

Tanzania National Panel Survey Living Standards measurement Study - Integrated Surveys on Agriculture SORGHUM & MILLET

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Tanzania National Panel Survey

LSMS-ISA: Sorghum & Millet

Sorghum and millet are most commonly grown on less fertile, drought-prone, and sloped terrain. Smallholder farmers in developing countries primarily grow sorghum (*Sorghum bicolor*) for local markets or subsistence consumption. Where possible the crop is grown as a dry season crop in rotation with other cereals. Millet (which is not a single species but rather a diverse group of small-grained annual cereal grasses) is particularly important for smallholder farmers on drought-prone marginal lands. So-called “major millets” like pearl (bulrush) millet (*Pennisetum glaucum*) and finger millet (*Eleusine coracana*) are fairly drought tolerant. Millet is primarily produced as a staple food, but is also important for livestock fodder and as a source of brewing material.

Sorghum and Millet Cultivation was Concentrated in Central and Southern Zones

The following analysis is based on results from the Tanzania National Panel Survey (TZNPS). In the 2007-2008 long and short rainy seasons, 13% of Tanzanian farming households cultivated sorghum and 6% cultivated millet, making these crops some of the least frequently cultivated priority crops in Tanzania (see Figure 1).^{1,2} As a result, detailed analysis and determining statistical significance was limited by the low number of observations, particularly of millet.³ While sorghum and millet are often grouped together, our results suggest that in Tanzania

1 Priority crops include maize, paddy, cassava, sorghum, millet, beans, groundnuts, sweet potatoes, yams, cowpeas, and mangoes.

2 Unless otherwise specified, analysis includes only agricultural households.

3 Using LSMS 2008 data, analysis for sorghum included 265 households and 297 plots; millet included 99 households and 114 plots. Only Central and Southern Zones had greater than 30 observations for sorghum; only Central Zone had greater than 30 observations for millet. The number of observations prevented detailed zonal analysis.

KEY FINDINGS

- Sorghum cultivation was common only in Central (43% of households) and Southern (24%) Zones. The only zone where millet was commonly grown was Central Zone (38% of households).
- Only 1.4% of households in Tanzania grew both sorghum and millet throughout the year.
- Sorghum and millet growers differed by gender of household head, proportion selling some of their harvest, input use, pre-harvest losses, and distance from the household to major roads and markets.
- Plots with millet or sorghum as the main crop cultivated produced the lowest value per hectare of all priority crops during the long rainy season.
- Male-headed households were significantly more likely to grow millet than female-headed households (6.5% of male headed households versus 3.5% of female headed households).
- Sorghum and millet growing households were poorer than non-growing households across the country.
- Millet sustained pre-harvest losses (53%) more frequently than any other priority crop, primarily due to birds.

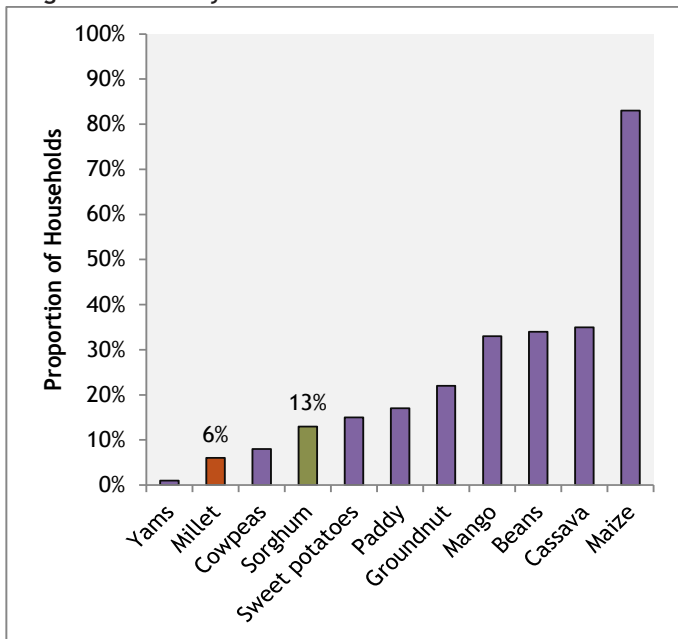
there were differences among the households that cultivated these distinct crops.

Most households that cultivated sorghum or millet did so only in the long rainy season, so our analysis focuses on long rainy season cultivation unless otherwise specified.⁴ While sorghum growing households were more likely to grow millet, and millet growing households were more likely to grow sorghum, only 1.4% of Tanzanian agricultural households surveyed grew both

4 The majority of Tanzania has one long rainy season that typically lasts from December through April. The North and Northeastern parts of the country have a long rainy season lasting from March through May and a short rainy season with lighter rainfall from October to December [Minot, N. (2010). *Staple food prices in Tanzania*. Washington, D.C. International Food Policy Research Institute].

