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Tanzania National Panel Survey
Living Standards Measurement Study - Integrated Surveys on Agriculture
HIGHLIGHTS

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Tanzania National Panel Survey

LSMS-ISA: Highlights

This brief reviews the national and zonal characteristics of agricultural production in Tanzania using the 2008/2009 Tanzania National Panel Survey (TZNPS), with support from the LSMS-ISA. More detailed information and analysis is available in the EPAR Tanzania LSMS-ISA Reference Report, Sections A-G.

***Figure 1*: United Republic of Tanzania**

KEY FINDINGS

- High variance across zones in terms of landholding size, number of crops cultivated and the predominance of cattle in the agricultural system.
- High variation in yields for most crops, with yields in general far below potential.
- Wide zonal variation in the mix of crops and the importance of short versus long rains.
- Low usage of inputs such as improved seeds and inorganic fertilizer.
- Limited participation of households in the agricultural value chain.

AGRICULTURAL PRODUCTION IN TANZANIA

Households in Tanzania are Predominantly Agricultural

In the 12 month period covered by the 2008/2009 TZNPS survey in Tanzania, 85% of households were considered agricultural, meaning they cultivated land, owned livestock, or participated in fishery. Agricultural households were more likely than non-agricultural households to have male household heads, larger families, and children under five who suffered from malnutrition. While the median years of education achieved for all adults was eight years, the median for women in agricultural households was slightly lower, only seven years (see *Table 1*).

Agricultural households were more likely than non-agricultural households to have male household heads, larger families and children under five who suffered from malnutrition.

***Table 1*: Median Household Profile for Tanzania, Agricultural vs. Non-Agricultural Households**

	Agricultural household (n=2474)	Non-Agricultural household (n=791)
Proportion of female-headed	25%	29%
Number of family members	5	4
Years of education for adult females 18 and over	7	8
Years of education for adult males 18 and over	8	8
Proportion of children five and under stunting (low height for age)	44%	33%
Proportion of children five and under underweight (low weight for age)	17%	11%
Proportion of children five and under wasting (low weight for height)	3%	3%

***Table 2*: Basic Farm Characteristics**

	Mean	10th percentile	Median	90th percentile
Number of plots	2.3	1	2	4
Household landholding (hectares)	2.11	0.40	1.32	4.25
Number of crops grown	4.7	2	4	9

High Variance in Landholding Size and Number of Crops Cultivated

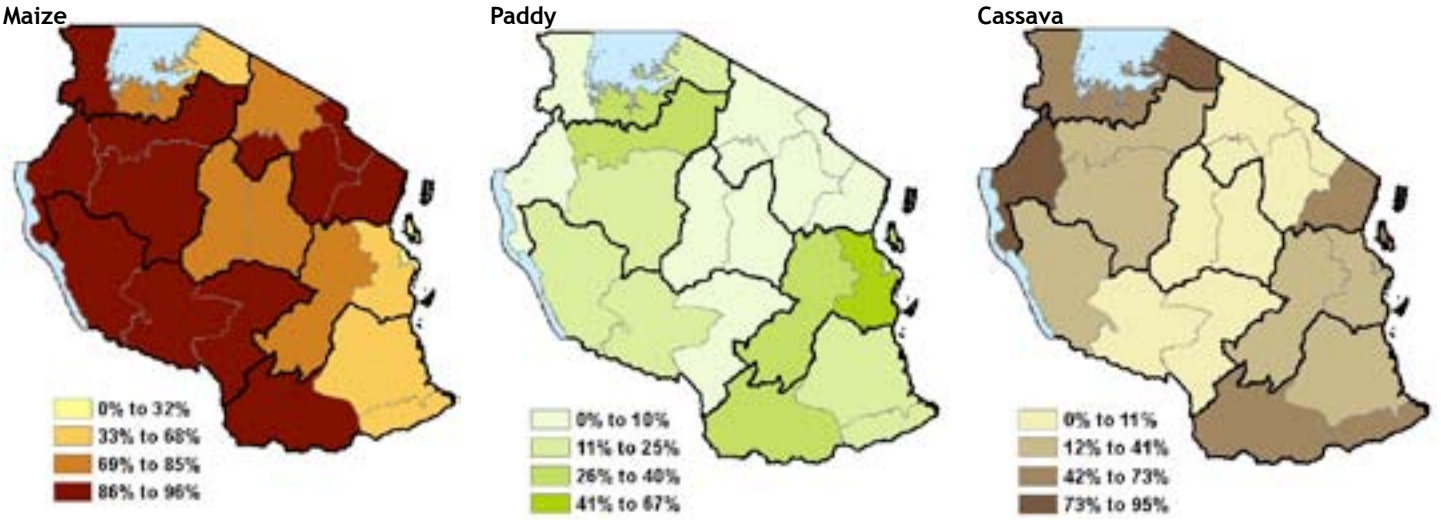
The median Tanzanian farmer cultivated four different crops on two plots that totaled 1.32 hectares (see *Table* 2). The range between the 10th percentile and the 90th percentile varied somewhat, from one to four plots, 0.4 to 4.25 hectares of landholding, and two to nine crops. These characteristics also varied somewhat geographically and by gender of household head. Both the median male and female farmer grew four types of crops, but female-headed households had less land (0.81 hectares, compared to 1.62 hectares for male-headed households) and fewer plots (one, compared to two for male-headed households).

The median Tanzanian farmer cultivated four different crops on two plots that totaled 1.32 hectares. These characteristics varied somewhat geographically and by gender of household head.

High Maize Cultivation Rates

Figure 2 shows the distribution of crop cultivation by region for maize, paddy, and cassava. However, sample size limitations preclude reliable statistics at the regional level. Maize was the predominant crop cultivated in Tanzania, with 83% of agricultural households growing maize during the long or short rainy season. Cassava was the second most commonly grown crop, cultivated by 35% of households. Beans, bananas and mangos were each cultivated by just over a third of households. Seventeen percent of households in Tanzania grew paddy, and cultivation varied substantially by region. Less than 10% of households grew paddy in ten different regions, while 45% of households in Pwani in the Eastern Zone and 67% of households on the island of Pemba cultivated paddy. The mix of crops varied geographically, but in all zones except Zanzibar, more than two-thirds of households grew maize.

***Figure 2*: Proportion of Households Cultivating Maize, Paddy and Cassava by Region**



Improved Seed Use Low Overall, but Highest for Maize

Twenty-two percent of agricultural households in Tanzania reported purchasing improved variety seeds for one or more of their crops. This figure was driven primarily by households that used improved variety maize seeds. Eighteen percent of households used improved variety maize seeds during the long or short rainy season on one or more of their plots. For all other priority crops[1], less than 6% of households used improved variety seeds during either rainy season.

As shown in *Figure 3*, improved variety seed use was most prevalent in the Northern Zone (39%), driven primarily by high usage in the Arusha and Kilimanjaro regions. The Western Zone had the second highest proportion (22%), driven by the Shinyanga region. The Southern Zone and Zanzibar had the lowest proportion of households purchasing improved seeds, 9% and 14% respectively.

Analysis of Median Yields Compared to 90th Percentile Suggests Yields are Low Relative to Potential

TZNPS yield estimates were well below numbers reported by the FAO, particularly when calculations were based on area planted rather than area harvested.[2] *Figure 4* provides the area harvested yields for the TZNPS 2008-2009 data compared to the 2008 FAO estimates. Differences between yields calculated from area harvested and area planted indicate that farmers may suffer from substantial pre-harvest losses. The gap between the median household long rainy season maize harvested yield of 0.66 t/ha and 90th percentile yield of 1.98 t/ha suggests that many farmers could achieve higher yields,

Millet had the smallest yield gap of any priority crop, yet millet farmers in the 90th percentile still produced 100% more per hectare than the median farmer in the long rainy season, indicating the potential for many farmers to greatly increase yields.

