (Table 8). The project also helped households that were market oriented in 2014 remain as such and reduced their transitions to subsistence farming by 5.7%, or to an off-farm diversification strategy by 7.5% (Table 9). For households that were off farm diversified in 2014, the project reduced the likelihood that they would transition to commercial farming by 3% (Table 10). There were no specific project components designed to promote off farm income diversification, so the fact that the project helped some subsistence farmers transition to an off-farm income diversification strategy may reflect new off-farm income earning opportunities arising as spillover benefits from the project along local agricultural value chains and within the rural nonfarm economy more broadly.

Table 8: Determinants of Household Transitions over 2014-2020 for Farm Households that were Subsistence Oriented in 2014, Marginal Coefficients

Variable	(1) *Remain subsistence oriented*	(3) *Transition to market oriented*	(5) *Transition to off-farm diversified*
Received treatment in t	-0.073***	0.076***	0.054**
	(0.027)	(0.019)	(0.027)
Household size	-0.023***	0.004	0.024***
	(0.009)	(0.006)	(0.009)
Education level of HH head	-0.004	0.002	0.006
	(0.004)	(0.003)	(0.004)
Female headed HH=1	0.086***	-0.029	-0.050
	(0.032)	(0.023)	(0.032)
Dependency ratio	0.014	0.004	-0.018
	(0.020)	(0.014)	(0.021)
Age of HH head	0.005***	-0.002**	-0.005***
	(0.001)	(0.001)	(0.001)
Agricultural wealth	0.010***	0.006***	-0.011***
	(0.003)	(0.002)	(0.003)
Own cellphone =1	0.067**	0.019	-0.054*
	(0.029)	(0.020)	(0.029)
Distance to extension officer	0.031*	-0.017	-0.004
	(0.017)	(0.012)	(0.017)
Distance to daily market	0.001	0.016	-0.011
	(0.019)	(0.014)	(0.019)
Access to credit	-0.059	0.123***	-0.108**
	(0.050)	(0.030)	(0.051)
Member of a farmers' club	0.044	0.078***	-0.107***
	(0.034)	(0.022)	(0.035)
Log mean season rainfall	0.003	0.005***	-0.006***
	(0.002)	(0.001)	(0.002)
Area of irrigated land	-0.092	-0.152	0.143
	(0.135)	(0.097)	(0.132)
Number observations	1,494	1,494	1,494

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

Table 9: ***Determinants of Household T*****ransitions** ***over 2014-2020 for Farm Households that were Market Oriented in 2014, Marginal Coefficients***

Variables	(1) *Transition to Subsistence*	(2) *Remain commercially oriented*	(3) *Transition to off-farm diversified*
Received treatment in t	-0.057*	0.103*	-0.075*
	(0.033)	(0.057)	(0.042)
Household size	-0.023**	0.008	-0.008
	(0.012)	(0.015)	(0.017)
Education level of HH head	0.009	0.007	-0.016***
	(0.006)	(0.007)	(0.006)
Female headed HH=1	0.106**	-0.221***	-0.005
	(0.045)	(0.069)	(0.045)
Dependency ratio	-0.007	0.043	0.013
	(0.019)	(0.037)	(0.034)
Age of HH head	0.002	-0.002	-0.006***
	(0.001)	(0.003)	(0.002)
Agricultural wealth	0.014***	0.008*	-0.029***
	(0.005)	(0.005)	(0.008)
Own cellphone =1	0.147***	0.007	0.058
	(0.047)	(0.043)	(0.038)
Distance to extension officer	0.052	-0.018	0.005
	(0.034)	(0.040)	(0.033)
Distance to daily market	-0.009	-0.076*	0.108***
	(0.027)	(0.039)	(0.030)
Access to credit	0.158***	-0.230**	0.254***
	(0.056)	(0.106)	(0.091)
Member of a farmers' club	0.113**	-0.007	-0.281***
	(0.050)	(0.048)	(0.069)
Log mean season rainfall	-0.001	0.007**	0.006**
	(0.003)	(0.003)	(0.003)
Area of irrigated land	0.017	-0.075	0.119**
	(0.136)	(0.066)	(0.060)
Number observations	308	308	308