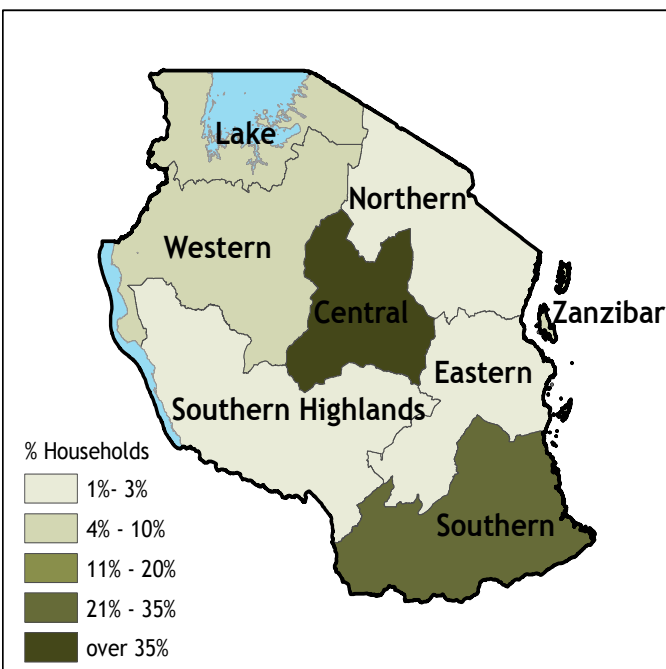
crops throughout the year. Of millet growing households, 68% reported growing pearl millet and 32% reported growing finger millet; no households reported growing both varieties. Pearl and finger millet are combined below as ‘millet’ for analysis.

Figure 1: Proportion of Households Cultivating Crops in the Long or Short Rainy Season



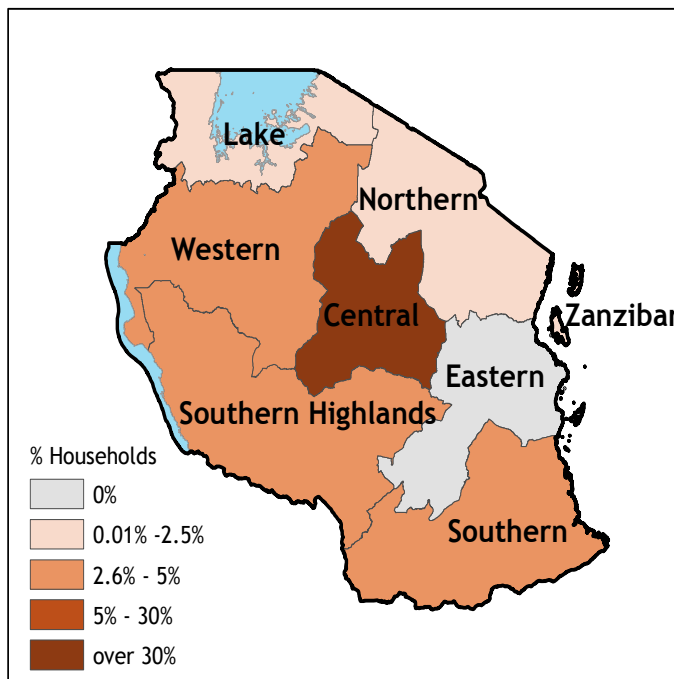
As illustrated by Figure 2, households commonly grew sorghum only in the Central Zone and Southern Zone. Forty-four percent of farming households in Central Zone (Dodoma, Singida) and 24% of farming households in Southern Zone (Ruwuma, Mtwara, Lindi) cultivated sorghum, while fewer than 10% of households grew it in any other zone. Millet was also most commonly cultivated in Central Zone (38%), while less than 5% of households cultivated it in any other zone (See Figure 3).

Figure 2: Proportion of Households Cultivating Sorghum



The analysis for most of this brief is at the national level, so some differences between sorghum and millet growers and other households may reflect characteristics of Central and Southern Zones, rather than of sorghum and millet cultivation. Box 1 provides more information about sorghum and millet farmers in Central Zone, where 64% of millet growers and 39% of sorghum growers were found.

Figure 3: Proportion of Households Cultivating Millet



Sorghum and Millet Growing Households were Poorer and Received Less Rainfall than Non-Growing Households

Millet and sorghum growing households appear to be poorer than non-growing households. Sorghum growing households consumed an average value of \$1.02/day per adult equivalent using an aggregate consumption variable; millet growing households consumed \$1.06/day.^{5,6} In contrast, the average for all agricultural households was \$1.33/day. Sorghum growing households were significantly more likely to cultivate maize, millet, and groundnuts but less likely to grow beans than non-sorghum growing households. Millet growing households were significantly more likely to grow maize, sorghum and groundnuts, but less likely to grow paddy, sweet potatoes or cassava than non-millet growing households.⁷

5 This variable comes from a total annual consumption variable aggregated by the World Bank. Food consumption covered the seven days prior to the interview; other consumption data was collected for the previous 30 days and the previous 12 months before the interview.

6 Millet growers consumption versus non-growers was statistically lower at $P < 0.0003$; sorghum growers consumption versus non-growers statistically lower at $P < 0.0000$.

