WORLD BANK GROUP

THE ECONOMICS OF TOBACCO FARMING IN INDONESIA

Health, Population, and Nutrition Global Practice

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SMOKING HAS BEEN A MAJOR CONTRIBUTOR C DISEASE BURDEN INDONESIA. SMO PREVALENCE AMONG WORKIN AGE INDIVIDUAL HAS EXCEEDED 3 PERCENT SINCE

LIST OF ACRONYMS

BPJS	National Health Insurance System
FGD	Focus Group Discussion
GTS	Green Tobacco Sickness
HRW	Human Rights Watch
IDR	Indonesian Rupiah Rates
ILO	The International Labour Organization
IRB	Institutional Review Board
KIS	Indonesia Health Card
KKS	Family Welfare Card
KPS	Social Security Card
LSMS	Living Standards Measurement Study
OECD	Organisation for Economic Co-operation and Development
SAPER	Social Assistance Public Expenditure Review
SD	Elementary education
SMA	High school education
SMK	Vocational school education
SMP	Junior high school education
USD	United States (US) Dollar

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EXECUTIVE SUMMARY

As the Indonesian government considers reform of its cigarette excise tax structure and rates, concerns have been raised about possible effects of any such reforms on tobacco farmers. Currently, Indonesia has a complex cigarette tax structure, which can encourage downward substitution to lower priced products. Cigarette prices across all tiers increased at a modest rate between 2010 and 2017 as the government continues to increase cigarette taxes; nevertheless, cigarettes are more affordable now than they were in 2000 in large part due to income growth. The main argument to adopt such a complex cigarette tax structure is to protect employment in tobacco manufacturing and tobacco farming.

Despite the concerns, tobacco leaf cultivation is a relatively small agricultural subsector in Indonesia by economic size. Tobacco leaf has typically comprised approximately 0.30% of the agricultural sector and 0.03% of gross domestic product (Indonesia Ministry of Agriculture, 2010). Additionally, Indonesia has consistently been a net importer of tobacco leaf to satisfy domestic demand, for example, importing an additional 75,353 tons in 2015. The high levels of imports are also likely driven, at least in part, by the fact that tobacco farming may not be a lucrative endeavor for many farmers and does not attract enough farmers willing to undertake this agro-economic endeavor to satisfy domestic demand.

This report aims to contribute to the policy debate over the reform of the Indonesian tobacco excise tax system by reporting results of a nationally representative survey of and focus group discussion with smallholder tobacco farmers that examine their livelihoods and how tobacco tax reform might affect these households. The survey sampled 1,350 current and former tobacco farming households across the largest tobacco-growing regions in the country (Central Java, East Java, and West Nusa Tenggara). The survey sampled smallholder tobacco farmers who grow the predominant leaf varietal, Virginia, and other leaf types, including Burley, Oriental and a number of local varietals. It focused on smallholder farmers both because they grow the preponderance of tobacco in Indonesia and because they are likely to be disproportionately more vulnerable than larger landholders in the event of any major policy change potentially affecting tobacco farming. The survey also sampled former tobacco farmers—households that recently elected to grow other crops instead of tobacco leaf—to understand if and how livelihoods change when farmers switch to alternative crops and/or other economic livelihoods.

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The report is part of the Indonesia Tobacco Employment Studies and was prepared by a team comprised of:

Jeffrey Drope (Scientific Vice-President, American Cancer Society);
Qing Li (Senior Data Analyst, American Cancer Society);
Edson C. Araujo (Senior Economist and Task-Team Leader, World Bank);
Pandu Harimurti (Senior Health Specialist and Task-Team Leader, World Bank);
Gumilang Aryo Sahadewo (Research Faculty Universitas Gadjah Mada and Consultant World Bank);
Nigar Nargis, PH.D. | Scientific Director, Economic and Health Policy Research;
Josefine Durazo (Survey Specialist, World Bank);
Firman Witoelar (Director of Research, SurveyMeter); and
Bondan Sikoki (Chairperson, SurveyMeter).

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Cover photos (clockwise from left): Tobacco leaves drying. Photo by Nikada / iStock. Landscape of fields and homes. Photo by Curt Carnemark / World Bank. Detail of water droplets on leaf. Photo by Curt Carnemark/ World Bank. Woman harvesting tobacco in Indonesia. Photo by 5bf5911a_905 / iStock.

Contrary to the consistent tobacco industry narrative in Indonesia, the survey and focus group discussion (FGD) findings strongly suggest that tobacco farmers' livelihoods are not prosperous for most tobacco-farming households. In the FGD data, many farmers described a dynamic in which they planted tobacco most years understanding that most of the time it would not generate very much income, but occasionally when prices were high and the weather was favorable, they could make extra income growing tobacco. Notably, only a minority of tobacco-farming households relied on tobacco farming as their major income-earning activity, even though many survey respondents reported it as their primary job.

The main findings of this report include:

- **Tobacco cultivation was not profitable for most farmers.** This finding was mostly consistent across regions, type of tobacco grown, and whether the farmer was on contract to grow tobacco.
  - Considering only direct costs (i.e., not household labor), most tobacco-farming households were spending more on their tobacco cultivation than the revenue they generated from it;
  - Incorporating a minimum value for household labor into the profit equation, overall profitability plummeted further;
  - Consistent with research in other countries, input costs for growing tobacco are typically very high in Indonesia compared to most other crops; and
  - Many tobacco farmers reported having limited capital—53 percent of tobacco farmers reported the need for loans to cultivate tobacco.
- **The opportunity costs of tobacco are high.**
  - Most tobacco farmers spent disproportionately (to revenues) large amounts of time cultivating tobacco leaf compared to nontobacco farmers' ratio of time to revenue; and
  - Because most former tobacco farmers spent far fewer hours in their fields, many engaged in other economically productive activities and could develop more robust and varied economic activities than their peers who continued to grow tobacco.
- **Tobacco farmers often miscalculate their return on investment.**
  - Nearly 90% of farmers miscalculated their costs by more than 25%, and the average miscalculation was more than 50%.

- **Poverty is widespread among tobacco farmers in Indonesia.** 72.2% of tobacco farmers are poor compared to 11.1% of the general population in the country.
  - Most tobacco-farming households were on social assistance in some form, including nearly three-fourths who used "rice for the poor" programs;
  - Food insecurity was common among tobacco-farming households—more than 60 percent of households reported insufficient food for the household at some point in the year; and
  - Tobacco farmers in this survey were more likely than former tobacco farmers to display the symptoms of green tobacco sickness.
- **On average, former tobacco farmers were doing better economically than current tobacco farmers.**
  - On average, former tobacco-farming households' average total incomes ($3,797.68) were higher than current tobacco household's total income ($2,921.19);
  - Former tobacco farming households typically generated more income from nonagricultural enterprises;
  - Former tobacco farmers' mean nonlabor costs to cultivate their crops were less than a quarter of current tobacco farmers' mean costs; and
  - Current tobacco farmers tended to be more dependent on social assistance and health care benefits provided by the government than former tobacco farmers.
- **Former tobacco farmers switched to other crops often due to economic reasons, such as low prices of tobacco leaf, more economically viable alternative crops, and cropping decisions based on weather.**
  - Tobacco farmers who farmed other crops were more willing to switch completely away from tobacco; and
  - Older farmers were less likely to be willing to switch, as were Burley farmers. In contrast, contract farmers were more likely to be willing to switch. Farmers who had reported recent sickness were also more likely to be willing to switch.

Recommendations

The evidence presented in this report clearly shows that tobacco farming is not economically viable in Indonesia for most farmers. Tobacco farmers were, on average, experiencing significant economic losses, and engaging in less diverse farming/economic activities, and thus, tended to be poorer and more dependent on government social assistance than their nontobacco-farming peers. Given the associated economic and social costs of tobacco growing, the government of Indonesia could make use of some

of the additional tax revenues from reforming the tobacco excise tax (estimated from 129 to 147 trillions of IDR—World Bank, 2016) to help tobacco farmers switch to alternative crops.

- **The government should help to improve supply chains and value chains for other goods in tobacco-growing areas.**
  - Many former tobacco farmers are making a better living growing other common, locally grown crops (e.g., corn, sweet potato, and green vegetables), an outcome that could be further enhanced with even small investments by governments in improved supply chains for these products;
  - Results from this study suggest that current tobacco farmers are also already growing many of these crops, so it is an issue of encouraging and/or incentivizing them to shift their factors of production to maximize economic opportunity; and
  - Even modest programs to enhance value addition—for example, encouraging and/or incentivizing limited processing of crops (such as removing unusable portions of the plants)—could markedly enhance farmers' incomes.
- **Encourage the expansion of markets—including exports—for nontobacco agricultural products to assure more sales opportunities for farmers.**
- **Government should provide more and better agricultural extension services to promote locally viable, nontobacco crops.**
  - Indonesia enjoys multiple growing seasons and other favorable conditions for the cultivation of many crops for smallholder farmers; yet, few farmers in this study reported currently receiving agricultural extension services for these nontobacco crops.
- **Improve farmers' managerial and business skills.**
  - More educated farmers will likely make better farming decisions;
  - Governments should provide training related to crop diversification, and financial and business literacy to help tobacco farmers make better cropping and business decisions; and
  - Education grants, for example, could support retraining programs for tobacco farmers and their dependents.
- **The government could help facilitate access to credit.**
  - Provide grants or low-interest loans to farmers willing to switch to alternative crops; and
  - Introduce financial programs or economic development programs as forms of transition assistance away from tobacco cultivation.

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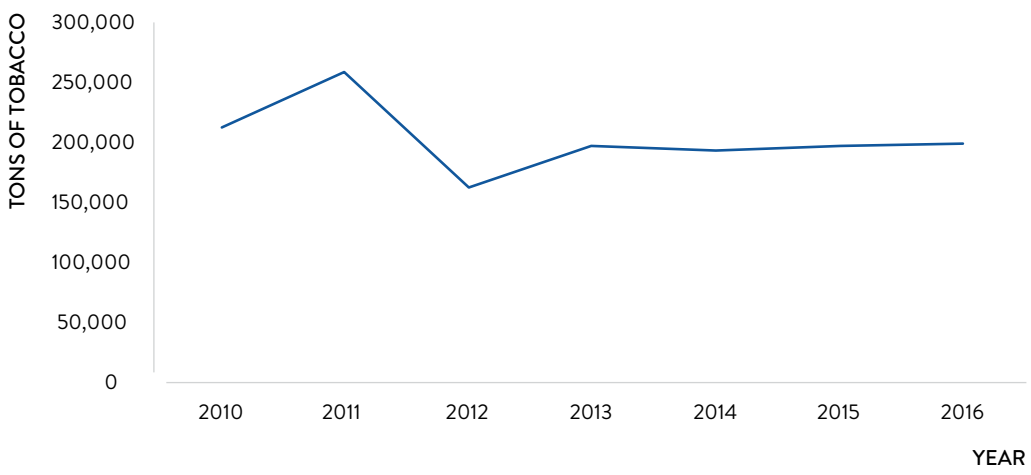
1 INTRODUCTION

Tobacco leaf cultivation is a relatively small agricultural sub-sector in Indonesia by economic size. The Directorate General of Estate Crops in the Ministry of Agriculture estimated that in 2017, Indonesia produced approximately 198,296 tons of raw tobacco leaf. As Figure 1 illustrates, this was fairly typical production for recent years. Tobacco leaf has typically comprised approximately 0.3% of the agricultural sector and 0.03% of gross domestic product (Indonesia Ministry of Agriculture, 2010). Each year, much of the domestic crop is absorbed by the Indonesian tobacco manufacturing sector, though a proportion is also exported—in 2016, it is estimated that less than one-fifth (30,000 tons) was exported. However, Indonesia has consistently been a net importer of tobacco leaf in order to satisfy domestic demand, for example, importing an additional 75,353 tons in 2015. The supply and value chains for tobacco leaf are global, and some leaf is exported because of demand for particular Indonesian varietals in other countries, particularly cigar tobacco (Keyser and Juita, 2005). The high levels of imports are also likely driven, at least in part, by the fact that tobacco farming may not be a lucrative endeavor for many farmers and does not attract enough farmers willing to undertake this agro-econoimc endeavor to satisfy domestic demand.

Tobacco farming employs significant and concentrated pockets of farmers across the country. According to Indonesia Plantation Statistics, there are currently more than half a million farmers who cultivate tobacco in the country, which is about ~1.6 percent of all farmers in Indonesia and about 0.7 percent of the total work force (see World Bank,

Figure 1: Tobacco Production (tons), 2010–2016



2017a). It is not clear from government data what proportion of these farmers are fulltime or parttime. Most tobacco cultivation occurs in East and Central Java (~85%), while another 6–8 percent is in West Nusa Tenggara.

As the Indonesian government considers reform of its tobacco excise tax structure and rates, concerns have been raised about possible effects of any such reforms on tobacco farmers. Though there has been some recent research on tobacco farmers' employment and livelihoods (e.g., Keyser and Juita, 2005; Mulyana, 2015), there has not been systematic research based on nationally representative, household-level economic survey data of smallholder tobacco farmers to understand better the nature of the typical livelihoods of these farmers. This report fills this gap by reporting results of a nationally representative survey of smallholder tobacco farmers with follow-up focus group discussions (FGDs) to examine their livelihoods and to understand how tobacco tax reform might affect these households.

The survey sampled 1,350 current and former tobacco farming households across the largest tobacco-growing regions in the country (Central Java, East Java and West Nusa Tenggara). The survey sampled smallholder farmers who grow the predominant leaf varietal, Virginia, and the other major leaf types, Burley and Oriental. It focused on smallholder farmers both because they grow the preponderance of tobacco in Indonesia and because they are likely to be disproportionately more vulnerable than larger landholders in the event of any major policy change potentially affecting tobacco farming. Because contracts between leaf-buying firms and smallholder farmers are common, it also sampled both independent and contract farmers to understand this dynamic. Finally, it sampled former tobacco farmers—households that recently elected to grow other crops instead of tobacco leaf—in order to understand if and how livelihoods change when farmers switch to alternative crops and/or other economic livelihoods. This survey of former tobacco farmers is the first of its kind and will illuminate how well former tobacco farmers do economically after switching and how that compares to farmers who continue to cultivate tobacco leaf.

Overall, the results suggest an economically unfavourable—i.e., unprofitable—dynamic for most current smallholder tobacco farmers. The main findings of this report include: 1) tobacco is not profitable for most farmers; 2) there is widespread poverty among tobacco farmers (greater than the national average); 3) former tobacco farmers on average are doing better economically than current ones; 4) there is widespread food insecurity among tobacco farmers; 5) there is evidence of child labour, including during school hours; and 6) engaging in tobacco farming is a key predictor of having the main symptoms of green tobacco sickness.

The report is structured as follows: it begins with a discussion of the research methods used to collect the survey data and the focus group discussion data, and the analytical approaches (Section 2). Section 3 presents and analyzes the characteristics of the farmers in the survey (current and former tobacco farmers). Section 4 focuses on the economics of tobacco growing including contracts, production, prices, costs and profits. The next section, Section 4, examines why tobacco farmers continue to grow tobacco despite mostly poor returns. Section 4.4 explores farmers' credit and debt. The following section,Section 4.5, examines the households' cultivation of other crops, particularly in the context of conceptualizing alternative agricultural livelihoods. Then its followed by a short discussion about child labour (Section 5), farmers' well-being including asset accumulation (Section 6), which includes the food security and health status. Sections 7 and 8 contain the report's concluding remarks and discuss a few recommendations in light of the results of the study.

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2 METHODS

2.1 — Sampling and survey instruments

The survey sampled 1,350 current and former smallholder tobacco-farming households in the major tobacco-growing provinces of East Java, Central Java and West Nusa Tenggara.[1] As presented in Table 1, within the three provinces, seven major tobacco-producing municipalities were purposively sampled as a result of their significant tobacco production, based on production data from Tree Crop Estate Statistics, 2014–16 (Indonesia Ministry of Agriculture 2016). The next stratum was a sample of two to four tobacco-producing villages, a key subdistrict distinction in Indonesia, within each of these municipalities. Within each selected village, a random sample of 75 farmers was drawn from the most recent lists of tobacco farmers for 2016 provided with the assistance of the village head.[2]

The survey instrument was developed based on similar surveys in other countries and expanded with significant data collection elements from the World Bank Living Standards Measurement Study (LSMS). The final questionnaire was divided into 26 sections and included the following major topics: household characteristics; livelihood, income and assets; land ownership and crop production; tobacco production generally; tobacco production under contracts (where applicable); tobacco marketing; farmer debt and credit; household food security; and the future of tobacco production and health. The survey instrument was influenced by recent survey-based research on the political economy of tobacco farming in Sub-Saharan Africa and the Philippines (Briones, 2015; Chavez et al., 2016; Goma et al., 2015; Magati et al., 2016; Makoka et al., 2016; Makoka et al., 2016) and the LSMS surveys implemented in many countries. The LSMS is a survey program that provides technical assistance to national statistical offices in designing and implementing multi-topic household surveys.

Data collection was conducted in November 2016 to January 2017. The data collection team comprised a team of experienced interviewers/enumerators, one research supervisor

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1 To determine the sample size of the survey, we first defined the population size N of tobacco farmers in Indonesia to be ~500,000. For the simple random sampling process, we adopted the conservative standard deviation $\hat{p}$ to be 0.5, confidence level as 95% (Z=1.96) and allowed the margin of error e to be 4% (Please see online appendix for full details on sample calculation).

2 On the basis of previous surveys of tobacco farmers in other countries and agricultural surveys in Indonesia, we expected the response rate to be between 80% and 90% and sought to reach out to ~1,400 tobacco farmers with a final sample size of 1,350 (96.74% response rate). We had no a priori reason to suspect that there were large regional differences, so we chose to implement the survey evenly across the selected municipalities; furthermore, we had the luxury of large subsamples in each province.