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

Table 10: Determinants of Household Transitions over 2014-2020 for Farm Households that were Off-farm diversified **in 2014, Marginal Coefficients**

Variables	(1) *Transition to Subsistence*	(2) *Transition to market Oriented*	(3) *Remain off-farm diversified*
Received treatment in t	-0.009	-0.030*	0.005
	(0.016)	(0.019)	(0.007)
Household size	-0.006	0.009	0.002
	(0.005)	(0.007)	(0.003)
Education level of HH head	-0.001	0.005	0.000
	(0.002)	(0.003)	(0.001)
Female headed HH=1	0.013	-0.003	-0.001
	(0.015)	(0.023)	(0.008)
Dependency ratio	-0.006	-0.033**	0.010
	(0.013)	(0.017)	(0.007)
Age of HH head	0.002**	-0.001	-0.001
	(0.001)	(0.001)	(0.000)
Agricultural wealth	-0.079	0.207*	0.034
	(0.063)	(0.125)	(0.063)
Own cellphone =1	0.026	0.002	0.000
	(0.016)	(0.019)	(0.008)
Distance to extension officer	-0.001	-0.010	-0.002
	(0.008)	(0.012)	(0.005)
Distance to daily market	-0.003	0.008	-0.002
	(0.008)	(0.012)	(0.005)
Access to credit	-0.038*	0.114***	-0.054***
	(0.023)	(0.035)	(0.020)
Member of a farmers' club	0.023	0.055**	-0.003
	(0.015)	(0.023)	(0.009)
Log mean season rainfall	0.003*	-0.000	-0.001
	(0.002)	(0.001)	(0.001)
Area of irrigated land	0.028	0.148**	0.006
	(0.025)	(0.071)	(0.036)
Number of observations	970	970	970

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

Beyond project treatment, several significant relationships are found that help explain the household transitions. Amongst households that were subsistence oriented in 2014, female headed households were 8.6% more likely to remain in subsistence farming than men (Table 8). Older farmers were also more likely to remain in subsistence farming, as were those who own a cell phone or who are located closer to an extension agent. Households with greater agricultural wealth were more likely to remain in farming, either on a subsistence or commercial basis. Membership in a farmers' organization and access to credit increased the likelihood of transitions from subsistence to commercial farming and reduced the likelihood of transitioning to an off-farm diversification strategy. Subsistence households located in areas with higher average rainfall were also more likely to transition to commercial farming, and less likely to become off-farm diversified. Larger households were less likely to remain in subsistence farming and more likely to transition to an off-farm income diversification strategy.

Amongst households that were commercially oriented in 2014, female headed households were more likely than men to transition backwards to subsistence farming. Households with greater agricultural wealth were more likely to remain in farming, either as subsistence or commercial farmers. Access to credit and irrigation increased the likelihood of transitions to off-farm income diversification, but all other significant factors acted to reduce the likelihood of such transitions.

Amongst households that were off-farm diversified in 2014, greater agricultural wealth increased the likelihood of transitioning to commercial farming, as did greater access to credit, membership of a farmers' club, or larger areas of irrigated land.

A Welfare Analysis

In this section we explore how the household transitions over 2014 to 2020 impacted on SF welfare as measured by per capita incomes (PCI).

Table 11 shows the average PCI of each household group for 2014, 2018 and 2020. In 2014, the average PCI of the market-oriented farm households was substantially higher than that of the other two groups, though the differences are not statistically significant. By 2020, the income gap had widened considerably. On average, transitions out of subsistence farming seemingly led to improvements in average household incomes, though again, none of these differences are statistically significant.

Table 11: Average Per Capita Income by Household Type, 2014, 2018 and 2020 (adjusted to 2014 prices)

	Subsistence oriented	*Market oriented*	*Off-farm diversified*	*Pooled*
2014	238	315	254	252
	(258)	(281)	(339)	(292)
2018	192.48	257.20	196.64	224.64
	(171.42)	(341.38)	(201.47)	(207.29)
2020	170.80	196.01	173.80	182.89
	(296.41)	(297.65)	(215.62)	(291.27)

Standard deviations in parentheses**.**

Individual households transitioning between livelihood strategies might have experienced very different outcomes in their PCI than Table 11 suggests and to analyze that variation we undertook a regression analysis. Using the same three-year panel data set as before, we estimated the model:

$$(2)\ Y_{i,t} = \alpha + \emptyset T_{mnt} + \gamma P_{it} + \beta X_i + \mu_t + \varepsilon_{it}$$

Where $Y_{i,t}$ is the PCI of household i at time t, $\emptyset$ is a vector of coefficients relating to T_{mnt}, and all other notation is the same as for equation (1).