Figure 3: Household Use of Improved Variety Seed for at least one Crop by Region

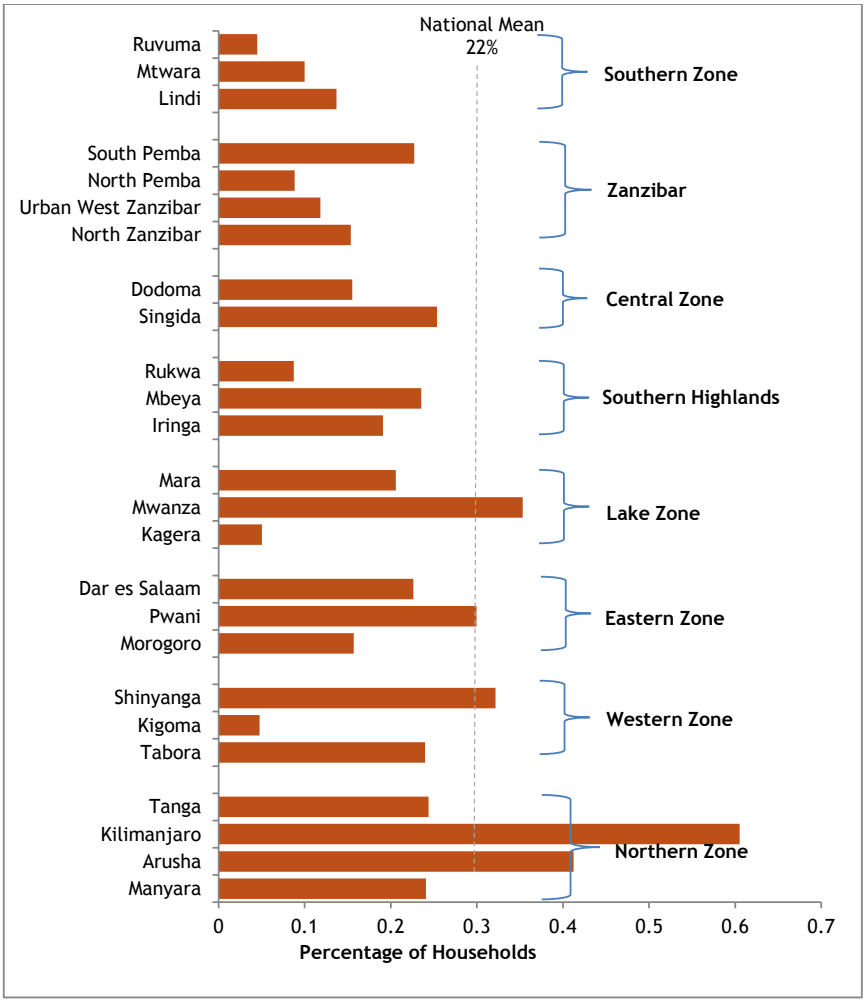
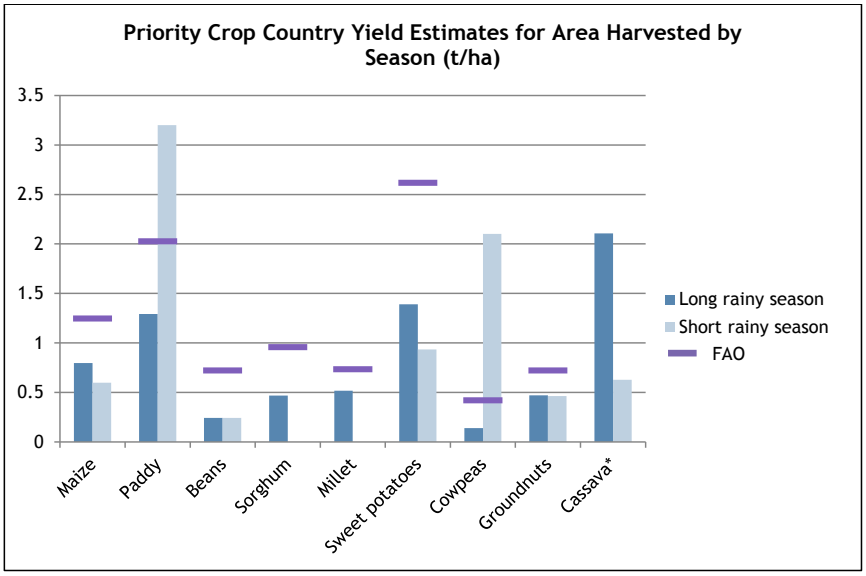


Figure 4: Average National Yields Calculated from TZNPS Data Compared to FAO Estimates



*** The FAO 2008 yield estimate for cassava is 6.44 t/ha. These averages exclude 609 observations of cassava yields recorded as a permanent crop in the TZNPS. The country yield for these excluded plots was .45 t/ha, assuming the entire plot was planted with cassava.**

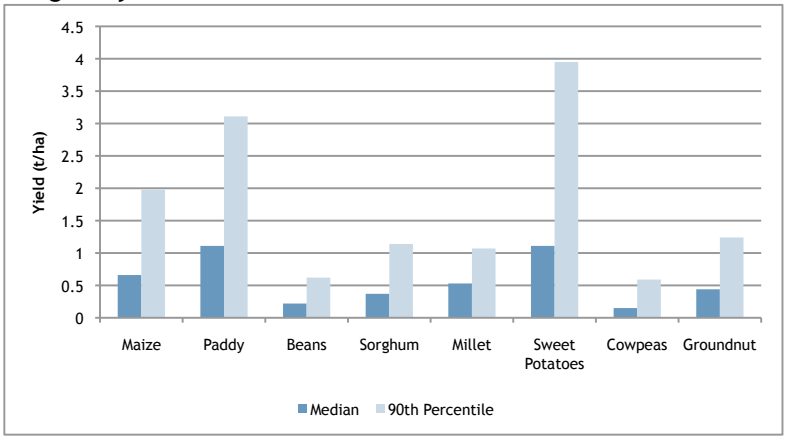
†Insufficient observations to calculate reliable yield estimates for sorghum and millet in the short rainy season and for yams in the long and short rainy seasons.

1 Priority crops include maize, paddy, cassava, sorghum, millet, beans, groundnuts, sweet potatoes, yams, cowpeas, and mangoes.
2 See *Appendix T* of *Section D* of the *Tanzania LSMS-ISA Reference Report* for a full description of the differences between the area planted and area harvested yield variables.

though yield potential varies by agro-ecological zone.

Millet had the smallest yield gap of any priority crop, yet millet farmers in the 90th percentile still produced 100% more tons per hectare than the median farmer in the long rainy season, indicating the potential for many farmers to increase yields (*Figure 5*).

***Figure 5*: Yields of Median Farmer Compared to 90th Percentile, Long Rainy Season**



Crop Production Constraints and Crop Loss Occur Throughout the Cultivation Process

Lost crop potential occurred throughout the cultivation process, beginning with farmers who were unable to plant their entire plot due to input constraints (approximately 11% of maize plots). Lack of tools or equipment was the primary reason given by respondents.

Thirty-four percent of maize plots experienced losses prior to the harvest caused primarily by animals (17%), theft (8%), and insects (6%).

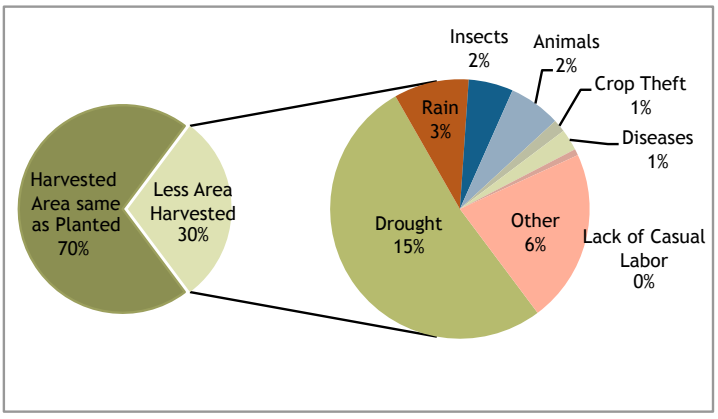
Thirty percent of maize plots experienced pre-harvest destruction sufficient to prevent harvesting a portion of their plot (see *Figure 6*). Drought was the main cause for these losses.

In addition to the 30% of farmers who reported harvesting a smaller area than planted, 2.7% of farmers harvested nothing due to total destruction of their plot (n=48 of 1912 plots).

Post-Harvest Losses

On average, long rainy season maize farmers who suffered post-harvest losses reported losing about 18% of their harvest.

***Figure 6*: Reasons for Area Harvested Less than Area Planted on Maize Plots in the Long Rainy Season**



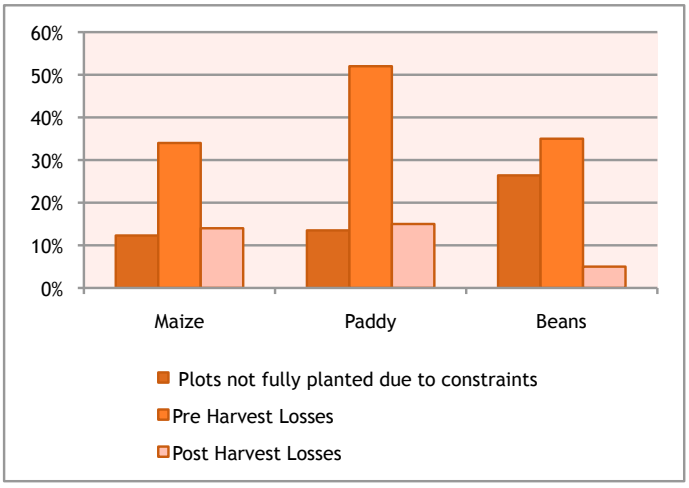
The main causes for these losses were rodents, pests, and insects. More farmers experienced post-harvest losses during the long rainy season than during the short rainy season. *Figure 7* shows the proportion of crops in the long rainy season that suffered from the three different types of losses.

Most Value Produced in the Long Rainy Season

Land productivity was calculated as the combined harvest value of all crops per hectare planted.[3] *Table 3* provides the household level land productivity estimates for each season as well as the aggregate land productivity (without livestock).

The average household value produced from agricultural activities by season and type of product varied substantially by zone, although in all cases the long rainy season generated the most value (see *Figure 8*). In addition to long rainy season

***Figure 7*: Lost Crop Potential by Proportion of Long Rainy Season Plot-Loss**



3 See *Appendix G* in *Section D* of the *Tanzania LSMS-ISA Reference Report* for a more thorough explanation of the methodology used to calculate land and labor productivity figures.

