1. Introduction

Ecosystem services are critical to human well-being (Haines-Young and Potschin, 2010). Throughout the world, natural and human-impacted areas provide regulating, cultural and provisioning ecosystem services (Bennett et al., 2009), and non-timber forest products (NTFPs) are a provisioning ecosystem service that supports human livelihoods in both developed and developing countries (Shackleton et al., 2015; Sisk et al., 2016; Živojinović et al., 2017). In agrarian parts of the developing world, communities depend significantly on local provisioning ecosystem services for their health and income (Altieri, 2004; Zenteno et al., 2013). While agricultural production often provides the bulk of food and income in these areas, provisioning ecosystem services from forests, shrublands and grasslands also make significant contributions to communities’ livelihoods (Ambrose-Oji, 2003; Heubach et al., 2011; Kar and Jacobson, 2012). Understanding the geographic and demographic characteristics of areas that depend on provisioning services in the form of NTFPs is key to conservation strategies that maximize NTFP availability to support human livelihoods and well-being (Angelsen et al., 2011; Kareiva, 2011).

It has been estimated that NTFPs provide income and nutrition for over two-thirds of Africa’s population (CIFOR, 2005). These products provide significant income to households and communities, with some products like shea oil and gum arabic being collected and exported to international markets (Mujawamariya and Karimov, 2014; Rousseau et al., 2017). Many other products, such as fuelwood and building materials, are also sold locally and are an income source. A global literature review of 51 case studies across 17 developing countries estimated that, on average, forests provide 22% of a household’s total income (Vedeld et al., 2007). While access to NTFPs is often moderated by political and cultural institutions (Lambini and Nguyen, 2014; Ludvig et al., 2016), a common feature of NTFPs is that they do not require financial capital to procure. Thus, households with less income tend to be the most dependent on forest products for food, fuel and materials (Vedeld et al., 2007).
In addition to providing income and supplying goods that households would otherwise have to purchase from markets, NTFPs also support nutrition outcomes, and many wild foods are consumed directly by the household that collected them. Given that forests and other natural areas offer significantly more species for consumption than agriculture alone, wild foods can significantly increase a household’s dietary diversity (Powell et al., 2015; Remans and Smukler, 2013) and also provide an income source (Ingram et al., 2017). A study in Madagascar found that removing households’ access to wildlife for consumption would increase rates of child anemia by 29% due to decreased meat consumption (Golden et al., 2011). While some wild foods are consumed continuously, many others are a reserve food supply used during times of famine. These “famine foods” are not preferred but are essential for households during hungry seasons or years when agricultural output is low (Mavengahama et al., 2013). Such foods increase household resilience to climate shocks. In surveys of households’ climate adaptation strategies in Mali, Tanzania, and Zambia, forests were found to play a key role in reducing vulnerability during droughts and floods by providing alternative food and income sources (Robledo et al., 2012).

While forests are significant providers of NTFP and provisioning ecosystem services, products sourced from other natural areas like shrublands and grasslands also play a significant role in households’ livelihoods (Pouliot and Treue, 2013). Because access to forested land is sometimes more regulated than access to grassland and shrubland, these non-forested areas can be a significant resource to less well-connected or less wealthy rural people, such as women or ethnic minorities (Pouliot and Treue, 2013). Whether products sourced from these areas can be included in the term “NTFP” is debatable, as a NTFP can often refer to many types of products sourced from a wide variety of environmental areas and land cover types (Belcher, 2005). For example, some trees that provide products typically classified as NTFPs, such as the Gum Arabic tree (Senegalia senegal), often grow in areas with less than the 10% canopy cover required to meet the FAO definition of a forest (FAO, 2012). Furthermore, products sourced from uncultivated non-forest areas have the basic fundamental economic characteristics of NTFPs identified in a comprehensive paper from the Center for International Forestry Research (CIFOR) on NTFPs and rural livelihoods: (i) they have low returns per unit area; (ii) they are primarily used for subsistence and often fill income gaps; and (iii) they are not planted, and are only managed indirectly, if at all (Angelsen and Wunder, 2003). Thus, while this paper examines foods from both forested and non-forested areas like grasslands and shrublands, we use the term NTFP to refer to provisioning ecosystem services sourced from any natural area following the characterization laid out by CIFOR (Angelsen and Wunder, 2003). In our analyses, we split NTFP into two categories: “wild foods” for NTFP like nuts, seeds, bushmeat, honey, or insects, and “nonfood NTFP” for other products such as building materials, medicines, and fibers. When speaking about both wild foods and nonfood NTFP, we use the general term NTFP.

While the benefit that NTFPs provide in supporting rural livelihoods has been clearly demonstrated in many case studies, few studies have been conducted at national and multinational scales relevant to policymakers or conservation and development practitioners (Reed et al., 2016). Indeed, a recent literature review lamented that this body of work is “limited by the propensity for small-scale and short-term evaluations” (Reed et al., 2016). Some notable exceptions to the preponderance of case studies include literature reviews on topics like wild food consumption (Powell et al., 2015) and environmental income from forests (Vedeld et al., 2007), as well as the Population-Environment Network (PEN) dataset on household NTFP use based on surveys conducted in 24 developing countries (Angelsen et al., 2014; Hickey et al., 2016). While these literature reviews and the PEN study have made significant contributions to our understanding of characteristics of households that depend on NTFPs and the degree of their dependence, they have a significant sampling bias, with most of the case studies and sample sites established opportunistically in areas with significant forest cover and where communities were already known to utilize forest resources. Thus, findings from these studies showing that NTFPs provide 22% of total income (Vedeld et al., 2007) or 28% of total income (Angelsen et al., 2014) cannot be taken as representative of all rural developing countries or as representative of any one country.

