Assessing Alternatives to Tobacco Farming for Smallholders in Malawi

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Executive Summary

This study uses nationally representative data on smallholder farmers in Malawi collected between 2009 and 2019, along with time series data on tobacco prices to consider the profitability of Malawian tobacco and potential alternative crops such as groundnuts, soybeans, pigeon pea and maize. We find that that the percentage of smallholder farmers growing tobacco declined over the past 10 years from 16% in 2009/10 to 5% in 2018/19. This is consistent with a decline in tobacco prices during that time. However, it is important to note that the tobacco price decline occurred after a significant boom in the late 2000's and tobacco prices are still at or above the levels from 15-20 years ago. We find that smallholder households who left tobacco cultivation shifted their land into maize cultivation and to a lesser extent groundnuts and soybean. However, for the 5% of households who remain in tobacco farming, the crop remains very profitable, generating far higher returns to land and labor than do alternatives such as maize and grain legumes (soybean, groundnuts and pigeon pea). The people who remained in tobacco cultivation expanded their area between 2009/10 and 2018/19 by 33% and their average yields increase by nearly 40%. This suggests that the tobacco sub-sector in Malawi may have undergone something of a structural transformation over the past decade, where inefficient producers have left as the price of tobacco declined, while the most efficient producers remained. As such, our policy scenarios clearly indicate that it will be very expensive to induce the remaining 5% of households to move away from tobacco through a combination of taxes on tobacco and subsidies for other crops. Therefore, we suggest that it would be more cost-effective for policy priorities in Malawi to focus on improving value chains for other high value crops rather than directly focusing on moving the remaining 5% of smallholder farmers out of tobacco cultivation.

1. Introduction

Malawi is arguably the world's most tobacco dependent economy. Sales of the crop account for 50% of the nation's total export value, and Malawi is the top producer of burley tobacco alongside Brazil and United States (United Nations, 2017). One of the unique feature of Malawian tobacco is that smallholder farmers with less than a hectare are the main producers, cultivating the crop as their main source of income (Otañez et al., 2007).

Despite the Malawian economy's dependence on tobacco, international donors and health organizations, have long suggested that the Malawian government should help smallholder farmers move out of tobacco. They cite the well-documented negative health risks associated with consuming tobacco. In addition, there is growing evidence to suggest that producing tobacco also poses direct risks to smallholder farmers themselves. For example, Xia & Deininger (2019) found that children in Malawian communities with a higher proportion of tobacco growing households spent more time engaged in casual labor and were less likely to advance to next grade in school compared to children in communities where tobacco cultivation was less prevalent. Additionally, they also found that children aged five to fourteen who worked on tobacco farms were more likely to suffer from green tobacco sickness, which was contracted by touching tobacco leaves. Health threats to tobacco producers and consumers, along with concerns about child labor may justify the need for alternatives to tobacco for Malawian farmers on public health and ethical grounds.

Despite these adverse health effects, farmers likely need a clear profit incentive to move away from tobacco production on their own. Otherwise policy interventions such as taxes and subsidies will be needed to change relative profitability and induce farmers to leave tobacco and move to other crops. Soybean, groundnuts, pigeon pea and more intensive maize cultivation are often advanced as potential alternatives to tobacco.

With these considerations in mind the objective of the present study is to estimate profitability of tobacco and alternative cash crops for Malawian smallholders. We seek to help answer the questions about the extent to which farmers can be expected to move away from tobacco on their own and what incentives are needed to encourage this switch to alternative crops. Specifically, we want to identify the price, cost and productivity scenarios under which alternatives such as soybean, groundnuts, maize, and pigeon pea can rival

tobacco's profitability for farmers. We conduct this analysis using nationally representative cross-sectional and panel datasets of smallholder farm households collected during the 2009/10, 2012/13, 2015/16, and 2018/19 growing seasons. First, we analyze the percentage of farmers that switch in and out of tobacco cultivation over the years, and the demographic characteristics of those who do so. Second, we examine the trends in export price and value of Malawi tobacco over the years. Third, we estimate the cost of production and gross margins for tobacco and potential alternative crops for Malawian smallholders. Finally, we run a set of policy scenarios that adjust observed market conditions to reduce the constraints that would make alternative crops more profitable for smallholders relative to tobacco. Our analysis is intended to provide new farm-level information on the profitability of tobacco and alternative crop cultivation over the past ten years in Malawi. The goal is that this information will help policymakers and donors in Malawi better understand the barriers smallholder farmers face to switch out of tobacco farming and assist in identifying the potential incentives and mechanisms.

2. Data

Throughout this study, we use the Integrated Household Survey (IHS) and Integrated Household Panel Survey (IHPS) datasets for Malawi. Both the datasets were collected by the National Statistical Office of Malawi and supported by the World Bank Living Standards Measurement Study (LSMS). Household-level data such as IHS and IHPS allow us to identify potential heterogeneity in tobacco and alternative crop profitability at the farm level. The cost of production analysis is based on the cross-sectional IHS dataset from 2009/10, 2015/16, and 2018/19 agricultural season. The cross-sectional data is representative of smallholder farm households at both the national and district levels. In order to understand the switching behavior of tobacco cultivating households we use the four waves of IHPS panel dataset for 2009/10, 2012/13, 2015/16, and 2018/19 agricultural season. These panel data are comprised of a sub-set of the households from the larger panel datasets. The panel

Table 1: Sample Size by Survey Wave for IHS and IHPS Datasets.

Dataset	2009/10	2012/13	2015/16	2018/19
IHS	9,945	NA	9,455	8,768
IHPS	892	1,137	1,470	1,804

Table 2. Switching in and out behavior of *tobacco households*.

Households that grew tobacco in at least one of the four survey years	Percent of tobacco growing households
Always growing	16
Dropping	45
Adding	39
Total	100

Source: World Bank Integrated Household Panel Survey. Note: 20% of the households grew tobacco in at least one of four survey waves, these are defined as tobacco growing households; Always growing = household grew tobacco in all four seasons (2009/10, 2012/13, 2015/16, 2018/19); Dropping = household grew tobacco in 2009/10 and dropped it in a later season; Adding = household did not grow tobacco in 2009/10 and added it in a later season

households were tracked overtime, and households who split into multiple households were all also tracked. This makes the panel data extremely useful for measuring household-level changes in production and other decisions over time.

Table 1 shows the sample size across waves for IHS and IHPS datasets. The IHS cross-sectional dataset interviewed 9,945 unique households in 2009/10, 9,455 in 2015/16 and 8,768 in 2018/19. The IHPS panel dataset interviewed 892 households in 2009/10, 1,137 in 2012/13, 1470 in 2015/16 and 1,804 in 2018/19. These households were tracked and resurveyed over time. The number of households in the second, third, and fourth wave of the IHPS dataset are higher than the first wave as some of the original household split over the years, but these split-off households were also tracked over time. Population density data used in this study is collected from Global High-Resolution Population Denominators Project. The data on Malawian tobacco exports are collected from Tobacco Control Commission (TCC).

3. Switching in and out of Tobacco Growing

In our sample, 20% of the farming households grew tobacco in at least one of the four survey years in the IHPS dataset. We refer to these households as tobacco growing households. Table 2 shows the switching in and out behavior of the tobacco growing households. We found that just 16% of them cultivated tobacco in all the four survey waves. Additionally, 45% of tobacco growing households dropped tobacco cultivation after 2009/10. Conversely, 39%

Table 3: Characteristics of Always growing households and Dropping households in first survey wave 2009/10.

	(1)	(2)	(3)
	Always growing	Dropping	Difference (1) - (2)
Household size	6.17	5.26	0.913*
	(2.389)	(2.297)	(2.31)
Total adults in HH	3.23	2.61	0.620***
	(1.237)	(1.196)	(3.03)
HH Head age (years)	45.74	40.14	5.608*
	(14.97)	(13.12)	(2.42)
Female HH head = 1	0.11	0.06	0.0458
	(0.312)	(0.240)	(1.04)
HH head has some education = 1	0.23	0.19	0.0446
	(0.428)	(0.393)	(0.65)
Value of durable goods assets ('000 MWK)	254.57	71.63	182.9
	(758.7)	(127.4)	(2.68)
Death of HH member = 1	0.02	0.07	-0.0469
	(0.146)	(0.253)	(-1.20)
Land owned (ha)	1.29	0.90	0.392*
	(1.189)	(0.629)	(2.84)
Herfindahl Diversity Index	0.42	0.44	-0.0175
	(0.135)	(0.122)	(-0.82)
Maize price (MWK/kg)	90.23	98.85	-8.625
	(11.36)	(48.94)	(-1.19)
Tobacco price (MWK/kg)	984.33	862.56	121.8
	(498.9)	(450.3)	(1.55)
Groundnut price (MWK/kg)	186.23	192.62	-6.387
	(55.91)	(68.20)	(-0.58)
Soybean price (MWK/kg)	137.66	141.15	-3.489
	(15.16)	(18.27)	(-1.17)
Pigeon Pea price (MWK/kg)	241.47	239.73	1.745
	(8.259)	(20.00)	(0.58)
Fertilizer price (MWK/kg)	424.38	4543.63	-4119.2
	(252.5)	(28104.3)	(-1.00)
HH borrowed on credit = 1	0.15	0.14	0.0126
	(0.360)	(0.344)	(0.21)
Land cultivated (ha)	1.63	1.07	0.560***
	(1.081)	(0.667)	(4.14)
Land rented for cultivation (ha)	0.30	0.23	0.0706
	(0.883)	(0.625)	(0.59)

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Table 3: Continued

	(1)	(2)	(3)
	Always growing	Dropping	Difference (1) - (2)
Hired labor (days)	14.64	9.76	4.881
	(32.66)	(26.95)	(1.01)
Maize land share	0.45	0.48	-0.0336
	(0.170)	(0.179)	(-1.12)
Tobacco land share	0.32	0.30	0.0180
	(0.174)	(0.164)	(0.64)
Groundnut Land share	0.13	0.11	0.0162
	(0.144)	(0.141)	(0.67)
Soybean Land Share	0.02	0.01	0.00794
	(0.0559)	(0.0424)	(1.01)
Pigeon pea Land Share	0.04	0.03	0.00450
	(0.110)	(0.0906)	(0.28)
Ganyu income (MWK)	16521.54	29691.06	-13169.5
	(45270.0)	(124449.9)	(-0.71)
Population density (Persons/sq.km)	279.56	226.80	52.76
	(528.0)	(110.6)	(1.09)
Distance to ADMARC (km)	6.48	6.47	0.0176
	(3.603)	(4.051)	(0.03)
Distance to Auction floor (km)	62.76	72.42	-9.655
	(36.19)	(47.65)	(-1.26)
Distance to border post (km)	33.56	33.24	0.310
	(16.58)	(14.95)	(0.12)
Distance to weekly market (km)	3.19	3.09	0.103
	(4.292)	(4.280)	(0.14)
Community has irrigation scheme = 1	0.06	0.09	-0.0271
	(0.247)	(0.289)	(-0.57)
Annual Mean Temperature (Deg C * 10)	206.24	210.78	-4.546*
	(11.55)	(13.67)	(-2.04)
Annual Precipitation (mm)	932.43	986.36	-53.93
	(144.0)	(176.9)	(-1.88)
Observations	47	132	179

Source: World Bank Integrated Household Panel Survey data. Note: All calculations in 2019 MWK. Column (1) represents the baseline characteristics of households that cultivated tobacco in all four waves. Column (2) represents the baseline characteristics of households that cultivated tobacco in baseline (i.e., 2009/10) but dropped it at least one of the later waves. The t-test significance indicators for continuous variables were based on their inverse hyperbolic transformed (IHST) values. IHST values were used due to the skewed nature of underlying distributions.

of tobacco growing households who did not grow tobacco in the first survey wave of 2009/10 added it in one or more of the subsequent survey rounds.

