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Promoting Participation in Oilseed Value Chains in Malawi

Who and where to target

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Introduction

By increasing their production for the market and realizing greater incomes, smallholder farming households can significantly accelerate local agricultural and rural economic development. The increased income of these commercially oriented farmers increases their demand for the goods, services, and labor that can be supplied by other, often poorer, households in their community, expanding local non-farm employment opportunities and raising incomes for those other households.[1] Appropriately targeting agricultural development efforts towards commercially oriented farming households has important second-round economic development benefits in their communities, effects which cannot be achieved without properly identifying such households.

In this Policy Note, we examine both household and spatial factors that may drive participation by smallholder farming households in oilseed value chains, focusing on those for groundnut, soyabean, and sunflower.[2] Groundnut has been an important secondary crop within many smallholder farming systems across Malawi for several generations, used both for own consumption within the household and for sale. Soyabean and sunflower are more recent introductions and are primarily grown for commercial sale by both smallholders and commercial farmers. Annual production and yield levels for these crops in recent years are shown in Table 1.

Table 1: National production and yields of oilseed in Malawi, annual average for 2013/14 to 2018/19

	Groundnut	Soyabean	Sunflower
Production, mt	34,000	167,000	18,000
Yields, kg/ha	620	990	1,020
Potential yields, kg/ha	2,500	4,000	3,000

Source: Production and actual yields based on analysis of annual data from Agricultural Production Estimates System, Ministry of Agriculture. Potential yields from Ministry of Agriculture and Food Security (MoAFS). 2012. *Guide to Agricultural Production and Natural Resources Management in Malawi*. Revised. Lilongwe: MoAFS.

After considering the agro-ecological suitability of different areas in Malawi for production of oilseeds, two sets of analyses are done using nationally representative household-level data from the fourth Malawi Integrated Household Survey (IHS4) of 2016/17.

- First, we develop a four-category economic typology of Malawian households based on survey information on their economic engagement and level of crop sales. A descriptive table is used to explore the propensity of households in each category to produce oilseed crops, to sell any of their production, and, if they sold any, the share of production sold.
- We then examine in a multivariate context the same facets of household participation in oilseed value chains.

These are done to generate evidence on where and which farming households might grow oilseed crops across Malawi. Government and other agricultural stakeholders can use this information to identify and foster the participation of smallholders in these value chains either through direct support to households most likely to engage in their commercial production or through targeted investments in the specific crop value chains.