The fact that studies of household use of NTFPs are usually only conducted in highly localized case studies is unfortunate, as a growing body of literature is beginning to associate various environmental data metrics from satellite imagery with indicators of income, health, and food security from household surveys. Such research has found relationships between an increased Normalized Difference Vegetation Index (NDVI) and decreased child mortality (Brown et al., 2014); more forest cover and greater dietary diversity (Ickowitz et al., 2014); and more forest cover and decreased child stunting (Johnson et al., 2013). Many of these studies have found significant associations, but the specific mechanisms underlying linkages between environmental indicators like NDVI and forest cover with human well-being remain under-explored at relevant scales. This is largely because multinational surveys on human well-being, such as Demographic and Health Surveys (DHS) and Living Standards Measurement Surveys (LSMS), do not collect data on the accessibility and collection of wild foods and non-food products in a standardized manner across countries. On the other hand, datasets that do include data on NTFP use, such as individual case studies or the PEN dataset, do not include detailed data on key measures of human well-being, such as agricultural production, health, and food security. Thus, datasets that can be used to find a significant relationship between vegetation indices or land cover and human well-being at multinational scales are often lacking data on the exact causal linkages. For example, a recent study showed that forest cover was associated with dietary diversity across 21 African countries (Ickowitz et al., 2014, p. 290), but could not explain the exact linkages, stating: “while we have found clear evidence linking tree cover and indicators of diet quality, we are not able to determine the drivers of this relationship. Our data do not allow us to distinguish between natural forests, old fallows, and agro-forests; thus we cannot ascertain if people living near forests are collecting more nutritious foods from the forest or if they are cultivating them on farms and in agroforests, or a combination.”

This paper aims to bridge these gaps – to provide a characterization of households that gather both food and nonfood NTFP in terms of both household characteristics and environmental characteristics. We do this by examining which geographical and household level variables are significant predictors of household wild food and nonfood gathering from 25 agro-ecological landscapes in 4 countries. While the landscapes in this study were not selected at random, they were selected purposively to monitor a variety of topics such as agricultural intensification, livelihoods, and environmental quality. Thus, landscapes were not selected with the specific intention of examining wild food or NTFP collection, and some of the landscapes selected had no households that reported collecting any NTFPs. This dataset therefore provides a unique opportunity to examine variation in NTFP gathering across and within multiple African countries and agro-ecological regions, as well as the factors associated with that variation, without relying on sample data that was collected in areas already known to have high levels of NTFP gathering. A geographic characterization of households that collect NTFP can, in turn, begin to fill in gaps in knowledge of the mechanisms by which ecosystem provisioning services (measured by satellite-derived environmental indices) could be contributing to positive human health outcomes. Finally, an understanding of which landscapes contain households that collect NTFP in significant numbers can aid conservation priority setting efforts that aim to maximize ecosystem service provision.

2. Methods and data

For household survey data, we used data from the Vital Signs project (Scholes et al., 2013). Vital Signs is an integrated monitoring system that collects data on agriculture, the environment and livelihoods in a number of agricultural landscapes in Africa. The sampling design involves six to
seven 10 × 10 km agricultural landscapes per country, with about 30 households per landscape. Landscapes were purposively placed within the identified regions in each country with the intention to cover a wide distribution of agro-ecological zones in areas where smallholder agriculture predominates (Scholes et al., 2013). Each household was interviewed about agricultural practices and production, off-farm and on-farm income, food security, and collection of food and nonfood NTFPs. A total of 751 households were interviewed across 25 landscapes in Ghana, Uganda, Rwanda and southern Tanzania (See Fig. 1). Data was collected from 2013 to 2016, with interview dates varying by landscape and country. The median amount of time spent in a landscape conducting household surveys was 20 days.

This study used multilevel logit models to determine the most significant geographic and household predictors of whether a household reported collecting NTFPs. Two separate regressions were run: one for whether the household collected wild foods and one for whether the household collected any nonfood NTFPs. The regressions were based on 751 households from Ghana, Uganda, Rwanda, and southern Tanzania.

While many analyses of wild foods include all undomesticated species, including those sourced from farmlands and villages (Powell et al., 2015), the Vital Signs questionnaire specifically asked about wild foods and other nonfood products collected from "nearby fallow lands, forest, woodland, shrubland, rivers, creeks, or other areas." Households were specifically asked about wild meat, wild insects, fish from local rivers/creeks, nuts or seeds, honey, building materials and medicinal plants but were also given the option to specify other NTFPs. Other products specified were snails, crabs, mushrooms, green vegetables, sisal, and palms for making mats. Because the particular NTFPs that households collected varied widely from one area to another, regressions were not run for each individual product. We used the same predictor variables for both regressions and allowed intercepts to vary at the landscape level and the country level. Additionally, although ancillary data was collected on frequency of collection and market value of NTFPs, the questionnaires were not designed to allow accurate estimation of values or quantities of all food products. To avoid the possibility of erroneous comparisons between areas, we only used simple binary outcomes.