Table 3: **Tanzania Household Level Land Productivity (crops only USD/hectare)**

Season	Value (USD)	Observations
Long Rainy Season	$131.76	1880
Short Rainy Season	$95.83	588
Fruit	$88.57	1166
Permanent Crops	$85.56	961
All Seasons	$234.89	2170

crops, households generated value from short rainy season crops, year-round or permanent crops, fruit, and livestock by-products. The findings suggest that:

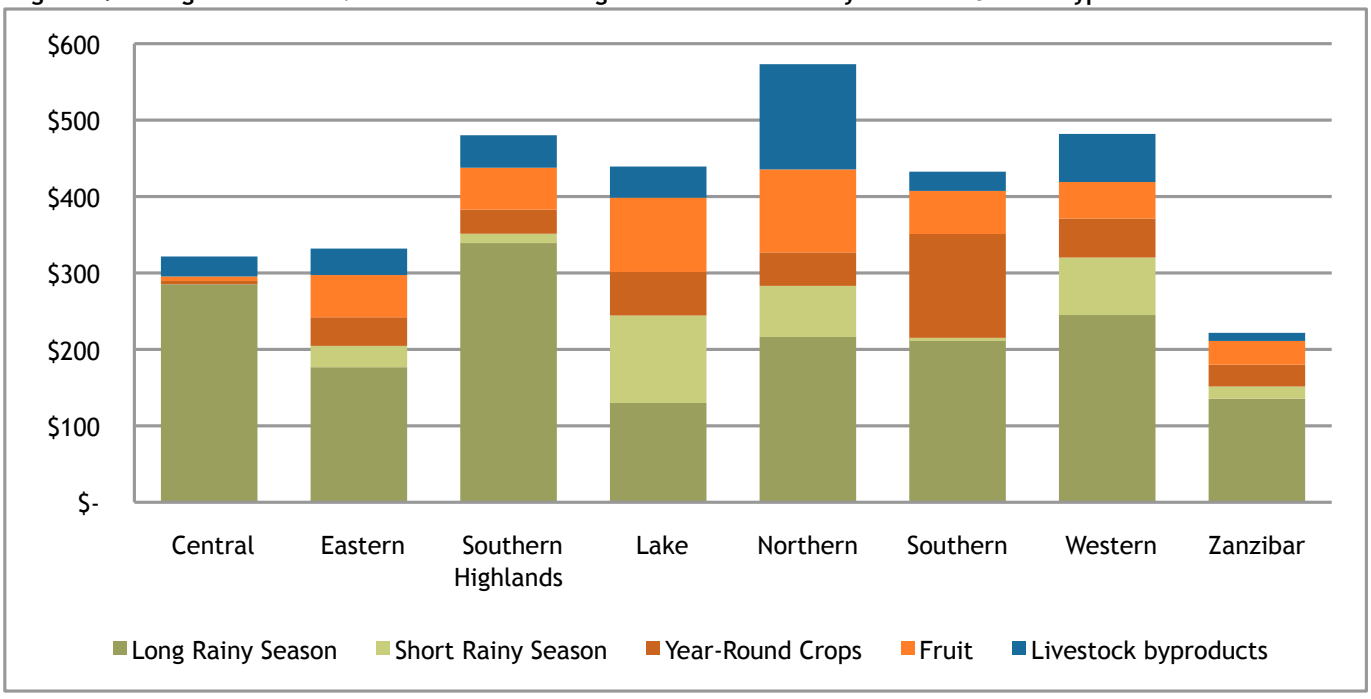
- The Northern Zone had the highest average value of agricultural activities ($573 per household) and Zanzibar the lowest ($222 per household).
- Livestock provide a relatively larger share of production value in the Northern and Western zones, and to a lesser extent in the Eastern, Southern Highlands and Lake zones.
- The relative importance of rainy seasons and crop mixes varies across zones. For example, while Central Zone households had high value from long rains production, the lack of a short rainy season and lower earnings from fruit, permanent crops and livestock meant that they earned less value overall from agricultural activities than households in other parts of the country.

Limited Participation in the Agricultural Value Chain

Thirty-three percent of households reported having at least one crop in storage from the long rainy season at the time of the interview. However, the responses varied greatly by the time of year of the interview and by crop. Storing food for the household was the most common reason for storing crops. Ninety-four percent of farmers storing maize reported storing it for food, while 4% reported storing it to sell at a higher price and 2% reported storing it for seeds for planting. Protecting stored crops was uncommon, with only 23% of households taking measures to protect stored crops after the long rainy season harvest. Eighty-three percent of agricultural households that grew crops processed one or more of those crops in some way (into flour, seeds, maize bran, etc.). Of households that processed crops, only 9% sold the resulting product.

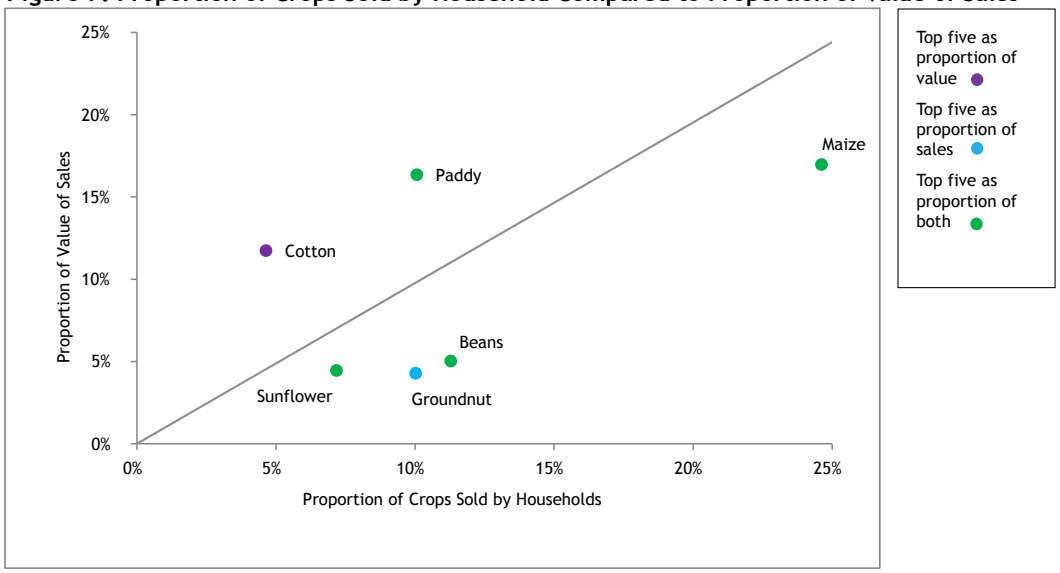
Fifty-nine percent of households that grew crops during the long rainy season also sold one or more of their crops. Paddy was the most commonly sold of the priority crops, with 52% of paddy farming households selling some of their harvest. Sorghum was least commonly sold, only 15% of households sold their yields. Generally, male-headed households were more likely to sell their harvests than female household heads. Thirty-one percent of male-headed households sold maize, while only 21% of female-headed households sold their maize harvests. Of those households that sold crops, 41% transported their crops for sale. Thirty-eight percent of those households paid to get their crops to market, and the median household expenditure was $4.17 for transporting crops.

Figure 8: **Average Household Value Produced from Agricultural Activities by Zone and Season/Type of Product**



Maize was the most important marketed crop for most households. *Figure 9* shows the top five crops that were sold in Tanzania by proportion of total value of sales and proportion of all household sales transactions.[4] Maize, paddy, beans, and sunflower were among the top five for both proportion of value and sales transactions. Cotton and paddy generated a relatively higher proportion of the value of crop sales when compared to the proportion of households that sold those crops. Sunflower, groundnut, and beans were sold by a higher proportion of households compared to the value that they generated nationwide. Maize represented 25% of all crops that were sold and 17% of the total value of all crops sold. Paddy represented only 10% of all crops that were sold, but 16% of the total value of all crops sold.

***Figure 9*: Proportion of Crops Sold by Household Compared to Proportion of Value of Sales**



ZONAL CROP CULTIVATION AT A GLANCE

While maize was the main crop cultivated in seven of the eight administrative zones, the second and third main crops cultivated varied by zone. Beans were in the top three crops cultivated in three zones, Southern Highlands, Northern Zone, and Lake Zone, while paddy fell within the top three in only one zone, Zanzibar. Cassava and bananas were also each among the top three crops cultivated in four zones (see *Table 4*).

Landholding size and household productivity also varied across zones. The median landholding size ranged from 0.61 hectares in Zanzibar to 1.72 hectares in the Western Zone. While landholding size was smallest in Zanzibar, median land productivity was highest, at $195 USD/ha, and although landholding size was greatest in the Western Zone, median land productivity was among the lowest, at $91 USD/ha (see *Table 5*).

***Table 4*: Crops Cultivated in Tanzania**

Zone	Top Three Crops Cultivated by the Highest Proportion of Households
Southern Highlands	Maize, Beans, Banana
Southern	Maize, Cassava, Cashew
Eastern	Maize, Banana, Mango
Zanzibar	Cassava, Paddy, Banana
Northern	Maize, Banana, Beans
Lake	Maize, Cassava, Beans
Western	Maize, Groundnuts, Cassava
Central	Maize, Groundnuts, Sorghum
Tanzania	Maize Cassava, Beans

***Figure 10*: Proportion of Households Using Inorganic Fertilizer**

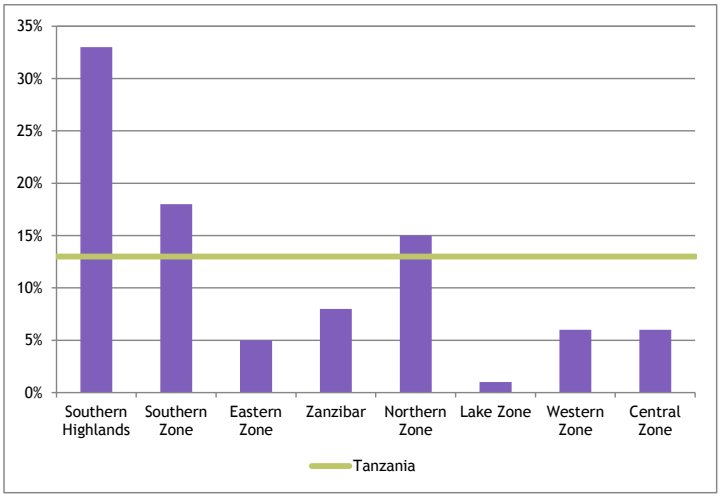
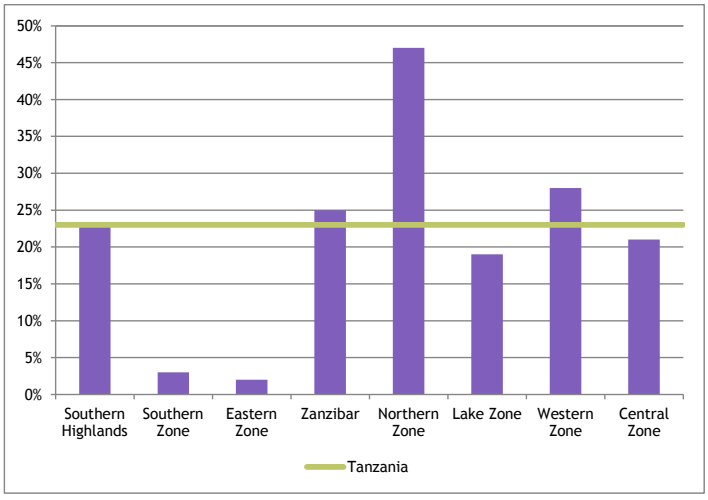


***Figure 11:* Proportion of Households Owning Cattle**



4 Note that there were 27 observations of tobacco sold in Tanzania, which due to the high value of this crop made up an estimated 18% of total value earned from crop sales (higher than the value from any other crop. However, due to the small number of observations this estimation was not included in the analysis.