Agro-ecological suitability for oilseed production across Malawi

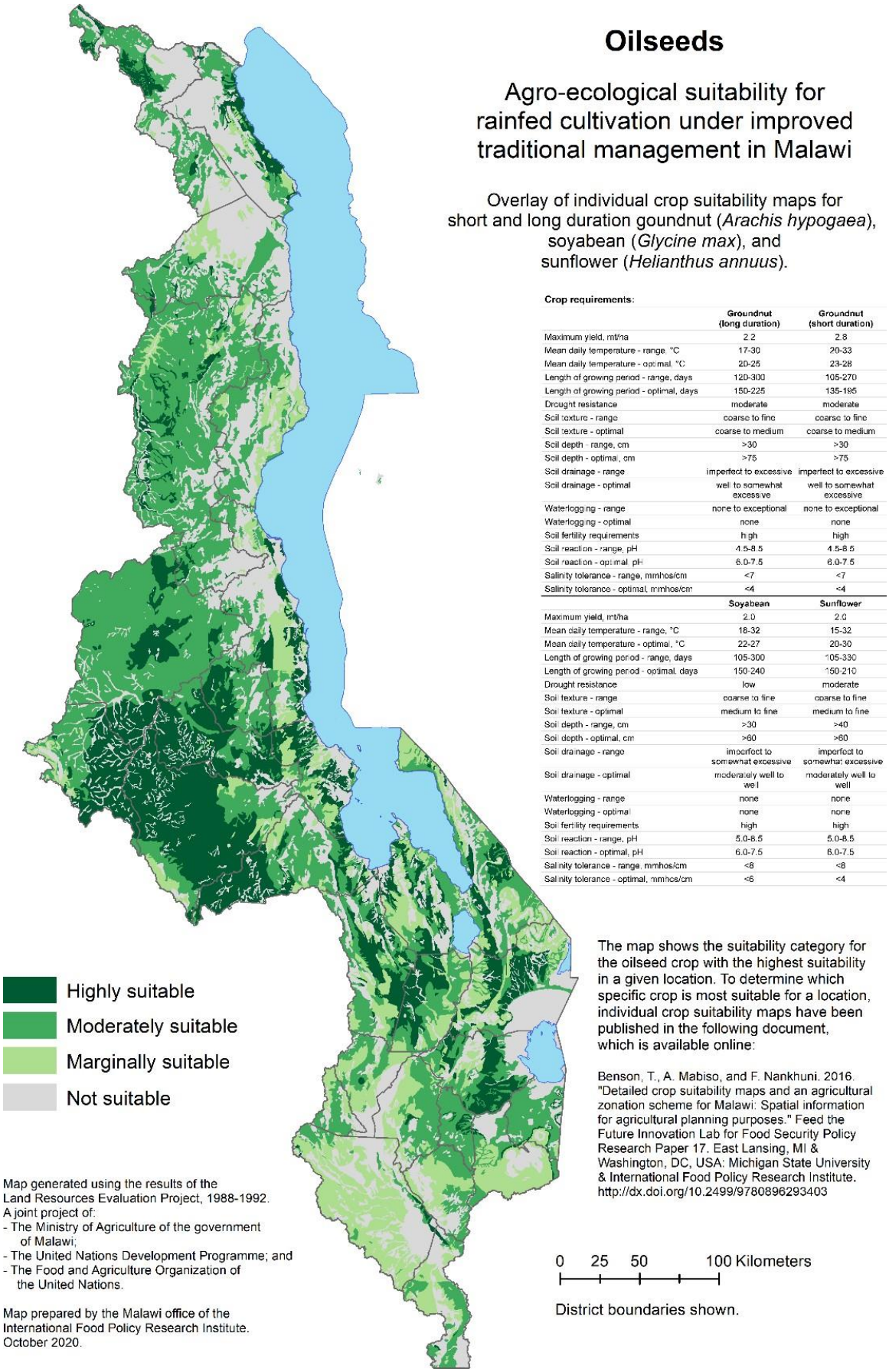
Figure 1 shows an overlay of crop-specific suitability maps for groundnut (both short and long-duration varieties), soyabean, and sunflower, with the value mapped for each land unit being the highest suitability level in a given location for any of the crops considered.[3] Generally we find that these oilseed crops are relatively well suited for production across Malawi.[4] Notably the alluvial areas of the Lower Shire Valley and around Lake Chilwa that are subject to flooding and the Rift Valley escarpments in the transition zones from the Mid-altitude plateau areas to the Lakeshore are the areas where oilseed crops are unlikely to do well.

Given the general agro-ecological suitability of much of the land in Malawi for production of these crops, the principal spatial constraints to smallholder farmers engaging in their commercial production are more likely to be linked to market access and the costs producers would face in order to profitably sell their oilseed.

What households produce oilseed in Malawi?

Analysis of the nationally representative IHS4 survey data shows that about a quarter of all households in Malawi that engage in any crop production produce groundnut, soyabean, or sunflower (Table 2). Groundnut is the most commonly produced oilseed crop, which remains important for own consumption by the households, with over 40 percent of groundnut producers not selling any of their production. In contrast, most producers of soyabean and sunflower sell most of their production. We also see in Table 2 that if a household produces soyabean or sunflower, they tend to dedicate a larger share of their cropland to those crops than is the case for groundnut, suggesting some specialization in production of the two crops.

Figure 1: Crop suitability map for production of oilseeds – groundnut (short and long duration), soyabean, and sunflower – under improved traditional management



Source: Benson, Mabiso, and Nankhuni (2016).