This suggest that there is i) movement into and out of tobacco cultivation depending on market and growing conditions, and most people are not attached to growing tobacco regardless of these conditions; ii) a larger share of households are dropping tobacco cultivation compared to those adding tobacco.

Table 3 presents the comparison of characteristics between always growing households who grew tobacco in each of the four survey rounds and dropping households who grew tobacco during the 2009/19 season but subsequently stopped cultivating it. The table shows that the two groups were statistically different from each other in 2009/10 on average in several observable ways . The always growing households had a significantly higher number of members on average at 6.17 compared to 5.26 for the dropping households. Specifically, the always growing households had 3.23 adult members on average in 2009/10 compared to 2.61 for the dropping households. Older household heads were more likely to always grow tobacco, while younger household head were more likely to drop tobacco. There is also evidence that those who always grew tobacco had 0.39 hectares more land than those who dropped tobacco after 2009/10 (a 43% difference). The same difference is true for land cultivated in 2009/10 between always growing tobacco households and those who dropped the crop after 2009/10. The former group cultivated 1.63 ha on average while the latter cultivated 1.07 ha on average in 2009/10. Finally, there is some evidence to suggest that those who always grew tobacco lived in climates that were about 0.5 degrees cooler on average in 2009/10 than those who dropped tobacco. All of these descriptive results suggest that land, and labor constraints are associated with people dropping tobacco and agro-climatic conditions play some role as well. This is reflective of the land, labor and environmental requirements to grow tobacco consistently over time.

Table 4 addresses the issue of what happens to tobacco land after people stop growing the crop. It is interesting to note that on average, maize received the highest share of land that was reallocated away from tobacco in all three years. Legume crops such as groundnuts, common beans, soybeans and pigeon pea all received an increase in land that was re-allocated to maize, but the increase was smaller than for maize. Another finding that

Table 4: Share of land cultivated for various crops amongst households that grow and those that stop growing tobacco

	2012/13			2015/16			2018/19		
	HHs that stopped growing tob. in 2012/13 but grew it in 2009/10	HHs that grew tob. in 2012/13	(1) - (2)	HHs that stopped growing tob. in 2015/16 but grew it in 2012/13	HHs that grew tob. in 2015/16	(4) - (5)	HHs that stopped growing tob. in 2018/19 but grew it in 2015/16	HHs that grew tob. in 2018/19	(7) - (8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	--Share of land cultivated--			--Share of land cultivated--			--Share of land cultivated--		
TOBACCO	0%	25%	-25%	0%	33%	-33%	0%	31%	-31%
MAIZE	57%	39%	19%	72%	46%	26%	49%	35%	14%
GROUNDNUT	18%	11%	7%	7%	6%	1%	13%	7%	5%
COMMON BEANS	3%	4%	-1%	2%	2%	0%	6%	0%	2%
SOYABEAN	4%	4%	1%	5%	4%	2%	9%	6%	3%
PIGEONPEA	6%	6%	0%	5%	2%	2%	5%	5%	-1%
NKHWANI	2%	6%	-3%	4%	3%	0%	14%	8%	6%
RICE	0%	0%	0%	0%	0%	0%	0%	0%	0%
GROUND BEAN	0%	0%	0%	0%	0%	0%	0%	0%	0%
SWEET POTATO	1%	0%	0%	1%	1%	0%	1%	1%	0%
IRISH POTATO	1%	0%	0%	0%	0%	0%	0%	1%	0%
FINGER MILLET	0%	0%	0%	0%	0%	0%	0%	0%	0%
SORGHUM	1%	2%	0%	2%	2%	1%	1%	1%	0%
PEARL MILLET	0%	0%	0%	0%	0%	0%	0%	0%	0%
COTTON	2%	0%	1%	1%	0%	1%	0%	0%	0%
SUNFLOWER	1%	0%	0%	0%	0%	0%	0%	0%	0%
SUGAR CANE	0%	0%	0%	0%	0%	0%	0%	0%	0%
CABBAGE	0%	0%	0%	0%	0%	0%	0%	0%	0%
TANAPOSI	0%	0%	0%	0%	0%	0%	0%	0%	0%
THERERE/OKRA	0%	0%	0%	0%	0%	0%	0%	0%	0%
TOMATO	0%	0%	0%	0%	0%	0%	0%	0%	0%
ONION	0%	0%	0%	0%	0%	0%	0%	0%	0%
PEAS	2%	1%	0%	0%	0%	0%	0%	0%	0%
PAPRIKA	0%	0%	0%	0%	0%	0%	0%	0%	0%

Source: World Bank Integrated Household Panel Survey

Table 5: Percentage of households that did not participate in crop cultivation.

	2012/13	2015/16	2018/19	2018/19
	HHs that stopped growing tob. in 2012/13 but grew it in 2009/10	HHs that stopped growing tob. in 2015/16 but grew it in 2012/13	HHs that stopped growing tob. in 2018/19 but grew it in 2015/16	HHs that grew tob. in all four survey years.
No. of households	126	115	158	53
(i) % of HHs that did not grow crops	10	16	16	0
% of (i) that practiced livestock farming	33	28	23	92
% of (i) that ran household enterprise	33	44	31	34
% of (i) with at least one member working as an employee	50	39	46	9
% of (i) with at least one member engaged in casual labor (ganyu)	50	72	62	60

Source: World Bank Integrated Household Panel Survey

bears more exploration is the rapid increase in share of area planted to the vegetable Nkhwani over time for both tobacco growing households and those who left tobacco. This has implications for both household nutrition, income and food security.

Table 5 indicates that in 2013 about 10% of households who stopped growing tobacco exited crop cultivation altogether, while 16% did so in 2016 and another 16% did so in 2019. The table further shows what these households who exited tobacco did for a living in those years. Majority of these households, who stopped growing tobacco and other crops, had at least one member engaged in ganyu (casual labor) or worked as an employee. About one-third of these households ran a household enterprise and one-fourth practiced livestock farming. This suggests a mixed picture of the outcomes for those who stopped growing tobacco and left crop cultivation altogether. A positive sign of economic transformation could be seen in the fact that a significant number of people formerly growing tobacco are now engaged in businesses or works as employees in other activities. However, the fact that the most common occupation for those who left tobacco and crop cultivation altogether was to

Table 6: Characteristics of households that stop growing tobacco and households that grow tobacco.

	2012/13			2015/16			2018/19		
	HHs that stopped growing tob. in 2012/13 but grew it in 2009/10	HHs that grew tob. in 2012/13	(1) - (2)	HHs that stopped growing tob. in 2015/16 but grew it in 2012/13	HHs that grew tob. in 2015/16	(4) - (5)	HHs that stopped growing tob. in 2018/19 but grew it in 2015/16	HHs that grew tob. in 2018/19	(7) - (8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Household size	4.88	5.69	-0.813**	4.82	5.39	-0.566*	4.28	5.44	-1.153***
	(2.062)	(2.374)	(-3.05)	(2.351)	(2.443)	(-1.98)	(2.041)	(2.276)	(-4.94)
Total adults in HH	2.64	3.22	-0.581***	3.00	3.20	-0.203	2.66	3.23	-0.571***
	(1.110)	(1.365)	(-3.87)	(1.499)	(1.559)	(-1.11)	(1.276)	(1.407)	(-3.94)
HH Head age (years)	38.42	44.00	-5.576***	41.16	44.07	-2.917*	38.65	44.97	-6.323***
	(13.81)	(14.43)	(-3.31)	(15.32)	(14.55)	(-1.65)	(14.69)	(14.06)	(-4.10)
Female HH head (yes= 1)	0.12	0.07	0.0525	0.18	0.12	0.0578	0.15	0.13	0.0269
	(0.326)	(0.252)	(1.54)	(0.382)	(0.323)	(1.40)	(0.360)	(0.332)	(0.73)
HH head has some education (yes= 1)	0.22	0.23	-0.0110	0.21	0.25	-0.0355	0.41	0.32	0.0937
	(0.413)	(0.420)	(-0.22)	(0.409)	(0.432)	(-0.70)	(0.494)	(0.467)	(1.82)
Value of durable goods assets ('000 MWK)	81.71	233.97	-152.3*	272.55	171.13	101.4***	106.76	242.70	-135.9***
	(147.0)	(937.7)	(-1.80)	(1115.0)	(452.3)	(1.10)	(375.3)	(866.3)	(-1.84)
Death of HH member (yes= 1)	0.07	0.07	-0.00162	0.26	0.14	0.124**	0.11	0.11	-0.00178
	(0.260)	(0.262)	(-0.05)	(0.442)	(0.347)	(2.71)	(0.311)	(0.313)	(-0.05)
Land owned (ha)	0.65	1.06	-0.410***	0.45	0.83	-0.374***	0.36	0.78	-0.423***
	(0.628)	(0.786)	(-4.78)	(0.802)	(0.912)	(-3.61)	(0.510)	(0.887)	(-5.32)
Herfindahl Diversity Index	0.51	0.38	0.136***	0.58	0.46	0.123***	0.41	0.38	0.0224
	(0.271)	(0.140)	(5.51)	(0.338)	(0.155)	(4.30)	(0.258)	(0.167)	(0.98)
Maize price (MWK/kg)	204.35	209.80	-5.443	254.29	250.13	4.158	32.20	33.20	-0.997
	(33.44)	(30.91)	(-1.43)	(27.84)	(35.49)	(1.07)	134.76	138.94	-4.172