The proportion of households that owned cattle also varied by zone, ranging from 2% in the Eastern Zone and 3% in the Southern Zone, to 47% in the Northern Zone. The remaining zones fell somewhere in the middle, between 19% and 28% of households owned cattle (see *Figure 11*). Similarly, the proportion of households who used inorganic fertilizer ranged from only 1% in the Lake Zone to 33% in the Southern Highlands (see *Figure 10*).

***Table 5*: Median Landholding and Productivity by Zone**

Zone	Median landholding size (ha)	Median land productivity for crops only (USD/ha)
Southern Highlands	1.21	$150
Southern	1.62	$123
Eastern	1.11	$140
Zanzibar	0.61	$195
Northern	1.21	$179
Lake	1.01	$167
Western	1.72	$91
Central	1.62	$79

SOUTHERN HIGHLANDS

The Southern Highlands Zone lies along the southwestern part of Tanzania and borders Zambia and Malawi to the south and is separated from the Democratic Republic of the Congo to the west by Lake Tanganyika. This zone is considered the breadbasket of Tanzania and includes the regions of Rukwa, Mbeya and Iringa. All three regions fall primarily within the Tanzanian Ministry of Agriculture's Maize/Legume system. The zone is largely mountainous and is partly covered by forests and grasslands. Rainfall is unimodal and the zone receives the highest rainfall of any part of the country during Tanzania's long rainy season.

High Rates of Malnutrition

Rates of malnutrition were higher than average in the Southern Highlands. Fifty-two percent of children under the age of five suffered from moderate to severe stunting, which was the highest proportion in the country and well above the national proportion. However, rates of underweight, wasting and low BMI for age in children under-five were all similar to national rates. The Southern Highlands also had the highest proportion of overweight children in the country, with almost 7% of children under-five categorized as moderately to severely overweight.

Agriculture and Maize Cultivation is Ubiquitous

Ninety-five percent of households in the Southern Highlands were engaged in agricultural activities; together with the Southern Zone the highest proportion nationally. Similar to national figures, 27% of agricultural households were female-headed, the median landholding size was 1.2 hectares, and the median farming household grew four crops.

The top five crops cultivated in the Southern Highlands were maize, cultivated by 93% of households that cultivate crops, beans (52%), banana (34%), mango (28%) and groundnut (24%). Nine percent of farming households cultivated paddy, which is about half of the national proportion. About 23% of agricultural households owned cattle, similar to the national rate, and the median number of cattle owned by these households was three, compared to the national median of five.

***Figure 12*: Southern Highlands**

***Table 6*: Proportion of Cultivating Households Growing Top Five Crops in Southern Highlands**

Crops	Iringa	Mbeya	Rukwa
Maize	92%	94%	92%
Beans	37%	64%	48%
Banana	22%	41%	37%
Mango	27%	24%	40%
Groundnut	14%	32%	23%

Higher Use of Inputs

Thirty-four percent of Southern Highland households used inorganic fertilizer, the highest rate in the country. However, use was unevenly distributed throughout the zone, and substantially higher in Irigna and Mbeya regions (*Figure 13*).

A higher proportion of Southern Highland households also used pesticide, herbicide or fungicide than the Tanzanian average. Twenty-two percent of households used one of these inputs compared to 15% of households nationwide. Once again, the high proportion was driven by Iringa and Mbeya, where 32% and 20% of households used pesticides, herbicides and/or fungicides. Only 11% of households in Rukwa used one of these inputs in 2008. Rates of organic fertilizer and receiving inputs on credit were also slightly higher than the national averages.

High Productivity and Yields

Median household land and labor productivity were both relatively high in the Southern Highlands. Median land productivity for all crops (excluding livestock byproducts) was $150.20 USD/ha, more than 10% above the national estimate, and the median labor productivity from a workday was $1.26, almost 30% higher.

Household crop yields were generally higher in the Southern Highlands compared to Tanzania as a whole. As shown in *Figure 16*, median maize yields were about 40% higher in the Southern Highlands (0.93 t/ha compared to a national median of 0.66 t/ha) and median household paddy yields were 67% higher (1.85 t/ha compared to 1.11 t/ha). The median beans yield (0.24 t/ha) was 9% higher and mango yields (0.14 t/ha) were 22% higher. Median groundnut yields (0.43 t/ha) were very similar to the national median (see *Figure 15*).

As shown in *Figure 14* while the median household maize yields varied by region from 0.81 t/ha in Iringa to 1.04 t/ha in Rukwa, all of the medians were above the national median.

Engaged in the Agricultural Value Chain

Seventy-three percent of households in the Southern Highlands that cultivated any crop during the long rainy season also sold at least one of those crops. Nationally only 59% of cultivating households sold some of their harvest. Maize and paddy were sold by a higher proportion of households that grew them in the Southern Highlands than in any other zone (43% and 88% of households sold these crops respectively).

***Figure 13*: Proportion of Households that Used Inorganic Fertilizer in the Long Rainy Season**

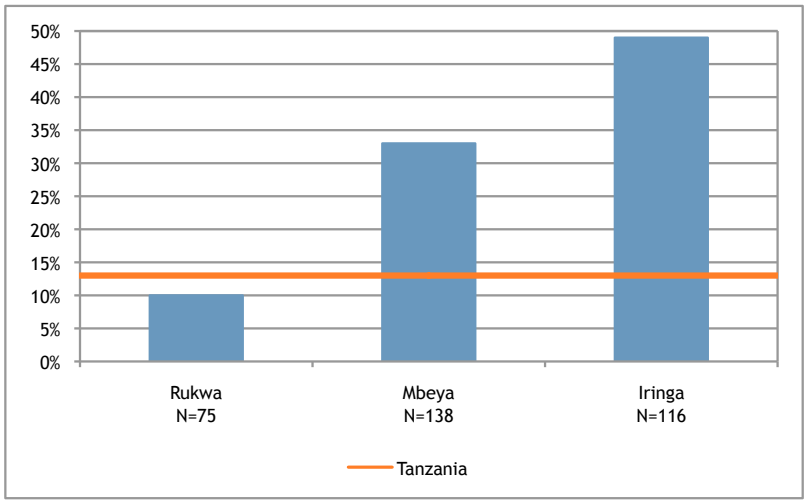


***Figure 14*: Median Household Maize Yields by Region**

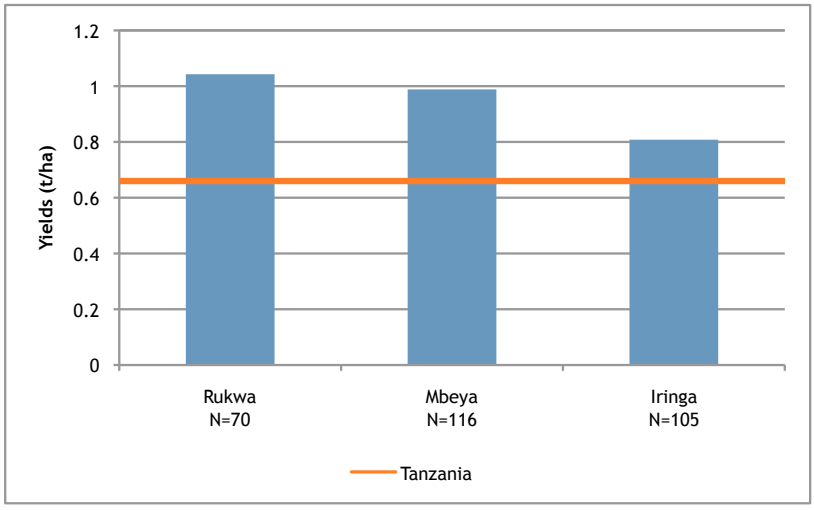


***Figure 15*: Median Household Crop Yields Compared to National Median**

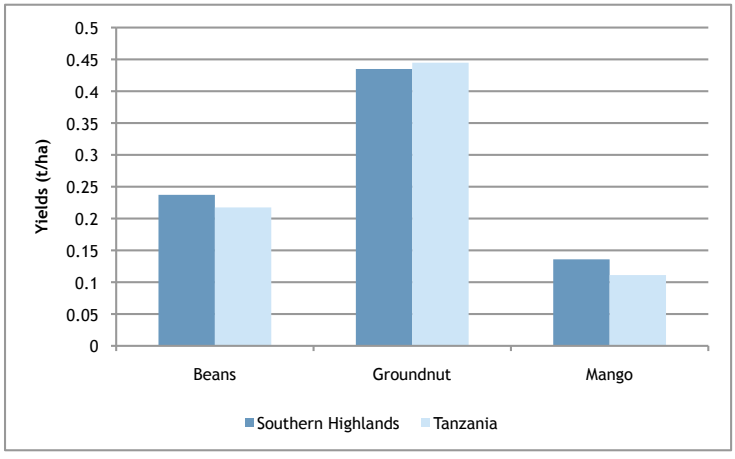
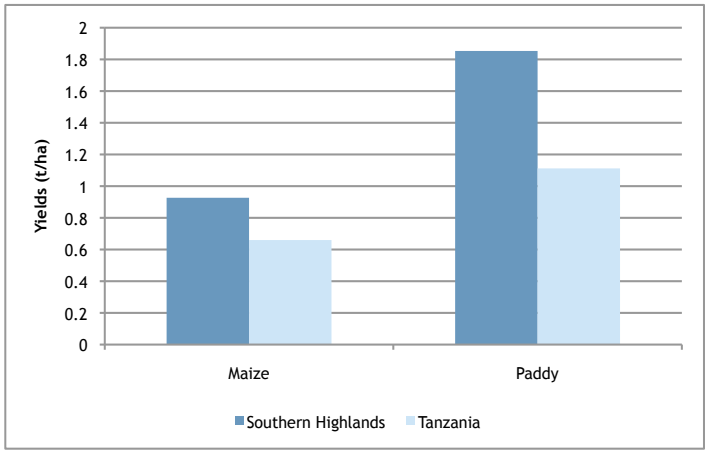