Table 2: Production of oilseed by households that produce any crops, 2016/17

	Oilseed	Groundnut	Soyabean	Sunflower
Produce [crop], % of households engaged in crop agriculture	23.6	15.5	10.2	1.1
If produce [crop], cropped area under [crop], ha	0.25	0.15	0.31	0.37
… cropped area under [crop], % share of total cropped area of producers	28.5	17.4	35.3	34.8
Sold [crop], % of [crop] producers	69.1	57.2	82.2	76.9
If sold any [crop], share of [crop] harvest sold, %	67.0	58.4	76.8	83.9
… sold more than half of crop, % of [crop] sellers	69.0	57.8	81.4	82.7

Source: Author's weighted analysis of 2016-17 Malawi Integrated Household Survey.
Note: Observations (IHS4 survey sample households that engage in crop agriculture): 9,293.

To help understand what sorts of households produce and sell oilseed crops in Malawi, all IHS4 survey sample households were placed into one of four categories based on their level of productivity, location, and the share of their maize production that they sold:

- **Commercially oriented smallholder households** reside in rural areas, are not ultra-poor (based on the solely food-based ultra-poverty line used in the poverty analysis of IHS4), and produce considerably more crop output than they consume within their own households. We focus on their maize output. As no reliable estimate of the net maize sales position of an IHS4 sample household can be computed from the survey data, households are categorized as commercially oriented if they reported selling annually more than 25 percent of the maize that they reported harvesting.
- **Other productive rural households** are economically active rural households that do not sell much, if any, of their maize production. The bulk of Malawian households fall into this category.
- **Not economically productive households** are ultra-poor and the share of household members that are workers (between 15 and 64 years of age) is less than 0.50 – that is, more members of the household are statistically defined as non-workers than as workers.
- **Urban households** are economically productive households residing in urban areas. Thirty percent of such households reported engaging in some farming.

The information on the production and sales of oilseed in general that was presented in Table 2 is disaggregated by household economic category in Table 3. Oilseed is more likely to be produced by commercially oriented smallholder households than those in the other categories. This pattern is seen across all three crops, including groundnut. Although not presented in Table 3, commercially oriented households are between 50 percent (groundnut and soyabean) and 100 percent (sunflower) more likely to produce oilseed crops than are households in the other categories. Given their relatively greater commercial orientation, it is not a surprise to find that such households are also more likely to sell a greater share of the oilseed they produce than are other households.

Table 3: Production of oilseed by households in different economic categories, 2016/17

Characteristic	All households	Commercially oriented smallholder households	Other productive rural households	Not economically productive households	Urban households
Share of households in the population, %	100.0	5.5	66.6	9.2	18.7
Engage in crop agriculture, %	75.8	100.0	84.7	88.9	30.3
Household cropland holding, for those engaged in crop agriculture, ha	0.66	1.01	0.66	0.53	0.54
Oilseed (groundnut, soyabean, sunflower) producing, of those engaged in crop agriculture, %	**23.6**	**36.0**	**24.2**	**16.2**	**16.7**
If produce oilseed, cropped area under oilseed, ha	0.25	0.34	0.25	0.25	0.19
… cropped area under oilseed, % share of total cropped area	28.5	25.7	29.0	29.0	26.4
Sold oilseed, % of oilseed producers	69.1	82.9	68.0	68.1	57.4
If sold any oilseed, share of oilseed harvest sold, %	67.0	70.2	66.4	65.1	71.0
… sold more than half of crop, % of oilseed sellers	69.0	74.9	68.4	63.4	72.1
Observations	*12,447*	*636*	*7,869*	*1,725*	*2,217*

Source: Author's weighted analysis of 2016–17 Malawi Integrated Household Survey.

Potential household and contextual drivers of the production and sale of oilseed in Malawi

These types of tables can only provide limited insights into the household characteristics and contextual factors that are driving the engagement of households in the production and possible sale of oilseed crops. To gain greater insights into these factors, we undertake three logistic regression analyses:

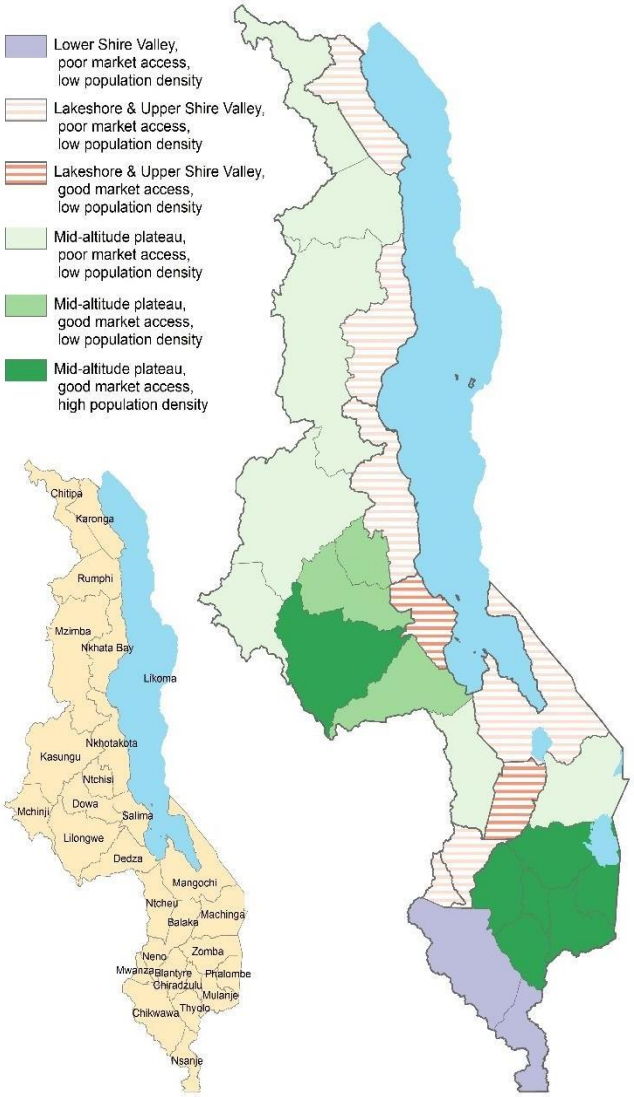
- Using the IHS4 sample of all crop-producing households, the first analysis examines what factors are associated with a household producing any of the three oilseed crops.
- We then examine for the sub-sample of all oilseed producing households in the IHS4, what factors are associated with their selling any of their production.
- Finally, for the sub-sample of households in the IHS4 that sold any of their oilseed production, what factors are associated with those that sold more than half of their production.

We use the same explanatory variables in all three models.[5]

- **Household demographic characteristics** – household size, share of household members that are workers, whether the head is a woman, and the age of the head (less than 35 years, 35 to 64 years (base category), and 65 years or older).
- **Maximum educational attainment within the household** – no education; some primary education (base category), and secondary level or higher.
- **Agricultural production characteristics** – total cropped area for household, whether household hired-in labor, whether household hired-out any of its labor (*ganyu*), and amount of livestock owned.

- **Non-farm livelihoods, credit** – Household member had wage employment, household has a non-farm economic enterprise, and member received a loan in past year.
- **Relative dependence on market for consumption** – The share of maize reported consumed by the household in the past week that was purchased is used as a proxy measure.
- **Agricultural development domains** – All districts of Malawi have been assigned to one of six domains, which reflect variation in agricultural commercialization potential across Malawi (Figure 2). They are defined based on the intersection of three agro-ecological zones – Lower Shire Valley (less than 250 m elevation), Lakeshore (and upper and middle Shire Valley – 250 to 650 m elevation), and Mid-altitude plateau (and highlands – above 650 m elevation); two levels of market access (less than or more than two hours travel time from one of the four major urban centers of Malawi); and two levels of population density (less than or more than 250 persons per sq. km).[6]
- **Household economic category** – Commercially oriented smallholder households; other productive rural households (base category); not economically productive households; and urban households.