The regression results based on equation (2) are presented in Table 12. The dependent variable is

the log of per capita income. We find that receiving the project treatment significantly reduced PCI among subsistence farmers whilst it significantly increased the PCI of market-oriented farmers. Households that were subsistence oriented in 2014 but transitioned to market-oriented farming by 2020 saw a significant increase in their PCI, but their PCI fell if they remained in subsistence farming. Market-oriented farmers in 2014 saw significant PCI increases if they continued in market-oriented farming but saw little change if they transitioned to other livelihood strategies. Off-farm income diversified households who remained as such in 2020 saw a significant increase in their PCI but saw significant gains if they either remained off-farm diversified or transitioned to market-oriented farming, and significant losses if they transitioned to subsistence farming.

Table 12: Effect of Livelihood Transitions on Per Capita Incomes over 2014-2020, by Type of Household in 2014

Variable	*Subsistence oriented (D)*	*Market Oriented (M)*	*Off-farm Diversified (D)*
	(1)	(2)	(3)
Received treatment	-0.401** (0.180)	1.480*** (0.341)	0.009 (0.048)
Remain as S	-0.304** (0.149)		
Remain as M		0.539** (0.231)	
Remain as D			0.175** (0.078)
Transition to S		0.142 (0.204)	-0.318*** (0.089)
Transition to M	0.546*** (0.132)		0.670*** (0.139)
Transition to D	-0.072 (0.145)	0.147 (0.213)	
Household size	-0.060*** (0.016)	-0.045 (0.036)	-0.060*** (0.013)
Education head	0.047*** (0.008)	0.023 (0.016)	0.036*** (0.006)
Female head = 1	0.054 (0.061)	-0.032 (0.128)	-0.056 (0.047)
Dependency ratio	-0.093** (0.040)	-0.122 (0.075)	-0.061** (0.030)
Age head	0.006** (0.002)	0.001 (0.004)	0.001 (0.002)
Agricultural wealth	0.023*** (0.006)	1.103 (1.280)	1.974*** (0.412)
Own cell phone = 1	0.464*** (0.057)	0.499*** (0.114)	0.407*** (0.043)
Distance to extension officer	-0.007 (0.032)	0.033 (0.082)	-0.023 (0.025)

Variable	*Subsistence oriented (D)*	*Market Oriented (M)*	*Off-farm Diversified (D)*
Distance to daily market	-0.015 (0.036)	-0.093 (0.086)	-0.039 (0.028)
Access to credit	0.156 (0.096)	0.320* (0.184)	0.264*** (0.074)
Member farmers' club	0.179*** (0.067)	0.216* (0.123)	0.226*** (0.051)
Log mean seasonal rainfall	0.007* (0.004)	-0.008 (0.007)	0.011*** (0.003)
Irrigated land	0.306 (0.250)	0.693 (0.623)	0.178 (0.198)
Constant	3.523*** (0.244)	3.938*** (0.463)	3.589*** (0.156)
Number observations	1,494	308	970
R-squared	0.199	0.283	0.145

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

Several other factors had a statistically significant impact on PCI outcomes. Household size and number of dependents were negatively related to changes in PCI regardless of household type, while education, agricultural wealth, cell phone ownership, Access to credit, and membership in. a farmers' club helped increase PCI for all household types.

CONCLUSIONS

Through the Malawi Sustainable Agricultural Production Program (SAPP) case study, we have demonstrated that is possible to identify and track over time household transitions across different types of livelihood strategies that are meaningful in terms of the opportunities available within a transitioning rural economy, such as those induced by an agricultural value chain projects. For this purpose, we show that a simplified World Bank smallholder typology performed better than several alternative approaches examined.