***Figure16*: Median Household Maize and Paddy Yields Compared to National Median**



THE SOUTHERN ZONE

The Southern Zone is bordered by the Indian Ocean to the east, Mozambique to the south and Lake Malawi to the west. It consists of the Ruvuma, Lindi and Mtwara regions (see *Figure 17*). The coastal areas of Lindi and Mtwara are characterized by low rainfall and low soil fertility. The Tanzanian Ministry of Agriculture characterizes this coastal area as the Cashew/Coconut/Cassava farming system. Ruvuma includes mountainous areas, which are similar to the Southern Highlands to the west, and also valleys. The region is characterized as part of the Maize/Legume system, experiences adequate rainfall, and is unimodal.

Small Households with Average Levels of Education

The median agricultural household had only four members in the Southern Zone, among the smallest in Tanzania. About 27% of agricultural households in the Southern Zone were female-headed, which was slightly above the national average. Education rates were consistent with the national rates for number of years adults attended school and the proportion of school-age boys and girls attending school.

Diversified Crops with Infrequent Livestock Ownership

Similar to the Southern Highlands, 95% of households in the Southern Zone engaged in agricultural activities; the highest proportion in the nation. Farming households in the Southern Zone had more land and cultivated more crops than in other zones. The median household landholding size was 1.62 hectares and the median farming household cultivated five crops, both above the national medians.

Households in the Southern Zone relied more heavily on permanent crops than households in other parts of the country as a result of high rates of cassava and cashew nut cultivation. About 31% of the average household value generated from agricultural activities came from permanent crops, almost three times the national average.

Although maize was the most commonly grown crop in the Southern Zone, only 74% of crop-growing households grew maize—lower than other zones, with the exception of the Eastern Zone and Zanzibar. In the coastal regions of Lindi and Mtwara, less than 70% of households cultivated maize. In Ruvuma, however, 87% of households cultivated maize. Cassava was the second most common crop in the Southern Zone, cultivated by 57% of farming households. Cashew was the third most common crop, and cultivation was highest in the coastal regions of Lindi and Mtwara. Nationally, only 9% of farming

***Figure 17*: Southern Zone**

***Table 7*: Proportion of Cultivating Households Growing Top Five Crops in Southern Zone**

Crops	Ruvuma	Lindi	Mtwara
Maize	87%	67%	68%
Cassava	65%	38%	63%
Cashew	20%	56%	76%
Mango	48%	28%	25%
Banana	47%	27%	16%

households grew cashew nuts. Mango and banana were the fourth and fifth most commonly cultivated crops, cultivated by 33% and 30% of farming households respectively. Only 3% of agricultural households in the Southern Zone owned cattle, much lower than the national proportion of 23%.

Low Rates of Input Usage with the Exception of Inorganic Fertilizer in Ruvuma

While organic fertilizer use was lower than in other parts of the country (8% of households compared to 22% nationally), inorganic fertilizer use was more prevalent in the Southern Zone (18% of households compared to a national average of 13%). These higher rates were largely driven by usage rates in the Ruvuma region (*Figure 18*). Almost 40% of households in Ruvuma used inorganic fertilizer, the second highest usage rate for any region in the country after Iringa, in neighboring Southern Highlands (49%).

Use of improved variety maize seeds was low. Only 6% of households cultivating maize used improved variety seeds in the long rainy season, much lower than the national average of 18% of households.

***Figure 18*: Proportion of Households Using Inorganic Fertilizer in the Long Rainy Season by Region**

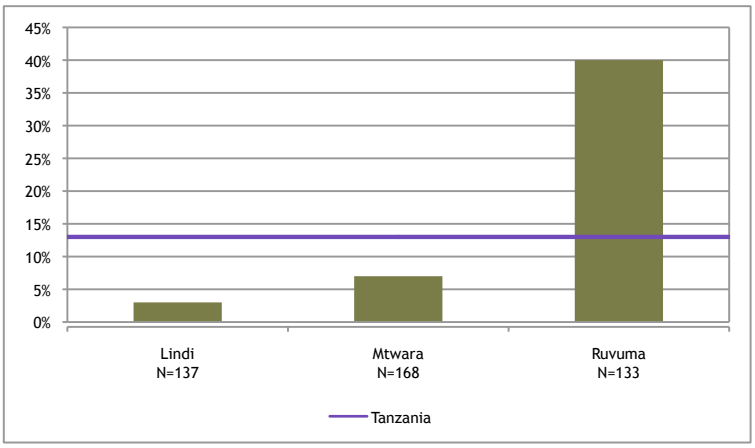


***Figure 19*: Median Household Yields for Tanzania and the Southern Zone**

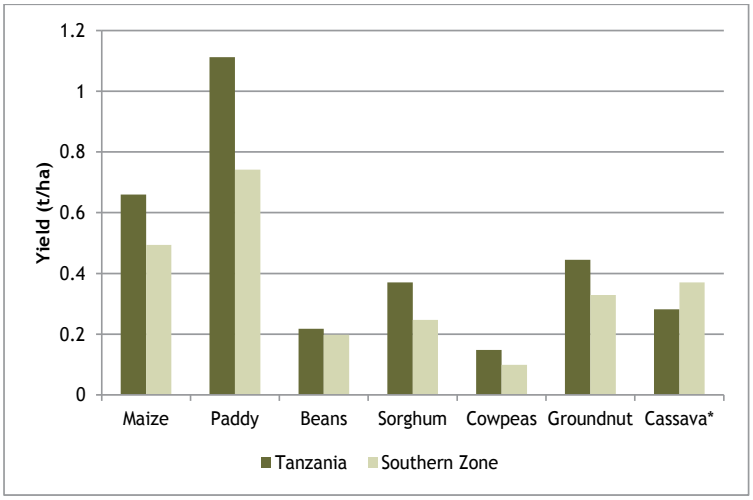
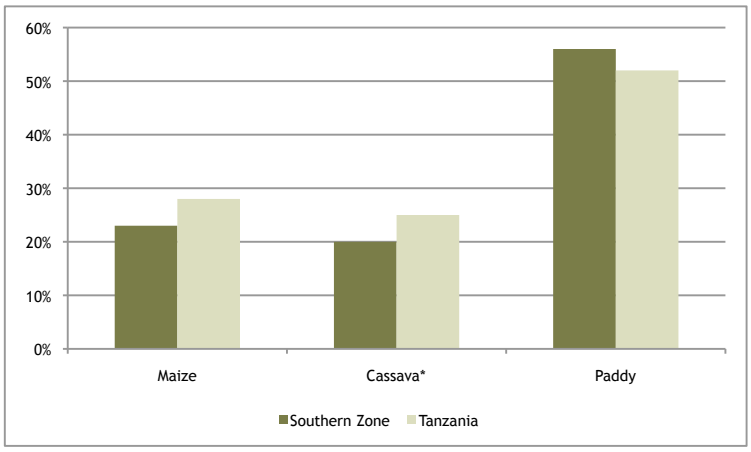


***Figure 20*: Proportion of Households that Sold Long Rainy Season Crops in the Southern Zone and Nationally**



Relatively Low Yields and Productivity

Median household yields in the Southern Zone were consistently lower than the national median yields, with the exception of cassava (see *Figure 19*), driven by low yields in Mtwara and Lindi. Ruvuma had a higher median household maize yield of 0.71 t/ha in the long rainy season, above the national median. The median paddy yield in Ruvuma was equal to the national median, while yields in Mtwara and Lindi were far below. The median cassava yields in Mtwara and Ruvuma were higher than the national median (0.38 t/ha and 0.30 t/ha respectively), but the median yield in Lindi was only 0.22 t/ha.

The median household land productivity for all crops in 2008 in the Southern Zone of $122.95 USD/ha was lower than the national median of $130.59 USD/ha. Household land productivity was lowest in Lindi ($113.74 USD/ha), followed by Mtwara ($122.95 USD/ha) and Ruvuma ($129.66 USD/ha).

Slightly Less Engagement in the Value Chain than the National Average

Only 24% of households in the Southern Zone transported any crops for sale, well below the national average. Eighty-seven percent of farming households processed at least one crop, slightly above national rates. However, only 6% of these households sold the processed crop, which was lower than the national rate.

As shown in *Figure 20*, a lower proportion of maize and cassava farming households in the Southern Zone sold their crops than the Tanzanian average. However, a slightly higher percentage of paddy farmers in the Southern Zone sold their harvests than the national proportion, driven by Ruvuma, where 84% of paddy farmers sold some of their harvest. In Lindi and Mtwara 24% and 37% of paddy farmers sold their harvest, well below the national proportion. Maize and cassava farmers in Ruvuma were also slightly more likely to sell their harvest than the national proportions.

With the exception of the Lake and Eastern zones, every other zone had a higher proportion of households that had crops in storage at the time of the interview than the 25% of households in the Southern Zone. Ruvuma had the lowest proportion of households storing crops, with only 16% of households reporting having crops in storage. Thirty-five percent of households in Lindi and 28% of households in Mtwara had long rainy season crops in storage. Ten percent of households used spraying, smoking or another method to protect crops stored from long rainy season harvests. Zanzibar was the only zone with a lower proportion protecting stored long rainy season crops, with 3% of households using some form of protection. Households in Ruvuma were most likely in the Southern Zone to protect their crops (15% of households), but were still below the national proportion.