Table 1: Survey Respondents, by Province, Municipality, and Village

PROVINCE	MUNICIPALITY	VILLAGE	N
East Java	Bojonegoro	Kepoh Baru	75
		Ngasem	75
		Ngraho	75
		Tambakrejo	75
	Jember	Balung	75
		Kalisat	75
		Pakusari	75
		Puger	75
	Temanggung	Bulu	75
		Parakan	75
Central Java	Lumajang	Pasirian	75
		Tempeh	75
	Magelang	Kaliangkrik	75
		Windusari	75
West Nusa Tenggara	Lombok Tengah	Janapria	75
		Praya Timur	75
	Lombok Timur	Sakra Barat	75
		Sakra Timur	75
	Total		1,350

and two principal investigators. The data were entered into and analysed using the STATA (V.13.1) statistical package. All activities for this research were approved by the Institutional Review Board (IRB) of the Morehouse School of Medicine, the IRB of record for the American Cancer Society, and the IRB of SurveyMeter in Indonesia.

We also implemented a series of focus group discussions (FGDs) with current and former tobacco farmers to contextualize the survey results and to inform our multivariate analyses of the dynamics around tobacco farming. We selected the villages purposively, choosing major tobacco-growing communities. The FGDs were conducted in villages in three municipalities: Sugigwaras, Ngraho and Ngasum. In the village of Alasagung in Sughiwaras, and Nganti in Ngraho, we conducted FGDs with active tobacco farmers. In the village of Mediunan, we conducted three FGDs: the first one with current farmers, the second one with former farmers, and the third with the middlemen who buy tobacco from the tobacco farmers and sell it to the tobacco processors and/or manufacturers. The participants were chosen by the survey team supervisor that was responsible in the study area from a list suggested by village leaders and farmers. The FGDs were fully recorded and transcribed. Analysis of the FGDs made full use of the transcripts as well as other notes from the FGDs including seating arrangement and the participation level of each participant.

2.2 — Data Analysis

The analysis consisted of both descriptive and multivariate analyses. The descriptive analysis aimed to elucidate the breadth and depth of farmers' general characteristics. The multivariate analyses aimed to explore causality of selected key relationships.

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3 FARMERS' CHARACTERISTICS

3.1 — Socio-demographic profile

Overall, the vast majority of tobacco farmers are middle-aged males, usually older than the general population and with no more than five years of schooling. In Table 2, we present the socio-demographic characteristics of the survey respondents. Households for both current and former tobacco farming households were similar at 3.86 and 3.69 respectively. First, the heads of the tobacco-farming households—the main focus of the survey—were overwhelmingly male at 96.5 percent, though as reported below, tobacco farming is undoubtedly a family endeavor. The majority of the respondents (63.3%) were middle-aged—between 36 and 60 years old. A further 23.3% were older than 60. In a country where the average age is approximately 28 years, these results suggest that tobacco farmers are significantly older than the average person. Most tobacco farmers in the survey were married (>90%). More than three-quarters of farmers reported a Sekolah Dasar (SD) education or less, which is the equivalent of 5 years of elementary school (or less), suggesting that the farmers did not typically have many years of formal education. These findings are similar to those for the agricultural sector from the 2015 National Labor Force Survey (Sakernas) though lower than the general population. Finally, four out of five households reported agriculture as their main economic activity.

The overwhelming majority of individuals in tobacco-farming households reported participating in tobacco farming as a first or second job in the last 12 months (>96%), demonstrating that most household members were contributing to the enterprise. In the survey, we asked individuals to name their "First" and "Second" occupation without additional qualification (e.g., which job earned the most income? Which job required the most hours?, etc.). Table 3 reports the main sources of livelihoods for all of the working-age household members, showing that most household members were contributing meaningfully to tobacco farming. In the current tobacco-farming households, around 83 percent of the household members also reported nontobacco agricultural activities as a first or second job. In former tobacco-farming households, approximately 96 percent of household members reported agriculture as their first or second job. The survey was implemented around tobacco harvest for many households and ~60 percent of household members from tobacco farms reported working on the farm in the previous week. Nearly 30 percent reported working on the farm without pay.

Table 2: Socio-Demographic Characteristics of Survey Respondents (household head)

Current vs. Former Farmer

	CURRENT FARMER		FORMER FARMER		ALL FARMERS	
	N=1,035	PERCENT	N=315	PERCENT	N=1,350	PERCENT
GENDER						
Female	36	3.48	14	4.44	50	3.7
Male	999	96.52	301	95.56	1300	96.3
AGE (YEARS)						
21–35	134	12.95	47	14.92	181	13.41
36–60	660	63.77	195	61.9	855	63.33
>60	241	23.29	73	23.17	314	23.26
MARITAL STATUS						
Never married	11	1.06	6	1.9	17	1.26
Married	969	93.62	293	93.02	1262	93.48
Divorced/ separated	13	1.26	2	0.63	15	1.11
Widowed	42	4.06	14	4.44	56	4.15
EDUCATION						
No school	124	11.98	29	9.21	153	11.33
Some Elementary Education (SD)	309	29.86	80	25.4	389	28.81
Elementary Education (SD)	350	33.82	106	33.65	456	33.78
Some Junior High (SMP)	44	4.25	11	3.49	55	4.07
Junior High (SMP)	98	9.47	44	13.97	142	10.52
Some High School (SMA)	8	0.77	3	0.95	11	0.81
High School (SMA)	60	5.8	23	7.3	83	6.15
Some vocational school (SMK)	3	0.29	1	0.32	4	0.3
Vocational school (SMK)	21	2.03	6	1.9	27	2
D1/D2/D3	2	0.19	0	0	2	0.15
Some College	2	0.19	1	0.32	3	0.22
College	14	1.35	10	3.17	24	1.78
Post Graduate	0	0	1	0.32	1	0.07
MAIN ACTIVITY						
Agricultural work	866	83.67	213	67.62	1079	79.93
Non-agricultural work	139	13.43	79	25.08	218	16.15
Home duties	2	0.19	4	1.27	6	0.44
Retired/aged	11	1.06	6	1.9	17	1.26
Unemployed (looking for work)	3	0.29	7	2.22	10	0.74
No work	14	1.35	6	1.9	20	1.48

Table 3: Main Source of Livelihood by Self-Report — Total Household Members

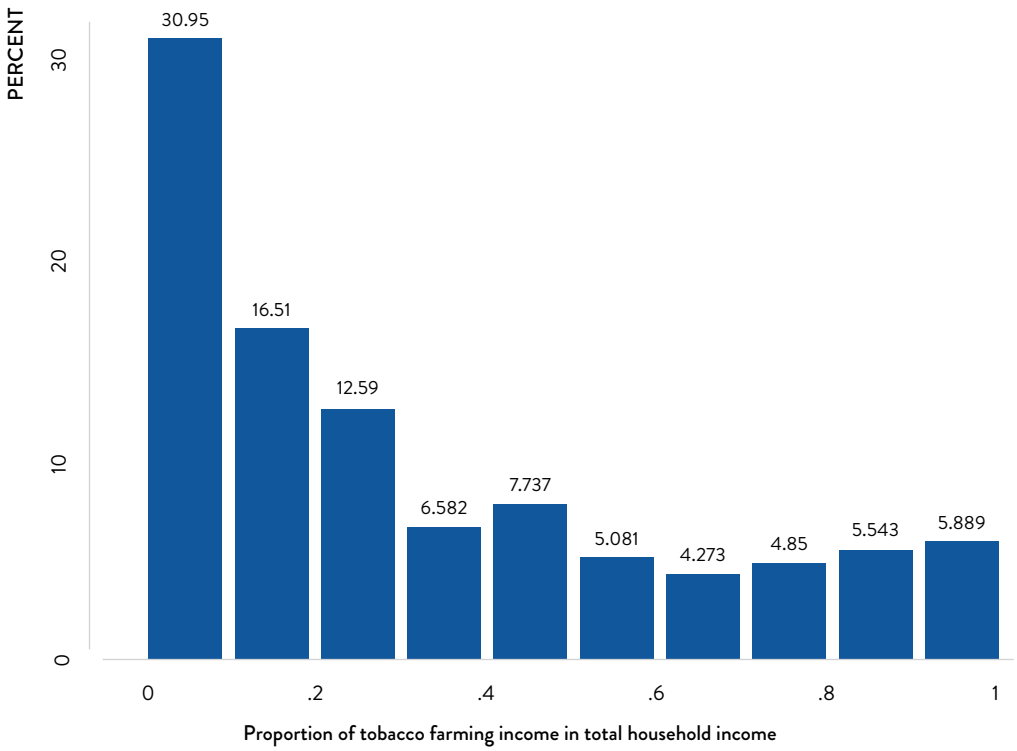
	CURRENT FARMER		FORMER FARMER	
	N	PROPORTION	N	PROPORTION
IN THE LAST 12 MONTHS				
Participated in tobacco farming	2,574	96.04%	572	–
Participated in nontobacco farming activities	2,574	83.18%	572	96.33%
IN THE LAST 7 DAYS				
Received payment in agricultural or non-agricultural activities	3,696	21.10%	1,056	24.62%
Running business (incl. fisheries, livestock, etc.)	3,696	26.76%	1,056	27.56%
Helped without pay of any kind	3,696	28.76%	1,056	25.47%
Worked on this household's farm	3,696	59.63%	1,056	45.64%

Note: N in Table 3 is the number of household members.

A little more than a quarter (26.8%) of each of the household members from both tobacco-farming and nontobacco households reported helping to run a small enterprise of some kind in the previous week, while nearly the same proportion reported receiving wages from somebody else's business enterprise.

Nearly three quarters of tobacco-farming households in the survey were deriving less than half of their income from tobacco growing. Figure 2 illustrates the household income from tobacco farming as a proportion of total household income. As Figure 2 shows, one-third of households reported that tobacco farming comprised less than 10 percent of their household income. This means that only a minority of tobacco-farming households relied on tobacco farming as their major income-earning activity, even though the survey respondent often reported it as their primary job. In the FGDs, many farmers described a dynamic in which they planted tobacco most years, understanding that most of the time it would not generate very much income, but occasionally, when prices were high and weather was favourable, they could make extra income growing tobacco. One farmer, when asked about falling prices, responded, "Farmers here must not have that thought and they keep cultivating tobacco no matter what … In any situation, no matter what, whether we suffer from loss or get advantage and profit, we keep cultivating. We are motivated to cultivate. We keep our spirit."

Figure 2: Tobacco Farming Income as a Proportion of Total Household Income

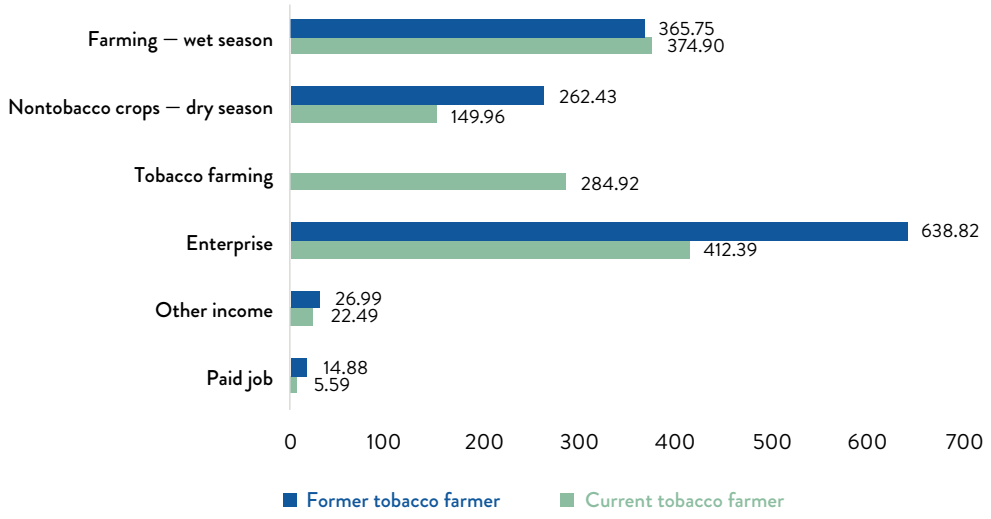


On average, former tobacco farming households' incomes were higher than current ones, and former tobacco farmers typically generated more income from non-agricultural enterprises. Former tobacco-farming households on average generated $3,797.68 in total income, while current farming households generated $2,921.19 (the average for all farmers in the survey was $3133.22). Note that this was income only and did not incorporate any costs of farming or other enterprises (addressed below). Table 4 demonstrates the proportion of farmers who drew income from the main sources. Of former tobacco farmers, 30 percent reported that they were not receiving any agricultural income. Figure 3 illustrates the major income source categories and amounts from these sources for both current and former tobacco-farming households. We observe that non-tobacco (wet) season(s) farmer income from agricultural sources is quite similar (~$370 USD). In the tobacco (dry) season, the former tobacco farming households generate substantially more income—$262 versus $150—from nontobacco agriculture than the tobacco-farming households, which is logical considering that they are allocating more land and resources to nontobacco agriculture than their tobacco-farming peers. Most notably, former tobacco-farming households'"enterprise" income from non-agricultural sources was $639 compared to $412 for tobacco farming households. This difference is likely due most to the extra time that former farmers have to dedicate to other economic activities, a dynamic that is discussed below in the labour cost section.

Table 4: Percentage of Farmers Receiving Income from Main Sources

	AGRICULTURE	ENTERPRISE	WAGE	OTHER
Former	70.16%	73.02%	100.00%	79.68%
Current	99.81%	71.75%	99.90%	80.42%
Total	**92.83%**	**71.99%**	**99.85%**	**80.19%**

Figure 3: Average Income from Different Sources (USD)

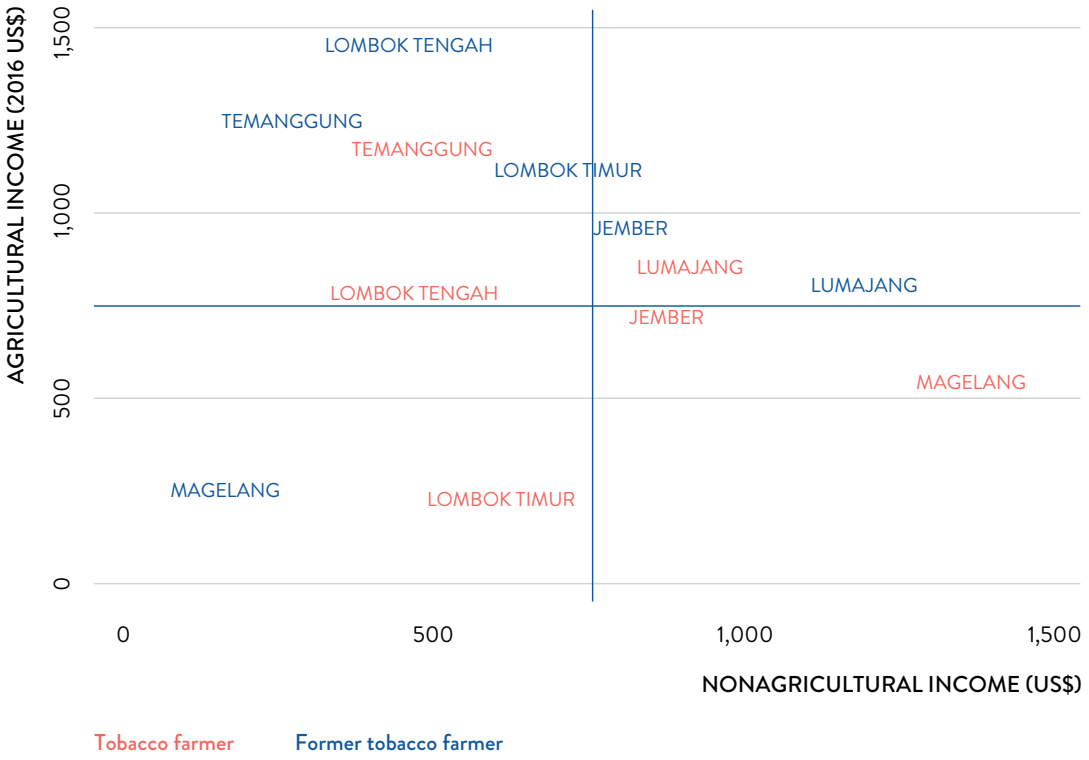


Dependence on agricultural income varies across regions. In order to examine further the dependence on agriculture for household income, in Figure 4, we plot regional agricultural (Y-axis) and non-agricultural (X-axis) incomes for both current and former tobacco-farming households. In the top left quadrant, we observe the most agricultural income-dependent regions, which include Temanggung and Lombok Tengah (for both current and former tobacco farmers). In the bottom right quadrant, we observe the households most dependent on non-agricultural income, including tobacco farmers in Magelang and Jember. Notably, Jember, Magelang and Temanggung demonstrated higher average per capita incomes, which means that both the least and most agriculture-dependent regions were better off in terms of income.

3.2 — Poverty

Poverty among tobacco farmers is widespread. In Indonesia, 8.3 percent of households fall below the World Bank poverty rate (World Bank, 2016) of $1.90/day (purchasing power parity), while 11.1 percent fall under the Indonesian government's poverty line

Figure 4: Agricultural by Non-Agricultural Income — By Region



(OECD, 2016), which was ~248,000 IDR per month. As presented in Table 5, using a measure of household total resources, which does not incorporate any of the farming or other business costs, the poverty rate among tobacco farming households is 20.8 percent at the World Bank threshold and 32.8 percent at the Indonesian government threshold. If we instead use a more realistic measure of household total income, which subtracts all of the expenses incurred to farm or to run other household businesses from total resources, the poverty rate of tobacco farming households jumps considerably to 69.8 percent at the World Bank line and 72.2 percent at the official government line. This jump in the proportion of farmers is largely a function of the considerable expense to cultivate tobacco leaf.