2.1. Household survey data

Household-level data used in the regressions included measures of food security and household wealth, as well as demographic characteristics that have been shown in the literature to be significant predictors of wild product use, including the gender of the household head, average household age, household size, and education as measured by the percent of the household that could read in any language and the average years of schooling for all household members (Coulibaly-Lingani et al., 2009). All household-level data was collected using the Vital Signs household survey questionnaire (Scholes et al., 2013).

As a measure of household food security, an adjusted version of the Household Food Insecurity and Access Scale (HFIAS) was used (Coates et al., 2007). This consisted of eight different coping strategies that a household might have to take in response to food insecurity, such as skipping meals or limiting the variety of food eaten. The scale was calculated as the total number of days in the past week the household had to undertake a given coping strategy, summed across all eight coping strategies. In addition to the HFIAS, because food security does not just consist of food access, availability, and utilization, but also requires temporal stability (Wheeler and von Braun, 2013), we added a temporal aspect with a binary variable of whether the household reported not having enough food to feed the household at any point in the previous year.

For measures of household economic status, we included household income from non-agricultural sources, such as off-farm wage labor and running a household business; the total cost of all expenditures made in

Fig. 1. Location of landscapes within the four Vital Signs countries. Each landscape is 10 x 10 km.
the previous year by a household for both food and nonfood products; and the total estimated value of all agricultural products produced in the previous year by a household, estimated as the summed production value of field crops, permanent crops, crop byproducts, crop residue, livestock, and livestock byproducts. Monetary estimates were calculated in local currencies for each country, and then converted to 2015 US dollars.

2.2. Household-level geographic data

Because not all of the households fell perfectly within the 10 × 10 km landscape in which they were intended to be sampled, and because there was significant within-landscape variation in land cover types, land cover was measured as a household-level variable. Land cover and protected area data was summarized within a given distance of a household. Regression results for land cover within 7.5 km of a household are included in the body of this paper. However, because the distance people travel to collect resources can vary significantly based on the resource and location (Maukonen et al., 2014) regression results within 2.5 km, 5 km, 10 km, and 15 km are included in Appendix A.

Two variables were generated at the household level as indicators of the prevalence of land cover types that might provide wild foods and nonfood NTFPs: one for area covered by only forest and another for area covered by any non-forest, non-agricultural land cover types. Land cover data came from the 300 m spatial resolution European Space Agency Climate Change Initiative (ESA CCI) land cover dataset (Defourny et al., 2017). Forest categories consisted of any land cover type with > 15% tree cover, including broadleaved, needleleaved, evergreen, deciduous, and flooded areas, while non-forest, non-agricultural categories (henceforth referred to as “grassland”) consisted of shrubland, grassland, herbaceous and sparsely vegetated areas with < 15% tree cover. Because the ESA CCI dataset has annualized data, land cover was extracted for each household for the year in which the survey was conducted.

Additionally, data on protected areas was collected from the World Database of Protected Areas (UNEP-WCMC and IUCN, 2017) and all areas within protected areas (PAs) with International Union for the Conservation of Nature (IUCN) categories I through V were counted as protected, while areas permitting sustainable resource use (category VI) or areas unclassified within the IUCN system were not counted as protected. The variable was calculated as the percentage of total area protected within a given distance of a household. Finally, the 12-month Standardized Precipitation Index (SPI) (Mckee et al., 1993) was calculated for each household at the landscape centerpoint using the 1 km spatial resolution CHIRPS dataset (Funk et al., 2015). The SPI was originally developed to allow inter-comparison of drought and wet periods between stations. The 12-month SPI compares the precipitation total for each set of 12 months to all other 12-month periods in the record. The value of the 12-month SPI in a given month is equal to the number of standard deviations above or below the mean of the total precipitation received in the 12 preceding months (Gutman, 1999). Because households were not all interviewed within the same month, two households in the same landscape could have different SPI values.

2.3. Landscape-level geographic data

For each of the 25 landscapes, data on distance to cities and population density were extracted using Google Earth Engine. These factors were selected because they could have an impact on household use of NTFPs, and they were measured at the landscape level because they do not vary significantly over a distance of 10 km. Market distance was counted as the travel time in hours to the nearest town with a population greater than fifty thousand people, and was sourced from the Harvest Choice Market Distance dataset (Harvest Choice, 2011). Population density was measured as the total number of people within each 10 × 10 km landscape in the year 2015, as measured in the 100 km resolution WorldPop dataset (Tatem, 2017).

2.4. Variable definitions

Although we used multiple indices of household food security and household income, none of these variables used were found to be multicollinear; however, other potential indices were excluded because of multicollinearity with the indices that we did use. The regression was run in R using the lme4 package version 1.1.12 (Bates et al., 2015) and significance estimates were generated using the lmerTest package version 2.0.32, which uses Satterthwaite’s degrees of freedom method to generate significance estimates (Kuznetsova et al., 2014). Variables were rescaled and centered to yield values from −1 to 1 to facilitate model estimation. For a description of each variable, see Table 1.