EASTERN ZONE

Tanzania's Eastern Zone is located along the coast, bordering the Indian Ocean and is made up of three regions: Dar es Salaam, Pwani and Morogoro. The terrain is comprised of plains and the climate, particularly along the coast, is hot and humid, characterized as a "tropical warm sub-humid" agro-ecological zone. Tanzania's Ministry of Agriculture characterizes the area as Maize/Legume, Cotton/Maize, and Horticulture systems. The zone also contains the country's largest city, Dar es Salaam, making it the most urban zone in Tanzania, with an estimated 56% agricultural households.

Household size was the smallest in the country, along with the Southern Zone, with the median agricultural household comprised of four members. Education levels were highest in the Eastern Zone, with an average of 7.1 years of schooling (6.2 for agricultural households), although the median education level of eight years was the same as the national median. The proportion of children suffering from stunting and overweight were lower in the Eastern Zone than all of Tanzania, but children suffering from underweight, wasting, and low BMI for age were higher.

The median landholding size was 1.11 hectares (1.21 hectares for rural households), slightly below the national median. The median farming household cultivated three crops. The top five crops cultivated in the zone were maize, bananas, mangos, paddy, and cassava (see *Table 8*).

Figure 21: Eastern Zone

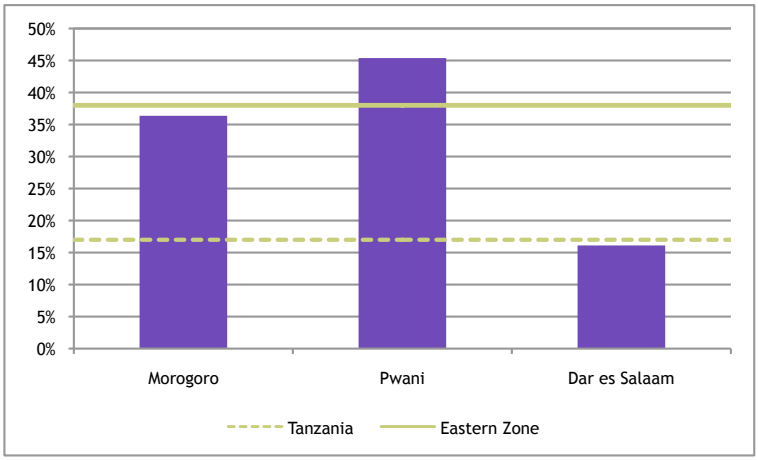
Table 8: Proportion of Cultivating Households Growing Top Five Crops in Eastern Zone

Crops	Morogoro	Pwani	Dar es Salaam
Maize	75%	63%	32%
Banana	48%	41%	33%
Mango	41%	43%	19%
Paddy	36%	45%	16%
Cassava	21%	41%	21%

High Rates of Paddy Cultivation

With the exception of Zanzibar, the Eastern Zone had the highest proportion of agricultural households cultivating paddy (see *Figure 22* for proportions of households cultivating paddy by region). Despite the high rate of cultivation, paddy yields in the long rainy season were the second lowest of the zones (median of 0.62 t/ha), with Zanzibar even lower (median of 0.55 t/ha), compared to the national household median yield of 1.11 t/ha. The Eastern Zone also had the second lowest rate of cultivation for maize (69%) and a median household yield of 0.49 t/ha, 34% below the national household median.

Figure 22: Proportion of Households Cultivating Paddy



The Eastern Zone's land productivity was mixed relative to national medians, with four zones having higher values and three having lower values. Households in the Eastern Zone reported the lowest rates of transporting crops for sale, with only 23% of households transporting crops for sale (compared to 41% nationally).

Low Livestock Ownership

The Eastern Zone had the lowest ownership rates for cattle (2%) and goats (7%), and the second lowest ownership (with Zanzibar the lowest) of chickens (57%). Input use was lowest in the country; only 18% of households used any input (organic fertilizer, inorganic fertilizer, herbicides, fungicides, or pesticides). However, use of improved variety seeds was relatively high – the third highest for use of maize improved variety seeds (behind the Northern and Lake zones) and second for use of paddy improved variety seeds (behind the Northern Zone). Rates of ownership and renting or borrowing farm implements was relatively low, with the exception of tractors, for which households in the Eastern Zone both owned and rented or borrowed more than any other zone (still only 0.8% and 7.6% respectively).

ZANZIBAR

Zanzibar is an archipelago located in the Indian Ocean, about 25km off the coast of mainland Tanzania. The two largest and most widely inhabited islands (Zanzibar and Pemba) are comprised of five regions: Zanzibar North, Zanzibar South/ Central, Zanzibar Urban/West, North Pemba and South Pemba. Zanzibar has a tropical climate and bimodal rains.

Household differences across gender were slightly more pronounced in this zone. Zanzibar had the lowest proportion of female-headed agricultural households (17%). The disparity in years of education between male agricultural household heads (mean 6.6 years; median eight years) and female household heads (mean three years; median zero years) was the highest of any zone. Compared to national averages, male household heads in Zanzibar had over half a year more of education; female household heads had over half a year less.

Compared to most other zones, Zanzibar had a slightly higher incidence of malnutrition in children under five. However, in the category of malnutrition that was most prevalent at the national level (43%), stunting (low height for age), Zanzibar had the lowest incidence of any zone (31%).

***Figure 23*: Zanzibar Zone**

High Rates of Cassava and Paddy Cultivation

The major crops cultivated by agricultural households in Zanzibar were cassava, paddy, banana, coconut and mango. Compared to national averages Zanzibar had a higher proportion of households cultivating cassava (82%) and paddy (51%). In contrast to other zones, maize was not an important crop and was cultivated by only a small proportion of agricultural households (6%). See *Table 9* for regional crop variation among households in this zone.

***Table 9*: Proportion of Cultivating Households Growing Top Five Crops in Zanzibar**

Crops	Zanzibar North	Zanzibar South/Central*	Zanzibar Urban/West	North Pemba	South Pemba
Cassava	76%		70%	96%	93%
Paddy	49%		37%	57%	76%
Banana	33%		54%	50%	59%
Coconut	26%		49%	24%	12%
Mango	16%		31%	5%	8%

*** Insufficient observations (less than 30) for reliable estimate**

Low Paddy Yields, High Cassava Yields

Zanzibar had comparatively low household paddy yields. During the long rainy season, paddy-growing households in Zanzibar produced an average household yield of 0.78 t/ha (median of 0.55 t/ha), compared to a national household average of 1.51 t/ha (median of 1.11 t/ha).

Zanzibar had higher than average household cassava yields. Compared to the national average of 0.86 t/ha, cassava-cultivating households in Zanzibar produced average yields of 1.67 t/ha. The median household cassava yield in Zanzibar was 1.04 t/ha, compared to a national median of 0.28 t/ha.

High Land Productivity but Low Household Agricultural Value

Average land productivity per hectare for all crops in Zanzibar was USD $273, the third highest of any zone. The median total land productivity per hectare for all crops in Zanzibar was $195 dollars, compared to a national median of $131 per hectare.

The average agricultural landholding size in Zanzibar was 0.81 hectares (median 0.61), the lowest of any zone. Perhaps due in part to land constraints, the average total household value produced from all agricultural activities was lowest among agricultural households in Zanzibar ($222), and came primarily from long rainy season crops.

Low Rates of Livestock Ownership

About 25% of agricultural households in Zanzibar owned cattle. Household ownership of goats and chickens was lower than most other zones, with only 9% of households owning goats and 30% owning chickens. Although the percentage of households owning chickens in Zanzibar was the smallest of any zone, the median farmer in Zanzibar owned 15 chickens, almost twice the national median.

Low Rates of Input Adoption

Adoption of agricultural inputs was low in Zanzibar. During the long rainy season in 2008, only 4% of cassava growers and 9% of paddy growers used improved cassava or paddy seeds. Similarly, during the same season only a small number of farmers applied inorganic fertilizer (7%) or pesticides and herbicides (3%) to any agricultural plot.

Low Participation in Agricultural Value Chain

Farmers in Zanzibar had the lowest rates of participation in the agricultural value chain. During the long rainy season, only 27% of farmers sold at least one crop, less than half the national average. During the same period, Zanzibar also had the lowest proportion of farmers processing at least one crop (51%) compared to the national average (83%).

NORTHERN ZONE

The Northern Zone of Tanzania borders Kenya and runs from the northeastern coast west to the Serengeti Plain. The zone comprises four regions, Arusha, Kilimanjaro, Manyara and Tanga.

The agro-ecological zones range from uplands coastal areas in Tanga to volcanic mountain highlands around Mount Kilimanjaro and Mount Meru in northern Arusha, and to undulating medium altitude plateaus and plains in the western part of the zone. Kilimanjaro and Arusha are characterized by the Tanzania Ministry of Agriculture as Banana/Coffee/Horticulture system and Kilimanjaro, Arusha, and Tanga as Cotton/Maize. The Northern Zone is also the center of Tanzania's tourism industry, based largely in the city of Arusha.

Levels of education of household heads were relatively high in the Northern Zone with a median of eight years of schooling for adults in agricultural households, and educational attainment of females 18 and older was just below the Eastern Zone, with an average of 5.5 years of education.

Regional Variation in Crop Mix

The crops most commonly grown by farming households in the Northern Zone were maize (88%), banana (42%), beans (40%), mango (27%) and cassava (20%). However, there was a fair amount of regional variation in the crop mix. Banana was frequently cultivated in the Kilimanjaro and Tanga regions, but infrequently cultivated in Arusha and Manyara. Cassava was frequently cultivated in Tanga, but infrequently cultivated in the other regions. There was less regional variation in terms of maize cultivation in this zone, with over 80% of farming households cultivating it in each region. *Table 10* shows the regional breakdown of crops grown in this zone.