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Tobacco price (MWK/kg)	970.80	1167.83	-197.0	536.45	631.60	-95.16	(32.59)	(34.43)	(-1.16)
	(213.8)	(615.3)	(-3.42)	(148.0)	(404.2)	(-2.42)	543.46	574.89	-31.43
Groundnut price (MWK/kg)	269.79	273.46	-3.678	352.01	343.11	8.900	(188.4)	(326.7)	(-1.07)
	(43.94)	(58.73)	(-0.59)	(106.6)	(109.9)	(0.69)	178.52	177.74	0.786
Soybean price (MWK/kg)	301.37	313.32	-11.95	357.46	370.79	-13.33	(49.96)	(54.69)	(0.14)
	(51.48)	(76.56)	(-1.50)	(78.51)	(113.7)	(-1.10)	201.73	195.42	6.316
Pigeon Pea price (MWK/kg)	246.28	248.69	-2.412	483.64	490.97	-7.333	(39.03)	(34.69)	(1.60)
	(19.13)	(25.87)	(-0.88)	(56.50)	(61.82)	(-1.03)	245.56	252.29	-6.736
Fertilizer price (MWK/kg)	831.45	15546.30	-14714.9	483.47	493.36	-9.886	(32.29)	(38.00)	(-1.76)
	(2659.5)	(93729.2)	(-1.75)	(106.5)	(147.4)	(-0.62)	403.12	388.95	14.17
HH borrowed on credit = 1	0.13	0.22	-0.0929*	0.23	0.30	-0.0767	(120.4)	(125.7)	(1.07)
	(0.335)	(0.416)	(-2.04)	(0.421)	(0.462)	(-1.45)	(0.446)	(0.469)	(-1.03)
Land cultivated (ha)	0.76	1.36	-0.608***	0.77	1.29	-0.519***	0.61	1.35	-0.734***
	(0.597)	(0.783)	(-7.22)	(0.688)	(0.777)	(-5.87)	(0.533)	(0.906)	(-8.98)
Maize land share	0.57	0.39	0.187***	0.72	0.46	0.258***	0.49	0.35	0.138***
	(0.262)	(0.193)	(6.84)	(0.262)	(0.205)	(9.12)	(0.233)	(0.190)	(5.84)
Tobacco land share	0.00	0.25	-0.248***	0.00	0.33	-0.334***	0.00	0.31	-0.308***
	(0)	(0.179)	(-14.84)	(0)	(0.212)	(-15.51)	(0)	(0.219)	(-16.14)
Groundnut Land share	0.18	0.11	0.0657**	0.07	0.06	0.00715	0.13	0.07	0.0550***
	(0.220)	(0.134)	(3.08)	(0.164)	(0.111)	(0.43)	(0.177)	(0.109)	(3.45)
Soybean Land Share	0.04	0.04	0.00661	0.05	0.04	0.0167	0.09	0.06	0.0348
	(0.106)	(0.0812)	(0.59)	(0.138)	(0.103)	(1.15)	(0.206)	(0.116)	(1.94)
Pigeon pea Land Share	0.06	0.06	0.00223	0.05	0.02	0.0232	0.05	0.05	-0.00564
	(0.147)	(0.139)	(0.13)	(0.129)	(0.0709)	(1.96)	(0.120)	(0.112)	(-0.43)
Ganyu income (MWK)	60,735.58	53,678.65	7056.9	96,126.48	124,177.6	-28051.1	191,281.6	116,072.1	75209.5
	(150393.5)	(157217.5)	(0.38)	(164241.4)	(433201.9)	(-0.66)	(580877.3)	(224465.1)	(1.65)
Distance to ADMARC (km)	5.94	7.50	-1.559***	8.22	6.33	1.888**	6.13	6.24	-0.112
	(3.964)	(4.051)	(-3.27)	(4.682)	(3.784)	(3.83)	(4.830)	(4.523)	(-0.22)
Observations	125	163	288	114	187	301	158	192	350

Source: World Bank Integrated Household Panel Survey data. Note: All calculations in 2019 MWK. The t-test significance indicators for continuous variables were based on their inverse hyperbolic transformed (IHST) values. IHST values were used due to the skewed nature of underlying distributions

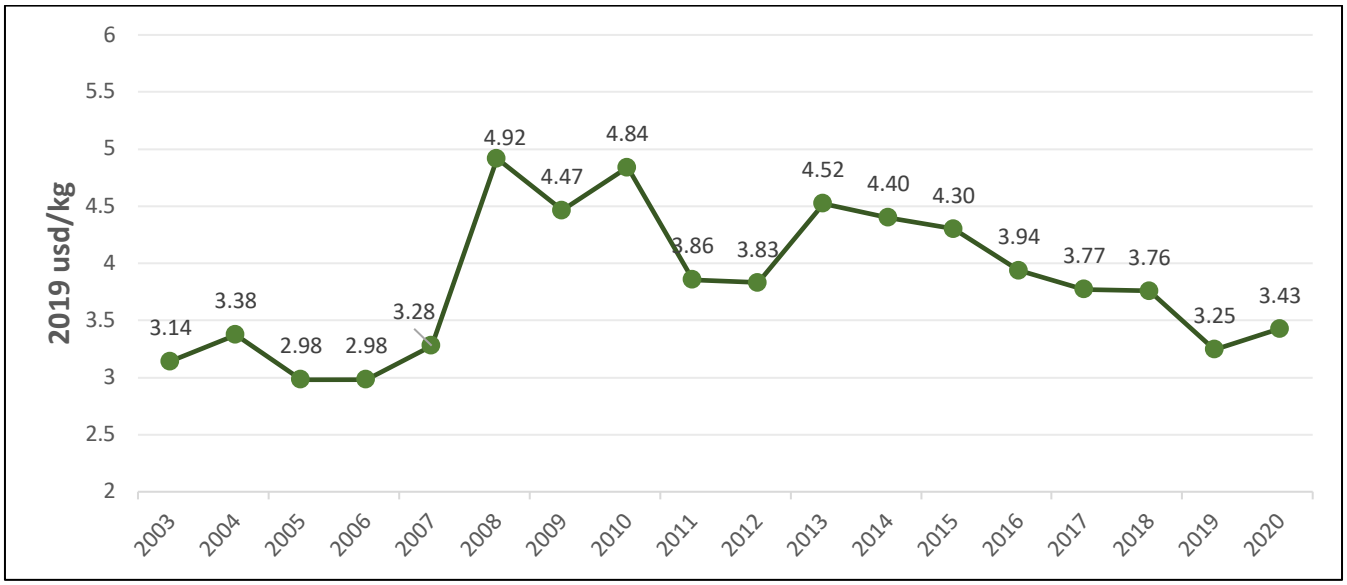
work as a ganyu laborer on another farm, raises questions about the well-being of these households as ganyu is generally considered an income source of last resort (Alwang & Siegel, 1999; Ricker-Gilbert et al., 2014).

Table 6 provides an ex-post comparison of the characteristics of households that stopped growing tobacco and households that grew tobacco. The results from table 6 indicate that households that stop growing tobacco dedicate a greater share of their land to maize and ground nut compared to the households that grew tobacco. Furthermore, table 6 echoes the ex-ante characteristic comparison presented in table 3 demonstrating the land, and labor constraints associated with households leaving tobacco cultivation.

4. Price trends for tobacco and alternatives over time

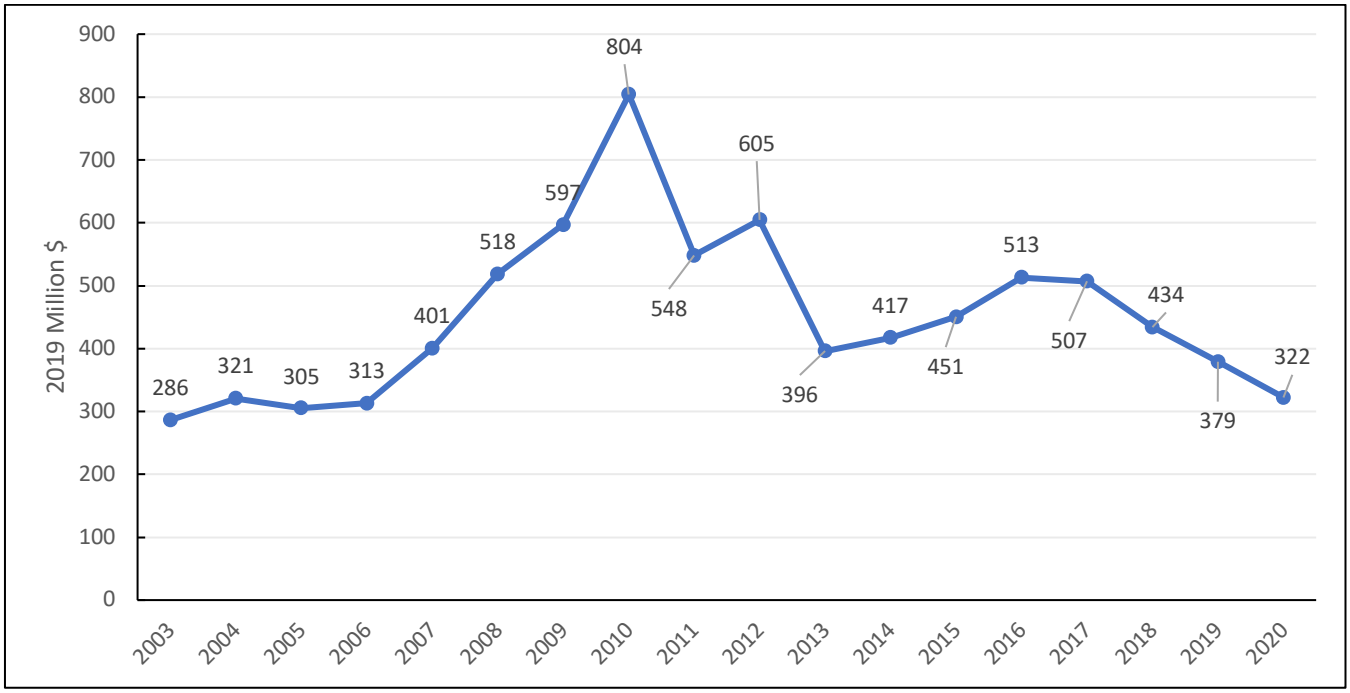
Figure 1 shows the real export price of Malawian tobacco in 2019 US Dollar per kg. The real export price of Malawian tobacco hovered around USD 3.00 per kilogram from 2003 to 2006 when it increased tremendously to nearly USD 5.00 per kilogram during the global commodity boom of the late 2000's. The prices since 2010 have experienced relative declines back towards their levels in the early 2000's, but still remain equal to or higher than average prices 15-20 years ago.