The poverty levels of former tobacco farmers is significantly lower than of current tobacco farmers. As illustrated in Table 5, former tobacco farmers seem, at first, to fare generally worse in terms of poverty than tobacco farmers using the household resource measure (23.8 percent at the World Bank threshold and 36.5 percent at the government line). The household resource measure incorporates wage income, revenue from agricultural (including sold and consumed) and non-agricultural activities, and other non-labor income. But, if we use the more realistic household income measure, the proportion of former tobacco-farming households below the poverty thresholds (46.2 percent at World Bank and 53.5 percent at the government line) is significantly smaller than the proportion below the poverty lines of the households that are continuing

Table 5: Poverty Status of Current and Former Tobacco Farmers

POVERTY STATUS	POVERTY AT $1.90 A DAY PER PERSON, PPP 2011		POVERTY AT NATIONAL POVERTY LINE 330,776 RUPIAH A MONTH PER PERSON	
	CURRENT	FORMER	CURRENT	FORMER
Headcount ratio measured by per capita resource	20.80%	23.81%	32.80%	36.51%
Headcount ratio measured by per capita income	69.75%	46.18%	72.24%	53.50%
Poverty line (million rupiah)	3.3		4	

PER CAPITA HOUSEHOLD RESOURCE/INCOME		
	CURRENT	FORMER
Annual mean per capita resource Million rupiah USD	24.65 1,848.06	20.83 1,561.45
Annual median per capita resource Million rupiah USD	7.47 559.94	7.65 573.31
Annual mean per capita income Million rupiah USD	5.47 410.22	14.24 1,067.48
Annual median per capita income Million rupiah USD	0.41 30.92	3.63 272.21

to grow tobacco. Again, the difference between current and former tobacco farmers' poverty rates is due in large part to the higher input costs of farming tobacco compared to other enterprises, both agricultural and non-agricultural. While current tobacco farmers fared slightly better in terms of per capita resources per household than former farmers, former farmers on average had significantly high mean and median per capita incomes.

On average, current tobacco farmers used social assistance more than former tobacco farmers. Considering the poverty issues illustrated above, different forms of social assistance are part of the economic reality of many current and former tobacco farming households. In Table 6, we present the results from an analysis of the social protection that current and former tobacco farmers reported receiving. Broadly speaking, only a minority of either group of farmers formally had a Social Security Card (KPS) or a Family Welfare Card (KKS). The most recent Social Assistance Public Expenditure Review

Table 6: Participation in Social Security Card (KPS) or Family Welfare Card (KKS)

INDICATORS	CURRENT FARMER (N=1,035)	FORMER FARMER (N=315)
Percentage of households who have KPS/KKS	14.69%	19.05%
Benefit 1: Percentage of households who received cash assistance/transfer in the last year		
With KPS/KKS	1.35%	1.12%
Not with KPS/KKS	1.35%	0.95%
Benefit 2: Percentage of households who received rice for the poor (Raskin) in the last year		
With KPS/KKS	0.68%	1.59%
Not with KPS/KKS	73.43%	70.16%
Benefit 3: Percentage of households who received assistance for health payment in the last year		
With KPS/KKS	0.29%	0.32%
Not with KPS/KKS	2.32%	3.17%
Benefit 4: Percentage of households who received assistance for poor student in the last year		
With KPS/KKS	2.51%	3.17%
Not with KPS/KKS	9.57%	6.67%
Overall percentage of households who received assistance from KPS/KKS or other sources in the last year		
One benefit	63.00%	61.21%
Two benefits	11.40%	10.48%
Three benefits	1.64%	1.27%
Four benefits	0.19%	0.32%
Total	**76.23%**	**73.28%**

(SAPER) reports that 25% of all Indonesians are eligible for KKS, though this does not necessarily translate into card distribution/card program coverage.[3] Notably, a large number of farmers complained in the FGDs that social protection was uneven, commonly making comments such as "some have, but some just don't," and "but here it is not spread evenly." The largest benefit that both groups of farmers received was "rice for the poor" with nearly 75 percent of households having received this assistance. This is slightly above the national average of 70 percent reported in the SAPER.

3 KKS and KPS are distributed to beneficiaries based on the Unified Data Base of indigent households for access to multiple social assistance programs such as Rice for the Poor and education financial assistance, etc.

Table 7: Current and Former Tobacco Farmers Using KIS/BPJS-PBI

INDICATORS	CURRENT FARMER (N=1,035)	FORMER FARMER (N=315)
Percentage of households who have KIS/BPJS-PBI		
KIS	24.25%	21.27%
BPJS-PBI	7.44%	7.93%
Both KIS and BPJS-KIS	0.58%	0.00%
None	67.73%	70.79%
Percentage of households who have KIS and used it in last one year	14.97%	6.67%
Percentage of households with voluntary BPJS (BPJS Sukarela/JKN)		
Plus KIS	0.48%	0.32%
Plus BPJS-PBI	0.39%	0.00%
Plus both KIS and BPJS-PBI	0.00%	0%
Only voluntary BPJS	4.93%	
None	63.67%	62.54%
Percentage of households who have voluntary BPJS and used it in last one year	19.32%	6.67%
Average number of household members who own		
KIS	2.53	2.85
BPJS-PBI	3.12	3.01
Voluntary BPJS	2.25	2.22

A greater proportion of current tobacco farmers than former tobacco farmers utilized government health benefits (Table 7). The largest observable difference between current and former tobacco farmers was the proportion who had Indonesia Health Card (KIS) or National Health Insurance System (BPJS) coverage and used them in the previous year. For current tobacco farmers with KIS, 15 percent of farmers used it compared to 6.7 percent of former farmers. For BJPS, it was 19.3 percent of current farmers using it in the last year versus 6.7 percent for former tobacco farmers. Nationally, the enrollment is approximately 10 percent, though this is higher among informal workers in the agricultural sector generally.

Table 8: Mean Total Land Owned (hectares), under Cultivation and Tobacco Cultivation by Region, Current and Former Tobacco Farmers

	CURRENT			FORMER	
	TOBACCO	CULTIVATED	OWNED	CULTIVATED	OWNED
Bojonegoro	0.22	0.37	0.41	0.43	0.46
Jember	0.39	0.57	0.59	0.37	0.44
Lombok Tengah	0.56	0.71	0.77	0.38	0.38
Lombok Timur	0.39	0.51	0.59	0.30	0.36
Lumajang	0.17	0.38	0.39	0.51	0.53
Magelang	0.15	0.19	0.23	0.14	0.15
Temanggung	0.49	0.64	0.68	0.25	0.50
Total	**0.33**	**0.49**	**0.52**	**0.39**	**0.43**

Table 9: Legal Entitlement of Land — Current and Former Tobacco Farmers, by Parcel

OWNERSHIP	TOBACCO FARMER	FORMER FARMER	TOTAL
Granted by local leader	13	3	16
Owned	1,520	423	1,943
Rented	569	82	651
Tenant (no rent)	283	58	341
Other	17	2	19
Total	**2,402**	**568**	**2,970**

3.3 — Land Use

There was considerable variation among regions in terms of the size of the total land owned, cultivated and cultivated specifically for tobacco. Table 8 shows the average size of owned land for current farmers varied between 0.23 in Magelang to more than three quarters of a hectare in Lombok Tengah. The proportion of land cultivated for tobacco specifically also varied significantly. In Lumajang, tobacco farmers on average cultivated less than half their land for tobacco while in Lombok Timur it was around two-thirds. Farmers in Magelang owned and cultivated the smallest amounts of land, on average at approximately 15 percent of a hectare.

The majority of farmers owned their land, though a larger percent of former farmers (74.5%) owned land compared to current tobacco farmers (63.3%). Table 9 presents the type of legal entitlement of tobacco-farming households. Since many households owned more than one separate parcel of land, we use parcel as the unit of analysis. The next most common land entitlement was rental, with current farmers renting more (23.7%) compared to former tobacco farmers (14.4%).

SMOKING HAS BEEN A MAJOR CONTRIBUTOR C DISEASE BURDEN INDONESIA. SMO PREVALENCE AMONG WORKIN AGE INDIVIDUAL HAS EXCEEDED 3 PERCENT SINCE

4 THE ECONOMICS OF TOBACCO GROWING

4.1 — Characteristics of tobacco farming: contracts, production and prices

Tobacco farmers in Indonesia grow all the major types of tobacco leaf, though the majority grow Virginia leaf. Accordingly, Table 10 reports the categories of tobacco farming enterprises by leaf type across the regions of the survey. Virginia is typically more input and labour-intensive because it requires flue-curing (with heat and smoke) compared to Burley which is air-dried. Farmers indicated that they believe there is a stronger market and higher prices for Virginia leaf. In the FGDs, a number of farmers indicated that they thought, for example, that the Oriental "leaves were too small" and that the "price was not good." Notably, the results from the survey do not support the farmers' general perception in this regard—Virginia leaf was not consistently more lucrative.

Though the majority of farmers reported being independent, more than 20 percent of farmers noted that they were in a formal or informal contract with some form of leaf buyer. In Table 11, we show the distribution of contract and independent farmers by region. In all major tobacco growing regions, some tobacco farmers have entered into contracts with various types of tobacco leaf buyers. We did not purposively seek out contract farmers, so the proportion, 21.7 percent, is from the survey's random sample only. Typically, these farmers receive their physical inputs such as fertilizer and pesticides

Table 10: Type of Tobacco Farming Enterprise by Region

	VIRGINIA	BURLEY	ORIENTAL	TOTAL
Bojonegoro	119	0	46	165
Jember	193	10	1	204
Lombok Tengah	115	0	0	115
Lombok Timur	120	0	0	120
Lumajang	26	43	0	69
Magelang	85	0	0	85
Temanggung	106	0	0	106
Total	764	53	47	864

Note: Many of the missing values were likely cigar filler tobacco, but farmers had a challenging time identifying their tobacco and used inconsistent local names.

Table 11: Distribution of Contract and Independent Tobacco Farmers by Region

	CONTRACT FARMER	INDEPENDENT FARMER	TOTAL
Bojonegoro	54	186	240
Jember	47	193	240
Lombok Tengah	27	93	120
Lombok Timur	16	105	121
Lumajang	50	25	75
Magelang	19	101	120
Temanggung	12	108	120
Total	**225**	**811**	**1,036**

from the leaf buyer without paying cash for them, but the farmer must sell their leaf to the buyer at a price dictated by the buyer, and the costs of the inputs are deducted from the sales.

We use multivariate analysis to examine farmers' decisions to enter into a contract with a leaf buyer. Using a dichotomous measure of contract (1) or no contract (0) as the dependent variables and a set of independent variables drawn from previous literature examining tobacco contract farming (Chavez et al., 2016; Goma et al., 2015; Magati et al., 2016; Makoka et al., 2016), machine-learning methods and stepwise regression. Results of the final regression model are presented in Table 12.[4] The regression results suggest that farmers paying more for hired labour were more likely to enter into a contract as were farmers who paid more for their input costs broadly reported, and also farmers who spent more on nontobacco crop inputs (no labour). Burley and Oriental farmers are far more likely to enter into a contract; in fact, most Burley and Oriental leaf farmers were on contract. Because some farmers did not provide answers to certain queries (including sales, type of tobacco, and land entitlement), we imputed values for these variables, and re-ran the analyses, finding that households that had more household tobacco-related labour costs were more likely to be in a contract, as were more experienced tobacco farmers. Older tobacco farmers were slightly less likely to enter into a contract to grow tobacco.

The sales and prices of tobacco leaf varied across regions. Table 13 reports on median tobacco production, price and income by surveyed region. There was considerable variation across regions with median volume lowest in Bojonegoro (200 kg) and highest in Lombok Tengah (1,400 kg). Average prices were highest in the two regions of Lombok, and Lumajang ($1.87/kg), and lowest in Bojonegoro ($0.45/kg). Median total household tobacco

4 The table contains the statistically significant coefficients only; full results are available on demand.

Table 12: Logistic Regression of the Decision to Enter into a Tobacco-Growing Contract

VARIABLES	COMPLETE CASES		MISSING IMPUTED	
	O.R.	S.E.	O.R.	S.E.
Household labour cost			1.036***	0.013
Hired labour cost	1.013*	0.008		
Input cost	1.119*	0.076		
Years of experience for tobacco farming			1.017**	0.007
Age			0.981**	0.007
Nonlabour cost on nontobacco crops	0.951*	0.027		
Burley	376.026***	454.687	8.202***	1.939
Oriental	65.248***	56.110	46.366***	16.590

*** p<0.01, **p<0.05, *p<0.1

sales were lowest in Bojonegoro ($29.99) and highest again in the two Lombok regions (>$400). It is not clear why this wide variation exists, but the results suggest for example that farmers in Lombok Tengah farm quite intensively with more hired labor and greater quantities of key inputs such as fertilizer. It is also possible that the type of leaf cultivated affects overall productivity. Deeper explanations of productivity, however, would require more research designed more specific to agricultural productivity in tobacco cultivation.

Table 13: Median Tobacco Production, Price and Income by Region

REGION	PRICE PER KG		
	VOLUME SOLD (KG)	(USD)	SALES (USD)
Bojonegoro	200	0.45	29.99
Jember	320	1.12	115.09
Lombok Tengah	1400	1.87	412.39
Lombok Timur	650	1.87	449.87
Lumajang	308	1.87	178.56
Magelang	410	0.22	52.49
Temanggung	300	2.62	119.97
Total	**344**	**1.50**	**127.46**

Table 14: Median Production, Price and Income by Leaf Type

LEAF TYPE	VOLUME SOLD (KG)	PRICE(USD)	SALES (USD)
Virginia	370	1.50	124.28
Burley	275	1.87	135.45
Oriental	130	1.87	149.96
Total	344	1.50	127.46

The sale of tobacco leaf also varied across leaf types. Table 14 presents median production, price and total sales by leaf type. While there was variation in the median volume sold across leaf type (ranging from 130 kg for Oriental and 370 kg for Virginia), notably, there was much less variation on price and total sales. Virginia fetched the lowest median price at $1.50/kg while the other two varietals earned farmers $1.87/kg. Median sales ranged from $124.28 for Virginia to $149.96 for Oriental. These low sales numbers in many cases are likely linked to the finding from Figure 2 that for many households, tobacco farming is not the primary income earner.

The price of tobacco varied by leaf type and the quality of the leaf. In Indonesia, the leaf buyer sets both the price and the quality grade; farmers have little or no agency over either price or grade, and the government does not interfere in either process. In Table 15, we report the average price for the different major leaf types and the quality grades within each type. Grade A Burley fetched the highest price at $2.44/kg while the Grade D Virgina fetched the lowest price at $1.12/kg. Notably, the average price of Burley across all grades is roughly the same median price reported by farmers in Kenya (Magati et al., 2016), the Philippines (Chavez et al., 2016) and Zambia (Goma et al., 2015), suggesting that prices for tobacco leaf are, in large part, global. The actual tobacco comprises approximately 1.5% of the price of a pack of 20 cigarettes. In the FGDs, farmers consistently reported that the middlemen—the most common buyer—determined the price and it was non-negotiable. When asked about questioning the buyer's evaluation of the quality, one farmer repeated, "The middlemen determines the price."

Tobacco farmers sell their leaf to a variety of buyers. In Table 16, we report on who the buyers of the farmers' tobacco leaf were. Because most farmers sell their leaf more than once in a growing season and not always to the same buyer, the unit of analysis is each discrete sale of tobacco leaf, which is the reason why the number of cases is significantly more than the number of tobacco-growing households. By far the largest

5 Taking an American blend in a 0.7 gram Marlboro stick as an example: 50% Virginia + 35–40% of Burley + 10–15% of Oriental = (1.5 * 0.5 + 1.87 * 0.5) * 0.0007 = 0.00118 for the tobacco cost of one stick, or 0.02359 for a pack of 20.0.02359/1.537 = 1.535% (Marlboro price from Euromonitor data 2016, exchange rate from EIU).

Table 15: Average Tobacco Price by Grade and Leaf Type

	VIRGINIA (*N=1,866)	BURLEY (N=114)	ORIENTAL (N=73)
A	1.57	2.44	1.72
B	1.50	1.91	2.10
C	0.97	1.54	1.72
D	1.12	1.35	2.02
Total	**1.50**	**1.87**	**1.87**

* Note: Some farmers sold their leaf at more than one time, sometimes earning different prices at each time, or reported selling more than one grade at a given time, which is why the number of price reports exceeds the number of surveyed households.

type of buyer was a "middleman"—more than two-thirds of tobacco sale actions were to middlemen. Some of the middlemen also appear to be part of another tobacco leaf sub-sector as there appear to be many warehouses where some treatment, including curing, of the tobacco leaf takes place. The next largest type of buyer was the cigarette company warehouse at 13.9 percent, while another 7.7 percent was reported by these farmers to be the cigarette company directly (but not the warehouse).

4.2 — Costs of Tobacco Farming

Consistent with research in other countries, input costs for growing tobacco are typically very high in Indonesia, particularly compared to most other crops (e.g, Briones 2015; Chavez et al., 2016; Goma et al., 2015; Keyser and Juita, 2005; Magati et al.,

Table 16: Type of Tobacco Leaf Buyers by Region

ICT/CITY	INDIVIDUAL MIDDLEMAN/ COLLECTOR	OTHER FARMERS	CONTRACT REPRESENTATIVE	COMPANY COLLECTOR	CIGARETTE COMPANY WAREHOUSE	CIGARETTE COMPANY	OTHER	TOTAL
Bojonegoro	340	19	5	26	36	0	0	426
Jember	406	15	1	37	60	7	3	529
Lombok Tengah	222	13	1	11	57	5	1	310
Lombok Timur	124	34	8	6	53	6	0	231
Lumajang	10	2	17	78	39	14	0	160
Magelang	139	11	0	3	21	1	0	175
Temanggung	222	21	17	5	32	21	0	318
Total	1,463	115	49	166	298	54	4	2,149

2016; Makoka et al., 2016; Mulyana, 2015). The evidence for Indonesia is consistent with these broader findings. In Table 17, we examine tobacco farmers' main non-labour input costs to grow tobacco leaf. The mean input cost was $255.55 and the median was $86.05. Fertilizers were the most common and one of the consistently largest expenses. Nearly all tobacco farmers (98.5%) reported purchasing non-organic fertilizers, while another 38% reported buying organic fertilizers. The average cost for those purchasing inorganic fertilizer was $37.49, and $22.49 for organic fertilizer. Rental of equipment was another common (~41%) and significant input cost reported by many households, on average $29.99. The single highest average cost was $224.94 for firewood, though only 10% of farmers reported purchasing this input. Firewood is sometimes used in Indonesia to cure Virginia tobacco leaf and only some households cure their own tobacco in this way. Most farmers reported curing their tobacco leaf by sun and air.