3. Results

The households in the dataset had significant variation in income, agricultural production, forest cover, and rates of NTFP collection. For example, in Mpatana, Tanzania the average agricultural production value per household was $55994 over the previous year, while it was only $286 in Kisoro, Uganda. Similarly, forest cover within 7.5 km of a household ranged from 0.004% in Nsobri, Ghana to 92.7% in Atebubu, Ghana, and rates of NTFP gathering ranged from 0% in Nyungwe and Volcanoes, Rwanda to 87% in Yumbe, Uganda. Finally, the landscapes were placed in areas with ample variation in precipitation, from 861 mm/yr in Sumbawanga, Tanzania to 1618 mm/yr in Mpatana, Ghana. For detailed summary statistics by country and by landscape, including dates of data collection, see Appendix B.

3.1. Types and rates of NTFP collecting

Our surveys find wide variability in the rates of collecting wild foods and nonfood NTFPs. The most common NTFP collected was building materials, followed by medicinal plants, while the most common wild food collected was nuts or seeds, followed closely by wild meat (See Tables 2 and 3).

In looking at the rates of households collecting only wild foods, only nonfood NTFPs, both types of NTFP, or neither wild food nor nonfood NTFPs, over half of households reported collecting no NTFP at all. Additionally, many more households collected nonfood NTFPs than wild foods (See Table 4). A more detailed tabulation is available in Appendix B.

3.2. Regression results

Across the 25 landscapes, the most significant predictors of whether a household would report collecting wild foods were the presence of forests or grasslands. Household characteristics like demographics, education, income, spending, and food security had little significance in determining whether a household would report collecting wild foods when geographic variables were included in the regressions (See Table 5).

Similar to wild foods, household characteristics had little significance for whether a household would report collecting nonfood NTFP. Unlike wild foods, however, land cover (forest cover or grassland) was not a significant predictor. Rather, the best predictor of whether a household would report collecting nonfood NTFP across the 25 landscapes and four countries was lower population density. Additionally, lower household literacy rates and higher HFIAS scores were both somewhat associated with nonfood NTFP collection (See Table 6).

Regressions were also run at 2.5 km, 5 km, 10 km, and 15 km spatial scales, and these results were included in Appendix A. Many of the variables that were significant predictors at a 7.5 km scale remained significant at all scales. Lower population densities remained a significant predictor of nonfood NTFP collection, even as forest cover, grassland area, and area protected were measured at different scales. For wild food collection, forests were a significant predictor of NTFP collection at all spatial scales and increased in significance at smaller scales.
Both wild foods and nonfood NTFPs, or no NTFP at all.

Table 4
Number and percentage of households that collected specific wild foods.

| Product                | Number of Households | Percentage of Households |
|------------------------|----------------------|--------------------------|
| Nuts or seeds          | 57                   | 7.6%                     |
| Wild meat              | 54                   | 7.2%                     |
| Honey                  | 41                   | 5.5%                     |
| Wild insects           | 18                   | 2.4%                     |
| Fish from local rivers | 13                   | 1.7%                     |
| Other - Vegetables     | 7                    | 0.9%                     |
| Other - Mushrooms      | 5                    | 0.7%                     |
| Other - Snails         | 3                    | 0.4%                     |
| Other - Crabs          | 3                    | 0.4%                     |
| Any Wild Food          | 126                  | 16.9%                    |

Table 5
Predictors of whether a household reported collecting wild food NTFP. Note: variables were centered and rescaled. n = 751. A p-value of < 0.001 is indicated with three stars (**), a p-value of < 0.01 is indicated with two stars (*), and a p-value of < 0.1 is indicated with a period (.).

| Estimate     | Std. Error | z value | Pr(>|z|) |
|--------------|------------|---------|---------|
| (Intercept)  | −3.40289   | 1.240898| −2.74228| 0.006101**|
| Head Gender  | 0.594308   | 0.448286| 1.325744| 0.184928  |
| Age          | −0.44911   | 0.895157| −0.50171| 0.615873  |
| Years of Schooling | −1.61346 | 1.132877| −1.42421| 0.154385  |
| Literacy     | 0.068992   | 0.917154| 0.075224| 0.940036  |
| Household Size| −0.05441  | 0.749899| −0.07356| 0.942165  |
| Critical Food Shortage| −0.03797 | 0.345719| −0.10982| 0.912553  |
| HFIAS        | 0.643374   | 1.376622| 0.467357| 0.604245  |
| Total Ag Production| 0.256779 | 1.76156 | 0.145768| 0.884105  |
| Net Business Income| −0.00705 | 1.404397| −0.00502| 0.998997  |
| Wage Income   | −2.76351   | 2.256545| −1.22466| 0.220702  |
| Nonfood Spending| −0.60565 | 1.880145| −0.32213| 0.747354  |
| Food Spending | −0.51856   | 0.994423| −0.52147| 0.602018  |
| Area Protected | −1.26698 | 1.458995| −0.86839| 0.385178  |
| 12 – month SPI  | 0.070670  | 0.489361| 0.137051| 0.89099  |
| Forest Cover   | 2.025117   | 0.948489| 2.135099| 0.027253* |
| Grassland     | 2.704174   | 1.192099| 2.266148| 0.023442* |
| Population Density | 0.194492 | 2.350343| 0.08275| 0.93405  |