Figure 2: Malawi – Agricultural development domains by district



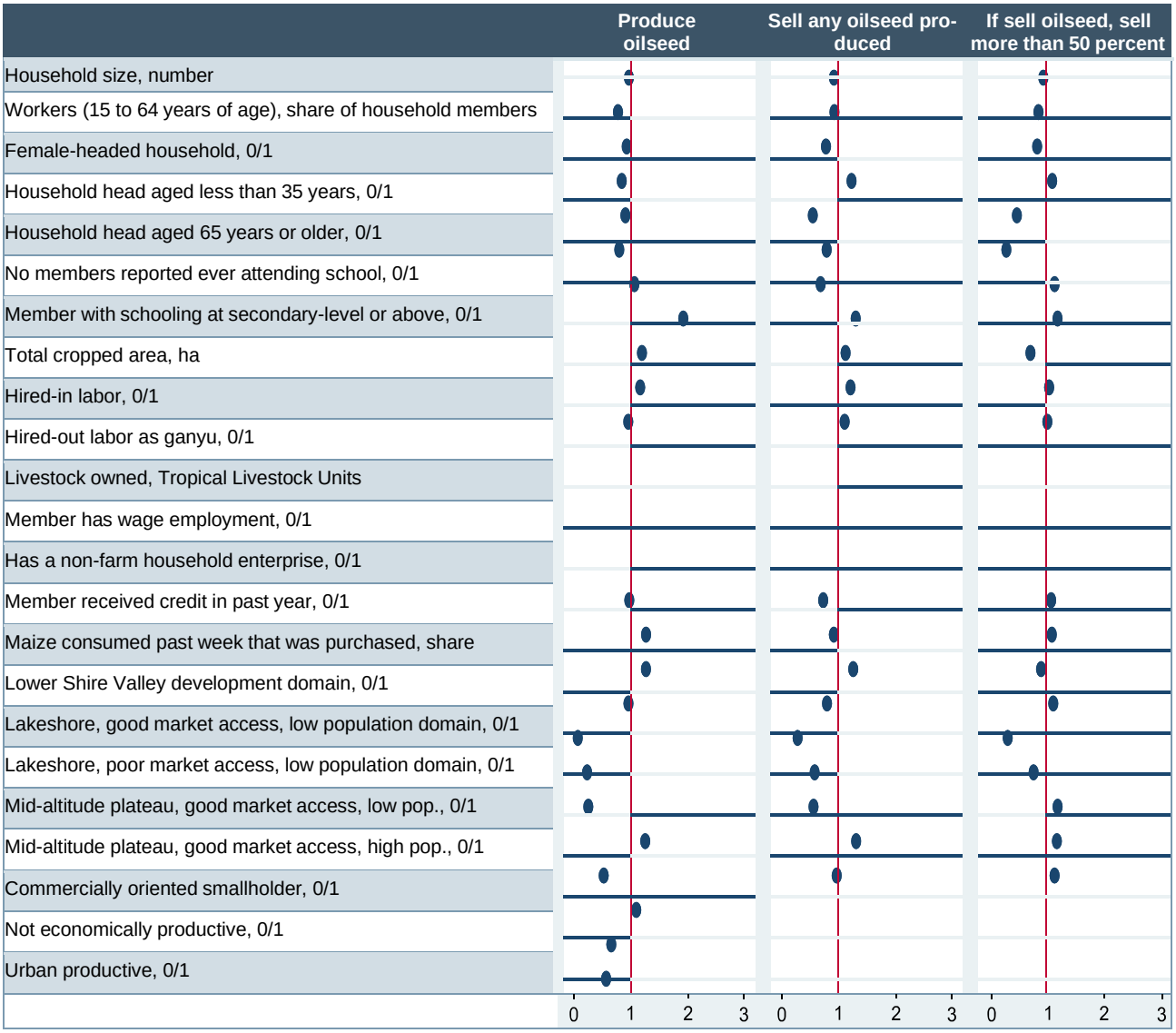
Source: Benson, Mabiso, and Nankhuni (2016).

The results of the three logistic analyses are presented in Figure 3 as plots of the odds-ratio for each explanatory variable together with their 95 percent confidence intervals.[7] Those explanatory variables for which the plot of the 95 percent confidence interval of the odds-ratio does not cross the 1.0 odd-ratio line are statistically significant (at the 5 percent level) determinants of a household engaging in oilseed production, making some sales of the oilseed they produce, or, if they sold any of their oilseed, selling more than 50 percent of their production, respectively.