Figure 1: Real price for tobacco exported from Malawi to World market in 2019 US $ per kg



Source: Tobacco Control Commission. Note: Real prices generated by deflating with US CPI values from World Bank data for CPTOTSAXN indicator

Figure 2: Real Gross Export Value for Malawian Tobacco in 2019 Kwacha



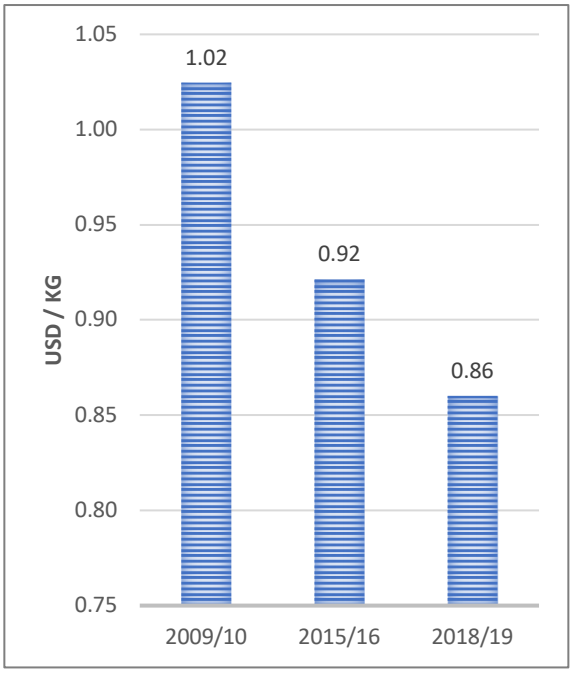
Source: Tobacco Control Commission. Note: Real prices generated by deflating with US CPI values from World Bank data for CPTOTSAXN indicator.

Figure 2 shows the gross export value of Tobacco exported from Malawi to world market in 2019 Malawi Kwacha. We found that the gross export value in 2020 had declined by 60% since 2010. However, the recent declining tobacco export values are still above their value in early 2000's. The trend in export value over the past 20 years is very similar to the trend in tobacco prices during that time period, as seen earlier in Figure 1.

Figure 3 shows the trends in real average farmgate tobacco prices received by smallholder over three seasons in 2019 US $ per kilogram from the IHS dataset. Almost all of the smallholders in the sample who grew tobacco grew the burley variety rather than flue cured. Average farmgate tobacco prices decreased between 2009/10 and 2018/19. This is consistent with the trend in tobacco prices and export values between 2010 and 2019 as seen in Figure 1 and Figure 2, suggesting a decline in tobacco over the past decade.

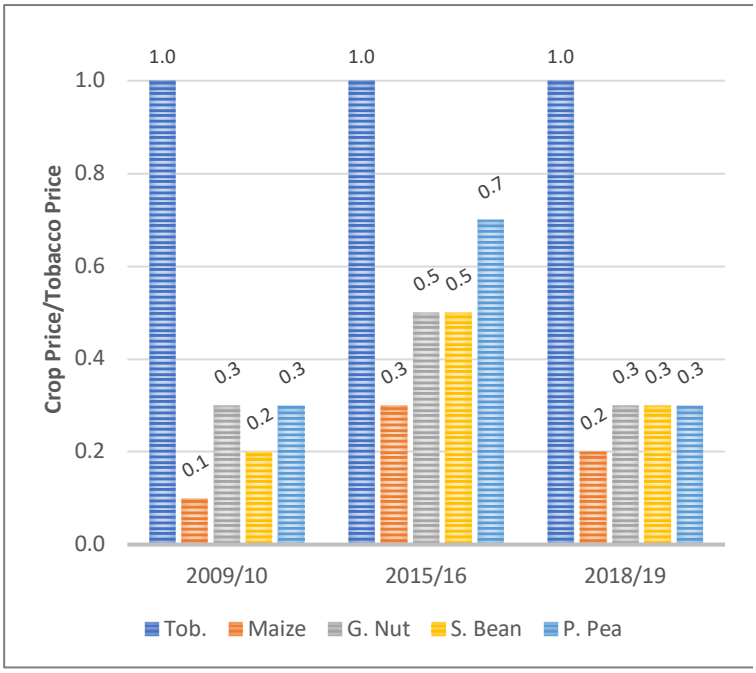
While the trend in farm gate tobacco prices is informative, in order to understand farmers decision-making processes tobacco prices should be compared to those of other crops. Figure 4 shows the ratio of average farmgate prices of alternative crops (maize, groundnut, soybean and pigeon pea) relative to tobacco using the IHS datasets. Results show that in

Figure 3: Real Average farmgate tobacco prices in 2019 US $ per kg



Source: World Bank IHS data

Figure 4: Real output farmgate price ratios (crop price / tobacco price) in 2019 Kwacha



Source: World Bank IHS data

2009/10 all four alternative crops were priced between 10-30% of tobacco on a per kg basis. The relative price ratios for alternative crops improved relative to tobacco in 2015/16 at 30% for maize, 50% for groundnut, 50% for soybean and 70% for pigeon pea. This likely reflected higher prices for these food crops during a drought year. Regardless it is important to note that tobacco prices and yields still remained higher even under these less favorable conditions. In 2018/19 the relative price ratios dropped back to 20% for maize, 30% for soybean and groundnut and 30% for pigeon pea compared to tobacco.

5. Cost of production and returns to tobacco and alternative crops.

Table 7 shows descriptive results from the IHS repeated cross sectional data on the number and percentages of households growing tobacco in Malawi and the changes in area under cultivation, total output and yields. This table reveals some very important information. First, in row iv) we see that the percentage of households growing tobacco nationally declined from 15% in 2009/10 to 6% in 2015/16 and to 5% 2018/19. As such the area under tobacco in row v) declined from 147,000 hectares in 2009/10 to 82,000 hectares in 2015/16 but rose to 92,000 hectares in 2018/19.

Table 7: Tobacco participation and production by smallholders over time

	2009/10	2015/16	2018/19
i) Number of households growing tobacco	1,335	561	440
ii) Estimated number of smallholders growing tobacco (weighted)	368,038	183,774	174,370
iii) Total number of households (weighted)	2,515,879	2,900,000	3,236,919
iv) Percent of households growing tobacco (weighted)	15%	6%	5%
v) Estimated total area under tobacco in '000 ha (weighted)	147	82	92
vi) Estimated total tobacco output in '000 tons (weighted)	130	100	120
vii) Average Area under tobacco if cultivating (ha)	0.40	0.45	0.53
viii) Yields (kg/ha) (mean)	984	1,281	1,372

Source: World Bank Integrated Household Survey

However, despite the decline in participation rates and total acreage over time, tobacco output in row vi) only declined from 130,000 tons in 2009/10 to 100,000 tons in 2015/16 and rose back up to 120,000 tons 2018/19. It is also interesting to note that the average area under tobacco for those who grew tobacco increased consistently from 0.40 hectares in 2009/10 to 0.53 hectares in 2018/19, a 33% increase. At the same time average tobacco yields for those who grew tobacco increased consistently for those who grew tobacco over time, from 984 kilograms/hectare in 2009/10, to 1,281 kilograms/hectare in 2015/16, to 1,372 kilograms/hectare in 2018/19, nearly a 40% increase in yields.

The fact that participation rates in tobacco dropped substantially overtime, and total tobacco area cultivated dropped, while at the same time area cultivated and yields increased for those who remained in tobacco cultivation suggests that the remaining 5% of the smallholder population that grew tobacco in 2018/19 were the most efficient producers of the crop. They were able to increase yields between 2009/10 and 2015/16 even though the latter year was a drought year. This is important to consider when estimating cost of production for tobacco and other crops, based on the information provided by households in the IHS dataset.

Table 8 presents estimates of the relative returns to land, labor through corresponding cost and profitability build-ups for tobacco, maize, groundnuts, soybeans, and pigeon pea in 2009/10, 2015/16 and 2018/19. While the first row of table 8 show that the percentage of smallholders cultivating tobacco declined over time, it also clearly shows that the percentage of smallholders cultivating groundnut fluctuated across seasons. The percentage of farmers growing groundnuts declined between 2009/10 and 2015/16 and increased between

Table 8: Cost of Production: Mean return to labor, land and corresponding cost build up