7 All p-values below 0.1000. See appendix for specific values.

Table 1: Descriptive Statistics of Sorghum and Millet Cultivating Households in Tanzania

	Sorghum Growing Households (11%)	Millet Growing Households (6%)	All Agricultural Households
Proportion of female headed households	27%	15%***	25%
Mean household head level of education (years)	4.5***	4.5	5.3
Mean household head age (years)	49.4*	48.8	47.3
Mean number of household members	5.7	4.9	5.4
Mean distance from household to nearest population center > 20,000 (km)	60.7*	44.3	50.9
Mean distance from household to nearest major road (km)	23	12.7***	18.5
Mean value aggregate consumption per adult equivalent (USD per day)	1.02***	1.06***	1.33
Mean Rainfall July 2007-June 2008 (mm)	639***	597***	726

*Statistically significant difference from non-growing households at 0.10 level.

**Statistically significant difference from non-growing households at 0.05 level.

***Statistically significant difference from non-growing households at 0.01 level.

Household heads of sorghum and millet growing households had less education compared to those in non-growing households. The median number of years of education for the household head was five years for both crops, compared to seven years for non-growers. Roughly equal proportions of male- and female-headed households grew sorghum, while male-headed households were significantly more likely to grow millet (6.5% of all male-headed households versus 3.5% of all female-headed households).⁸

Millet and sorghum appear to have been grown in areas that were drier than non-growing areas.⁹ Households that grew either crop received significantly lower average rainfall throughout the year than non-cultivating households. Millet growing households received an average of 597 mm annually, while non-growers received 738 mm.¹⁰ Sorghum growers received 639 mm annually, while non-growers received 741 mm.¹¹ Households in Central Zone, where millet and sorghum cultivation was most common, received less rainfall than the national average in 2007-2008 (Central-500 mm; Tanzania 726 mm). Households in Southern Zone, where sorghum cultivation was also common, received an average of 799 mm, slightly higher than the national average.

Farmers growing millet were significantly less likely to rank their soil as “good” than non-growers (50% for non-millet plots and 30% for millet plots), rather than “average” or “bad”.¹² Sorghum growing households were significantly further from

8 P< 0.0060

9 Geospatial data provided by the World Bank. Data was originally referenced to household GPS coordinates. See World Bank “Appendix A: Confidential Information, Geospatial Variables” for more information.

10 P<0.0000

11 P<0.0001

12 P<0.0020

towns or cities (population center of >20,000) than non-sorghum growing households; millet growers were closer to population centers, but the difference was not significant.¹³

Table 1 provides further descriptive statistics of millet and sorghum cultivating households.

Pre-Harvest Losses and Constraints Were Common, Particularly Among Millet Plots

Farmers reported substantial production constraints as well as pre- and post-harvest losses on sorghum and millet plots. Seventeen percent of sorghum plots and 21% of millet plots were not fully planted due to constraints; a lack of equipment or tools was the most commonly cited constraint. In addition, 53% of millet plots sustained pre-harvest losses, the highest proportion for any priority crop. As shown in Figure 4, farmers attributed most of these losses to birds. Sorghum plots also frequently experienced pre-harvest losses (43%) due primarily to birds (see Figure 5).

Compared to other priority crops, millet had the highest proportion of plots where the area harvested was less than the area planted (40%). While millet is typically characterized as a heat- and drought-tolerant crop, among plots where farmers reported harvesting less area than planted, 59% were not fully harvested due to drought. Fewer sorghum plots had losses in area between planting and harvesting (31%).¹⁴

13 Sorghum: p<0.0445; millet: p<0.2192

14 Farmers were asked two separate questions: “Was the area harvested less than the area planted?” and “Were there any losses of crops before the harvest?” Some farmers reported losses for both questions, and it is possible that some farmers reported the same losses twice.

Figure 4: Millet Pre-Harvest Losses

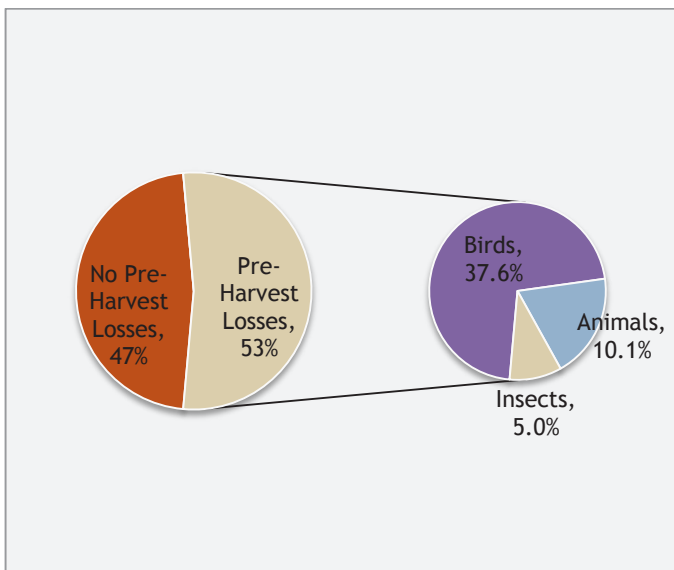
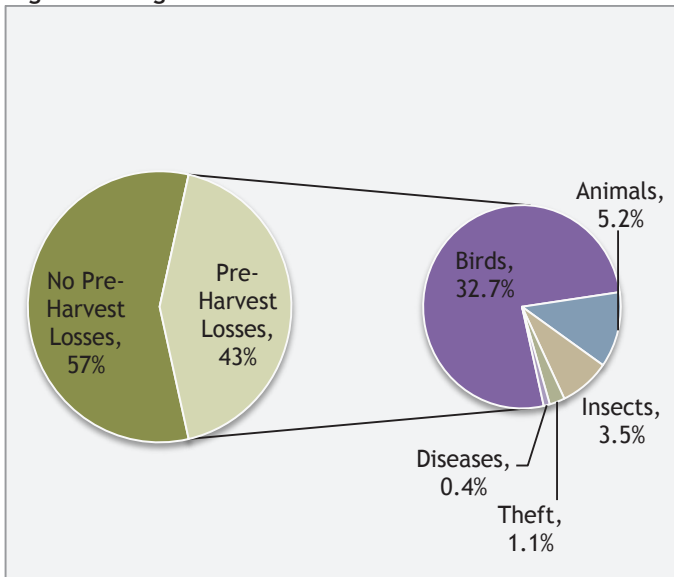