***Figure 24*: Northern Zone**

***Table 10*: Proportion of Cultivating Households Growing Top Five Crops in Northern Zone**

Crops	Arusha	Kilimanjaro	Tanga	Manyara
Maize	85%	88%	87%	92%
Banana	25%	59%	56%	5%
Beans	36%	51%	28%	48%
Mango	15%	28%	44%	9%
Cassava	5%	9%	52%	0%

High Maize Yields

The median landholding size in the Northern Zone was 1.21 hectares, but this median masks low landholdings in many highland areas in Arusha and Kilimanjaro and larger landholdings in many lowland areas. The region had the country's second highest average and median maize yields in the long rainy season (1.03 t/ha and 0.74 t/ha respectively) after the Southern Highlands. Paddy and cassava were relatively unimportant in this region, with only about 5% and 20% of households growing each, respectively. The median yield among those households growing cassava in the Northern Zone was 0.37 t/ha, with the Central, Eastern, and Zanzibar zones having higher median cassava yields.

High Rates of Livestock Ownership

Livestock played an important role in the agricultural economy in the Northern Zone. While median cattle herd size per household in the Northern Zone was just four, lower than the Lake, Central, and Western zones, ownership rates were the highest in Tanzania, with 47% of agricultural households owning one or more cattle. Livestock by-products were an important component of agricultural value produced. Twenty-eight percent of agricultural households in the Northern Zone produced traditional cow milk and 8.5% produced improved cow milk, the highest of any zone. The value of livestock by-

products as a proportion of total household value produced was also highest in the Northern Zone.

High Agricultural Value and Productivity

The Northern Zone had the highest average household value produced from agricultural activities across all the zones, due in part to two rainy seasons in many areas of the zone and the value produced from livestock by-products. The Northern Zone also had one of the highest median total household land productivity (crops only) of any zone in Tanzania ($179 USD/ha) and one of the highest levels of median household labor productivity in the long and short rainy seasons ($1.22/day and $0.68/day respectively).

High Rates of Input Adoption

At 34%, households in the Northern Zone had the highest rates of organic fertilizer use of any zone. Fifteen percent of households used inorganic fertilizer, which is relatively high, although lower than Southern Highlands and the Southern Zone. Northern Zone farmers had the highest use of improved seed varieties (largely for maize) of any zone, driven largely by the high intensity farming areas of Arusha and Kilimanjaro regions. In Kilimanjaro, 61% of households reported using improved variety seeds; zone-wide the average was 39%. *Table 11* shows regional variation in adoption of improved variety maize seeds and inorganic fertilizer.

Lower than Average Participation in the Value Chain

Compared to a national average of 59%, only 47% of farmers in the Northern Zone that grew crops during the long rainy season sold one or more crop from their harvest. Forty-two percent of Northern Zone households that sold crops transported them for sale and 44% paid for that transportation. The median household in the Northern Zone spent more to transport crops than farmers in other zones: USD$8.34 during the long rainy season, twice the national average. The Northern Zone also had the highest percentage of farmers that used cars to transport crops during the long rainy season, 33%, compared to the national average of 15%.

LAKE ZONE

The Lake Zone surrounds Lake Victoria and shares borders with Kenya, Uganda, Rwanda, and Burundi. It comprises the regions of Kagera, Mwanza, and Mara. The Lake Zone's terrain is mainly flat with rolling hills, located at medium to high altitudes. While the land in Mara and Mwanza is mainly large sandy plateaus, Kagera is wet and swampy. The Tanzanian Ministry of Agriculture categorizes all three regions as Cotton/Maize system and Kagera is also characterized as Banana/Coffee/Horticultural and Maize/Legume systems. The zone's bimodal rains allow for two growing seasons, though precipitation varies across the plains and highlands.

The median agricultural household in the Lake Zone had six members, higher than the national median of five. The region ranked in the middle on education measurements, though it stood out as having the highest proportion of school-age boys from agricultural households attending school (94%) and second highest proportion of school-age girls (91%). Nutritionally, the TZNPS recorded lower than average rates of stunting and wasting in children under age five in the Lake Zone.

***Figure 25*: Lake Zone**

***Table 12*: Proportion of Cultivating Households Growing Top Six Crops in Lake Zone**

Crops	Kagera	Mwanza	Mara
Maize	90%	80%	59%
Cassava	70%	61%	80%
Beans	93%	35%	12%
Mango	59%	50%	20%
Banana	86%	19%	7%
Sweet Potato	30%	52%	58%

***Table 11*: Regional Variation in Adoption of Improved Variety Maize Seeds and Inorganic Fertilizer**

Technology	Arusha	Kilimanjaro	Tanga	Manyara
Improved Variety Maize Seeds	33%	61%	19%	23%
Inorganic Fertilizer	11%	32%	8%	0%

High Variety of Crops Cultivated

The median Lake Zone farmer cultivated six crops, the highest variety of all Tanzanian zones. Household crop diversity ranged from high in Kagera (eight crops) to average in Mwanza and Mara (five and four crops, respectively). The top crops and the proportion of households that grew them included maize (80%), cassava (69%), beans (54%), mango (47%), and sweet potatoes and banana (44% each). See *Table 12* for proportion of households growing the top six crops by region. Nineteen per cent of households cultivated paddy, less prevalent than in the Southern, Eastern, and Zanzibar zones, but above the national mean of 17%. However, cultivation rates in Mwanza and Mara were higher, with 32% and 22% of households cultivating paddy.

A wide ranging crop mix gave Lake Zone farmers a relatively well balanced combination of annual value produced by agricultural activities (long and short rainy season crops, permanent crops, fruit, and livestock). Median land productivity from crop cultivation was the highest in the Lake Zone ($167.12 USD/ha) after the Northern Zone and Zanzibar. Productivity varied greatly within the zone, and was highest in Kagera ($281.76 USD/ha) and lowest in Mara ($63.90 USD/ha). However, median land productivity for long rainy season crops was the country's lowest at just $49.91 per hectare, suggesting that annual productivity may be a result of continuous cultivation and crop diversity, rather than intensive cultivation or high crop yields.

Low Maize Yields

Median landholding size was 1.01 hectares, the smallest after Zanzibar, and yields for maize and cassava were lower than in other zones, which may be due in part to intercropping strategies that are not fully captured in the TZNPS yield data. Median long rainy season maize yields were the second lowest (0.49 t/ha) of all zones, and short rainy season maize yields ranked third lowest (0.45 t/ha). The Lake Zone was second only to the Northern Zone in proportion of maize farmers that used improved variety seeds (19%), raising a question as to why overall yields were not higher.

Concentrated Cattle Ownership

Although only 19% of households owned cattle, Lake Zone cattle owners had the largest median herd size (nine cattle) of all zones. Ownership rates were higher in Mwanza and Mara (24% and 25%, respectively) than in Kagera (11%). Livestock ownership of chickens and goats (71% and 36% of households, respectively) was relatively average to above average.

Low Input Use

Organic fertilizer use was slightly above average, with 22% of households applying it to crops, but inorganic fertilizer use was the lowest of all zones, with almost no one using it (1%). Overall, the Lake Zone was the third lowest zone to use any input (organic fertilizer, inorganic fertilizer, pesticides, herbicides, or fungicides) with only 25% of households reporting input usage.

Fewer farmers than average processed a portion of their crops (80%). Similarly, a relatively small proportion of farmers that cultivated long rainy season crops sold any of those crops (48%), with only the Northern Zone and Zanzibar having fewer households (47% and 27% respectively). Those who did transport crops for sale tended to walk or travel by bicycle, suggesting either close proximity of markets or lack of motorized vehicles, though TZNPS data are insufficient to confirm this. The Lake Zone had the fewest farmers transporting crops by car (5%) or animal (1%).

WESTERN ZONE

Tanzania's Western Zone includes three regions—Kigoma, Tabora, and Shinyanga. Kigoma borders Burundi and Lake Tanganyika to the west. Shinyanga and Tabora's topography comprises mainly well-drained flatlands and hilly plateaus. Kigoma has three agro ecological zones—tropical lakeshore, mountainous highlands of high elevation, and swampy, tsetse-infested lowlands. The Ministry of Agriculture in Tanzania characterizes all three regions as both Maize/Legume and Cotton/Maize systems. Shinyanga is also considered part of the Sorghum/Millet/Livestock system and parts of Tabora are pastoralist. The Western Zone has a single growing season.

The median Western Zone agricultural household included six members. Children under age five had relatively average to high nutrition. Of all zones, the Western Zone had the lowest proportion of children who were severely underweight

***FIgure 26*: Western Zone**

***Table 13*: Proportion of Cultivating Households Growing Top Five Crops in Western Zone**

Crops	Kigoma	Tabora	Shinyanga
Maize	93%	95%	96%
Groundnut	41%	41%	48%
Cassava	87%	20%	21%
Mango	48%	39%	32%
Beans	69%	32%	19%

(14.7% compared to 16.5% nationally) and one of the lowest proportions of children who showed signs of wasting (1.9% compared to 2.8% nationally).

Low Education Rates

The Western Zone ranked near the bottom in many education measures. Although the proportion of adult males in agricultural households with any schooling (84%) and their median years of education (eight years) was the same as the national median, Western Zone females fared worse. In agricultural households 41% of female adults had never attended school, compared to 35% nationally. Fifty-eight percent of female household heads had never attended school, compared to 46% nationally. The median adult female had just five years of education, below the national median of seven and significantly different from her male counterpart. Notably, the Western Zone also had the lowest proportion of school age boys (81%) and girls (82%) currently enrolled in school.