	2009/10					2015/16					2018/19				
	Tob.	Maize	G. Nut	S. Bean	P. Pea	Tob.	Maize	G. Nut	S. Bean	P. Pea	Tob.	Maize	G. Nut	S. Bean	P. Pea
Percent of hhs growing crop	15	95	26	5	21	6	92	15	10	22	5	93	27	16	29
Area (ha)	0.4	0.43	0.25	0.26	0.2	0.45	0.35	0.27	0.28	0.14	0.53	0.29	0.25	0.29	0.13
Est. total area (000's ha)	147	1,022	162	36	106	82	924	120	81	86	92	883	212	146	119
Revenue															
Yield (kg/ha)	984	1959	743	749	613	1281	1841	943	849	668	1372	2198	1060	995	837
Total Output (kg)	351	662	155	167	99	567	515	228	219	74	697	526	216	258	82
Est. total output (mill. tons)	0.13	1.59	0.1	0.02	0.05	0.1	1.38	0.1	0.06	0.05	0.12	1.58	0.19	0.13	0.08
Gross Revenue (000's MWK/ha)	**726**	**218**	**161**	**109**	**139**	**949**	**409**	**327**	**285**	**304**	**935**	**322**	**223**	**197**	**178**
Costs (000's MWK/ha)															
Seed	0.5	3.9	2.7	1.2	1.8	5.4	11.3	10.2	7.4	7.1	15.2	11.1	9.3	6.4	4.0
Seed Transport	0.1	0.1	0.1	0.0	0.0	0.3	0.3	0.2	0.0	0.1	0.9	0.4	0.2	0.2	0.1
Fertilizer	49.5	13.5	2.4	2.8	10.4	109.1	27.6	5.2	8.4	20.8	114.9	25.2	5.0	7.6	21.6
Fertilizer Transport	1.1	0.5	0.1	0.1	0.4	2.1	0.7	0.1	0.1	0.5	2.8	0.9	0.1	0.2	0.7
Hired Labor	4.3	3.6	3.4	2.6	4.0	10.6	5.9	8.0	6.4	4.9	22.2	6.4	6.8	6.6	6.1
Transport to buyer	30.5	0.0	0.2	0.5	0.1	27.8	0.0	0.8	0.6	0.0	24.0	0.0	0.5	0.6	0.0
Land	26.7	22.2	24.1	26.9	25.8	33.4	33.8	29.7	29.4	35.3	31.1	35.1	29.3	30.0	35.4
HH labor	281.1	174.7	199.1	191.7	182.9	350.4	231.3	264.2	228.5	250.0	397.6	288.5	350.4	276.6	331.7
Total costs excl' land	**367.0**	**196.3**	**208.0**	**198.9**	**199.5**	**505.9**	**277.1**	**288.8**	**251.4**	**283.4**	**577.6**	**332.5**	**372.3**	**298.1**	**364.3**
Total costs excl' hh labor	**112.6**	**43.8**	**33.1**	**34.1**	**42.4**	**188.8**	**79.6**	**54.3**	**52.4**	**68.7**	**211.1**	**79.1**	**51.2**	**51.5**	**67.9**
HH labor days (days/ha)	316	194	236	218	219	333	215	247	210	262	272	223	253	203	280
Returns to land (000's MWK/ha)	**359.3**	**22.0**	**-47.1**	**-90.3**	**-60.4**	**443.4**	**131.6**	**38.4**	**33.1**	**20.9**	**357.1**	**-10.9**	**-149.0**	**-100.6**	**-186.6**
Return to labor (000's MWK/day)	**5.0**	**1.7**	**1.1**	**0.6**	**0.5**	**5.6**	**3.7**	**2.1**	**2.3**	**1.8**	**8.7**	**2.2**	**1.4**	**1.4**	**0.5**

Source: World Bank Integrated Household Survey data. Note: All calculations in 2019 MWK. Figures computed using weights to ensure representativeness. Tob.=Tobacco; G.Nut=Groundnut; S. Bean=Soya bean; P.Pea=Pigeon Pea.

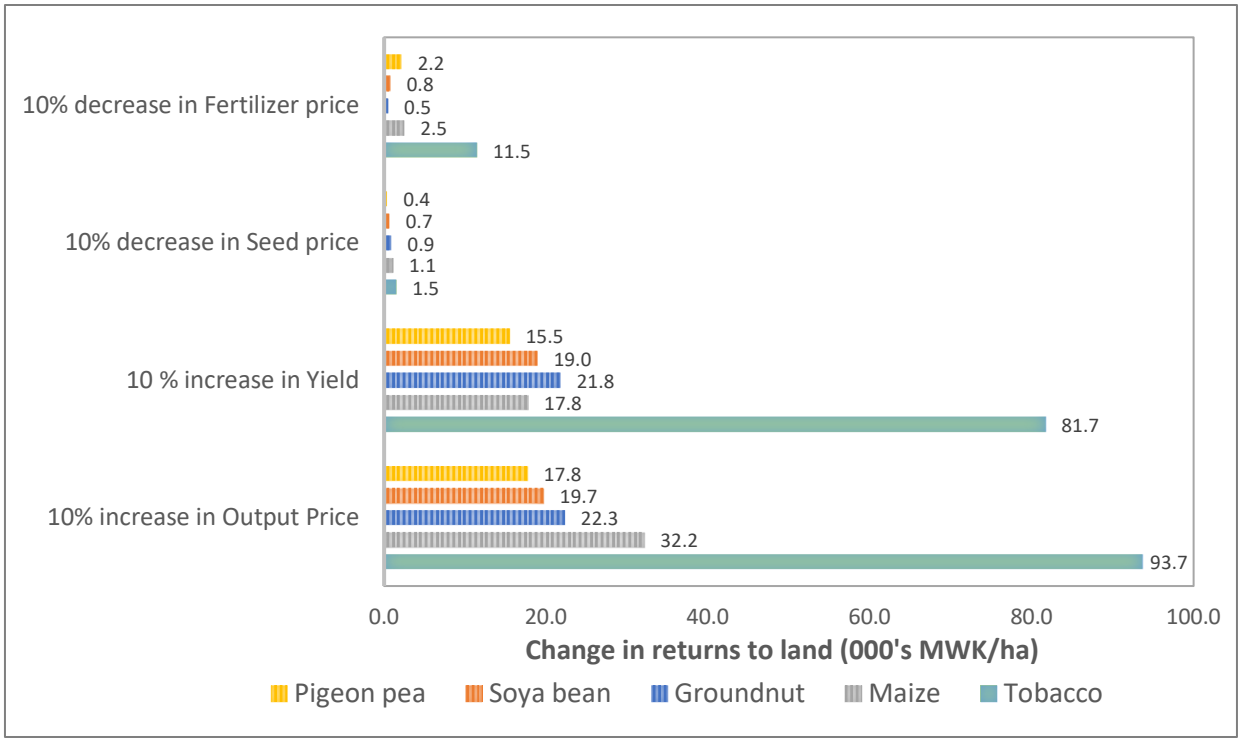
2015/16 and 2018/19. Furthermore, the percentage of farmers growing pigeon pea increased over the years from 21% in 2009/10 to 29% in 2018/19. Additionally, percentage of smallholders in the sample who grew maize declined over the years from 95% in 2009/10 to 93 % in 2018/19 while the percentage of farmers growing soybean increased from 5% in 2009/10 to 16% in 2018/19. Average area[1] devoted to groundnut decreased between 2009/10 and 2015/16 but increased in 2018/19. Average area dedicated to pigeon pea declined over the years from 0.2 ha in 2009/10 to 0.13 ha in 2018/19 about 35% decline. Conversely, average area dedicated to soybean increased by 12% between 2008/19. Similar to pigeon pea, average area devoted to maize declined over the years from 0.43 ha in 2009/10 to 0.29 ha in 2018/19.

Table 8 also shows that tobacco farmers experienced substantially higher yields for their tobacco than farmers did for other cash crops. This is consistent across seasons and holds even during the drought season of 2015/16. While the other cash crops had lower yields, their relative yield rank compared to tobacco was consistent over time. Groundnut yields came in second to tobacco, soybean yields came in third, and pigeon pea yields came in last. While maize enjoyed higher yields than tobacco across all years, the yield advantage of maize has declined over the years. Related to yields and prices, table 8 also presents gross revenue, costs and returns to land and labor for tobacco and potential alternative cash crops. To that end tobacco farmers who cultivated the crop obtained higher gross revenues[2] on average than did farmers who cultivated other alternative crops. Meanwhile, the costs for tobacco are also higher than that of other alternatives. Fertilizer costs for tobacco are almost four times that of maize which has the second highest fertilizer costs. Furthermore, tobacco cultivation incurred highest hired labor costs and own household labor costs (*opportunity*

1 We used the GPS values for plot area. The missing plot areas were imputed with the self-reported values. We divide the plot area among respective crops based on steps provided by Evans School Policy Analysis & Research Group (EPAR).

2 Gross revenues were generated using quantity of crop which was both sold and unsold. The value of unsold crop was based on the prices received for sold crop by the household. If the household did not sell the crop, then the median price at community level were used (only if there were more than 7 observations). Similarly, if community level prices were not available then district level median prices were used (again if more than 7 observations were available) and lastly if district prices were not available then national median prices were used.

Figure 5: Return to land sensitivity analysis.



Source: 2018/19 World Bank Integrated Household Survey. All values in 2019 MWK

cost)[3]. This partly reflects the high labor requirements for tobacco farming. Additionally, cost to transport tobacco to buyers are also markedly higher than other alternative crops. This is likely due to the auction floors being the mandatory sales locations whereas the other crops could be sold locally. Overall, the high gross revenues of tobacco dominate its high costs resulting in strikingly higher returns to land[4] and labor[5] compared to its alternatives.

6. Policy Scenarios to improve competitiveness of tobacco alternatives

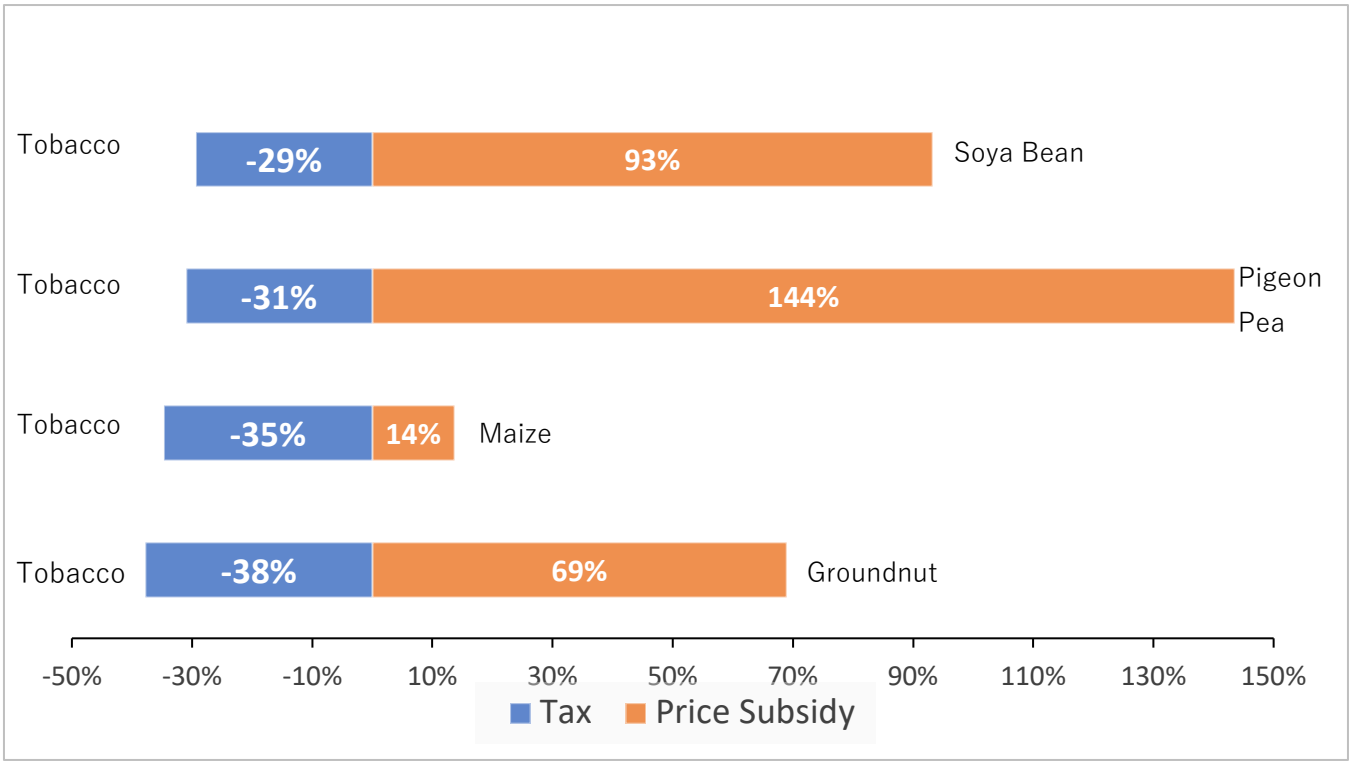
The results in the previous section indicated return to land for tobacco are much higher than that of alternatives. In order to identify the potential policy levers to raise the competitiveness of alternative crops we perform sensitivity analysis on returns to land of tobacco and alternative crops. Specifically, we calculate the change in returns to land

[3] The median hours per day spent by own HH labor were same for crops under consideration (8 hours per day).