Figure 5: Sorghum Pre-Harvest Losses



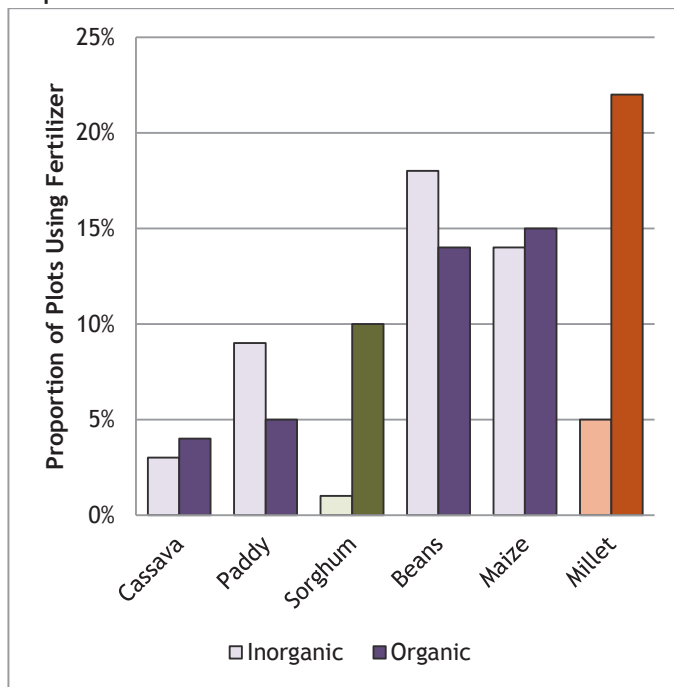
Farmers Commonly Used Organic Fertilizer on Millet Plots; Other Inputs Were Rarely Used

Farmers reported using at least one input (inorganic fertilizer, organic fertilizer, improved seed, pesticide, herbicide or fungicide) on 21% of sorghum plots and 31% of millet plots.¹⁵ Only 5% of sorghum and 3% of millet plots were planted with improved variety seed. Farmers rarely used inorganic fertilizer (1%-sorghum; 4%-millet) or pesticides, herbicides, and fungicides (7%- sorghum; 5%- millet). However, as shown in Figure 6, organic fertilizer was applied on 22% of millet plots, the highest among all priority crops. Organic fertilizer was used on 10% of sorghum plots. Households that owned cattle were more than twice as likely to apply organic fertilizer. Twenty-

15 Aside from improved variety seed, farmers reported input use by plot, not by crop.

three percent of sorghum growers who owned cattle used organic fertilizer, while only 6% without cattle used it.¹⁶ Among millet growers, 37% of cattle owners used organic fertilizer compared to 17% of non-cattle owners.¹⁷

Figure 6: Proportion of Plots Using Fertilizer for Selected Crops



Median Sorghum and Millet Yields Estimated at Less than Half of 90th Percentile Yields

Mean plot yields were 0.51 t/ha for sorghum and 0.58 t/ha for millet (See Figure 7).¹⁸ Sorghum plots with median yields produced only one-third the plot yield that 90th percentile plots achieved (0.36 t/ha versus 1.07 t/ha). The gap for millet plots was the smallest of all priority crops, but millet still has room for improvement with median plots yielding half of 90th percentile plots (0.53 t/ha versus 1.07 t/ha).¹⁹

Between the two zones with sufficient numbers of observations, Central Zone median sorghum yields were almost double Southern Zone yields (0.49 t/ha Central; 0.25 t/ha Southern). While all zones received less rainfall than their respective nine year averages in 2007-2008, Southern Zone’s deficit was the most severe.