Some of the key findings by type of explanatory variable are the following:

- **Household demographic characteristics** – Demographic characteristics are not uniformly strong determinants of oilseed production or sales. Only the age of the household head appears to matter – compared to our base category of households with heads aged 35 to 64 years, households with younger heads are less likely to produce oilseed, whereas households with heads aged 65 years and older, while equally likely to produce, are less likely to sell any oilseed. But, if they do sell, they do not sell a large share of their production.

Figure 3: Household and contextual determinants of oilseed production and sales, results of logistic analysis, plots of odds-ratios with 95 percent confidence intervals



Source: Analysis of IHS4 by author.

Note: 'Produce oilseed': Observations: 9,293 households; pseudo-R2: 0.111. 'Sell any oilseed produced': Observations: 2,052; pseudo-R2: 0.046. 'If sell oilseed, sell more than 50 percent': Observations: 1,386; pseudo-R2: 0.031.

Base categorical variables: age of household head – "Household head aged 35 to 64 years, 0/1"; maximum educational attainment within the household – "Member with some primary schooling, 0/1"; agricultural development domain – "Mid-altitude plateau with low population density and poor market access, 0/1"; household economic category – "Other productive rural households, 0/1".

- **Maximum educational attainment within the household** – Education apparently plays no role in oilseed production decisions. However, households with higher levels of education are more likely than other households to not sell any of the oilseed they produced. In contrast, households with no education are as likely as households with primary levels of education to sell groundnut, but significantly less likely to sell more than half of their production.

- **Agricultural production characteristics** – Households with larger areas of cropland are significantly more likely to produce, to sell, and to sell a large share of their oilseed than households with smaller landholdings. This is the strongest and most consistent direct relationship seen across the three analyses. In contrast, the results on use of labor (hiring-in or hiring-out) are inconsistent, and the amount of livestock owned by a household has no bearing on their production or sales of oilseed.

- **Non-farm livelihoods, credit** – Whether a household member has wage employment appears not to affect decisions on production or sales of oilseed by a household. However, households with at least one household enterprise, are more likely to produce oilseed, although not for sale. Closer analysis would be needed to determine if these oilseeds are inputs to some of the enterprises. Households in which a member acquired a loan of some sort in the past year are both more likely to produce oilseed crops and sell them (but not a large share) than households that did not obtain credit.

- **Relative dependence on market for consumption** – Our measure of a household's dependence on the market – the share of maize consumed by the household that was purchased – does not appear to be associated with households deciding either to grow oilseed or to sell any of what they produced.

- **Agricultural development domains** – The results for the six domains suggest that agro-ecological, market access, and landholding factors are important both in determining where oilseeds are produced and where producers are likely to produce it for sale.

  - On the production of oilseeds, our base domain is the 'Mid-altitude plateau with low population density and poor market access'. Only households in the Mid-altitude plateau with low population density but with good market access were more likely than households in the base domain to produce oilseed. Households in the other four domains were significantly less likely to do so. This likely reflects both agro-ecological constraints to production or, in areas with high population density, households having insufficient land to meet their staple food needs, primarily maize, and also produce oilseed.

    Considering Figure 1, which shows large areas along the lakeshore suitable for oilseed, the low likelihood of oilseed production in the two Lakeshore development domains is unexpected. We note that the crop suitability map is based on average agro-climatological conditions and does not consider variability in those conditions. Oilseed production in the Lakeshore domains is riskier than would be indicated by only considering average conditions. In consequence of increased risks of drought or floods, in particular, Lakeshore farmers (and those in the upper Shire Valley) may be less likely to produce groundnut, soyabean, or sunflower than farmers in the Mid-altitude plateau upland areas. However, this pattern requires further study.

  - In terms of oilseed sales, access to market seems to be one key element of what drives oilseed producers to sell some of their output, since households with poor market access are less likely than other households to sell any of the oilseeds they produce. However, this only applies to producers in Lower Shire Valley and the Lakeshore: producers with poor market access in the Mid-altitude plateau zone are as likely to sell some of their oilseed output as producers with good market access in the same agro-ecological zone.

  - We find no development domains in which oilseed-selling households are more likely than those in other domains to sell more than half of their output.

- **Household economic category** – Commercially oriented smallholder households and other productive rural households (our base category) are equally likely to produce oilseed, while those that are not economically productive or reside in urban centers are significantly less likely to do so.