[4] Ret. to land (MWK/ha) = Gross Revenue(MWK/ha) – Total costs excluding land costs(MWK/ha)

[5] Ret. to labor(MWK/days) = {Gross Rev.(MWK/ha) – Tot. costs excl. HH labor costs(MWK/ha)} / HH labor(days/ha)

Figure 6: Farm-gate tobacco price tax and price subsidy levels of alternative crops needed to be equally profitable as tobacco cultivation.



(Source: 2018/19 World Bank Integrated Household Survey. Note: The resulting real returns to land (000's MWK per ha) from balanced budget scenario are as follows: 83.5 (Soybean and Tobacco), 67.9 (Pigeon Pea and Tobacco), 33.3 (Maize and Tobacco), and 5.0 (Ground nut and Tobacco). All values in 2019 Malawi Kwacha.

corresponding to a 10% change in four determinants of returns to land (fertilizer price, seed price, yield, and output price). Figure 5 shows that returns to land of all crops are more responsive to revenue increasing determinants (yield and output price) than to cost reducing determinants (fertilizer price and seed price). Thus, we explore policy scenarios that would increase the gross revenues of other crops and in turn bring the returns to land of alternatives closer to that of tobacco.

6.1 Output price improving scenarios:

Providing price subsidy is often suggested to improve the profitability of the crop. However, price subsidies can exert tremendous pressure on the budget. Hence, in order to relax the fiscal burden, we look at a balanced budget scenario where the price subsidy for the crops under investigation is fully funded through revenue generated from a tax on tobacco. The objective is to understand how much price subsidy would be needed for each crop so as to

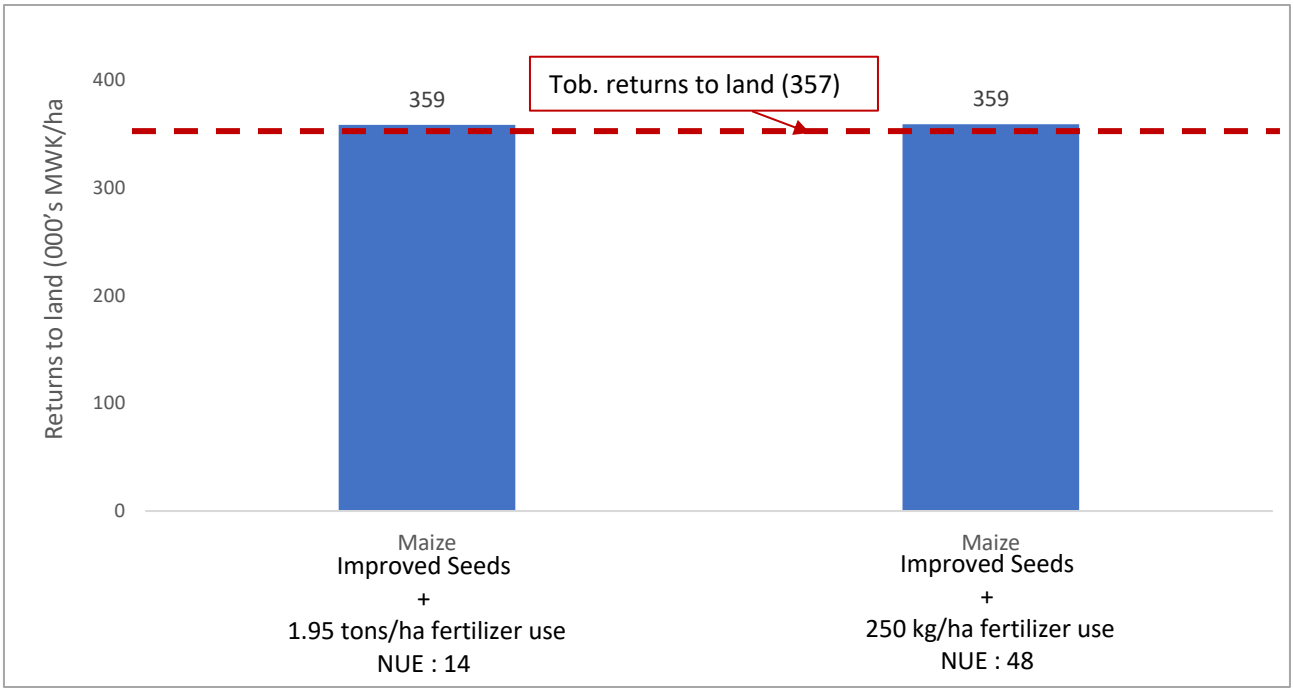
make its returns to land similar to that of tobacco subject to self-sufficiency constraint. In doing so, we assume no supply response to price changes and no transaction costs. Figure 6 shows the price subsidy of crops and corresponding tobacco tax needed to make the alternative as competitive as tobacco. We find that a 29 % tax on tobacco would be needed to support a 93% soybean subsidy. A 144% price subsidy for pigeon pea funded through 31% tobacco tax would make pigeon pea as competitive as tobacco. While the average returns to land of maize are higher than that of soybean and pigeon pea, a much higher tobacco tax would be required to fund a maize price subsidy since there are a large number of maize producers in Malawi. Lastly, a 69% price subsidy supported through a 38% tobacco tax would be required to make groundnut as competitive as tobacco. Furthermore, even higher levels of price subsidies would be required in absence of tobacco tax since tobacco returns to land are highly sensitive to changes in own price. Thus, government funded price supports with or without tobacco tax might not be feasible and there is need to explore new international and domestic markets for alternatives to raise their competitiveness compared to tobacco.

6.2 Yield improvement scenarios:

Another mechanism to increase the profitability of alternative crops to tobacco would be to improve yields of these crops. In terms of the potential for increasing maize yields, encouraging more fertilizer use and shifting from local seeds to improve maize seeds are often seen as ways to raise the yield levels of smallholder farmers. However, figure 7 shows that even with the consideration that all smallholders adopt improved maize varieties, fertilizer use would need to increase to an unrealistically high rate of 1.95 ton/ha in order for maize returns to land to match tobacco levels.6. This assumes an optimistic nitrogen use efficiency rate of 14 kilograms of maize per kilogram of nitrogen based on estimates from the Maize Productivity Task Force in Malawi from the mid 1990's (MPTF, 1999). In fact, a

[6] We use linear functional form to predict the maize yield response to fertilizer application. Local maize response equation: Yield(kg/ha) = 1301.6022 + (7/3)*fertilizer applied (kg/ha). Improved maize response equation: Yield(kg/ha) = 1512.8877 + (14/3)* fertilizer applied (kg/ha). While the linear response equations is not appropriate at high levels of fertilizer use such as 1.95 tons/ha, it provides with an upper bound estimate on yield response. The fertilizer use efficiency is calculated by dividing the nitrogen use efficiency (NUE) by 3. Following (Snapp et al., 2014), the NUE for local maize was assumed to be 7 and NUE of improved maize seed was assumed to be 14. Improved maize varieties include OPV, hybrid, and hybrid recycled varieties.

Figure 7: Real returns to land in 2019 Kwacha from improved maize productivity scenario.



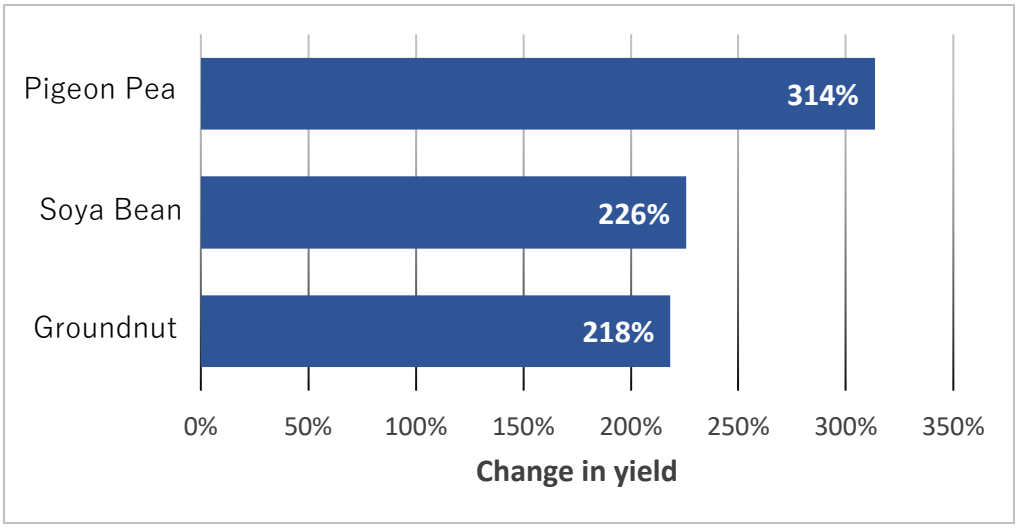
Source: 2018/19 World Bank Integrated Household Survey

recent review of NUE rates on Malawian smallholder's fields reveals that rates are actually much lower than estimate from the MPTF (Burke et al., 2021). This suggests that at the current efficiency of improved maize varieties and fertilizer it is unlikely to increase the return to land of maize to that of tobacco.