16 P<0.0115

17 P<0.0533

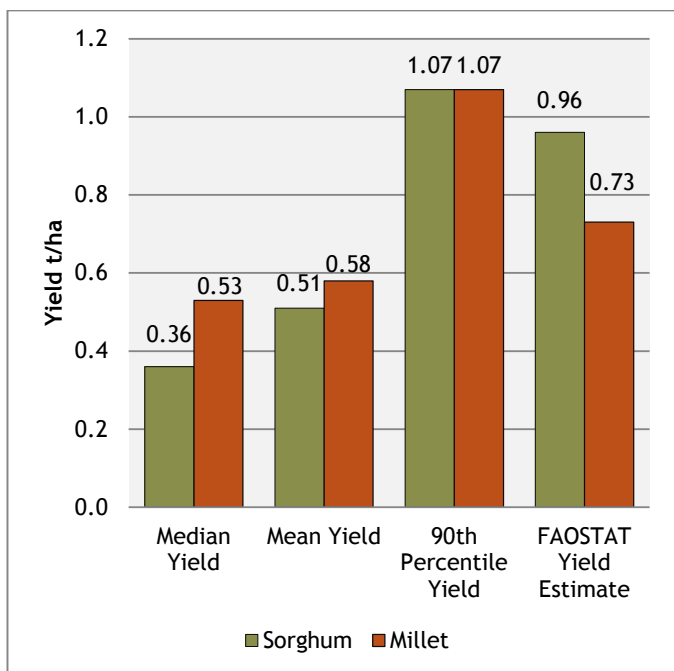
18 The top 1% of yields were excluded from yield analysis.

19 EPAR Brief 161&162 Section D “Crops” p. 45 Figure 43

Yield Differences by Gender of Head of Household Were Not Statistically Significant

Median sorghum yields for female-headed households were lower than for male-headed households (0.25 t/ha-female; 0.40 t/ha-male)²⁰, while median millet yields were slightly higher for female-headed households (0.53 t/ha-female; 0.52 t/ha-male).²¹ However, mean yields were not significantly different by gender of household head for either crop.

Figure 7: Sorghum and Millet Yields



Management Practices Appear to Affect Yields

Sorghum yields for plots with any input (inorganic fertilizer, organic fertilizer, pesticide/herbicide/fungicide, or improved variety seed) were significantly higher than plots with no input use (0.68 t/ha versus 0.46 t/ha).²² Millet yields were also higher for plots with input use, but the difference was not statistically significant (0.69 t/ha versus 0.52 t/ha).^{23,24}

The survey did not collect information about planting density, and intercropped plots were included in yield averages. Sixty-three percent of sorghum plots were intercropped, most frequently with maize and cassava. Forty-five percent of millet plots were intercropped, most frequently with maize and groundnuts. Yields for intercropped sorghum and millet were significantly lower than non-intercropped cultivation. However, this is not a valid measure of overall plot productivity as it does not account for the yield of the other crops that were intercropped on the plot.²⁵

20 P<0.2322

21 P<0.7231

22 P<0.0349

23 P<0.1168

24 A low number of observations prevented yield analysis by individual input.

25 Sorghum: p< 0.0291; millet: p< 0.0478

High Producing Plots had Significant Differences from Other Plots

Comparing plots with yields at or above the 70th percentile to lower yielding plots below the 70th percentile revealed differences in management and other characteristics.²⁶

High producing sorghum plots yielded, on average, 1.05 t/ha compared to 0.26 t/ha for the lower producing plots.²⁷ Among millet plots, the high producing plots yielded 1.02 t/ha compared to 0.38 t/ha for lower producing plots.²⁸ Table 2 summarizes the differences in the characteristics of high producing plots.

Farmers with plot yields at the 70th percentile or higher (referred to here as ‘high producing’ plots) were more likely to have used at least one input (improved variety seed, organic fertilizer, inorganic fertilizer, or pesticide/herbicide/fungicide) on their plots than farmers with plots with lower yields. Similarly, farmers were more likely to have used fertilizer on high producing plots than on lower producing plots. The difference was significant for sorghum (24% versus 5%)²⁹ and for millet (40% versus 22%)³⁰. Significantly more high producing sorghum farmers hired labor than farmers with lower producing plots (46% versus 18%).³¹ In contrast, millet farmers hired less labor for high producing plots, though this difference was not statistically significant (34% versus 43%).³² Farmers with high producing plots had a greater median number of years of education than lower producing plots (sorghum: 8 years versus 5; millet: 5 years versus 4). There were no significant differences between high and lower producers for age or gender of household head.

High producing millet plots received significantly greater rainfall and experienced significantly less rain variation from the nine year average than lower producing plots. There was no such rainfall difference for high and lower producing sorghum plots. High producing plots for both sorghum and millet had higher average elevations than lower producing plots.³³ For high producing plots, the distance to major markets was significantly further for both sorghum and millet,³⁴ though the distances to the nearest population center and nearest road were not.

26 Note that briefs for paddy and maize compared top 90th percentile yields, but due to lower number of observations for sorghum and millet, the threshold for “high producing” plots is defined as above the 70th percentile in order to have a sufficient number of observations for analysis. Analysis includes intercropped and non-intercropped plots.

27 P<0.0000

28 P<0.0000

29 P<0.0048

30 P<0.0117

31 P<0.0001

32 P<0.4343

33 Sorghum: High producing plots - 1059 m; non-high producing plots - 921 m (p value: 0.0530). Millet: high producing plots - 1272 m, non-high producing plots - 1170 m (p< 0.0375).