Table 3
Number and percentage of households that collected specific nonfood NTFPs.

| Product                | Number of Households | Percentage of Households |
|------------------------|----------------------|--------------------------|
| Building Materials     | 209                  | 27.8%                    |
| Medicinal Plants       | 170                  | 22.6%                    |
| Palms for Mats         | 2                    | 0.26%                    |
| Sisal                  | 1                    | 0.13%                    |
| Any Nonfood NTFP       | 284                  | 37.9%                    |

4. Discussion
One of the most striking results in this analysis is that geographic variables like land cover and population density are better predictors of whether a household will report collecting NTFP than any household scales. Grassland was most significant at 7.5 and 10 km scales, but lost significance at both larger and smaller scales. Additionally, a lower percentage of area protected was somewhat significant as a predictor of wild food collection at 5 km scales and was significant as a predictor of nonfood NTFP collection at 10 and 15 km scales.
level variables that have been shown to influence wild product gathering in other contexts (Bakkegaard et al., 2017; Coulibaly-Lingani et al., 2009; Melaku et al., 2014). These findings are to be related in line with a similar study conducted in China, which found that geographic factors like soil quality and forest distance were significant predictors of whether a household would collect NTFP, while household socio-economic factors, such as annual per capital income or education levels, were not (Zhu et al., 2017). The presence of both forests and grasslands were significant predictors of whether a household would report collecting wild foods, while lower population density was significantly associated with higher collection of nonfood NTFPs. Given that there is also substantial variability between landscapes in terms of socio-economic characterization (see Appendix B), it is also apparent that the geographic context, rather than socio-economic factors, is the greatest determinant of whether households in that landscape will report gathering NTFP.

Interestingly, very different contexts determine whether a household will report collecting wild foods or nonfood NTFPs. The fact that environmental land cover types predicted whether a household will report collecting wild food suggest that this land cover variable is likely capturing availability of wild foods in particular land cover types. Both wild meats and wild nuts and seeds, the two most frequently reported types of wild food collected, require some amount of natural habitat in order to grow, and thus are unavailable in areas without these land cover types. Building materials, on the other hand, can often consist of mud bricks or other products that don’t necessarily require the presence of a particular land cover type. Even organic building materials, like thatch and wood, can be sourced from marginal areas or small plots, whereas food species of wild meat and plants like shea (Vitellaria paradoxa), locust bean (Parkia biglobosa), and Syzygium fruits require some natural habitat (Naughton et al., 2015). The fact that lower population densities were associated with greater collection of nonfood NTFPs could be due to a number of factors. It possible that in densely populated areas artificial building materials and medicines are more readily available, that households have higher incomes in densely populated areas to purchase these resources, that there is greater competition for natural building materials and medicines in these areas, or that NTFP availability is quickly exhausted in densely populated areas.

Another significant finding was that household level variables related to demographics, education, food security, and income had little predictive power in determining whether a household would report collecting NTFPs. This stands in opposition to pre-existing work on household determinants, which has found that factors like age, household size, education levels, and income sources are significant determinants of whether a household would report having access to NTFPs (Coulibaly-Lingani et al., 2009). Where our models did find that household level predictors were somewhat significant, they concurred with previous literature: both decreased household literacy and decreased food security were somewhat associated with greater collection of non-food NTFPs. This is likely because illiteracy and food insecurity are associated with poorer and marginalized members of communities, which previous studies have found to be more likely to depend on NTFPs (Pouliot and Treue, 2013). It is possible that household-level variables do have significant effects within a landscape, as prior research suggests, but that our sample size was not large enough to detect these relationships. Coulibaly-Lingani sampled over 1800 households in one province of Burkina Faso, and showed that within this small area many household characteristics were significant predictors of NTFP access (Bakkegaard et al., 2017; Coulibaly-Lingani et al., 2009). However, when comparing between countries and agro-ecological zones, as the Vital Signs dataset does, it seems that land cover and population density have more explanatory power than household characteristics when determining if NTFP gathering is part of a given household’s livelihood strategy. Thus, these geographic and land cover variables should be taken into account in future econometric work on NTFP access and utilization.

Assessing the presence of forests, grasslands and protected areas within varying distances (see Appendix A) also revealed interesting results. The percent of the land covered by forest was most significant as a predictor of wild food collection at very local scales, around 2.5 km, while the percent of land covered by forest within 10 and 15 km of a household had a less significant effect. Grassland was only significant at 7.5 and 10 km scales. Interestingly, the presence of protected areas was also significant at some scales for both wild foods and nonfood NTFP, with a greater presence of protected areas associated with less NTFP gathering. This could be due to a variety of factors, such as exclusion of households from access to NTFPs within protected areas to greater competition for the NTFPs that fall outside of PAs. It could also be due to respondent bias, with households being reluctant to admit to behavior that is illegal or that may appear illegal. Nevertheless, our findings at multiple scales do suggest that PAs have an effect on household’s reported NTFP gathering, although not as salient of an effect as the presence of forests and grasslands. This has significant implications for conservation policy, suggesting that restrictive protected areas, such as those with IUCN categories I through IV, may decrease local peoples access to wild foods and nonfood NTFPs. Thus, more research is needed on policy strategies that allow people to maintain their livelihoods while also meeting conservation goals, such as community-based forest management and protected areas permitting sustainable use of resources (Ellis and Porter-Bolland, 2008).