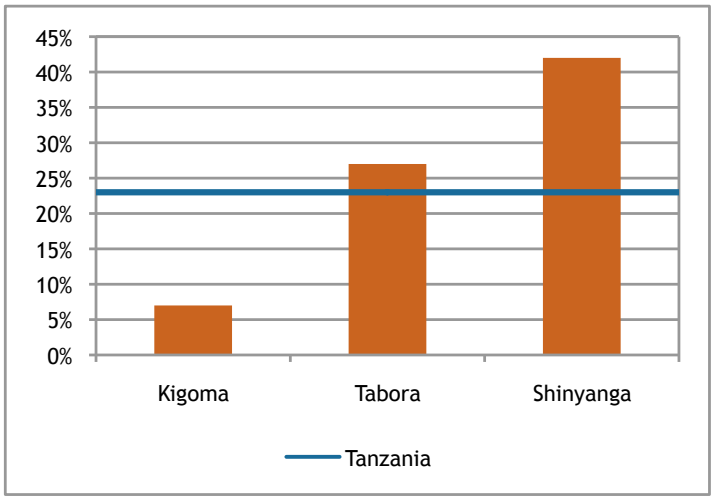
Relatively Large Landholdings, Maize and Groundnuts Predominate

With a median of 1.72 hectares per household, farming households in the Western Zone had the largest landholdings in all of Tanzania. Maize was the predominant crop and 95% of households cultivated it during the long rainy season, more than in any other zone. Among those farmers only 15% used improved variety seed, lower than the national adoption rate of 18%. Median maize yields (0.59 t/ha) were below Tanzania's national median of 0.66 t/ha. The top five crops cultivated in the Western Zone were maize, groundnuts (44%), cassava (41%), mango (38%), and beans (38%). *Table 13* illustrates the differences within the zone by providing the proportion cultivating each of the top five crops by region. The Kigoma region clearly drives the high proportion of households cultivating cassava and beans. While paddy was not one of the top five crops cultivated in the Western Zone, the highest cultivation rates were in Shinyanga, where 28% of households reported cultivating paddy.

High Livestock Ownership

The Western Zone had the second highest proportion of cattle-owning households after the Northern Zone, driven by particularly high cattle owning rates in the Shinyanga region (see *Figure 27*). Median herd size was eight in Shinyanga and 13 in Tabora (compared to national median of five), but there were too few observations to calculate herd size in Kigoma. Western Zone agricultural households were most likely to own chickens (75%) and second most likely to own goats (43%).

***Figure 27*: Proportion of Agricultural Households Owning Cattle in Western Zone**



Lower Crop Input Use, Low Land Productivity

The zone ranked in the middle for use of organic fertilizer (28% of households), while inorganic fertilizer use was only 7%, well below the national adoption rate of 13%. Western Zone farmers were the only farmers that were more likely to own (18%) rather than rent or borrow (16%) an ox, ox cart, or ox plow. Conversely, they were the least likely to either own or borrow a tractor.

Despite large landholding and cattle herd sizes and a fairly well balanced mix of long and short rainy season crops, the Western Zone had the second lowest median land productivity ($91.45 USD/ha). Land productivity ranged from $80.69 USD/ha in Shinyanga to $111.96 USD/ha in Tabora.

Low Intensity Cultivation

Many Western Zone farmers processed crops in some way (93%) and the zone had the largest proportion of farmers who transported crops for sale (70% compared to 41% nationally) and lower than average transportation costs. These farmers were the most likely to transport crops by animal, and second to Lake Zone farmers, were the least likely to transport their crops by car. Large landholding, low land productivity, and a high proportion of farmers that sell crops suggests that Western Zone farmers have very low intensity cultivation but that they still generate a surplus for sale.

CENTRAL ZONE

The Central Zone is located in the middle of Tanzania, and includes the regions of Dodoma and Singida. A mix of large plateau, plains, and arable land characterize the terrain and the region is primarily semiarid. The Ministry of Agriculture characterizes the area as part of the Pastoralists and Agropastoralist system. While the city of Dodoma is the official capital of Tanzania, the area remains largely agricultural. An estimated 93% of households were agricultural (compared to the national rate of 85%).

Lowest Levels of Education in the Country

The median household size was five members, which was the same as the national median. The Central Zone had the lowest education levels in the country. Adults in agricultural households had completed a median of five years of education, compared to the national median of eight years. Twenty-six percent of male adults (over the age of 18) and 48% of female adults in agricultural households in the Central Zone did not attend school, which was the highest of any zone and well above the national proportions of 17% of male adults and 35% of female adults.

Relatively Low Rates of Malnutrition

The Central Zone consistently had fewer children suffering from malnutrition than the average for Tanzania (see *Figure 29*). In particular, the rates of children suffering from moderate to severe wasting, low BMI for age, and overweight, were the lowest among all zones.

***Figure 29*: Proportion of Children Under Five Years Old Suffering From Malnutrition**

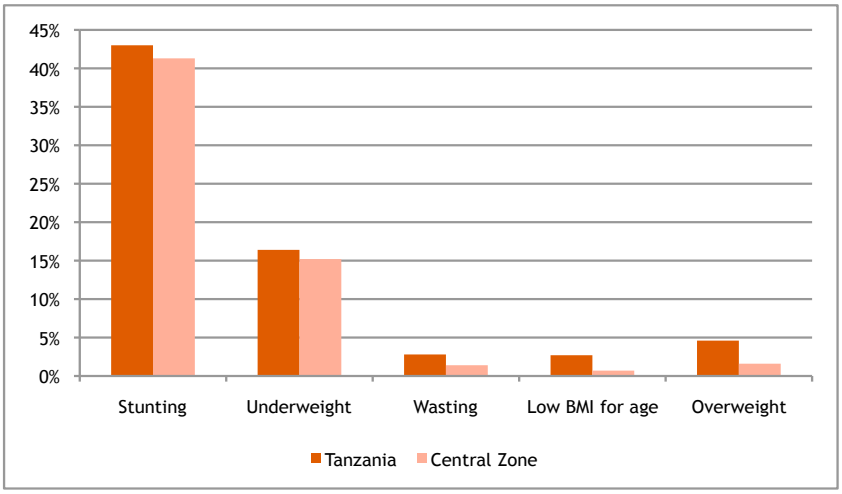


***Figure 28*: Central Zone**

***Table 14*: Proportion of Cultivating Households Growing Top Five Crops in Central Zone**

Crops	Dodoma	Singida
Maize	78%	81%
Groundnut	70%	21%
Sorghum	41%	50%
Millet	40%	33%
Sunflower	36%	29%

Large Landholding Size

The median landholding size was 1.62 hectares, which along with Southern Zone was the second highest of the zones (highest was Western Zone at 1.72 hectares), and well above the national median. Yet agricultural households in the Central Zone grew a median of only three crops, below the national. The top five crops cultivated in the zone were maize, groundnut, sorghum, millet, and sunflower (see *Table 14* for proportion of households cultivating each crop by region).

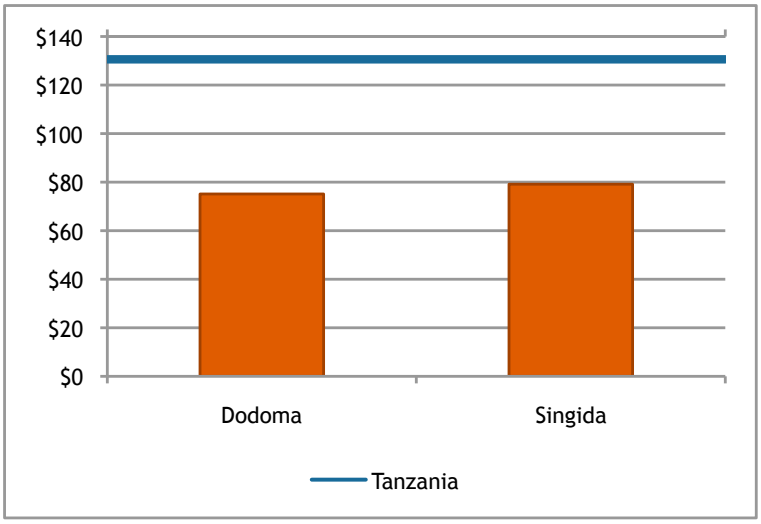
While a large proportion of agricultural households in the Central Zone cultivated maize (79%), both paddy and cassava cultivation rates were among the lowest in the country (8% and 2% respectively). Households in the Central Zone reported average rates of transport, with 40% of households transporting crops for sale in the long rainy season. However, households in the Central Zone were more likely than any other zone to have had their long rainy season crops in storage at the time of the interview (55% of households).

Lowest Median Land Productivity in the Country

The median agricultural household land productivity (crops only) in the Central Zone was the lowest in the country, $79.15 USD/ha. Within the zone, Dodoma's median land productivity was $75.12 USD/ha, compared to Singida's $79.15 USD/ha (see *Figure 30*).

Twenty-one percent of agricultural households in the Central Zone owned cattle, 27% owned goats, and 65% owned chickens. While ownership was not particularly high, the median number of cattle owned by cattle-owning households in the Central Zone was tied for second highest with the Western Zone (eight cattle) and just below the Lake Zone (nine cattle).

***Figure 30*: Median Land Productivity of Regions in Central Zone Compared to National Median**



High Rates of Organic Fertilizer Usage and Farm Implements

The Central Zone had one of the highest rates of input use, behind the Southern Highlands and the Northern Zone, with 38% of agricultural households applying at least one type of input (organic fertilizer, inorganic fertilizer, herbicides, fungicides, or pesticides). However, this was driven by the high usage of organic fertilizer (33% of agricultural households). Only 6% of agricultural households applied inorganic fertilizer and 5% of agricultural households applied herbicides, fungicides, or pesticides. The Central Zone was also among the lowest in terms of improved variety seed, with only 11% of maize plots using improved varieties.

Households in the Central Zone had high ownership and renting/borrowing rates for farm implements. The highest proportion of households owned a hand hoe (98%) and the second highest proportion, behind the Western Zone, owned an ox (14%). The Central Zone also had the highest proportion of households that rented/borrowed an ox (25%).

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

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 LSMS-ISA 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 nationallly 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.