In addition to improving the productivity and welfare of the average smallholder farmer in the project area in Malawi (Cavatasi and Maggio, 2022), we find that the SAPP project was successful in helping some subsistence farmers transition to commercial farming (market-oriented). It also helped increase the likelihood that farmers already engaged in commercial farming would remain as such, reducing backward transitions to subsistence farming. Although there were no specific project components designed to promote off farm incomes, the project did lead some subsistence farmers to transition to an off-farm diversification strategy. The project also reduced the likelihood that off-farm diversified households would transition back to farming (both subsistence and market-oriented).

Subsistence oriented farmers who transitioned to market-oriented farming over 2014 to 2020 benefited from a significant increase in their per capita income, as did existing market-oriented farmers who remained as such. Off-farm income diversified households who remained as such in

2020 also saw a significant increase in their per capita income and if they transitioned to market-oriented farming, but a significant loss if they transitioned to subsistence farming.

Another important finding is that having before and after project data on the aggregate distribution of farm households by livelihood type is not an adequate basis for assessing a project's impact on household livelihood transitions. This is because aggregate data can conceal diverse but offsetting patterns of movement between types that can occur at individual household levels. In the Malawi case, the aggregate data suggest that the project had little if any impact on transitioning subsistence-oriented farmers to market-oriented farming, whereas there is evidence of a successful impact when individual household transitions are tracked and analyzed. This finding implies that to assess project impacts on household livelihood strategies then household surveys need to be conducted both before and after project implementation and for the same households.

From a policy perspective, our findings show that farmers pursue broader goals than just increasing farm production and income and are willing to pursue new livelihood strategies when this can improve their welfare on a sustainable basis. Transitions out of subsistence-oriented farming depend on two main factors: new market opportunities for higher value agricultural production stimulated by the project, and from new nonfarm opportunities that arise as spillover benefits from the project along local agricultural value chains and within the rural nonfarm economy more broadly. Policy makers should have this broader lens in mind when designing new projects for smallholders. Our findings also show that it can take several years for household transitions to occur and settle in, suggesting that smallholder projects should embrace sufficiently long time frames in their design and implementation. Project monitoring and evaluations should also adopt a similar long time frame and track livelihood transitions as well as the usual assessments of progress made, the achievement of expected goals, and the identification of bottlenecks in implementation. However, rigorous monitoring and evaluations and impact assessment is expensive and tracking household transitions is probably best focused on projects that area implemented within regions already undergoing a dynamic transformation and/or on projects which have significant value chain components.

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APPENDIX A

Table A1: Determinants of Household Transitions over 2014-2020 for Farm Households that were Subsistence Oriented in 2014

Variable	(1) *Remain subsistence oriented*	(3) *Transition to market oriented*	(5) *Transition to off-farm diversified*
Received treatment in t	-0.213***	0.336***	0.170*
	(0.080)	(0.086)	(0.087)
Household size	-0.066***	0.018	0.075***
	(0.025)	(0.027)	(0.028)
Education level of HH head	-0.010	0.009	0.019
	(0.012)	(0.012)	(0.013)
Female headed HH=1	0.252***	-0.129	-0.157
	(0.093)	(0.102)	(0.102)
Dependency ratio	0.039	0.020	-0.058
	(0.060)	(0.062)	(0.065)
Age of HH head	0.016***	-0.009**	-0.015***
	(0.004)	(0.004)	(0.004)
Agricultural wealth	0.028***	0.025**	-0.036***
	(0.010)	(0.010)	(0.011)
Own cellphone =1	0.195**	0.084	-0.172*
	(0.086)	(0.090)	(0.093)
Distance to extension officer	0.091*	-0.077	-0.012
	(0.049)	(0.053)	(0.054)
Distance to the nearest daily market	0.004	0.069	-0.036
	(0.055)	(0.061)	(0.060)
Access to credit	-0.171	0.543***	-0.341**
	(0.145)	(0.132)	(0.164)
Member of a farmers' club	0.127	0.343***	-0.338***
	(0.101)	(0.097)	(0.112)
Log mean season rainfall	0.009	0.022***	-0.019***
	(0.006)	(0.006)	(0.007)
Area of irrigated land	-0.267	-0.671	0.453
	(0.393)	(0.426)	(0.418)
Constant	-0.975***	-2.234***	1.104***
	(0.311)	(0.318)	(0.340)
Observations	1,494	1,494	1,494
Number of households	747	747	747