While greater presence of forests and grasslands is significantly associated with wild food collection and low population densities are associated with nonfood NTFP collection, there are many areas in Africa with high population densities where agricultural land use is predominant. In these areas households likely do not collect NTFP, not only because forests and grasslands are less common, but also because they are well protected or highly fragmented and not as productive of wild food species. This is especially true in Rwanda and southwest Uganda, where the Vital Signs data indicates very little wild food or nonfood NTFP collection and there is little substantial natural land cover outside of national parks like Nyungwe and Volcanoes in Rwanda or Bwindi Impenetrable forest in Uganda. Thus, our results show there may be significant populations of smallholder farmers in Africa that rely on little to no NTFP resources. This suggests that the contribution of NTFP to local incomes across all rural households in sub-Saharan Africa may be much lower than the 22% calculated by Vedeld in a literature review or the 28% calculated by the PEN study (Angelsen et al., 2014; Vedeld et al., 2007). At the very least, our data and analyses suggest that NTFP dependence varies widely across different parts of the continent.

### Table 6

Predictors of whether a household reported collecting nonfood NTFP. Note: variables were centered and rescaled. n = 751. A p-value of < 0.001 is indicated with three stars (***), a p-value of < 0.01 is indicated with two stars (**), a p-value of < 0.05 is indicated with one star (*), and a p-value of < 0.1 is indicated with a period (.).

| Variable                          | Estimate | Std. Error | z value | Pr(>|z|) |
|----------------------------------|----------|------------|---------|----------|
| Intercept                        | -0.17005| 0.90919    | -1.1748 | 0.806377 |
| Head Gender          | 0.34727 | 0.05996   | 1.9734  | 0.223168 |
| Age                              | -0.39671| 0.72252   | -0.54927| 0.582817 |
| Years of Schooling              | 0.16752 | 0.82589   | 0.20284 | 0.83926  |
| Literacy                        | -1.22975| 0.73762   | -1.66717| 0.095481 |
| Household Size                  | -0.34939| 0.51763   | -0.67498| 0.499688 |
| Critical Food Shortage           | 0.36043 | 0.24510   | 1.493406| 0.13533 |
| HFIALs                          | 1.80554 | 0.98705   | 1.829224| 0.067366 |
| Total Ag Production             | 2.07537 | 1.49795   | 1.402774| 0.160684 |
| Net Business Income             | 1.35572 | 1.44661   | 0.937817| 0.348339 |
| Wage Income                     | 1.91413 | 1.69341   | 1.130345| 0.258331 |
| Nonfood Spending                | 0.94364 | 1.38057   | 0.683747| 0.494135 |
| Food Spending                   | -0.0562 | 0.920869  | -0.06225| 0.950366 |
| Area Protected                  | -1.19388| 0.888749  | -1.20747| 0.227252 |
| 12 - month SPI                  | -0.0928 | 0.432267  | -0.21462| 0.830061 |
| Forest Cover                    | -0.67606| 0.966626  | -0.69966| 0.48414  |
| Grassland                       | 0.40619 | 1.05513   | 0.381366| 0.702932 |
| Market Distance                 | 1.24709 | 1.419427  | 0.87858 | 0.379627 |
| Population Density              | -3.08889| 1.42321   | -2.17037| 0.029979 |
One benefit of this study was its multinational approach, providing significant variety in landscape characterization in terms of factors like landcover type, market distance, and population density. This allows us to build on previous studies that have mostly taken place in one country or setting and compare between landscapes and countries to determine which geographical contexts are most associated with households that collect NTFPs. The multilevel models used in this study take advantage of the multinational approach to allow estimates in one country to borrow strength from the other countries in the analysis. Conducting an analysis at this scale also allows us to speak to previous studies conducted at similar scales finding associations between natural landcover and positive human well-being outcomes (Ickowitz et al., 2014; Johnson and Brown, 2014).

Furthermore, increasing food security and access to provisioning ecosystem services is an increasing goal of conservation in developing countries (Shackleton et al., 2015; Tscharntke et al., 2012), and this research can justify conservation schemes designed to increase availability of provisioning ecosystem services to communities, even in areas where case studies of NTFP collection have not been conducted. Nevertheless, there are some risks to missing important local variables when creating multinational statistical models. While we did not have data on cultural diversity, for example, we did allow for intercepts in the model to vary at the landscape scale and the nation scale, with the intent to account for variation in community and national factors among landscapes and countries.