Farmers typically use significantly fewer inputs for nontobacco crops during the tobacco-growing season. It is important to consider that many tobacco farmers even during the tobacco season are also growing nontobacco crops. Table 18 illustrates the main inputs that tobacco farmers reported for nontobacco crops grown during both the

Table 17: Main Inputs for Tobacco Farming and Average Cost (Current Dry Season)

INPUT	PROPORTION OF FARMERS WHO USED THE ITEM	AVERAGE COST (USD)
Fertilizer, non-organic	98.45%	37.49
Fertilizer	38.16%	22.49
Pesticides (chemicals)	83.86%	9.37
Gasoline for clove farming equipment	39.61%	9.00
Oil	13.91%	3.67
Firewood/fuel wood	10.24%	224.94
Bamboo, bamboo sticks, rice hay, descuke-ride	42.51%	.
Knapsack sprayer	85.60%	.
Drums	24.06%	.
Sprinkler	66.47%	.
Rental of equipment/livestock	41.16%	29.99
Transportation (to market)	45.02%	.
Water pump	25.51%	.
Mattock, sickle	99.61%	.
Others	9.57%	29.99

Table 18: Tobacco Farmers' Inputs for Cultivating Nontobacco Crops

INPUT	DRY SEASON		WET SEASON	
	PROPORTION OF FARMERS WHO USED THE ITEM	AVERAGE COST (USD)	PROPORTION OF FARMERS WHO USED THE ITEM	AVERAGE COST (USD)
Fertilizer, non-organic	59.34%	15.63	98.46%	63.02
Fertilizer	25.32%	5.62	51.54%	45.2
Pesticides (chemicals)	42.97%	5.32	84.80%	26.97
Gasoline for clove farming equipment	18.41%	6	33.26%	21.94
Oil	2.56%	2.62	9.86%	5.64
Firewood/fuel wood	0.26%	0.37	0.62%	11
Bamboo, bamboo sticks, rice hay, descuke-ride	.	.	12.01%	.
Knapsack sprayer	.	.	86.86%	.
Drums	.	.	13.04%	.
Sprinkler	.	.	23.00%	.
Rental of equipment/livestock	19.69%	16.87	59.34%	41.8
Transportation (to market)	.	.	38.91%	.
Water pump	.	.	17.76%	.
Mattock, sickle	.	.	99.18%	.
Others	2.30%	64.67	5.44%	71.99

tobacco-growing (dry) and nontobacco (wet) seasons and the average costs of these inputs. The mean input cost was $60.72 and the median was $25.86. The most common inputs were non-organic fertilizer (59% of farmers) and pesticides (43%). Non-organic fertilizer was one the highest average input costs for tobacco farmers' nontobacco crops at $15.63. Equipment rental ($16.87) was another significant cost, but only ~20% of farmers reported renting equipment. Moreover, average costs for both were significantly less than what tobacco farmers typically spend on these two inputs for their tobacco crops. In the second set of columns for the wetter seasons, we observe that these costs look closer to the tobacco-growing costs with significant average input costs, for example, for both types of fertilizer. These data suggest that many tobacco farmers are allocating inputs away from nontobacco crops toward their tobacco crops during the tobacco-growing season.

Table 19: Former Tobacco Farmers' Main Inputs for Cultivating Nontobacco Crops (during the season where others farm tobacco)

INPUT	DRY SEASON		WET SEASON	
	PROPORTION OF FARMERS WHO USED THE ITEM	AVERAGE COST (USD)	PROPORTION OF FARMERS WHO USED THE ITEM	AVERAGE COST (USD)
Fertilizer, non-organic	90.31%	30.74	97.56%	64.76
Fertilizer	52.42%	8.44	49.19%	49.58
Pesticides (chemicals)	72.69%	7.5	84.96%	27.62
Gasoline for clove farming equipment	41.41%	9.3	37.80%	15.26
Oil	13.22%	2.77	15.85%	5.57
Firewood/fuel wood	0.44%	7.5	0.00%	.
Bamboo, bamboo sticks, rice hay, descuke-ride	.	.	9.76%	.
Knapsack sprayer	.	.	88.21%	.
Drums	.	.	13.41%	.
Sprinkler	.	.	27.64%	.
Rental of equipment/livestock	44.49%	29.99	72.76%	46.85
Transportation (to market)	.	.	49.19%	.
Water pump	.	.	17.48%	.
Mattock, sickle	.	.	98.78%	.
Others	7.49%	74.98	4.88%	68.82

Former tobacco farmers typically use fertilizer less intensively than their tobacco-farming counterparts. In Table 19, we report former tobacco farmers' principal inputs during the season in which current tobacco farmers were growing tobacco. The average input cost was $177.25 and the median was $63.36. Approximately 9 out of 10 former tobacco farmers reported using non-organic fertilizers at an average cost of $30.74, which is less than their tobacco-farming counterparts. Roughly the same proportion of former tobacco farmers were renting equipment and spending similar amounts compared to their tobacco-growing peers.

Beyond obvious physical inputs, there are other direct costs associated with farming, including depreciation of equipment used for farming, interest costs from loans, rent for land, and in the case of tobacco, government levies collected by the leaf buyers.

Table 20: Median Non-labour Costs (USD), Current and Former Tobacco Farmers, by Region (all seasons)

Current tobacco farmers

	DEPRECIATION	N	COST OF INTEREST	N	RENT	N	LEVIES	N
Bojonegoro	35.47	240	11.73	240	3.12	240	1.44	240
Jember	24.80	240	60.92	238	28.49	240	20.81	238
Lombok Tengah	22.19	120	152.77	120	3.44	120	7.23	120
Lombok Timur	16.85	121	88.48	120	113.72	120	32.63	121
Lumajang	16.59	75	36.72	75	2.00	75	15.21	75
Magelang	18.12	120	19.73	120	4.30	120	6.82	120
Temanggung	16.45	120	136.21	120	18.37	120	12.12	120
Total	**23.71**	**1,036**	**65.57**	**1,033**	**23.69**	**1,035**	**13.08**	**1,034**

Former tobacco farmers

	DEPRECIATION	N	COST OF INTEREST	N	RENT	N
Bojonegoro	42.06	59	2.77	56	5.72	59
Jember	7.46	60	15.88	53	40.86	50
Lombok Tengah	160.03	30	106.60	20	97.62	25
Lombok Timur	1.59	30	488.15	22	1544.28	26
Lumajang	11.43	75	0.00	75	22.29	75
Magelang	1.08	30	0.28	27	5.62	28
Temanggung	9.24	30	31.93	24	34.03	21
Total	**28.49**	**314**	**52.86**	**277**	**167.31**	**284**

In Table 20, we present these costs by region. For depreciation, we use the accounting discipline's straightline method.[6] We observe fairly consistent median costs across regions with the cost of interest being typically the highest. Farmers in Lombok Tengah appeared to take out the largest loans to farm tobacco on average, while farmers in Lombok Timur rented more land to cultivate tobacco leaf. Farmers in Lombok Timur also tended to pay considerably more rent to grow other crops than tobacco.

6 Straight-line depreciation = (purchase price of asset – approximate salvage value)/estimated useful life of asset.

Figure 5: Learning Curve of Cost Estimation for Tobacco Farmers

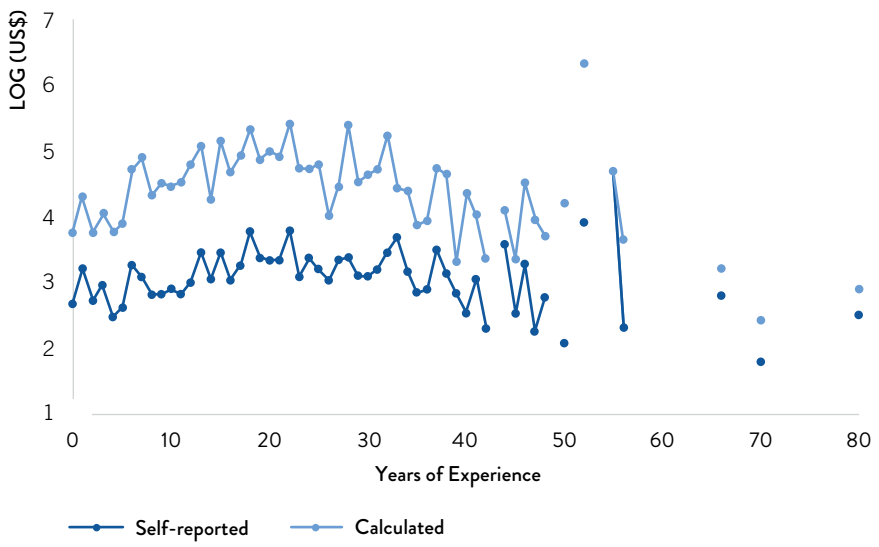
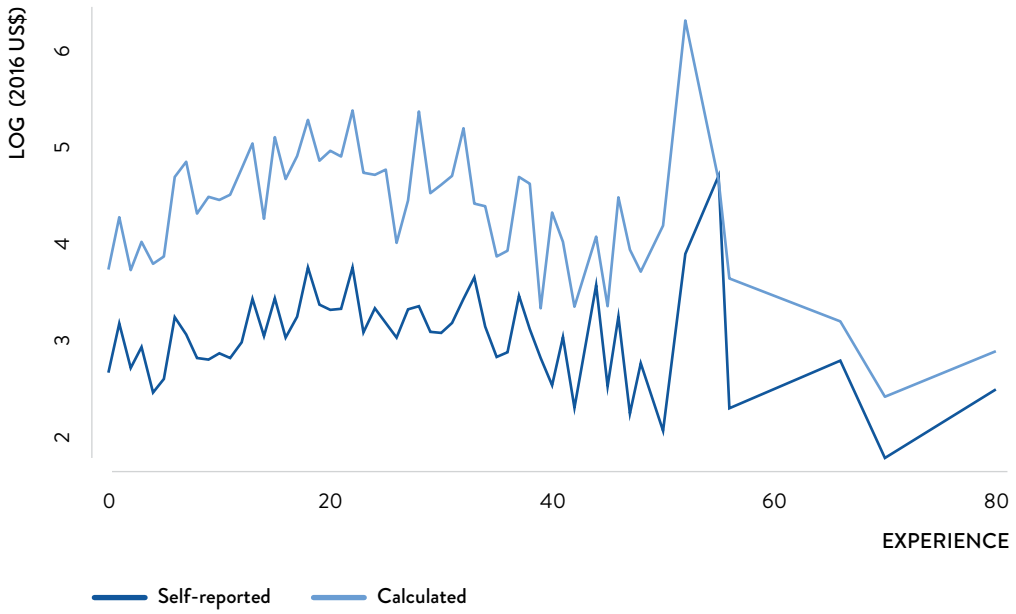
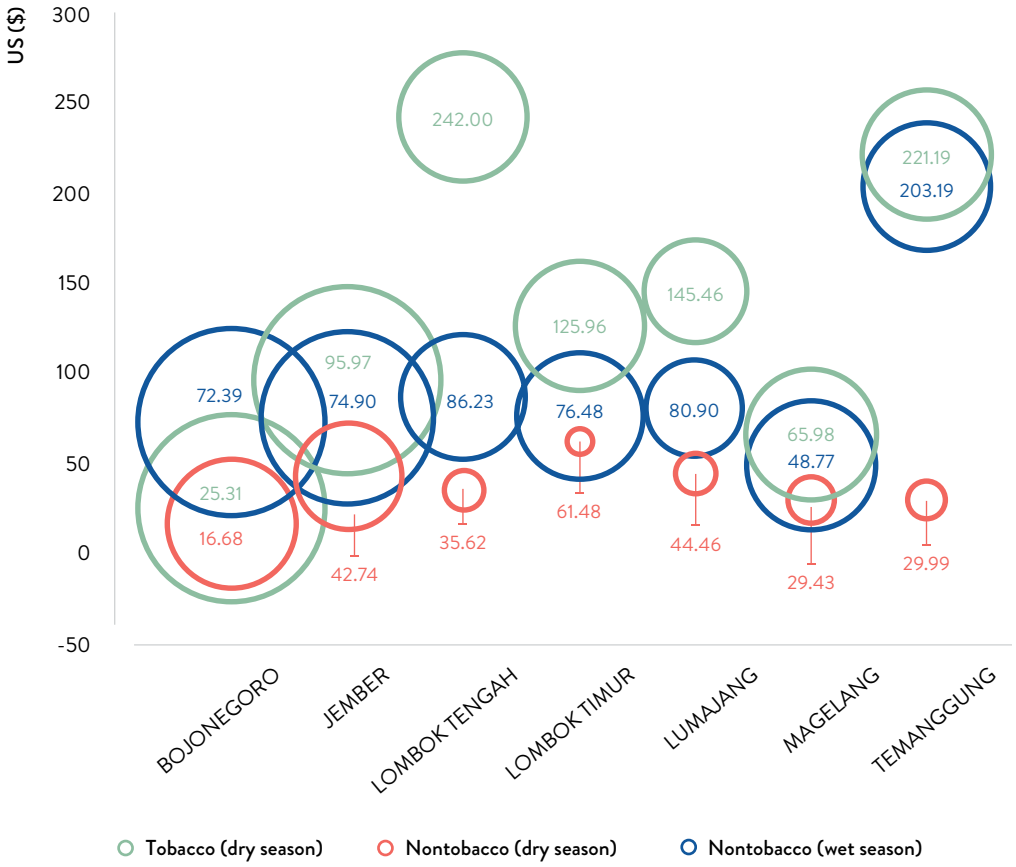


Figure 6: Learning Curve of Cost Estimation for Tobacco Farmers Receiving Elementary Level Education or Less



Farmers' perceptions of input costs are largely different from the actual costs, with the exception of the most experienced farmers. Each season, farmers must make a calculation as to the difference between the total estimated cost of inputs to grow tobacco (or any crop) versus expected revenue from selling the crop. In the survey, before enumerating each cost systematically, we asked each respondent to estimate how much

Figure 7: Median Input Costs for Tobacco Farmers by Region — All Seasons

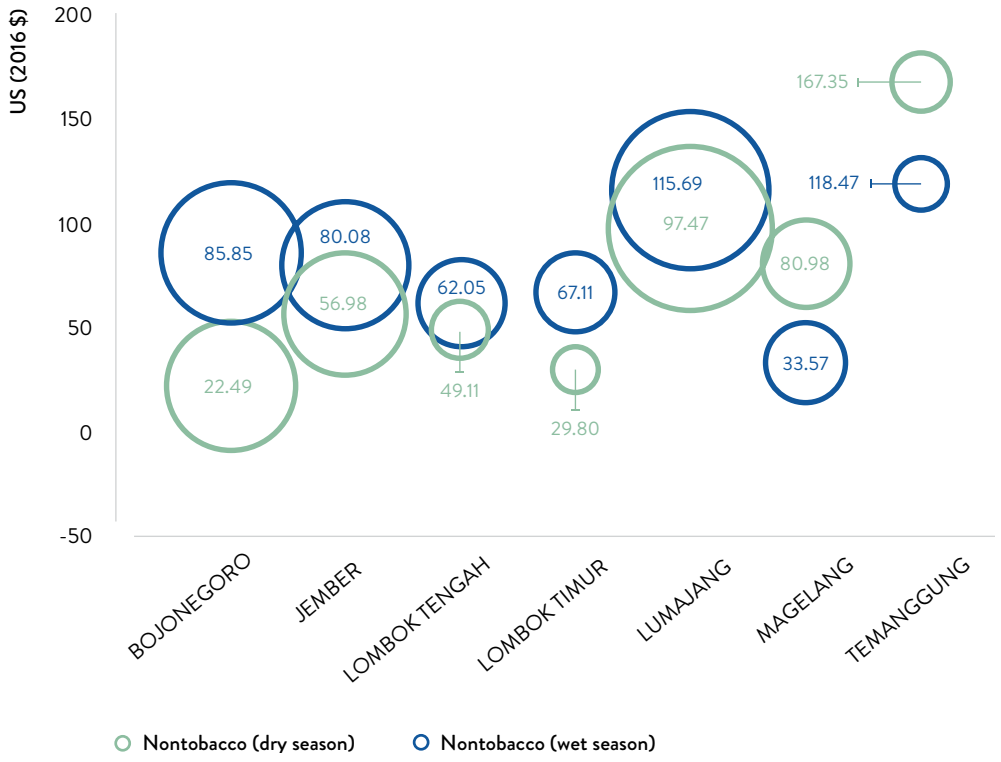


Note: Bubble size is the number of non-missing cases that ever reported a value.

they thought their total tobacco-related input costs were for that season. We examine the difference between these estimates and the actual total of their costs and plot it in Figure 5 by years of experience. We observe that only very experienced farmers (more than 30 years) were actually close in their estimates. We use the logged value of the inputs because the estimates were actually quite divergent for some of the farmers (i.e., their actual costs were in reality far higher than estimated costs when they were asked to systematically itemize all of their expenses). These findings suggest that many farmers are likely making cropping decisions based on considerable underestimation of their costs. Figure 6 is a similar figure for farmers with an elementary education or less and the graph suggests that these farmers learn over time and make better cost estimations as they become very experienced. This dynamic appears to be driven by Bojonegoro, Jember and Magelang where the evidence for this learning was statistically strongest.

Median tobacco input costs for tobacco farmers vary considerably across regions and more than their nontobacco input costs (in both wet and dry seasons). In Figure 7, we compare tobacco farmers' non-labour median input costs among regions for both dry

Figure 8: Median Input Costs for Former Tobacco Farmers by Region — All Seasons



Note: Bubble size is the number of non-missing cases that ever reported a value.

(tobacco and nontobacco) and wet seasons. We observe the most variation in median non-labour input costs across regions for the actual tobacco growing. Lombok Tengah and Temanggung both break the $200 (USD) threshold, while Bojonegoro had the lowest median input cost for tobacco farming at $25.31. There was much less variation across regions for nontobacco farming input costs during the dry (tobacco) season. The range was $16.68 to $61.48. For wet season farming for tobacco farmers, there was not large variation on median input costs with the exception of Temanggung, which was $203.19. The next highest median input cost during the wet season was Lumajang at $80.90.

Former farmers' input costs varied among regions but there was less variation than with current tobacco farmers. In Figure 8, we examine the median input costs for former tobacco farmers in both dry and wet seasons. We observe some variation among regions during the dry season, ranging from $22.49 in Bojonegoro to $167.35 in Temanggung, though the latter had significantly higher costs than the region with the second highest median costs (Lumajang at $97.47). There was less variation among regions for median input costs during the wet seasons with a range of $33.57 in Magelang to $115.69 in Lumajang.