34 Sorghum: High producing plots- 91.4 km; non-high producing plots-72.4 km (p<0.0757). Millet: high producing plots-95.7 km; non-high producing plots- 69.9 km (p<0.0333).

Table 2: Comparison of High (\geq 70th Percentile) and Lower ($<$ 70th Percentile) Producing Plots

	Sorghum		Millet	
	High Producing Plots	Lower Producing Plots	High Producing Plots	Lower Producing Plots
Mean plot yield (t/ha)	1.05***	0.26	1.02***	0.38
Mean plot size (ha)	1.5	1.4	1.4	1.2
Mean rainfall at household July 2007 - June 2008 (mm)	608	626	633**	552
Mean variation between 2007-2008 rainfall and nine year average (mm)	95	90	45*	63
Mean elevation at household (m)	1059*	920.9	1272**	1170
Historical (1960-1990) mean temperature at household (C)	22.7	22.8	21.8	21.9
Proportion of plots using any input [^]	33%**	17%	49%***	25%
Proportion of plots using organic fertilizer ^{^^}	24%***	4%	38%***	16%
Mean education for household head (years)	5.1	4.0	4.9	4.0
Proportion of plots with hired labor	46%***	18%	34%	43%
Distance from household to nearest major market (km)	91*	72	96**	70
Proportion of plots from households with no or slight constraints to soil workability	47%	38%	47%	31%
Proportion of plots from households with no or slight constraints to soil nutrient availability	36%	49%	30%**	53%

*Statistically significant difference from lower producing plots at 0.10 level.

**Statistically significant difference from lower producing plots at 0.05 level.

***Statistically significant difference from lower producing plots at 0.01 level.

[^]Used any of the following: improved variety seed, organic fertilizer, inorganic fertilizer, or pesticide/herbicide/fungicide.

^{^^} Used organic fertilizer or inorganic fertilizer.

Land and Labor Productivity Was Lower for Sorghum and Millet than for Other Priority Crops

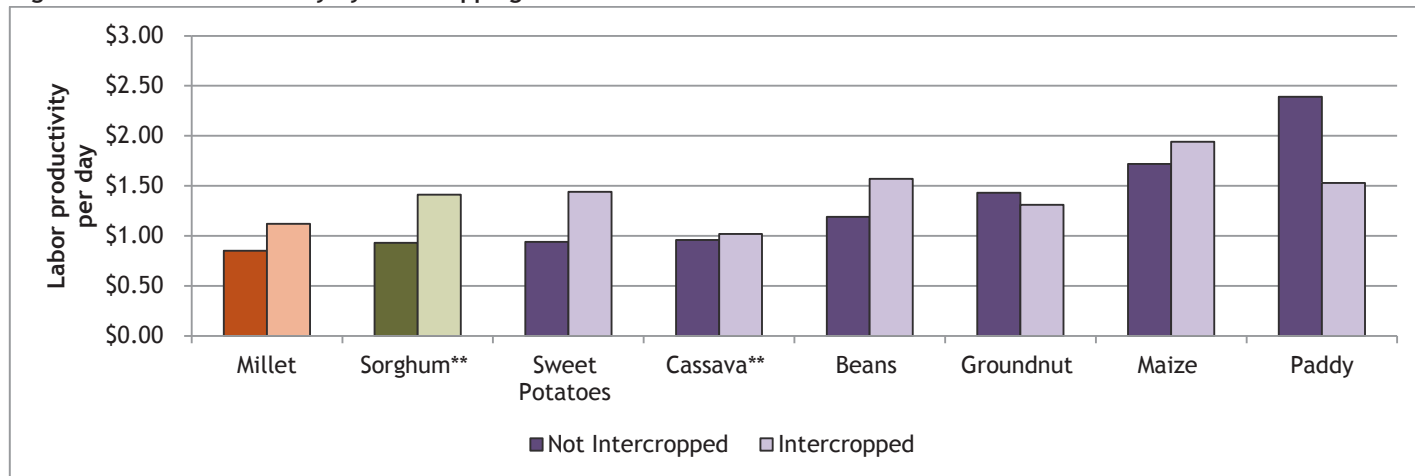
Sorghum and millet plots had some of the lowest land and labor productivity of the priority crops.³⁵ The mean land productivity was \$16.03/ha on sorghum plots and \$14.19/ha on millet plots. Labor productivity was \$1.16/day on sorghum plots and less than a dollar per day (\$0.97) on millet plots. Figure 8 compares labor productivity for intercropped and non- intercropped plots across priority crops. Intercropped sorghum plots had significantly higher labor productivity than non-intercropped plots.

35 Productivity values were calculated by summing the estimated value of harvest for each crop on a given plot. If the respondent had not finished the harvest, the value of the crop not yet harvested was projected by assigning the same value/kilogram to the amount left to be harvested. Comparison excludes yams and cowpeas due to insufficient observations.