This study had some limitations that must be noted. One issue is that while the landscape locations were not sampled in a way that targets communities that are known to collect NTFP, they were also not randomly sampled, and therefore may exhibit some bias in the representativeness of the households interviewed. Another limitation was that while this survey asked respondents if they collected NTFPs and what kind they collected, it did not explore questions of frequency, uses, and domestication status of NTFP that were collected, as previous work has done (Casas et al., 2007; Heubach et al., 2011; Kar and Sullivan, who helped the design the NTFP module of the Vital Signs instruments could be targeted to support livelihoods via NTFP.

A.1. Wild Food Collection

A.1.1. 2.5 km

Table A.1.1

Regression for wild foods with geographic variables measured at a 2.5 km buffer around each household. A p-value of < 0.001 is indicated with three stars (**), a p-value of < 0.01 is indicated with two stars (**), a p-value of < 0.05 is indicated with one star (*), and a p-value of < 0.1 is indicated with a period (.)

|                     | Estimate | Std. Error | z value | Pr(>|z|) |
|---------------------|----------|------------|---------|----------|
| (Intercept)         | −3.43138 | 1.074157   | −3.19449| 0.001401**|
| Area Protected      | −2.2174  | 2.069019   | −1.07172| 0.283847  |

Acknowledgements

This work was made possible through grants OPPGD943 and OPP1140919 from the Bill & Melinda Gates Foundation, Seattle, WA; grant 016 GRP 301 from the Rockefeller Foundation, New York, NY; and grant 15-107423-000-INP from the MacArthur Foundation, Chicago, IL. We also thank Ravic Nijbroek, Kyle DeRosa, and Claire Sullivan, who helped the design the NTFP module of the Vital Signs household surveys as well as the two anonymous reviewers for their helpful and insightful comments.
### Table A.1.1 (continued)

| Estimate | Std. Error | z value | Pr(> |z|) |
|----------|------------|---------|------|
| Forest Cover | 2.294866 | 0.851461 | 2.695209 | 0.007034** |
| Grassland | 0.307016 | 1.315592 | 0.233367 | 0.815476 |
| Head Gender | 0.57594 | 0.453623 | 1.269646 | 0.204211 |
| Age | −0.5151 | 0.890432 | −0.57848 | 0.56294 |
| Years of Schooling | −1.62585 | 1.136473 | −1.43061 | 0.152543 |
| Literacy | 0.145568 | 0.930138 | 0.156502 | 0.875638 |
| Household Size | −0.09113 | 0.753169 | −0.12099 | 0.906396 |
| Market Distance | −1.61265 | 2.420055 | −0.66637 | 0.505175 |
| Population Density | −0.2175 | 1.433043 | −0.15177 | 0.879365 |
| 12 – month SPI | 0.101208 | 0.530129 | 0.190913 | 0.848594 |
| Critical Food Shortage | −0.02604 | 0.345313 | −0.07542 | 0.939882 |
| HFIAS | 0.500821 | 1.392471 | 0.359664 | 0.719099 |
| Total Ag Production | 0.34366 | 1.776028 | 0.193499 | 0.846568 |
| Net Business Income | −0.10878 | 1.406026 | −0.07737 | 0.938329 |
| Wage Income | −2.82504 | 2.283327 | −1.23725 | 0.215995 |
| Nonfood Spending | −0.54817 | 1.86646 | −0.2937 | 0.768989 |
| Food Spending | −0.51271 | 0.994593 | −0.5155 | 0.606207 |

#### A.1.2. 5 km

Table A.1.2

Regression for wild foods with geographic variables measured at a 5 km buffer around each household. A p-value of < 0.001 is indicated with three stars (***) , a p-value of < 0.01 is indicated with two stars (**) , a p-value of < 0.05 is indicated with one star (*), and a p-value of < 0.1 is indicated with a period (.).

| Estimation | Std. Error | z value | Pr(> |z|) |
|------------|------------|---------|------|
| (Intercept) | −3.45593 | 1.17012 | −2.95348 | 0.003142** |
| Area Protected | −3.57338 | 1.962139 | −1.82117 | 0.068582 |
| Forest Cover | 2.016719 | 0.932362 | 2.16302 | 0.03054* |
| Grassland | 2.072987 | 1.216874 | 1.703543 | 0.088468 |
| Head Gender | 0.647645 | 0.451405 | 1.43473 | 0.151364 |
| Age | −0.54958 | 0.890548 | −0.61712 | 0.537153 |
| Years of Schooling | −1.45946 | 1.128882 | −1.29284 | 0.196067 |
| Literacy | 0.138391 | 0.926983 | 0.149291 | 0.881324 |
| Household Size | −0.11711 | 0.749162 | −0.15632 | 0.875781 |
| Market Distance | −0.19372 | 2.038423 | −0.08392 | 0.93312 |
| Population Density | 0.743553 | 1.327429 | 0.560145 | 0.57538 |
| 12 – month SPI | 0.074462 | 0.500711 | 0.148712 | 0.881781 |
| Critical Food Shortage | 0.563351 | 1.387599 | 0.40599 | 0.68475 |
| HFIAS | 0.563351 | 1.387599 | 0.40599 | 0.68475 |
| Total Ag Production | 0.215317 | 1.773681 | 0.121395 | 0.903378 |
| Net Business Income | −0.08709 | 1.40453 | −0.06201 | 0.950558 |
| Wage Income | −2.83191 | 2.306549 | −1.22777 | 0.219534 |
| Nonfood Spending | −0.57118 | 1.874393 | −0.30473 | 0.760572 |
| Food Spending | −0.60913 | 0.993946 | −0.61284 | 0.539981 |