Tobacco farming is highly labour-intensive in Indonesia. Tobacco farming has a wide reputation for being labour intensive, and research in other countries supports that

Table 21: Median Hours Worked by Farming Household Members by Gender, Age and Tobacco/Nontobacco Crops (tobacco/dry season)

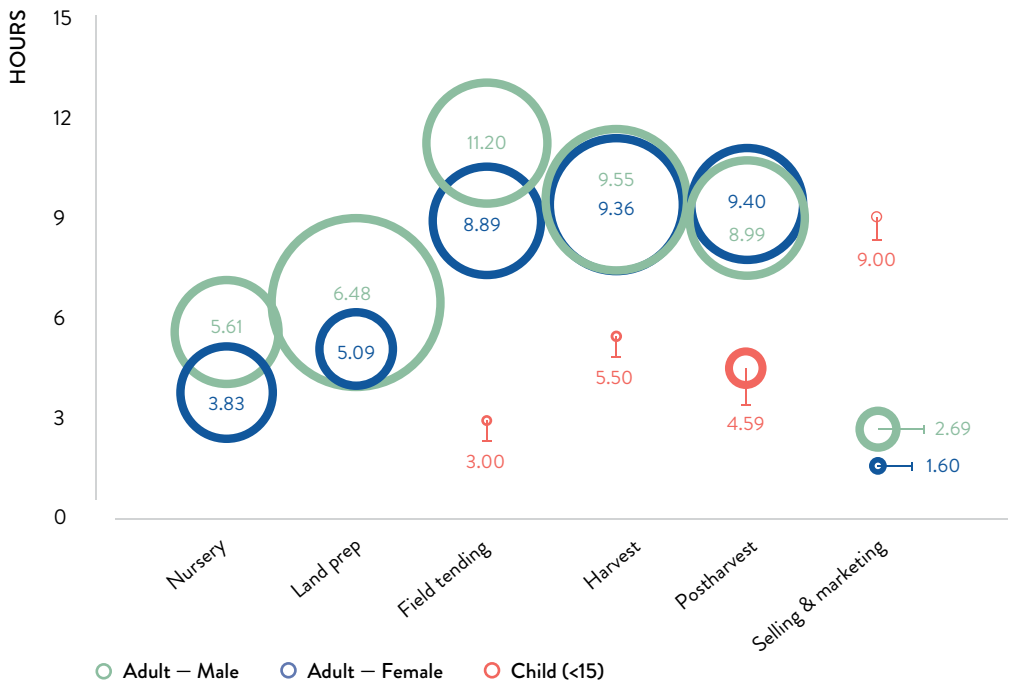
	TOBACCO FARMERS				FORMER TOBACCO FARMERS	
	TOBACCO		NONTOBACCO		NONTOBACCO	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
<15	35	22.5	10	15	12	9
15–20	120	100	140	54	25	12.5
21–35	540	300	186	120	256	128
36–60	640	434	288	180	418	180
>60	600	465	270	177	360	135
All	600	360	240	147	360	180

reputation (e.g., Chavez et al., 2016; Goma et al., 2015; Magati et al., 2016; Makoka et al., 2016). The results from this survey presented in Table 21 suggest the same in Indonesia. For example, as reported in Table 21, the median male individual in a household worked 600 hours on tobacco cultivation in the tobacco-growing season, while the median female individual worked 360 hours. It is critical to note that these individuals also worked on nontobacco crops in the same season. The median male dedicates 240 hours to non-tobacco crops while the median female spends 147 on other crops. In contrast, the median former tobacco farmer dedicates far less time to her/his crops. The median male spends 360 hours on cultivating his crops in the dry season while the median female spends 180 hours.

Most households hire non-household workers to assist with tobacco cultivation. Farmers also hire labour, adult and child, to work at agricultural tasks. Figure 9 illustrates that hired labourers – men, women and children – are used for most major agricultural activities on tobacco farms. For example, the mean household hires men for more than 11 days to tend the tobacco fields and women for more than 8 days (labourers are typically hired by the day, not the hour, which is why the unit of analysis is different than for household labour; in FGDs, farmers reported that average days were around 10 hours).

Current tobacco farmers typically allocated far more labour—household and hired—to cultivation of crops than former tobacco farmers. For many years, even though tobacco farming is a labour-intensive crop, researchers have rarely addressed the issue of the value of labour inputs in studies of tobacco farming, let alone incorporated them into the calculation of farmers' costs. But in Indonesia's increasingly dynamic economy, many tobacco farmers have other economic opportunities and, therefore, it is important to conceptualize that there are opportunity costs to farming tobacco. In other words, time spent cultivating tobacco is time that could be spent on other potentially more profitable

Figure 9: Hired Labour for Tobacco Farming by Gender, Adult/Child — Days



Note: Bubble size is the number of non-missing cases that ever reported a value.

economic endeavors. More recent studies have begun to address this issue by assigning defensible values based on local agricultural wage rates to this household labour (e.g., Chavez et al., 2016; Goma et al., 2015; Magati et al., 2016; Makoka et al., 2016). Following their methodologies, we calculated an hourly rate using official regional agricultural minimum wages and official workweeks (some regions had more hours in a workweek) and multiplied by the number of household labour hours reported. In other words, these individuals at a minimum could have found casual work laboring on other tobacco farms; realistically, many of these farmers were very experienced and could have earned more than a typical day labourer so these estimations are very conservative. In Table 22, we compare current and former tobacco farmers' household and hired labour for the tobacco-growing (dry) season. For the current tobacco farmers, we also break down the value of labour between their tobacco and nontobacco crops. Clearly, tobacco farmers are investing an enormous amount of resources into both household and hired labour across all regions. In most regions, the amount of tobacco farmers' labour dedicated to tobacco was more than the former tobacco farmers were dedicating to their crops, but on top of that, the current tobacco farmers were allocating nearly as many hours to their nontobacco crops.

Table 22: Average Household and Hired Labour Costs (USD) for Current and Former Tobacco Farmers, by Region (dry/tobacco season only)

	CURRENT FARMER								FORMER FARMER			
	TOBACCO				NONTOBACCO				NONTOBACCO			
	N	HIRED LABOUR	N	HOUSEHOLD LABOUR	N	HIRED LABOUR	N	HOUSEHOLD LABOUR	N	HIRED LABOUR	N	HOUSEHOLD LABOUR
Bojonegoro	240	276.02	240	617.44	35	75.03	130	443.89	21	95.26	50	444.36
Jember	240	1319.94	240	837.58	65	179.37	98	357.68	31	333.47	41	443.92
Lombok Tengah	120	1525.68	120	974.15	6	121.34	25	309.83	8	423.63	11	363.47
Lombok Timur	121	1313.07	120	607.98	4	138.34	31	344.96	6	65.54	8	324
Lumajang	75	819.48	75	963.29	9	197.53	15	482.7	61	283.73	75	610.91
Magelang	120	170.44	120	1109.43	2	322.04	50	732.13	9	739.09	24	705.93
Temanggung	120	490.76	120	1201.22	7	87.56	31	918.42	8	308.11	12	878.75
Total	**1036**	**835.71**	**1035**	**858.54**	**128**	**145.32**	**380**	**482.93**	**144**	**295.45**	**221**	**544.41**

Table 23: Direct Non-Labour Mean Costs of Farming

VARIABLE	OBSERVATIONS	MEAN
Shared Cost		
Depreciation	511	14.94
Interest	511	42.03
Rent	136	626.10
Non-tobacco Crop		
Sales	447	76.62
Hired Labour Cost	373	14.56
Household Labour Cost	495	153.97

VARIABLE	OBSERVATIONS	MEAN
Tobacco		
Sales	413	376.20
Household Labour Cost	458	683.35
Hired Labour Cost	511	373.11
Input Cost	509	123.54
Levies	511	9.05

Mean costs of farming are higher than mean sales. In Table 23, we present the mean of sales and each major cost (for "typical" farmers—those in the 25–75th percentile for land and household size) for tobacco and nontobacco crops. The number of observations varies because not all farmers incur every cost (for example, only some farmers rent land). The largest cost is household labour, with a mean roughly twice that of sales.

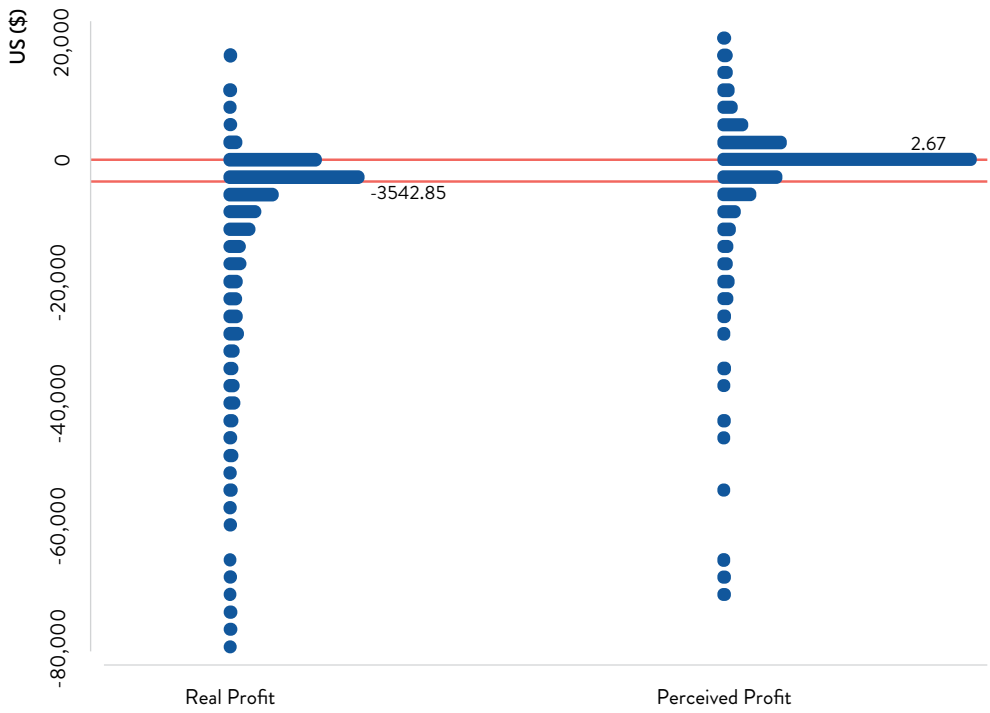
Table 24: Tobacco (Dry) Season — Profits per Hectare (USD) — Former and Current Tobacco Farmers

	TOBACCO		TOBACCO (DRY SEASON)	
	REAL	PERCEIVED	REAL	PERCEIVED
Current	–3,542.85	2.67	–1,245.80	695.87
Former	.	.	–356.71	451.37
Total	–3,542.85	2.67	–1,079.35	665.16

4.3 — Profits

Tobacco farmers' perceived profits ("gross margins") from tobacco are close to zero, while realized profits (which incorporate value of household labour) are negative; former tobacco farmers' profits are also negative but generally higher than current tobacco farmers'. Recent tobacco farming research in other countries suggests that tobacco farming is not very profitable for most smallholder farmers (e.g., Chavez et al., 2016; Goma et al., 2015; Magati et al., 2016; Makoka et al., 2016). Accordingly, to examine the profit dynamic in Indonesia, we used the information presented above on revenue and costs to calculate the profits of the tobacco farmers. We first examine per hectare profits with the important qualification that most farmers have small plots of land. In other words, some of the numbers will seem to be of a large (usually negative magnitude), but readers should take into account that the vast majority of households cultivate only part of a hectare, often a small proportion. In Table 24, we present both median "perceived" profits per hectare, which are what agricultural economists would term "gross margins" a straightforward calculation of the revenues from selling crops less the direct non-labour expenses including physical inputs (e.g., fertilizer and pesticide), hired labour, marketing expenses and transportation. We observe that for current tobacco farmers, the median perceived profit from growing tobacco is $2.67 per hectare. "Realized" profits per hectare incorporate the minimum valuation of household labour presented above. The median realized profit per hectare for tobacco farming was –$3542.85. We also compared the nontobacco crops for both current and former tobacco farmers. For the current tobacco farmers, their median perceived profit for their nontobacco crops was $695.87/hectare while the median realized profit with labour included was –$1245.80. For former tobacco farmers, the median perceived profit was $451.37 while the median realized profit was –$356.71. These results suggest that the median former tobacco farmer is doing considerably better than the median tobacco farmer in his/her agricultural pursuits.

Figure 10: Distribution of Profit per Hectare for Tobacco Farming (USD)



Most tobacco farmers are not turning a profit. In Figure 10, we examine the distribution of perceived and real profits. We observe that the tobacco farmer had negative perceived profits though there were clearly households with positive perceived profits. In contrast, there were far fewer households that demonstrated positive real profits.

There was variation in median profits across regions, driven largely by variation in hours allocated by household labour to cultivation. In Table 25, we examine the median profits per hectare for current tobacco farmers for both their tobacco and non-tobacco crops by region. We observe that there is considerable variation among regions. The wide variation in the real profits is best explained by the wide variation across regions in the number of hours reported by household members to cultivate tobacco leaf.

In profitability, independent tobacco farmers generally fared better than contract farmers. In Table 26, we compare the median profits per hectare for contract versus independent farmer by district. In brief, per hectare profits varied widely, but in most districts, independent farms fared better on profits compared to their contracting neighbors. In terms of perceived profit for the independent farmers, there was wide variation, ranging from $1212.13 median profit per hectare in Lumajang to a loss of $476 per hectare in Jember. For contract farmers, only the farmers in Magelang had a positive perceived profit. The realized profits across all regions and both types of farmers varied considerably,

Table 25: Median Profit (USD) per Hectare for Current Tobacco Farmers by Region (tobacco/dry season)

REGION	TOBACCO		NON-TOBACCO CROPS (DRY SEASON)	
	REAL PROFIT	PERCEIVED PROFIT	REAL PROFIT	PERCEIVED PROFIT
Bojonegoro	-3,178.43	324.91	-1,261.07	737.43
Jember	-5,488.72	-476.57	-1,153.20	603.58
Lombok Tengah	-2,171.83	-448.76	-1,053.07	-267.18
Lombok Timur	-1,514.57	376.10	-4,790.65	64.98
Lumajang	-5,521.54	-446.25	-1,210.23	106.27
Magelang	-9,083.75	153.03	-3,055.80	8,201.88
Temanggung	-3,379.26	-269.34	-1,576.44	4,641.25
Total	**-3,542.85**	**2.67**	**-1,245.80**	**695.87**

Table 26: Median Profits per Hectare (USD) — Independent and Contract Tobacco Farmers, by Region

REGION	CONTRACT		INDEPENDENT	
	REAL PROFIT	PERCEIVED PROFIT	REAL PROFIT	PERCEIVED PROFIT
Bojonegoro	–1,726.82	477.80	–4,216.13	283.27
Jember	–8,235.78	–22.32	–5,345.33	–476.57
Lombok Tengah	–3,589.81	–1,269.05	–2,065.64	–333.67
Lombok Timur	–2,983.44	–1,568.79	–1,460.83	411.99
Lumajang	–5,707.49	–1,086.30	–5,375.43	1,212.13
Magelang	–14,984.48	633.58	–11,876.14	126.26
Temanggung	–4,283.98	–1,189.06	–3,327.56	–155.93

but were all negative. The median real profit for contract farmers in Lombok Timur was closest to breaking even at $–823.75. Both contract and independent farmers appeared to fare the worst.

Profits per kilogram (perceived and realized) for tobacco leaf were also negative for almost all regions. Because many tobacco farmers cultivated small plots of land—often a small fraction of a hectare—it can be challenging to put the per hectare profits into a meaningful perspective for the average household. Accordingly, we also calculated per

Table 27: Current Tobacco Farmer Median Profits per Kilogram (USD) by Region

	TOBACCO		OTHER CROPS	
	REAL PROFIT	PERCEIVED PROFIT	REAL PROFIT	PERCEIVED PROFIT
Bojonegoro	-3.70	0.03	-1.39	0.27
Jember	-6.01	-1.10	-0.24	0.09
Lombok Tengah	-1.08	-0.23	-0.62	0.03
Lombok Timur	-1.33	-0.10	-15.10	0.72
Lumajang	-4.54	-0.82	-0.59	0.05
Magelang	-3.59	-0.03	-1.05	0.15
Temanggung	-5.91	-0.76	-10.34	0.63
Total	**-3.77**	**-0.26**	**-1.12**	**0.20**

kilogram profits for both tobacco and as a point of comparison for nontobacco crops, which are presented in Table 27. The per kilogram perceived and realized profits for tobacco were negative for all regions except perceived profit in Bojonegoro. The perceived per kilogram profits for nontobacco crops were positive for all regions, though no region demonstrated realized per kilogram profits for nontobacco crops.

There was wide variation in profit per kilogram for tobacco farming. In Figure 11, we present the distribution of the real and perceived profits per kilogram for both tobacco and nontobacco crops for current tobacco farmers. We find a wide distribution particularly among the real profits per kilogram for tobacco farming.

Perceived profits per kilogram were mostly positive for former tobacco farmers, while realized profits were negative. In Table 28, we present the median profits per kilogram for former tobacco farmers. With the caveat that this is a somewhat crude measure because the prices by weight of different crops vary tremendously, sometimes as a function of other variables such as how much water is in the crop (e.g., garlic versus tomatoes), there is nevertheless some interesting information to consider. First, the median perceived profits per kilogram are positive or close to positive in most regions. For the median realized profits, they are negative in all regions. However, the losses are typically much smaller in magnitude than for the current tobacco farmers' nontobacco crops as we observe above in Table 27.