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

Table A2: ***Determinants of Household T*****ransitions** ***over 2014-2020 for Farm Households that were Market Oriented in 2014***

Variables	(1) *Transition to Subsistence*	(2) *Remain commercially oriented*	(3) *Transition to off-farm diversified*
Received treatment in t	-1.707*	2.711**	-2.022**
	(0.955)	(1.319)	(0.971)
Household size	-0.691**	0.219	-0.207
	(0.305)	(0.391)	(0.482)
Education level of HH head	0.259	0.192	-0.432**
	(0.179)	(0.191)	(0.184)
Female headed HH=1	3.149***	-5.794***	-0.145
	(1.081)	(1.404)	(1.217)
Dependency ratio	-0.214	1.130	0.356
	(0.572)	(0.938)	(0.901)
Age of HH head	0.061	-0.063	-0.157***
	(0.039)	(0.073)	(0.047)
Agricultural wealth	0.403***	0.221*	-0.792***
	(0.129)	(0.134)	(0.130)
Own cellphone =1	4.377***	0.178	1.573
	(1.061)	(1.143)	(1.083)
Distance to extension officer	1.534	-0.481	0.129
	(1.024)	(1.057)	(0.898)
Distance to the nearest daily market	-0.255	-1.997**	2.933***
	(0.812)	(0.843)	(0.694)
Access to credit	4.696***	-6.020**	6.877***
	(1.471)	(2.651)	(2.195)
Member of a farmers' club	3.343**	-0.187	-7.603***
	(1.386)	(1.249)	(1.478)
Log mean season rainfall	-0.033	0.192***	0.170***
	(0.081)	(0.074)	(0.064)
Area of irrigated land	0.129	-1.975	3.194**
	(1.058)	(1.839)	(1.510)
Constant	-0.120	-12.921***	7.603*
	(3.661)	(3.971)	(4.162)
Receive treatment in t	-1.707*	2.711**	-2.022**
	(0.955)	(1.319)	(0.971)
Observations	308	308	308
Number of households	154	154	154

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

Table A3: Determinants of Household Transitions over 2014-2020 for Farm Households that were Off-farm diversified **in 2014**

Variables	(1) *Transition to Subsistence*	(2) *Transition to market Oriented*	(3) *Remain off-farm diversified*
Received treatment in t	-0.795	-0.794*	0.329
	(1.313)	(0.482)	(0.483)
Household size	-0.524	0.242	0.139
	(0.399)	(0.186)	(0.172)
Education level of HH head	-0.073	0.135	0.010
	(0.206)	(0.083)	(0.080)
Female headed HH=1	1.184	-0.085	-0.093
	(1.161)	(0.594)	(0.558)
Dependency ratio	-0.555	-0.864*	0.641*
	(1.099)	(0.442)	(0.355)
Age of HH head	0.145***	-0.020	-0.043**
	(0.041)	(0.023)	(0.021)
Agricultural wealth	-7.038	5.407*	2.296
	(4.494)	(3.148)	(4.102)
Own cellphone =1	-2.283***	0.048	0.013
	(0.881)	(0.485)	(0.527)
Distance to extension officer	-0.055	-0.265	-0.154
	(0.746)	(0.316)	(0.340)
Distance to the nearest daily market	-0.292	0.204	-0.121
	(0.662)	(0.318)	(0.307)
Access to credit	-3.383***	2.964***	-3.587***
	(1.255)	(0.701)	(0.767)
Member of a farmers' club	2.047**	1.424**	-0.202
	(1.012)	(0.562)	(0.613)
Log mean season rainfall	0.267***	-0.005	-0.084*
	(0.098)	(0.038)	(0.045)
Area of irrigated land	2.492	3.865**	0.419
	(1.939)	(1.680)	(2.383)
Constant	-11.509*	-6.829***	9.829***
	(6.087)	(1.900)	(2.091)
Observations	970	970	970
Number of households	485	485	485

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

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