Post-Harvest Losses for Sorghum Are Relatively High Among Priority Crops

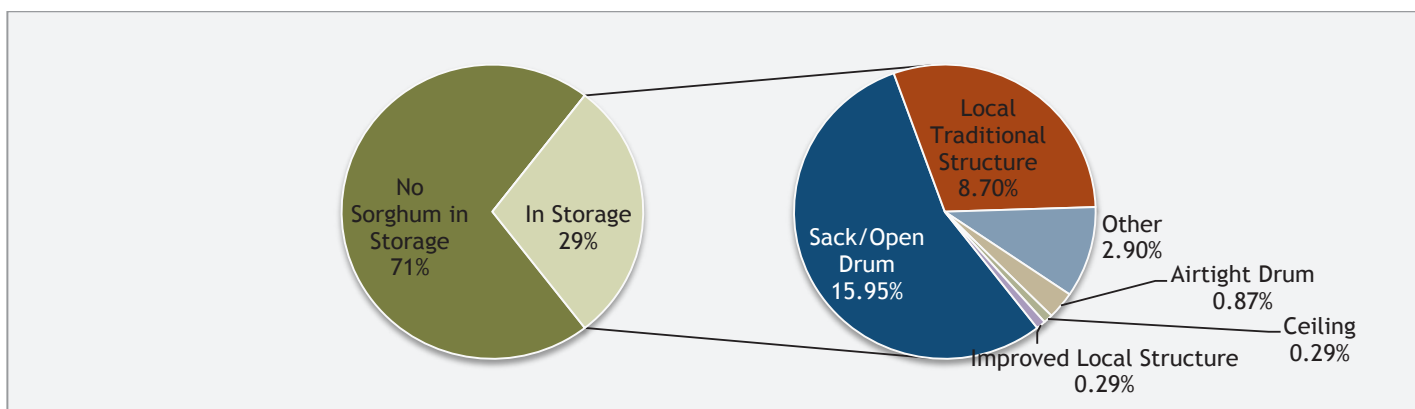
Fourteen percent of sorghum growing households and 8% of millet growing households reported post-harvest losses. Of all priority crops, only paddy and maize had more frequent post-harvest losses than sorghum. For both crops the most commonly reported reason for these losses was insects, followed by rodents/pests. About half (54%) of millet farmers had millet in storage at the time of the interview, compared to 29% of sorghum growers. Farmers almost always stored sorghum for household consumption (95%); less than 3% stored to sell at a higher price, for seed, or for other reasons. Insufficient observations prevented analysis of the reasons for storing millet. Sorghum was most often stored in (non-airtight) sacks/ open drums or in local traditional structures (See Figure 9).

Figure 8: Labor Productivity by Intercropping



**Statistically significant difference between intercropped and not intercropped at 0.05 level

Figure 9: Sorghum Storage Methods



Millet Was More Likely to Be Sold than Sorghum

Among sorghum cultivating households, only 15% sold any of their production, the lowest proportion selling of any priority crop, and 41% of millet cultivating households sold some of their harvest. Selling households sold a median of 100kgs of both crops (mean sorghum sold- 269 kg; mean millet sold-277 kg). Of households that sold these crops, the average household sold about half of what they harvested (51%-sorghum; 48%-millet). Paddy, beans, cassava, groundnut, and sweet potato sellers also sold about half of their production on average, while households that cultivated maize sold an average of only 38% of their production. The total value of sorghum and millet sold averaged close to \$44 per household for each crop, but median total value per household was much lower (\$17.52 for both crops).³⁶ More male-headed households sold sorghum while more female-headed households sold millet. Female-headed households received less per kilogram when they sold millet and sorghum, but none of these differences were statistically significant. Sorghum and millet sold for similar prices, averaging \$0.21 and \$0.22 per kg, respectively.

36 There were fewer than 50 observations for each crop. For sorghum, five households sold over \$100 worth, including one household that sold \$300 worth. For millet, three households sold over \$100 worth and one household sold \$667.

Sorghum and Millet Were More Commonly Eaten as Flour than as Grain³⁷

Few agricultural households reported eating millet or sorghum grain in the week prior to the survey (3%), but 11% consumed millet or sorghum flour. Non-agricultural households consumed millet or sorghum flour at a similar rate (11%), but significantly less ate sorghum or millet grain (1%)³⁸. Among households that grew either millet or sorghum, 32% ate sorghum or millet flour in the seven days prior to the survey, significantly more than agricultural households that did not grow it (7%).³⁹ Children in millet or sorghum growing households were not significantly more likely to suffer from nutritional deficits than non- millet or non-sorghum growing households.⁴⁰ Children of non-millet growers, however, were significantly more likely than millet growers to be overweight (6.8% versus 1.5%).⁴¹

37 Because LSMS-ISA interviews were conducted by zone throughout the growing seasons, the consumption statistics focus on the seven days prior to the survey interview and may not represent average household consumption that occurs throughout the year.