Design or targeting of oilseed value chain strengthening efforts

This analysis suggests that efforts to increase small farmers' production of oilseeds in Malawi should focus on farmers with larger landholdings in the Mid-altitude plateau zone. Land availability appears to be an important consideration in both farmers' decisions to produce oilseeds and how much of this to sell. Labor availability appears not to be as important in such decisions.

While Figure 1 indicates that areas along the Lakeshore (and upper Shire Valley) should be well suited for oilseed production, our household survey results suggest that farmers in those areas are significantly less likely to produce oilseeds than those farming at higher elevations. A better understanding of what drives the reluctance of lakeshore farmers to produce oilseeds is needed.

Finally, at present, education is not an important determinant of whether a household produces or sells oilseeds. Given low yields for all three oilseed crops examined farmers should be encouraged to use more knowledge-intensive techniques to produce these crops. This will require that farmers are better educated, as this will assist them to use such techniques and also to sell their oilseed at a profit. Continuing to improve education levels in Malawi should also contribute to improved overall productivity and an expansion of the oilseed sector.

ENDNOTES

[1]Mellor, J.W. 2017. *Agricultural Development and Economic Transformation: Promoting Growth with Poverty Reduction*. Cham, Switzerland: Palgrave Macmillan.

Haggblade, S., P.B.R. Hazell, and T.A. Reardon. 2007. *Transforming the Rural Nonfarm Economy: Opportunities and Threats in the Developing World*. Baltimore: Johns Hopkins University Press.

[2] Cottonseed is also a potentially important oilseed. However, the IHS4 dataset does not allow one to distinguish the amount or value of production and sales of cotton lint from cottonseed, so cotton is not included in the analysis here.

[3] The Land Resources Evaluation Project (LREP), which ran from 1988 to 1992, was a joint government of Malawi, United Nations Development Programme (UNDP), and Food and Agriculture Organization (FAO) project that involved a close reconnaissance of the agro-ecological resources of Malawi. Extensive field work was done to map the soils across the country at the relatively detailed scale of 1:250,000 (1 cm = 2.5 km). Weather data was analyzed to generate averages for various indicators for use in mapping the agro-climatological zones of Malawi at the same geographic scale.

The soils and agroclimate maps developed were then overlaid to develop a 'land unit' map for Malawi. Each land unit is defined by a unique combination of relatively homogeneous soil and climate properties within its boundaries. These land units were then used with information on the optimal soil and climate conditions for growing a range of rainfed agricultural crops, as well as irrigated rice and tree species, to undertake a spatial suitability analysis for the production of each in each land unit.

For detail on LREP and the crop suitability maps produced by the project, see: Benson, T., A. Mabiso, and F. Nankhuni. 2016. *Detailed crop suitability maps and an agricultural zonation scheme for Malawi: Spatial information for agricultural planning purposes*. Feed the Future Innovation Lab for Food Security Policy Research Paper 17. East Lansing, MI & Washington, DC, USA: Michigan State University & International Food Policy Research Institute. http://dx.doi.org/10.2499/9780896293403

[4] To determine which of the oilseed crops is most suited for production in a particular location, the user will need to consult the individual crop suitability maps in Benson, Mabiso, and Nankhuni (2016). For example, the specific crop accounting for the inland areas of Salima district being judged highly suitable for oilseed production is short-duration groundnut, while for the area that is highly suitable for oilseed production in north central Lilongwe district, it is sunflower.

[5] An exception is that variables on the economic category of the household are only used for the oilseed production analysis. As these categories are defined in part by level of crop sales, they are not used in the sales-related analyses.

[6] See Benson, Mabiso, & Nankhuni 2016 (see endnote 3). Note that the full combination of the three factors theoretically would allow for 12 (3x2x2) different types of development domains. However, Malawi has only six types.

[7] The odds-ratio is the chance of the dependent variable changing from 0 to 1 as a result of a one-unit positive change in the explanatory variable. A statistically insignificant odds-ratio is one – that is, a one-to-one or even chance. Odds-ratios less than one indicate an inverse relationship between the independent and dependent variables, while those greater than one suggest a direct relationship.

ABOUT THE AUTHOR

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