Figure 11: Distribution of Profits per Kilogram for Current Tobacco Farmers

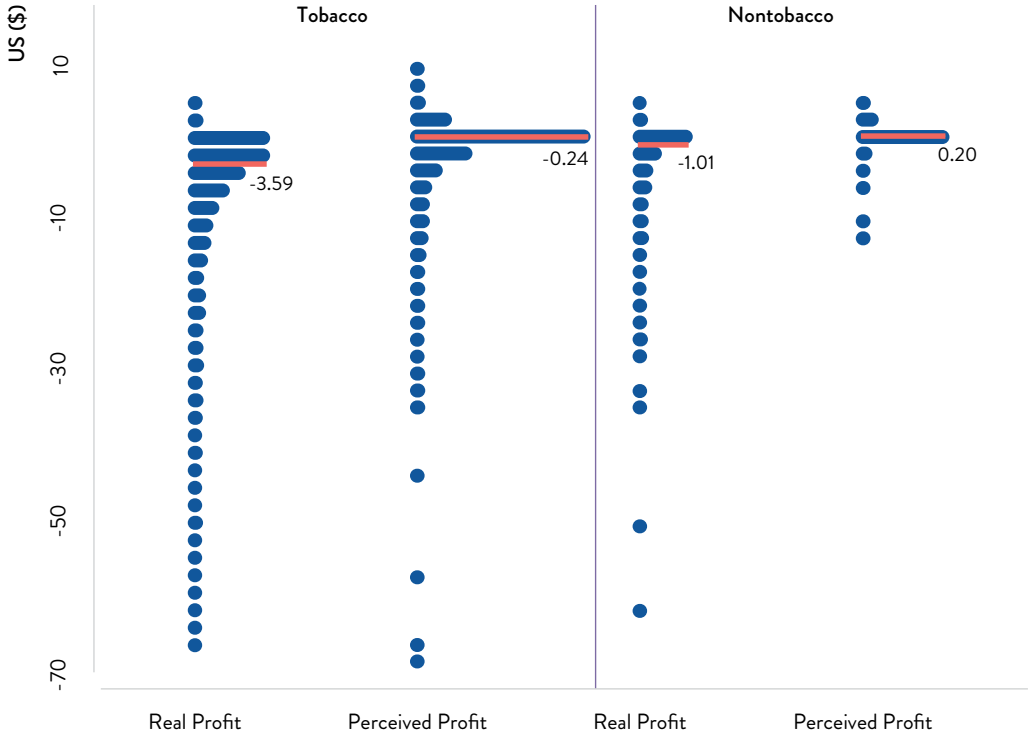
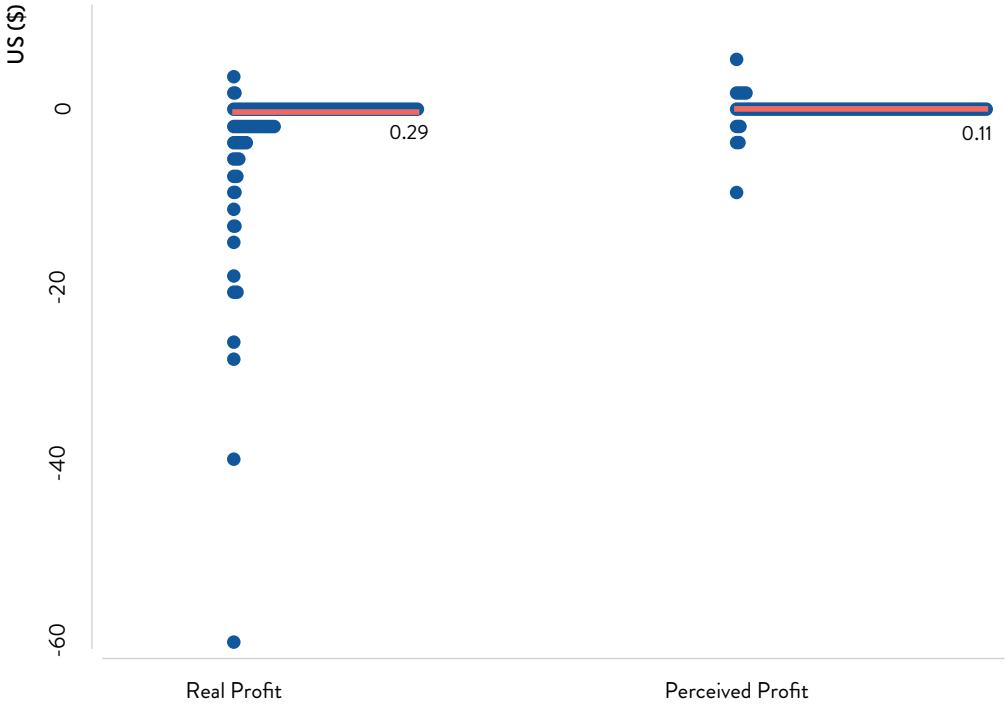


Table 28: Former Tobacco Farmer Median Profits per Kilogram (USD) by Region

	REAL PROFIT	PERCEIVED PROFIT
Bojonegoro	–1.95	0.24
Jember	–0.17	0.07
Lombok Tengah	–0.59	–0.15
Lombok Timur	–0.88	–0.01
Lumajang	–0.16	0.09
Magelang	–0.32	0.27
Temanggung	–0.14	0.28
Total	**–0.30**	**0.11**

The distribution of profits per kilogram was much tighter for former tobacco farmers than current ones. In Figure 12, we present the distribution of the real and perceived profits per kilogram for former tobacco farmers. We find a tighter distribution particularly among the perceived profits per kilogram compared to the tobacco farming profits distribution above in Figure 11.

Figure 12: Distribution of Profits per Kilogram for Former Tobacco Farmers



Most tobacco farmers allocated a far greater proportion of their expenses toward cultivating their tobacco crops compared to the proportion of their revenues from selling tobacco leaf. In order to understand better how farmers allocated their expenses compared to their sales, we plotted the proportion of total agricultural costs (nonlabour and labour) that were spent on tobacco farming (X axis) with the tobacco proportion of total household agricultural revenue (Y axis) in Figure 13. We observe that a majority of farmers were misallocating their expenses toward tobacco farming — in other words, the proportion of total farming expenses for tobacco for most households was much higher than tobacco's share of total agricultural revenues.

The size of a farmer's tobacco crop is negatively related to their income. We also ran multivariate analyses to predict farmers' income. Building on Klasen et al. (2013) work on cash crop choices in Indonesia, we utilized the following model: Income = (tobacco) + (agricultural self-employment) + (agricultural wage) + (nonagricultural self-employment) + (nonagricultural wage) + demographic characteristics. For the sake of space, we present only the significant findings in Table 29 (complete findings are available upon request). One of the most significant findings was that the size of the area planted for tobacco was a strong negative predictor of farmer income. Notably, other agricultural variables including total area cultivated for crops and agricultural self-employment (i.e., not under contract) were positive predictors of income. Household size was negatively related to income and wage employment was positively related.

Figure 13: Share of Tobacco Farming Costs Versus Share of Total Revenues

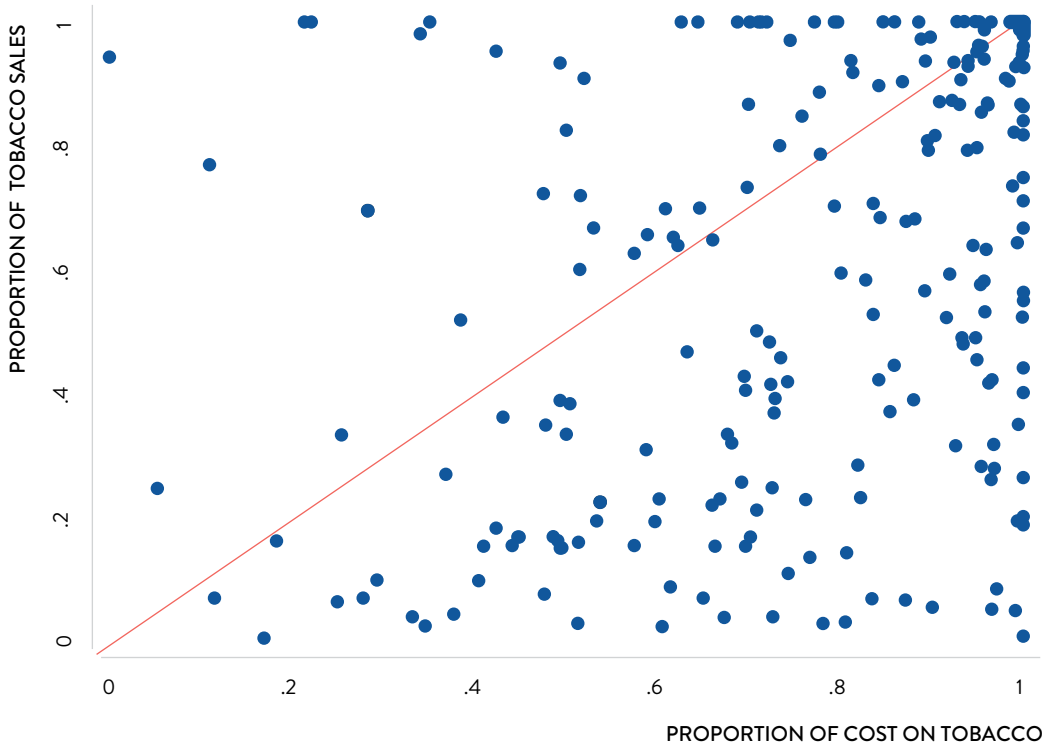


Table 29: Predicting Farmers' Income

VARIABLES	FIXED EFFECTS MODEL	RANDOM EFFECTS MODEL
Area tobacco	-1,097*** (342.30)	-967.3*** (323.80)
Area cultivated	1,172*** (305.80)	1,116*** (294.60)
Household size	-301.3*** (96.84)	-301.3*** (95.33)
Nonfarm Self-employment	0.338*** (0.01)	0.339*** (0.01)
Ag. Self-employment	0.523*** (0.06)	0.533*** (0.06)
Wage employment	0.653** (0.30)	0.691** (0.30)
Observations	627	627
R-squared	0.593	
Number of districts	7	7

*** p<0.01, **p<0.05, *p<0.1

4.4 — Credit and Debt

The majority of tobacco farmers reported the need for loans to cultivate tobacco. Because farmers typically need inputs to begin the cultivation process and most Indonesian farmers do not have large savings, access to credit is an important financial need for many households. Tobacco farming is particularly input-intensive, and this dynamic likely heightens the need for credit to obtain these inputs. In fact, 52.7 percent of tobacco farmers reported needing credit, which was statistically significantly more than former tobacco farmers. Not surprisingly, 50 percent of tobacco farmers applied for a loan, which was more than the 42.9 percent of former tobacco farmers ($p<0.05$). Most of the tobacco farmers (~97%) were able to obtain the loans for which they applied. Farmers reported needing loans for many reasons beyond inputs though it was the modal reason for tobacco farmers, as reported in Table 30. However, simply meeting daily needs and paying for education were also major reasons that farmers identified.

Table 30: Reasons Reported for Needing Loans

	CURRENT		FORMER	
	N	PERCENT	N	PERCENT
Inputs for tobacco farming	318	36.76		
Land for tobacco farming	39	4.51		
Inputs for farming other crop	140	16.18	46	21.20
Land for farming other crop	13	1.50	6	2.76
Schooling	74	8.55	20	9.22
Purchasing house	9	1.04	7	3.23
Purchasing vehicle	8	0.92	4	1.84
Investing in business	49	5.66	32	14.75
Special occasions (e.g., wedding)	35	4.05	17	7.83
Meeting daily needs	142	16.42	54	24.88
Health expenses	24	2.77	10	4.61
Other	14	1.62	6	2.76
Total	**865**	**100**	**217**	**100**

4.5 — Other Crop Growing

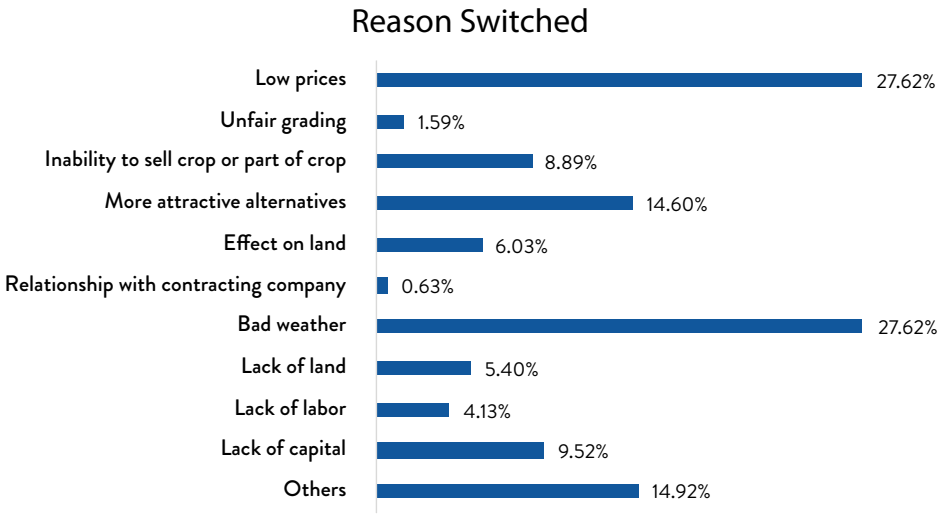
Though both former and current tobacco farmers grew a wide variety of crops to sell, former tobacco farmers grew a far wider variety. In Table 31, to better understand differences in cropping decisions, we compare the proportion of former farmers growing common, locally-grown, nontobacco crops in order to sell with the proportion of current tobacco farmers growing these crops to sell. There is a very clear pattern that in both the dry and wet seasons, the former farmers cultivate a much broader range of crops to sell. The red font indicates the crops where a greater proportion of former farmers are growing the specific crop. For example, 100 percent of former tobacco farmers report growing sweet potato in the dry season to sell, while only 12.5% of current farmers report growing sweet potato to sell. Similarly, all of the former farmers reported growing non-green vegetables in the dry season to sell while less than 40 percent of current farmers reported growing these crops. One major exception to this pattern was paddy (rice) wherein the proportion of current and former farmers growing paddy in both seasons was similar. Since this is a staple food crop, this is unsurprising. But without doubt, former tobacco farmers were growing a significantly broader cross section of nontobacco crops than their tobacco-farming counterparts.

Note: Red font indicates where a greater proportion of former farmers are growing that specific crop. Blue font indicates where a greater proportion of current tobacco farmers are growing that specific crop.

Table 31: Proportion of a Crop Grown to Sell

CROP	DRY SEASON		WET SEASON	
	CURRENT FARMER	FORMER FARMER	CURRENT FARMER	FORMER FARMER
Cassava	60.00%	100.00%	37.50%	61.11%
Sweet potato	12.50%	100.00%	12.50%	33.33%
Ground nut	69.23%	80.00%	46.15%	80.00%
Cashew nut and other nut	65.71%	88.89%	57.14%	51.85%
Soybean	58.33%	83.33%	66.67%	83.33%
Corn	70.37%	84.87%	51.85%	71.71%
Chili	90.24%	96.70%	81.95%	96.70%
Shallot	66.67%	-	66.67%	-
Coconut	0.00%	100.00%	0.00%	100.00%
Banana	83.33%	40.00%	83.33%	20.00%
Green vegetables	61.90%	97.37%	59.52%	89.47%
Other vegetables	37.04%	100.00%	40.74%	92.59%
Clove	100.00%	-	25.00%	-
Rice	55.56%	42.42%	52.78%	52.53%
Wood	87.50%	85.71%	-	-
Total	**70.76%**	**80.69%**	**58.03%**	**72.89%**

Figure 14: Reasons Given by Tobacco Farmers for Switching from Tobacco



Former tobacco farmers are growing and selling common, local crops. In Table 32, we compare sales (in USD) of nontobacco crops between current and former tobacco farmers. While there is considerable variation across the surveyed regions, in each one, there are several crops that former tobacco farmers are selling significantly more than current tobacco farmers. For example, former tobacco farmers in Jember are selling significantly more corn and chili in the dry season than their tobacco-growing peers. In other words, they are choosing to grow more of commonly-grown, local crops and selling them instead of growing tobacco. Thus, there is little need to imagine a new "alternative" crop to which tobacco farmers could switch, but rather, current farmers can do what former tobacco farmers are already doing by identifying local crops that grow well, cultivating and selling them for profit. As discussed above, on average, these former tobacco farmers are doing better economically than their tobacco-growing neighbors. Their strategy appears simple: grow what you know how to grow. The evidence suggests that the strategy appears to be a successful one for many of these farming households.

Former tobacco farmers switched to other crops for a variety of reasons including low prices, bad weather and more attractive alternatives. The main reasons (see Figure 14) that tobacco farmers provided for switching away from tobacco leaf were typically economic. Low prices and more attractive alternatives were two of the top three explanations. The other major explanation was weather; in the year of data collection, the rainy season had been unseasonably long in several of the survey areas and some FGD participants also reported that the rains had affected their cropping decisions. These findings raise doubts about the durability of switching—it is clear that many tobacco farmers are making calculated decisions based mainly on potential economic returns.