The second scenario presented in Figure 7 also indicates that at the government recommended fertilizer application rate of 250 kg/ha, the nitrogen use efficiency (NUE) of improve maize seeds would need to increase to 48 kilogram / ha (Snapp et al., 2014). This would require massive investments in complimentary inputs such as better soil fertility management, improved water control and more efficient use of labor in order to boost NUE. However, reaching an NUE of 48 is unrealistic in the average Malawian smallholder production system at any time in the near future.

Figure 8 show the yield increases required for soybean, pigeon pea and groundnut to raise their average returns to land to tobacco levels. Soybean and groundnut yields need to increase by around 200 % from their 2018/19 yield levels and pigeon pea yields would need to increase by more than 300%. Thus, yields of soybean, ground nut and pigeon pea need to be more than 3000 kg/ha to match tobacco returns to land. Furthermore, due to limited

Figure 8: Yield increases required for soybean, ground nut and pigeon pea to be equally profitable as tobacco.



Source: 2018/19 World Bank Integrated Household Survey

information on NUE for these crops, we do not take into account the cost of productivity improving technology (i.e., seeds or fertilizer to realize these increased yields). Hence, these estimates should be considered as lower bound values. This scenario demonstrates that current levels of soybean, groundnut, and pigeon pea yields need to increase by a vast amount and underscores the need for research on development and adoption of improved seed varieties.

7. Conclusions

The analysis included in this report provides important insights into tobacco profitability for smallholder farmers over time and in relation to other alternative crops. Alternative crops include maize, groundnut, soybean, and pigeon pea. The main source of data on smallholder households came from the IHS and IHPS survey collected by the World Bank in 2009/10, 2012/13, 2015/16 and 2018/19. We also obtained data on tobacco prices over time in Malawi from the Tobacco Control Commission.

We found evidence that just 20% of households grew tobacco in one of the four IHPS survey waves grew it in every wave and only 16% of households grew tobacco in all four survey waves. Interestingly, 45% of households dropped tobacco after 2009/10, while 39% of households added tobacco cultivation in 2009/10. This suggests that most households

are not wed to tobacco cultivation and adjust their crop based on changes in agronomic and market conditions across years. Those who left tobacco farming had less land and family labor compare to the households that grew tobacco.

Analysis of tobacco prices suggests that the real price of tobacco has declined over the past ten years in Malawi, but the downward trend in tobacco prices seems to be a reversion back to price levels from 15-20 years ago before the global commodity boom of the late 2000's. The household level data is consistent with this as our results suggest that the number of smallholders growing tobacco declined from 15% in '09/10 to about 5% in '18/19. While the participation in tobacco declined over the years, average area under tobacco grew by 33% and average yields increase by 40% from 2009/10 to 2018/19. Moreover, for those who continued to cultivate tobacco, it remained profitable. This was true both in terms of gross revenue and returns to land and labor compared to alternative crops. Prices for maize, groundnut, soybean and pigeon pea never approached prices for tobacco at the farmgate and were often only 20-40% of tobacco prices.

Sensitivity analysis of cost of production suggests that tobacco returns to land are much more responsive to price changes than other crops. Thus, drop in prices of tobacco over the last ten years led the households with sufficient land and family labor to intensify tobacco cultivation to make up for the reduction in returns to land due to price change. The households that didn't have enough land and labor endowments moved out of tobacco farming to cultivate more maize and legumes. Overall, these findings suggest that the tobacco sub-sector in Malawi may have undergone something of a structural transformation over the past decade. Inefficient tobacco producers have left for other income generating activities as the price of tobacco declined, while the most efficient producers remained. As such, our policy scenarios clearly indicate that it will be very expensive to induce the remaining 5% of households to move away from tobacco through a combination of taxes on tobacco and subsidies for other crops. Therefore, we suggest that it would be more cost-effective for policy priorities in Malawi to focus on improving value chains for other high value crops rather than directly focusing on moving the remaining 5% of smallholder farmers out of tobacco cultivation.

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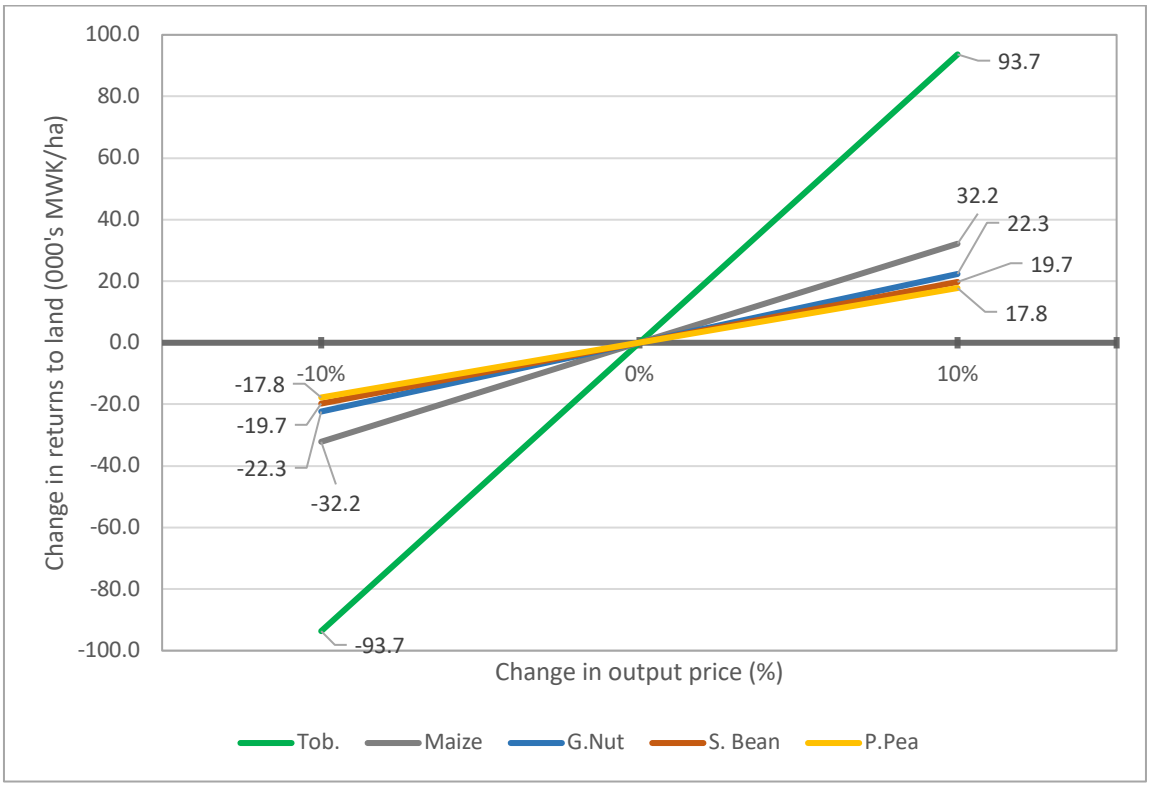
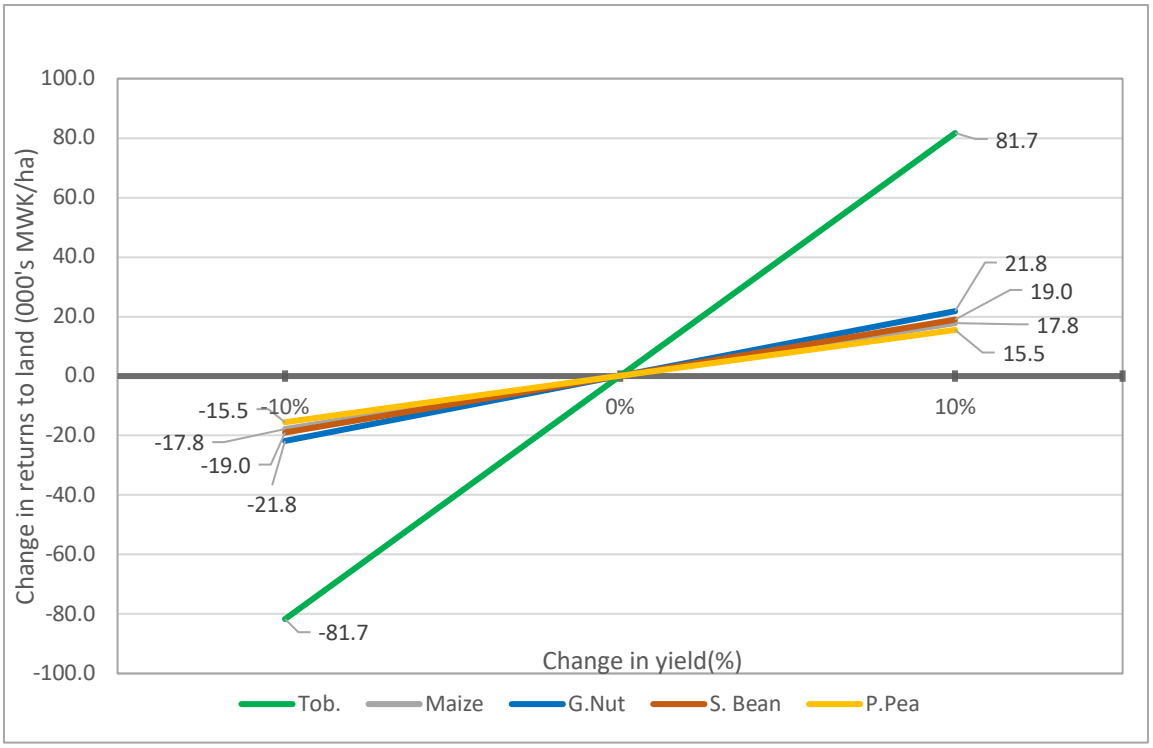
Appendix