38 P<.0017

39 P< 0.0000

40 Moderate or severe wasting, stunting, underweight, low BMI.

41 P<0.0034

Strategic Implications and Outstanding Questions

Although sorghum and millet were some of the less frequently cultivated of the priority crops, analysis of TZNPS survey data suggests that they were an important source of income and consumption for farmers who cultivated them. As with other priority crops, the wide gap between the highest-producing and median-producing plots indicates the potential for yield gains for many farmers. Because only 1.4% of households grew both crops, and sorghum and millet growers differed in various household characteristics, interventions might be more successful by targeting sorghum or millet growers specifically.

Millet and sorghum may be increasingly important crops in Tanzania given their ability to grow on marginal lands. However, millet and sorghum growing households appear somewhat poorer than non-growing households, possibly driven by agro-ecological endowments of the region. Moreover plots with millet or sorghum as the main crop cultivated produced the lowest value per hectare of all priority crops. Further investigation into low land and labor productivity is needed to understand how interventions promoting sorghum and millet can improve livelihoods.

High rates of reported pre-harvest losses (sorghum-43%; millet-53%) and post-harvest losses (sorghum-14%; millet-8.4%) suggest that strategies to reduce bird damage pre-harvest and to improve post-harvest storage could improve farm profitability. Eighty-five percent of sorghum growing households stored their harvest in sacks, open drums, or local traditional structures, while only 4% used improved storage techniques. While sorghum and millet are typically characterized as heat- and drought-tolerant crops, farmers frequently report losses between planting and harvesting because of drought conditions. While other priority crops experienced losses due to drought, sorghum and millet farmers cite drought as a constraint more frequently than for other crops. Further research may reveal whether these drought losses are due to particular varieties planted, the regional climatic conditions, planting sorghum and millet on marginal land, or other causes.

Fifteen percent of sorghum growing households and 41% of millet growing households sold the crop; sellers of both reported selling about half of their production. This suggests sorghum and millet farmers can cultivate production in surplus of their households' needs. Non-agricultural households consume sorghum/millet flour at similar rates as agricultural households, suggesting these non-growing households may provide a market for sorghum/millet flour. Sorghum and millet were grouped together in questions regarding consumption of flour and grain; disaggregated information about consumption could reveal food preferences between the two crops that are important to marketing strategies.

Because sorghum and millet are cultivated by a limited number of farmers, a better understanding of sorghum and millet cultivation and potential in Tanzania may ultimately require more intensive surveying in sorghum and millet growing areas,

which this survey suggests are in Central and Southern Zones.

Please direct comments or questions about this research to Leigh Anderson and Mary Kay Gugerty, at eparx@u.washington.edu.

Box 1: A Closer Look at Central Zone

Many of the differences in household characteristics between sorghum and millet growers relative to Tanzania as a whole may derive from regional characteristics rather than crops per se. The numbers below present household data for sorghum and millet growing households relative to all Central Zone agricultural households. Millet growing households have above average consumption within Central Zone, which has considerably lower average consumption than other zones in Tanzania. Within Central Zone, sorghum growing households have more members, on average, and millet growers are located closer to the nearest road and population center.

Household Characteristics of Sorghum and Millet Growers in Central Zone

	Sorghum Growing Households (44%)	Millet Growing Households (38%)	All Agricultural Households
Proportion of female headed households	29%	20%	24%
Mean household head level of education (years)	4.4	4.1	4.6
Mean household head age (years)	46.5	48.9	46.1
Mean number of household members	5.5***	4.7	5
Mean distance from household to nearest population center > 20,000 (km)	57.9	39.1*	54.3
Mean distance from household to nearest major road (km)	15.8	7.6**	14.1
Mean value aggregate consumption per adult equivalent (USD per day)	\$0.94	\$1.08	\$0.99
Mean Rainfall July 2007-June 2008 (mm)	504	488	503

*Statistically significant difference from non-growing households at 0.10 level.

**Statistically significant difference from non-growing households at 0.05 level.

***Statistically significant difference from non-growing households at 0.01 level.

This brief presents summary statistics from the Tanzania National Panel Survey (TZNPS), which was implemented by the Tanzania National Bureau of Statistics, with support from the World Bank Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) team. The LSMSISA data were collected over a twelve-month period from October 2008 through September 2009. The sample design was constructed to produce nationally representative estimates, and it consists of 3,265 households from eight administrative zones, each with a rural/urban cluster, for a total of sixteen sampling strata. The resulting data can produce nationally representative estimates at the national and zonal level. Sample size limitations preclude reliable statistics at the regional or district level. Agricultural households completed an additional farm questionnaire, resulting in 2,474 respondents who report involvement in any crop, fishing or livestock cultivation.

In 2011 EPAR completed the Tanzania LSMS-ISA Reference Report, a document consisting of eight sections that highlights specific areas such as crops and productivity, livestock, and inputs. The Reference Report provides summary statistics, detailed information on EPAR's methodology for analysis, and the opportunities and challenges that the LSMS-ISA survey data present. Please refer to the Section A: Introduction and Overview and Section D: Crops and Productivity of the Reference Report for more information on the data and analytical methodology used in this brief.

An appendix with confidence intervals and number of observations for all data in this brief is available upon request. While LSMS-ISA data was collected in kilograms and acres, we have converted units to metric tons (t) and hectares (ha) for this brief. One hectare = 2.47 acres and 1 t = 1000 kg.