Table 32: Average Extra Sales (USD) Generated by Former Tobacco Farmers (compared with current farmers)

	CROP/REGION	BOJONEGORO	JEMBER	LOMBOK TENGAH	LOMBOK TIMUR
DRY SEASON	Cassava	29.23			
	Sweet potato		–29.99	–37.49	
	Ground nut	–0.37			
	Cashew nut and other nut	16.70	–1.12	–20.53	–7.50
	Soybean	19.25	–20.69	21.56	
	Corn	–30.87	610.09	99.35	75.47
	Chili	18.32	355.12	567.97	–521.21
	Shallot				–75.54
	Coconut				
	Banana	–9.50	87.73		
	Green vegetables	–42.93	94.47	–23.09	–7.50
	Other vegetables	–88.85	–11.92		2.25
	Clove				
	Rice	408.01	–498.09	–404.89	134.96
	Other fruits	–25.48	–150.71		
	Other	–9.37			
	Total	**3.84**	**387.96**	**204.66**	**–255.26**
WET SEASON	Cassava	46.86			
	Sweet potato		–93.72		
	Ground nut	–98.26			–224.94
	Cashew nut and other nut	–11.90	299.92		
	Soybean	112.53			
	Corn	13.44	441.07		–419.88
	Chili	–45.99	320.60	112.47	–795.72
	Coconut	–2061.93			–1931.46
	Banana				
	Green vegetables	4.77			–22.49
	Other vegetables	–13.50	–224.94		
	Clove				
	Rice	–78.44	27.09	356.00	–271.79
	Other fruits		–149.96		
	Other				
	Total	**–213.24**	**2.89**	**234.24**	**–611.05**

	LUMAJANG	MAGELANG	TEMANGGUNG	AVERAGE
	62.42	11.95	-10.50	23.27
		9.00		-19.49
	226.94		-89.97	45.53
	101.22		-106.19	-2.90
				6.71
	246.15	13.87	191.95	172.29
	91.39	502.93	724.93	248.49
				-75.54
	22.49			22.49
		-8.25		23.33
	353.61	285.36	-1274.64	-87.82
	-299.92	533.50	393.64	88.12
			-32.84	-32.84
				-90.00
	-239.93	551.67	187.84	64.68
		61.11		51.73
	117.89	**412.88**	**423.22**	**185.03**
	843.51	7.25	-22.49	218.78
		-39.36		-66.54
	410.51			29.10
	124.12		-46.90	-58.65
				112.53
	101.23	-23.39	-57.14	9.22
	558.47	1260.02	348.75	251.23
		-133.35	-288.07	-1103.70
		-11.62		-11.62
	9.75	1130.28	-198.32	184.80
	15.00	3161.83	-759.41	435.80
	423.19	-262.43	-479.87	-40.89
	1824.49	438.18		704.24
	260.34	4916.32	-731.28	1481.79
	457.06	**949.43**	**-248.30**	**148.25**

Tobacco farmers who farm other crops are more willing to switch completely away from tobacco. As evidenced by the large number of former tobacco farmers in this survey, the prospect of switching from tobacco to other crops is a very realistic one. Accordingly, we examine the determinants of current farmers' willingness to switch to alternative crops, presented in Table 33. The dependent variable is a dichotomous indication by the tobacco farmers that they have ever considered switching or are in the process of switching (value of 1) versus having never considered switching (value of 0). The independent variables are drawn from both previous literature (e.g., Chavez et al., 2016; Goma et al., 2015; Magati et al., 2016; Makoka et al., 2016) and using machine-learning methods and stepwise regression. For the sake of simplicity and space, we show only the statistically significant independent variables in Table 33; however, the full results of all of the underlying analyses and the fully-specified regression are available in the supplementary appendices (available upon request). The odds ratio for the cost of household labour dedicated to tobacco farming suggests that households that allocate less time to tobacco farming are more willing to switch. In a related finding, the odds ratio for labour costs allocated toward nontobacco costs suggest that farmers who allocate more time to nontobacco products are more likely to be willing to switch. Farmers in Jember were also much more likely to be willing to switch. This is a region where there is widespread existing crop switching behaviours away from tobacco to other crops, so this is a reasonable finding as tobacco farmers observe their neighbours making other cropping decisions beyond tobacco. Because some survey respondents did not answer the questions about how much they sold in order to use the full sample, we also imputed values using the "hot-deck, nearest-neighbor" method (Andridge and Little 2010) and re-ran the analyses. The results using the imputed dataset revealed several other statistically significant coefficients. Older farmers were less likely to be willing to switch as were Burley farmers. In contrast, contract farmers were much more likely to be willing to switch. Farmers who had reported recent sickness were also more likely to be willing to switch.

For most former tobacco farmers the switch to alternative crops is not yet a durable one. The survey asked if former farmers saw themselves switching back to tobacco. While only 16.51% saw themselves very likely switching back, 60.63% indicated that they might switch back to tobacco. Nearly one fifth (18.41%) regard a switch back to tobacco as impossible and 4.44% declared it "very impossible."

4.6 — Why Farmers Continue to Grow Tobacco

The two main reasons that farmers reported for growing tobacco were (perceived) profitability and cash generation. Despite strong evidence of poor prospects for profitable tobacco farming, several hundred thousand tobacco farmers continue to cultivate tobacco leaf in Indonesia. This dynamic begs an important question: why continue to grow tobacco? Accordingly, in Figure 15, we examine the reasons that farmers

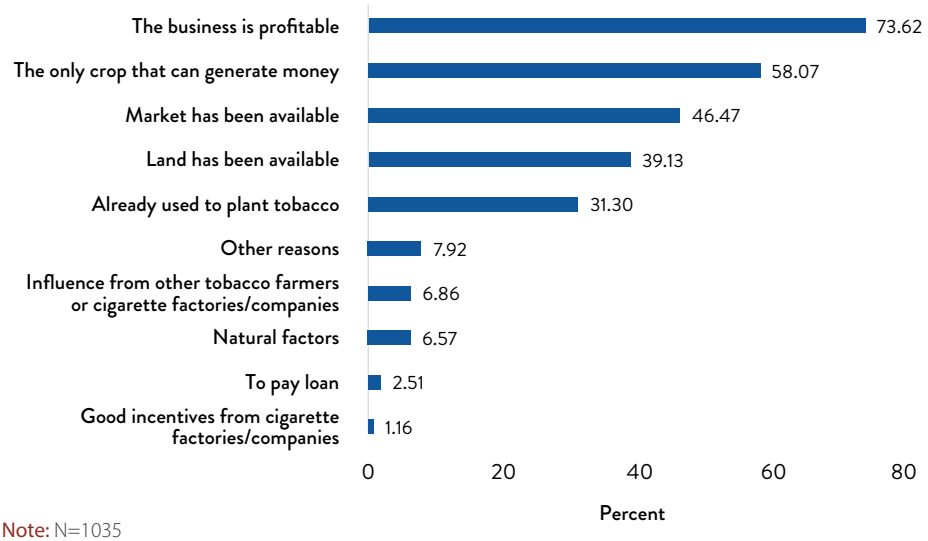
Table 33: Logistic Regression Analysis of Willingness to Switch to Alternative Crops

VARIABLES	COMPLETE CASES		MISSING IMPUTED	
	ODDS RATIO	STANDARD ERROR	ODDS RATIO	STANDARD ERROR
Household labour cost	0.922**	0.031	0.962***	0.012
Labour cost on nontobacco crops	1.071**	0.033	1.072***	0.016
Jember	2.540***	0.867	2.154***	0.321
Age			0.986**	0.006
Contract farmer			2.143***	0.372
Sick in the past 30 days			1.289*	0.17
Burley			0.528**	0.145

*** p<0.01, **p<0.05, *p<0.1

identified for growing tobacco. Farmers were asked to answer yes or no to each of the common reasons from the relevant literature (Chavez et al., 2016; Goma et al., 2015; Magati et al., 2016; Makoka et al., 2016) and were also given the opportunity to identify their own additional reasons. The numbers represent the percentage of farmers who identified that particular reason (thus the numbers do not sum to the number of respondents). The most common reason was that farmers believed that tobacco farming is profitable (73.6%) and/or is the only crop that can generate money (58%). These responses were fairly consistent among independent and contract farmers, too (supplementary appendices have breakdown and are available upon request). In the focus group discussions, farmers consistently raised the possibility that good weather would lead to good quality, which would in turn lead to higher prices and increased profitability. However, this is at odds with the evidence presented in Section 4.3, which unequivocally shows that most tobacco farmers are not turning a profit.

Figure 15: Current Tobacco Farmers' Reasons for Growing Tobacco



Note: N=1035

SMOKING HAS BEEN A MAJOR CONTRIBUTOR C DISEASE BURDEN INDONESIA. SMO PREVALENCE AMONG WORKIN AGE INDIVIDUAL HAS EXCEEDED 3 PERCENT SINCE

5 CHILD LABOUR

Existing research presents evidence of child labour in the Indonesian agricultural sector. Indonesia has experienced recent challenges around the issue of child labour in the agricultural sector. The International Labour Organization (ILO) recently estimated that up to 1.5 million children, aged 10–17, work on Indonesian farms (ILO, 2017). Human Rights Watch also recently examined this dynamic in the tobacco sector and found that children working on farms, often at the expense of their education, was widespread (HRW, 2016). Considering the importance of this issue, we asked respondents in the survey to enumerate each household member's contribution to tobacco farming, including children. Recognizing that child labour is especially prone to under-reporting as a result of the social stigma of exploiting children and because children contribute to casual work on farms to a certain extent in most countries, we sought to determine if children were working on a consistent basis during school hours; in other words determining if agricultural work was replacing education.

There is evidence that it was more common for children to work cultivating tobacco than other crops. In Table 34, in the columns under "# Total Cases—Help of Children," we report any time a respondent indicated that a household child under 15 (the typical age of adulthood in Indonesia) had worked at a tobacco farming activity. In the second set of columns, we report the number of times that a household (i.e., non-hired) child was reported working more than eight days that month during official school hours at each activity. We were able to cross-reference working and school attendance because the survey asked when the child attended school—morning or afternoon—and then asked the precise times when each individual in the household worked at tobacco farming tasks. We also asked similar questions for nontobacco farming activities. We found that a report of a child working on tobacco cultivation was generally rare at less than 4 percent for even the most common farming activities, field tending and postharvest work. For children working consistently during school hours, it was also rare at less than 2% for field tending and postharvest activities. We did find, however, that children working at tobacco farming activities both generally and during school hours was more common than children working in other crop cultivation. The final section of the table is children working on any crop; the reason that the tobacco and nontobacco sections do not sum to the "all" is that some children were working on tobacco and nontobacco crops. Finally, it is important to reinforce that this was not a focus of the survey and child labour is a very difficult phenomenon to measure in a survey of this nature.

Table 34: Child Agricultural Labour

TASKS RELATED TO TOBACCO CULTIVATION	# TOTAL CASES – HELP OF CHILDREN		# TOTAL CASES – DURING SCHOOL HOURS
	HOUSEHOLD	HIRED	HOUSEHOLD
Seedbed prep & seedling care	19	0	0
Land prep	25	0	0
Field tending	40	2	1
Harvest	26	2	0
Postharvest (including storing)	41	32	0
Selling and marketing	5	1	0

TASKS RELATED TO CULTIVATION OF NON-TOBACCO CROPS	# TOTAL CASES – HELP OF CHILDREN		# TOTAL CASES – DURING SCHOOL HOURS
	HOUSEHOLD	HIRED	HOUSEHOLD
Seedbed prep & seedling care	9	0	0
Land prep	8	0	0
Field tending	11	0	0
Harvest	15	1	0
Postharvest (including storing)	13	0	0
Selling and marketing	4	0	0

TASKS RELATED TO CULTIVATION OF ALL CROPS (TOBACCO AND NONTOBACCO)	# TOTAL CASES – HELP OF CHILDREN		# TOTAL CASES – HELP OF CHILDREN
	HOUSEHOLD	HIRED	HOUSEHOLD
Seedbed prep & seedling care	22	0	0
Land prep	26	0	0
Field tending	42	2	1
Harvest	37	3	0
Postharvest (including storing)	48	32	0
Selling and marketing	8	1	0

SMOKING HAS BEEN A MAJOR CONTRIBUTOR C DISEASE BURDEN INDONESIA. SMO PREVALENCE AMONG WORKIN AGE INDIVIDUAL HAS EXCEEDED 3 PERCENT SINCE

6 WELL-BEING

6.1 — Asset Accumulation

Former tobacco farmers have significantly higher assets than current tobacco farmers. Some development experts identify asset accumulation as an important component of economic development. Under certain conditions, these assets can partially form the basis of a household's economic security and/or contribute to other economic activities. They may also reflect the permanent income status of households, which can be a better and longer term indicator of economic well-being. For example, for farmers having a vehicle to transport goods and/or having a mobile phone to monitor market prices helps make these households more prosperous. Accordingly, in Table 35, we examine current and former tobacco farmers' household and agricultural assets. The most commonly held assets were televisions, gas cylinders for cooking, mobile/cell phones and motorcycles. The most valuable assets were cars and large livestock, though in both cases ownership of such assets was rare (~7 and 25 percent respectively). A two-sample test demonstrates that former tobacco farmers have significantly higher assets than their peers who continue to grow tobacco. Comparing to a broader population, the most recent Indonesian Family Life Survey (IFLS, 2016) reports that 41 percent of agricultural households more generally indicated having larger livestock.

6.2 — Food Security

Most households grew some of their own food though less than half of these food-producing households grew enough to feed the household for the entire year. Research has suggested that tobacco cultivation may be related—negatively—to food security (Eriksen et al., 2015; Khisa, 2011). The results from this survey suggest that the dynamic of food security among tobacco farmers is complex (Table 36). Rice is the staple food in most of Indonesia, although in a handful of regions, corn is also a staple crop. Three quarters of tobacco-farming households reported growing their own food. A greater percentage of current tobacco-growing households grew their own staple food compared to former tobacco farming households. Of these households, approximately 40 percent reported growing enough food for the entire year. Again, tobacco-growing households that grew the staple crop typically grew more than former tobacco-farming households ($p < 0.01$). For the remaining households, they either purchased their food on the market or used a combination of cultivating their own food and buying the remainder.

Table 35: Household and Agricultural Assets — Former vs Current Tobacco Farmer (percentage and current value)

Current vs Former Tobacco Farmer

ASSETS	CURRENT FARMER N=1,035		FORMER FARMER N=315	
	PROPORTION OF FARMERS HAVING IT	CURRENT | VALUE (USD)	PROPORTION OF FARMERS HAVING IT	CURRENT VALUE (USD)
Household				
TV	88.6	31	89.84	31
DVD/VCD player/home theater/ Playstation/Xbox/radio tape	40.87	10	36.51	9
Parabola	19.13	29	18.41	32
Oven/microwave	1.84	13	1.27	6
Refrigerator	27.92	53	35.24	51
Gas cylinders 3 kg or more	83.67	8	86.35	7
Washing machine	4.83	58	5.08	62
Air conditioner	0.97	26	0.63	38
Home telephone	0	-	0.32	4
Cell phone	78.16	20	80.32	19
Computer/laptop	7.54	121	9.21	116
Tablet	5.41	34	6.98	37
Camera/handycam	1.35	57	1.59	36
Water heater	0.58	38	0.32	7
Water electric pump	37	13	31.43	12
Genset	2.13	77	3.81	96
Car	7.05	3450	7.3	10797
Boat/motorboat	0	-	0	-
Motorcycle	85.12	500	83.17	531
Livestock				
Big livestock	24.73	1303	26.67	1624
Small livestock	25.99	257	20.63	252
Fowl	43.96	47	33.33	94
Agricultural				
Cart	5.41	24	2.22	75
Plow	0.87	208	1.9	167
Tractor	7.63	651	4.13	732
Agricultural water pump	18.07	82	13.65	75
Cutting machine	9.72	124	5.31	91
Machine: others	27.89	50	21.76	80
Tools: others	59.63	4	58.33	5

Table 36: Staple Food Production by Month

FOOD SELF-SUFFICIENCY	CURRENT (N=1,035)	FORMER (N=315)
Whether the household produces their own food (Yes=1, No=0)	77.20%	67.93%

LONGEVITY OF FOOD SUPPLY (MONTHS)	CURRENT (N=799)	FORMER (N=214)
	8.14	7.66

	MONTH	CURRENT (N=799)	FORMER (N=214)
Months that staple food production lasted for household	≤1 month	2.38%	3.27%
	2 Months	3.50%	3.27%
	3 Months	9.64%	13.08%
	4 Months	11.76%	10.75%
	5 Months	3.88%	8.88%
	6 Months	9.76%	12.15%
	7 Months	3.38%	2.34%
	8 Months	7.88%	3.74%
	9 Months	2.38%	0.93%
	10 Months	2.50%	3.74%
	11 Months	0.75%	0.00%
	12 Months	42.18%	37.85%

Farmers that do not grow their own food typically purchase it in the market. In Table 37, we present the results of a survey question asking nonfood-growing farmers how they acquire their staple food. Nearly all of these farmers reported buying the staple food in the market.

The majority of survey respondents reported that they did not have sufficient food to feed their household. In Table 38, we examine households' perceptions of their food security and in particular whether they thought their household had sufficient food. There was considerable variation with Bojonegoro and Jember having the highest proportion of households reporting that they always had sufficient food at around 40 percent and

Table 37: How Nonfood-Growing Farmers Acquire Food

MANNER OF GETTING STAPLE FOOD (IF NOT PRODUCING OWN)	FREQUENCY	% OF TOTAL
Buy staple food	329	97.63
Get for free	2	0.59
Work for food	3	0.89
Beg	1	0.30
Others	2	0.59
Total	337	100

the highest level of average food security. Lombok Tengah had the lowest rate of "has sufficient food" at 20 percent and together with Lombok Timur, the lowest average rates of food security. Notably, we did not find any statistically significant differences between current and former tobacco-growing households. Referring back to the section on social protection (Table 6), many tobacco-farming households relied in part on "rice for the poor" programs to feed their families at different points in the year.

Farmers with owned their land and/or those who grew more tobacco were more likely to be food secure. To examine the dynamics around food security, we examined in multivariate analyses the determinants of household food security. Similar to the other multivariate analyses, we used previous literature (e.g., Khisa, 2011, Mulyana, 2015) and machine-learning methods and stepwise regression to identify the relevant independent variables from the survey results. In Table 39, we report only the statistically significant coefficients, though all of the foundational analyses are available by request in the supplementary appendices. We found that tobacco farmers who own their land are more likely to be food secure as were those who sold more tobacco. This finding might seem counterintuitive but it actually highlights the complexity of the idea of food security. It is not merely what farmers grow, but just as importantly, the income that tobacco and/or other business enterprises can generate to purchase food. The odds ratios also suggest that farmers who considered switching were less likely to be food secure as were households that allocated less labour to tobacco farming. In the imputed models, we find that farmers who grow Oriental leaf are more likely to be food secure while those who grow Burley leaf are less likely to be food secure. Additionally, two regions, Jember and Lombok Tengah, were less likely to be food secure. The Jember finding is particularly interesting in light of its higher average food security score, which suggests that there is considerable inequality in the region.