Figure A1: Sensitivity of returns to land to change in output price



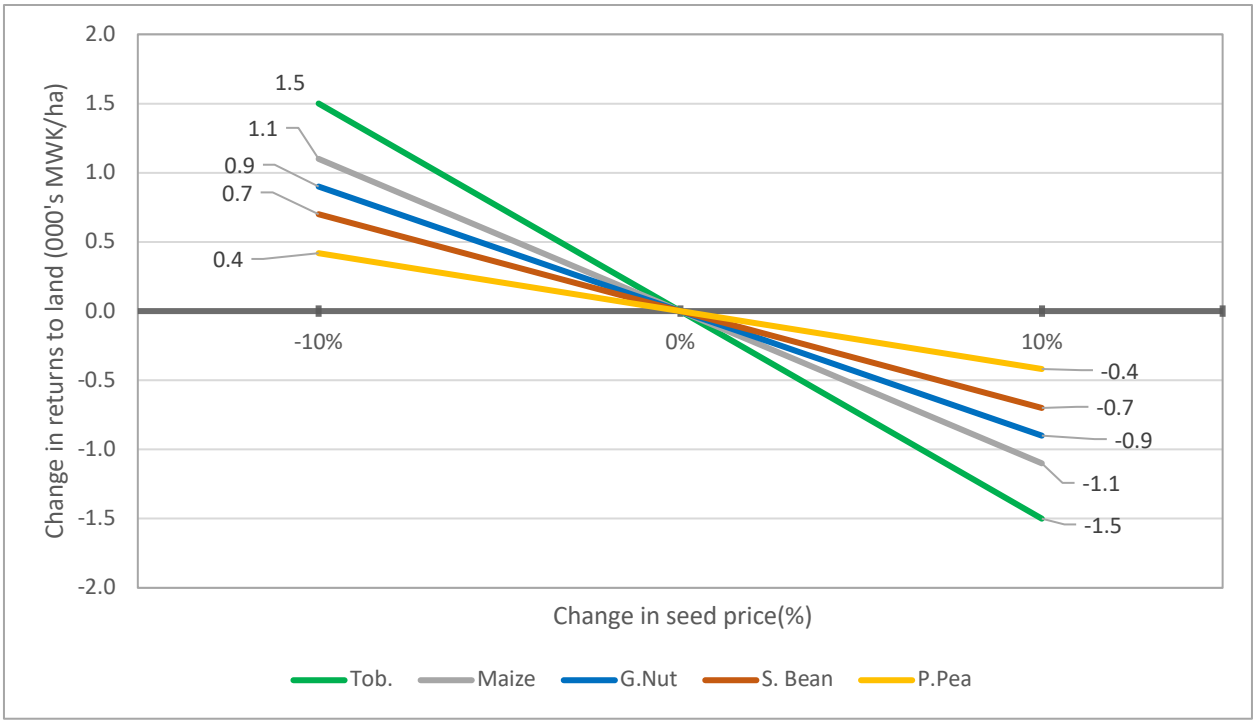
Source: 2018/19 World Bank Integrated Household Survey. All values in 2019 MWK

Figure A2: Sensitivity of returns to land to change in yield



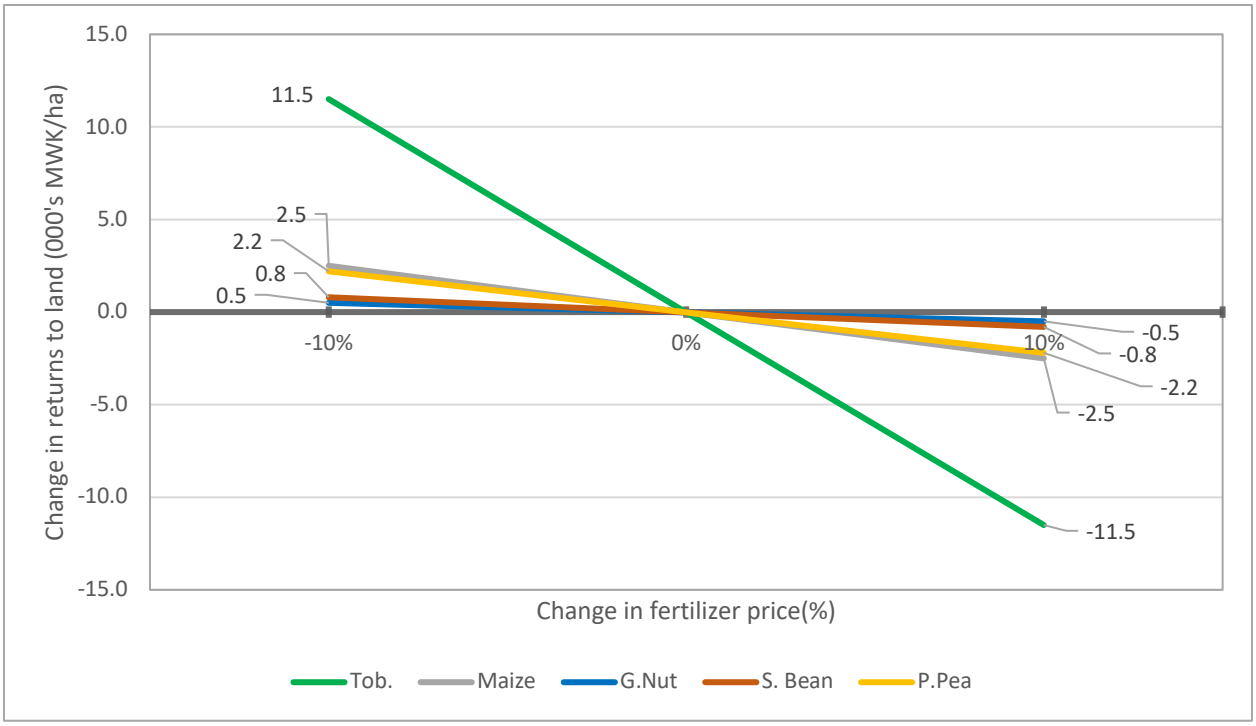
Source: 2018/19 World Bank Integrated Household Survey. All values in 2019 MWK

Figure A3: Sensitivity of returns to land to change in seed price



Source: 2018/19 World Bank Integrated Household Survey. All values in 2019 MWK

Figure A4: Sensitivity of returns to land to change in fertilizer price



Source: 2018/19 World Bank Integrated Household Survey. All values in 2010 MWK

Table A1: District level tobacco participation by smallholders over time.

	Percentage of households in the district growing tobacco		
District	2009/10	2015/16	2018/19
Dowa	52%	23%	16%
Kasungu	46%	20%	18%
Ntchisi	43%	22%	18%
Rumphi	40%	27%	22%
Lilongwe	27%	15%	10%
Mchinji	27%	9%	11%
Chitipa	24%	7%	5%
Mzimba	21%	13%	12%
Zomba	13%	3%	1%
Dedza	8%	2%	2%
Ntcheu	8%	2%	2%
Mangochi	7%	0%	1%
Machinga	7%	1%	1%
Phalombe	7%	4%	7%
Chiradzu	5%	1%	2%
Balaka	5%	0%	1%
Nkhotakota	5%	0%	1%
Lilongwe City	4%	5%	2%
Nkhata bay	4%	3%	3%
Karonga	3%	0%	1%
Salima	3%	1%	1%
Mulanje	3%	0%	1%
Blanytyr	1%	0%	0%
Nsanje	0%	0%	0%
Neno	0%	0%	0%
Mwanza	0%	0%	0%
Zomba City	0%	0%	1%
Mzuzu City	0%	2%	1%
Thyolo	0%	0%	0%
Chikwawa	0%	0%	0%
Blantyre	0%	0%	0%
Likoma	0%	2%	0%

Source: World Bank Integrated Household Survey

Table A2: Plot-level participation rates (%) for various crops over time

	% of all plots		
	2009/10	2015/16	2018/19
MAIZE	71%	75%	69%
NKHWANI	8%	25%	33%
PIGEONPEA	19%	21%	24%
GROUNDNUT	14%	9%	14%
BEANS	6%	9%	11%
SOYABEAN	3%	6%	7%
SORGHUM	5%	7%	7%
RICE	4%	4%	5%
SWEET POTATO	2%	2%	4%
TOBACCO	8%	4%	3%
PEAS	1%	2%	2%
SUNFLOWER	1%	1%	1%
PEARL MILLET	1%	1%	1%
THERERE/OKRA	0%	0%	1%
IRISH POTATO	1%	0%	1%
FINGER MILLET)	1%	0%	1%
COTTON	2%	2%	1%
TOMATO	0%	0%	1%
GROUND BEAN	0%	0%	1%
SUGAR CANE	0%	0%	0%
TANAPOSI	0%	0%	0%
ONION	0%	0%	0%
PAPRIKA	0%	0%	0%
CABBAGE	0%	0%	0%
WHEAT	0%	0%	0%

Source: World Bank Integrated Household Survey

Table A3: Participation rates (%) for various crops amongst households that stop growing tobacco and households that grow tobacco.

	2012/13			2015/16			2018/19		
Percentage growing each crop	HHs that stopped growing tob. in 2012/13 but grew it in 2009/10	HHs that grew tob. in 2012/13	(1) - (2)	HHs that stopped growing tob. in 2015/16 but grew it in 2012/13	HHs that grew tob. in 2015/16	(4) - (5)	HHs that stopped growing tob. in 2018/19 but grew it in 2015/16	HHs that grew tob. in 2018/19	(7) - (8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MAIZE	90	99	-9	83	98	-16	80	96	-16
TOBACCO	0	100	-100	0	100	-100	0	100	-100
GROUNDNUT	51	63	-12	20	37	-17	39	46	-7
RICE	2	2	0	0	0	0	2	1	1
GROUND BEAN	2	1	0	0	0	0	1	1	0
SWEET POTATO	5	6	-1	4	5	-1	9	8	2
IRISH POTATO	2	1	2	1	0	1	1	5	-4
FINGER MILLET	1	0	1	2	0	2	1	4	-3
SORGHUM	5	11	-6	10	8	1	9	12	-3
PEARL MILLET	0	2	-2	2	3	-1	1	0	1
BEANS	12	23	-11	8	10	-2	18	29	-11
SOYABEAN	17	23	-7	16	21	-5	24	27	-3
PIGEONPEA	16	20	-4	13	10	3	15	18	-3
COTTON	3	1	2	3	0	3	0	1	-1
SUNFLOWER	1	1	0	1	1	0	1	2	-1
SUGAR CANE	0	0	0	0	0	0	0	1	-1
CABBAGE	1	0	1	0	0	0	0	0	0
TANAPOSI	1	0	1	0	2	-2	1	1	0
NKHWANI	16	37	-22	17	27	-10	52	58	-6
THERERE/OKRA	0	4	-4	1	2	-1	0	1	-1
TOMATO	1	1	0	0	4	-4	1	0	1
ONION	1	0	1	0	0	0	0	0	0
PEAS	4	9	-5	2	3	-1	1	0	1
PAPRIKA	0	0	0	0	0	0	1	0	1

Source: World Bank Integrated Household Survey