Table 38: Perceived Level of Food Security

	BOJONEGORO	JEMBER	LOMBOK TENGAH	LOMBOK TIMUR	LUMAJANG	MAGELANG	TEMANGGUNG
						Rice (54.7%)	Rice (90%)
Staple food of the family	Rice (100%)	Rice (100%)	Rice (100%)	Rice (100%)	Rice (100%)	Corn (45.3%)	Rice (90%)
% who produce their own food	93.33	76	90	84.67	90.67	46.67	24.67
Level of food security of household (average)	3.27	3.26	2.9	2.8	3.2	3.2	3.2
1. Always lacks food	2.33	2	5.33	12	0	1.33	2
2. Sometimes lacks food	8	8.67	19.33	20	8.67	11.33	10
3. Usually has sufficient food	49.33	50.33	55.33	42	56	60.67	56
4. Has sufficient food	40.33	39	20	26	35.33	26.67	32
Average number of income sources	4.46	4	3.66	3.56	4.2	4.1	3.95
% of respondents who considered switching away from tobacco farming	29.6	30.7	11.3	7.3	8.8	6.9	5.1

Regardless of other variables, most rice-growing households grew the same amount of rice. To examine the complexities of growing cash crops versus food crops, in a three-dimensional probability function, we plotted the number of households with total household resources and the quantity of rice produced (Figure 16). The high peak suggests that most households, regardless of the total resources, grew around the same amount of rice. We speculate that farmers grow rice to hedge against the volatility of the market for the agricultural goods that they want to sell (e.g., tobacco), but the results confirm that most farmers are not attempting to feed their households with their own food production alone. More research is necessary on food security and tobacco farming.

Regardless of other variables, tobacco farmers tend to grow around the same amount of non-staple food crops. In Figure 16, in a related p.d.f. to examine all food crops instead of just rice, we plot the number of farmers, total household resources and all food crops. We find again that most farmers produce roughly around the same amount of non-staple food crops, reinforcing the notion that most farmers are relying in considerable part on their tobacco cash crop to be able to buy food for the household.

Table 39: Determinants of Food Security

VARIABLE	COMPLETE CASES		MISSING COMPUTED	
	O.R.	S.E.	O.R.	S.E.
Considered switching	0.341***	0.142	0.795*	0.110
Ownership of the land	3.384***	1.356		
Sales of tobacco	1.070*	0.041		
Household labour cost	0.919**	0.040		
Years of experience for tobacco farming			0.985***	0.005
Farming tobacco continuously			2.646***	0.661
Burley			0.345***	0.085
Oriental			1.682*	0.498
Jember	0.227***	0.112	0.307***	0.054
Lombok Tengah			0.704*	0.147
Lombok Timur	0.330*	0.220		

*** p<0.01, **p<0.05, *p<0.1

Figure 16 (a): Total Household Income Actual Rice Grown for Current Tobacco Farmers (bivariate probability function – p.d.f.)

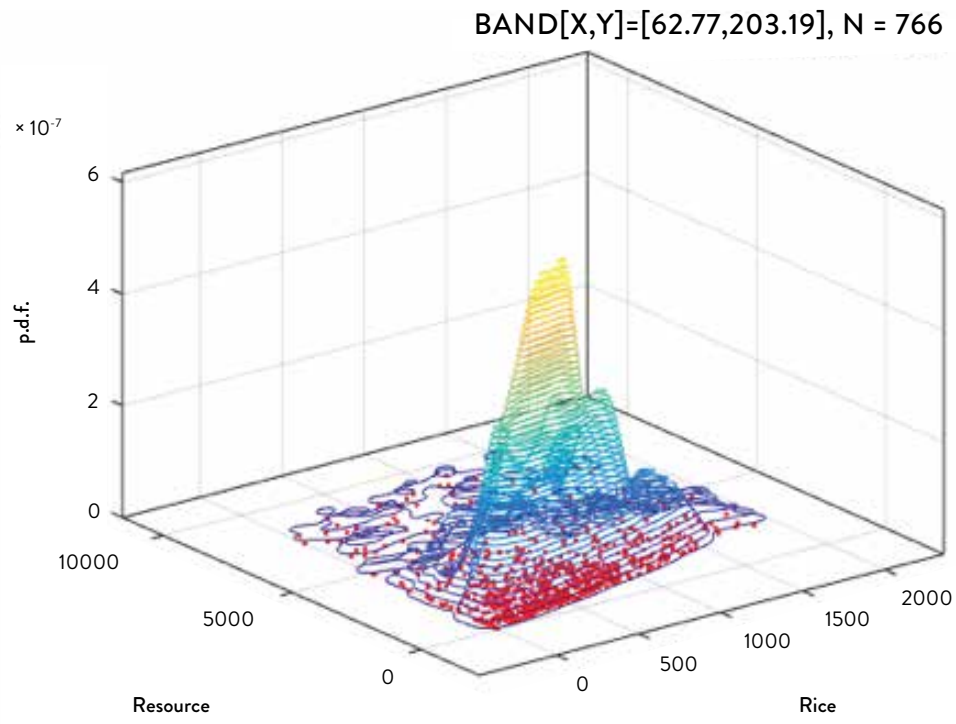
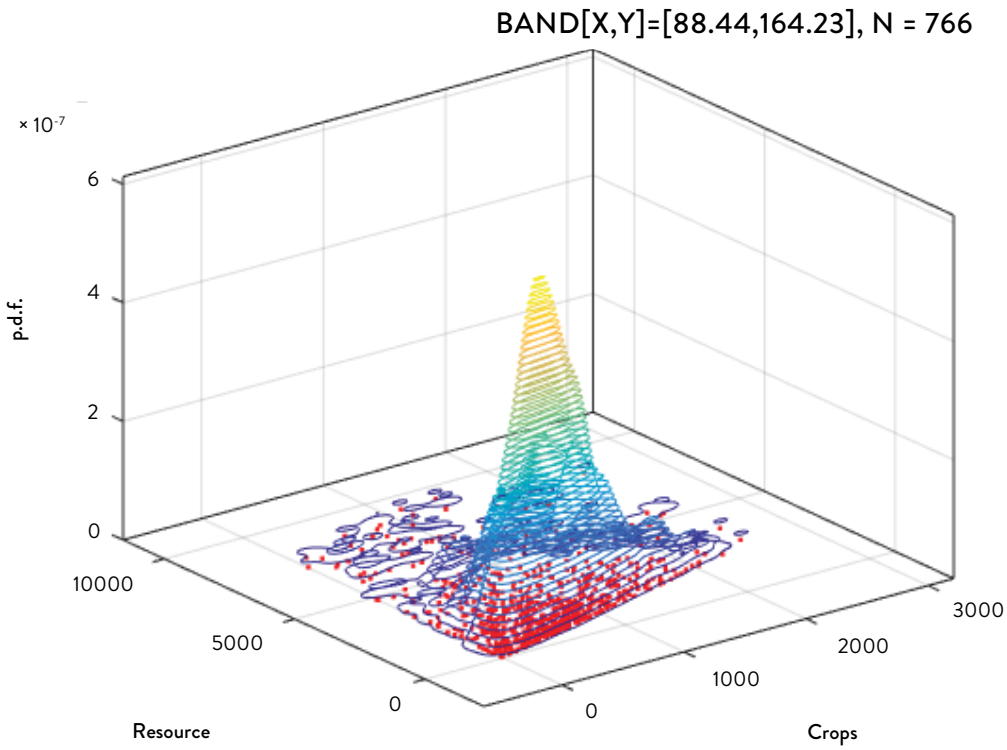


Figure 16 (b): Total Household Resources and All Food Crops Grown for Current Tobacco Farmers (bivariate probability function – p.d.f.)



6.3 — Health Status

Working-aged male tobacco farmers were more likely to report recent sickness than their nontobacco-farming counterparts. There is considerable discussion in the tobacco-focused public health literature about the dangers of green tobacco sickness (GTS) generally (e.g., Hipke, 1993; McBride et al., 1998) and specific to Indonesia (Rokmah, 2015; Suprapto, 2005). Handling tobacco without protection—such as rubber gloves—causes the absorption of nicotine, a known toxin, through the skin and other membranes. As a result, tobacco farmers who do not wear protective gear when handling tobacco leaves frequently report the symptoms of nicotine poisoning (or GTS). In Table 40, we first present the proportion of current and former tobacco growers by gender and age who reported being sick in the previous 30 days. More than 30 percent of tobacco farmers between ages 36–60 reported being sick in the previous 30 days while nearly 40 percent of women over 60 who farmed tobacco reported being sick. We found that a greater proportion of male current tobacco farmers between the ages of 36–60 (the largest labour pool) had GTS symptoms compared to the same age group of male former tobacco farmers ($p < 0.01$). Similarly a larger proportion of female current tobacco farmers demonstrated more GTS symptoms than their former tobacco farming peers ($p < 0.01$).

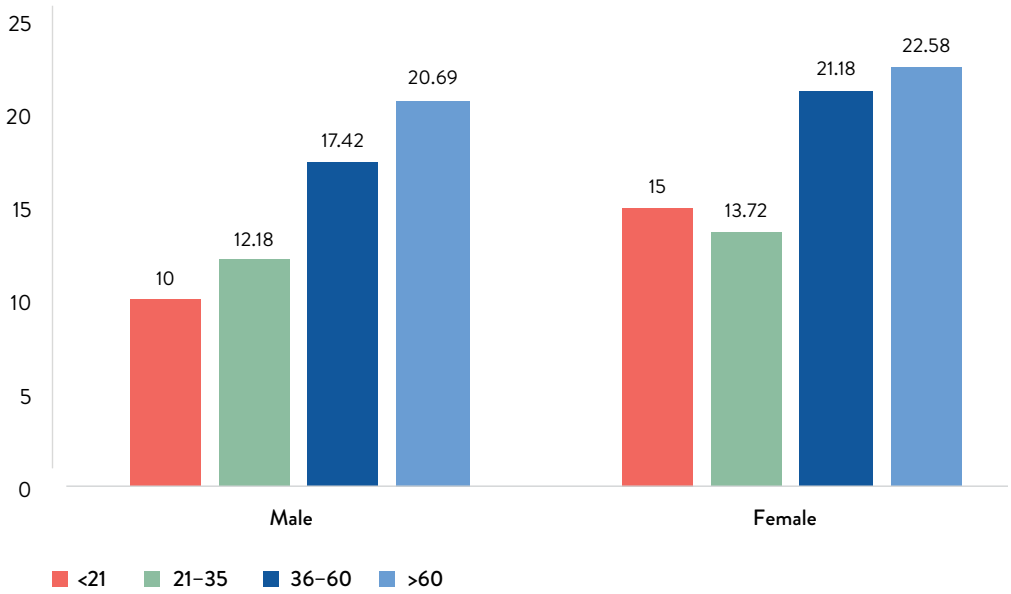
Table 40: Reported Sickness in Last 30 Days by Gender and age — Current and Former Tobacco Farmers

AGE	CURRENT TOBACCO FARMER		FORMER TOBACCO FARMER	
	MALE	FEMALE	MALE	FEMALE
<15	27.97%	23.67%	30.07%	23.31%
15–20	19.13%	19.77%	15.22%	6.67%
21–35	17.03%	17.43%	15.84%	22.22%
36–60	30.28%	30.78%	23.38%	29.49%
>60	36.14%	39.26%	40.32%	36.96%
Total	**26.88%**	**25.54%**	**24.87%**	**25.56%**

Older tobacco farmers were more likely to report the main symptoms of green tobacco sickness. In Figure 17, we examine reports of the symptoms of GTS. We find that a sizable proportion of older farmers report the main symptoms of GTS. More than 20 percent of tobacco farmers older than 60 reported the main GTS symptoms. For male tobacco farmers between 36 and 60, it was 17.4 percent and for female tobacco farmers in the same age category it was 21.2 percent.

Tobacco farming is the largest predictor of having major symptoms of green tobacco sickness. In Table 41, we report the results of a log regression predicting individuals reporting major symptoms of GTS, using the sample that includes both former and current tobacco farmers. In particular, the dependent variable is the respondents' reporting of 1–4 symptoms of GTS (stiffness, weariness, pain, or soreness in certain parts of the body; tiredness or weakness are not included as symptoms). Working from existing literature that examines GTS, we included tobacco farming, age, cost of pesticide (as a proxy for magnitude of pesticide use) and the number of hours worked. We found that the largest predictor of GTS symptoms was tobacco farming. Age was also statistically significant: older farmers were more likely to report major GTS symptoms.

Figure 17: Individuals Reporting 1–4 Main Symptoms* of Green Tobacco Sickness Symptoms



Note: Symptoms include stiffness, weariness, pain, or soreness in certain parts of the body (tiredness or weakness are not included as symptoms).

Table 41: Log Regression of Green Tobacco Sickness Symptoms

VARIABLES	IF GREEN TOBACCO SICKNESS SYMPTOM: 2–4
If tobacco farmer	1.100***
	(0.409)
Age	0.029***
	(0.007)
Cost of pesticide	0.000
	(0.000)
Hours worked	–0.001
	(0.001)
Intercept	–5.490***
	(0.539)
Observations	2,966

Note: Robust standard errors in parentheses, *** p < 0.01, ** p < 0.05, * p<0.1

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7 LIMITATIONS

Logistical considerations posed very small limitations to the study. As one might reasonably expect, the quality of available data used for sampling varied among kabupaten. For example, the survey team found errors such as when a row of data for a kecamatan was simply copied and pasted from another kecamatan. In the field, the team found that some high-producing villages had few former farmers, and the team had to visit several dusun (sub-villages) to find a larger sample of former farmers. In contrast, in other villages that had started growing less tobacco, it was necessary to visit several dusun in order to find a sufficient number of farmers. Finally, the team sometimes encountered local names of tobacco varieties that were not easily categorized, which made it challenging to ensure a sample that represented the most common tobacco grown in the district.

The study is cross-sectional. It is possible that this snapshot in time was different than other time periods and does not represent general trends completely accurately. However, the dozens of farmers in the FGDs indicated that the survey year was a typical one and not one farmer raised any concern that there was anything exceptional about the time period except for a few who suggested that it had been a somewhat longer than normal rainy season. The study team has secured resources to re-survey farmers in the coming years to generate a longitudinal panel of current and former tobacco farmers.

The study only considers current and former farmers in tobacco-growing regions. Ideally, we would have utilized a control group who were never tobacco farmers and lived in a nontobacco-growing region. The difference in profitability of such farmers with current tobacco farmers would represent the difference attributable to both tobacco cultivation and the regional externalities arising from tobacco cultivation. The current estimate of the difference in profitability between current and former tobacco farmers likely under-estimates it. Due to limited resource, the sample was drawn purposively from clustered tobacco cultivating regions. It was not possible to cover tobacco farmers who never grew tobacco from nontobacco growing areas.

The study mainly considered only nontobacco crop cultivation as an alternative livelihood. Another potential limitation is the study considered only nontobacco crop cultivation as alternative livelihood option. It did not explore the possibilities of nonfarm economic activities (e.g., petty trade and businesses).

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8 CONCLUSION

The results of this survey shed considerable light on the livelihoods of tobacco farmers in Indonesia. Considering how widespread that tobacco farming is, some of the findings are surprising insofar as the farmers' own responses to the survey suggest that the livelihood is not a prosperous one for many or even most tobacco-farming households. The survey also illuminates the differences between current and former tobacco farmers.

First, the evidence suggests strongly that tobacco cultivation is not profitable for most farmers. Though there is some variation, the overall result of a lack of profitability is consistent across regions, type of tobacco grown, and whether the farmer is on contract to grow tobacco. That said, some regions fare worse than others, and independent farmers appear to generally fare better than those on contract. Even when we consider only nonlabour costs—or what most agricultural economists would term "gross margins"—most tobacco-farming households are spending more on their tobacco cultivation than they are making from it. When only a minimum value for household labour is incorporated into the profits equation, the overall profitability plummets further. What is more problematic is that tobacco farmers are spending disproportionately large amounts of time cultivating tobacco leaf compared to nontobacco farmers in the survey, meaning that their economically productive time is almost completed subsumed by tobacco growing. In contrast, their neighbors who are no longer growing tobacco are generally developing more robust and varied economic lives.

Second, perhaps not surprising considering the lack of profitability, there is widespread poverty among tobacco farmers in Indonesia. The proportions of tobacco farmers who fall below the World Bank and Indonesian government poverty lines are dramatically higher than national averages. As a result, a considerable number of the tobacco-farming households are on social assistance of some form, and nearly three quarters require use of "rice for the poor" programs to feed their families.

Third, on average, former tobacco farmers are doing better economically than current ones. While the former tobacco farmers are not yet enjoying high levels of prosperity, the results of the survey highlight several important dynamics. First, former tobacco farmers' costs to farm are much lower than current tobacco farmers, and as a result their overall net revenue is typically higher. Second, the former tobacco farmers are spending far fewer hours in their fields and there is clear evidence that many of them use that time to do other economically productive activities such as running a small business on the side.

Fourth, there is fairly widespread food insecurity among tobacco-farming households. In all regions, 60 percent or more of the households reported some time during the year when there was not sufficient food for the household. As mentioned above, the majority of tobacco-farming households were in the government's subsidized rice program.

Fifth, tobacco farmers in this survey were more likely than former tobacco farmers to display the symptoms of green tobacco sickness. There has not been a lot of research on this issue in Indonesia or even globally, but these clear results suggest that it requires more attention. Tobacco farming is hazardous to the farmers' health if the proper precautions are not taken.

If tobacco farming is not a particularly viable crop for most tobacco farmers, how should policy makers react? First, governments could better farmers' lives by helping to improve supply chains and markets for other goods. It is clear that many former tobacco farmers are making a better living growing other types of crops for sale, an outcome that could be further enhanced with small investments by governments. It is clear that current tobacco farmers believe that the supply chains for tobacco are better—which may in fact be currently correct—but this is a place of realistic intervention by national and local authorities. Similarly, governments could also help to grow markets—including exports—for other agricultural goods. Indonesia is in an enviable position of multiple growing seasons and other favorable conditions for the cultivation of crops for smallholder farmers. They just need better assurances that they would have places to sell their goods.

Improved farmers' financial literacy will likely help tobacco farmers make better cropping and business decisions. The evidence here demonstrates that farming nontobacco crops is more lucrative though many tobacco farmers continue to believe the opposite. This is likely in considerable part a shortcoming of agricultural education. Governments can help all farmers by providing more and better agricultural extension services to promote nontobacco crops. There is a broader element in this scenario, too, of concerns about the quality of general farm management. The results here demonstrate that many farmers are struggling to evaluate their own costs accurately. With better farm business and management skills, they could make cropping decisions that better reflect the reality of the economic outcomes that we observe here.

Though farmers did not consistently identify a lack of credit as a central challenge, the survey results suggest that the farmers had limited capital. Thus, greater access to capital through improved credit schemes could help to improve the possibilities for tobacco farmers to cultivate other crops and/or develop other nonagricultural economic enterprises.

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