#### A.1.3. 10 km

Table A.1.3

Regression for wild foods with geographic variables measured at a 10 km buffer around each household. A p-value of < 0.001 is indicated with three stars (***) , a p-value of < 0.01 is indicated with two stars (**) , a p-value of < 0.05 is indicated with one star (*), and a p-value of < 0.1 is indicated with a period (.).

| Estimation | Std. Error | z value | Pr(> |z|) |
|------------|------------|---------|------|
| (Intercept) | −3.36349 | 1.225662 | −2.74422 | 0.006065** |
| Area Protected | −0.42656 | 1.282335 | −0.33264 | 0.739406 |
| Forest Cover | 2.17146 | 1.020222 | 2.128419 | 0.033302* |
| Grassland | 2.471235 | 1.184458 | 2.086385 | 0.036944* |
| Head Gender | 0.558173 | 0.446934 | 1.248894 | 0.211704 |
| Age | −0.42809 | 0.892946 | −0.47941 | 0.631648 |
| Years of Schooling | −1.62095 | 1.134954 | −1.42821 | 0.153232 |

(continued on next page)
### Table A.1.3 (continued)

| Feature                  | Estimate  | Std. Error  | z value  | Pr( > |z|) |
|--------------------------|-----------|-------------|----------|------|
| Literacy                 | 0.078704  | 0.918096    | 0.085725 | 0.931685 |
| Household Size           | -0.06667  | 0.749821    | -0.08891 | 0.929153 |
| Market Distance          | -0.06811  | 2.45369     | -0.02776 | 0.977854 |
| Population Density       | 1.05348   | 1.384996    | 0.760638 | 0.446874 |
| 12 – month SPI           | 0.111744  | 0.491286    | 0.227453 | 0.820071 |
| Critical Food Shortage   | -0.03709  | 0.345139    | -0.10745 | 0.914432 |
| HFIAS                    | 0.611404  | 1.37359     | 0.445189 | 0.656183 |
| Total Ag Production      | 0.313547  | 1.758436    | 0.178676 | 0.858192 |
| Net Business Income      | -0.02238  | 1.40809     | -0.01589 | 0.987318 |
| Wage Income              | -2.78523  | 2.263736    | -1.23037 | 0.21856 |
| Nonfood Spending         | -0.62724  | 1.889475    | -0.33197 | 0.739915 |
| Food Spending            | -0.47109  | 0.995918    | -0.47302 | 0.636199 |

### A.1.4. 15 km

Table A.1.4

Regression for wild foods with geographic variables measured at a 15 km buffer around each household. A p-value of < 0.001 is indicated with three stars (***), a p-value of < 0.01 is indicated with two stars (**), a p-value of < 0.05 is indicated with one star (*), and a p-value of < 0.1 is indicated with a period (.).

| Feature                  | Estimate  | Std. Error  | z value  | Pr( > |z|) |
|--------------------------|-----------|-------------|----------|------|
| (Intercept)              | -3.37623  | 1.1964      | -2.82199 | 0.004773*** |
| Area Protected           | 1.04874   | 0.90963     | 1.107058 | 0.950922 |
| Forest Cover             | 2.159198  | 1.285572    | 1.762742 | 0.077944 . |
| Grassland                | 0.585464  | 0.448365    | 1.305775 | 0.191629 |
| Head Gender              | 0.338702  | 0.291166    | 1.163264 | 0.244722 |
| Age                      | -0.3606   | 0.72616     | -0.49658 | 0.619486 |
| Years of Schooling       | 0.209777  | 0.83233     | 0.252036 | 0.78195 |
| Literacy                 | -0.01297  | 0.344106    | -0.0377  | 0.969299 |
| Household Size           | -0.07616  | 0.748265    | -0.10179 | 0.918295 |
| Market Distance          | -0.16214  | 2.51893     | -0.06437 | 0.948676 |
| Population Density       | 1.114599  | 1.419501    | 0.785205 | 0.432333 |
| 12 – month SPI           | 0.577112  | 1.374988    | 0.419721 | 0.674689 |
| Critical Food Shortage   | -0.01297  | 0.344106    | -0.0377  | 0.969299 |
| HFIAS                    | 0.577112  | 1.374988    | 0.419721 | 0.674689 |
| Total Ag Production      | 0.403324  | 1.736556    | 0.232255 | 0.81634 |
| Net Business Income      | -0.04002  | 1.408844    | -0.0284  | 0.977339 |
| Wage Income              | -2.81653  | 2.264945    | -1.24335 | 0.213673 |
| Nonfood Spending         | -0.6239   | 1.87312     | -0.33308 | 0.739073 |
| Food Spending            | -0.47925  | 0.991707    | -0.48326 | 0.628912 |

### A.2. Nonfood NTFP

#### A.2.1. 2.5 km

Table A.2.1

Regression for nonfood NTFP with geographic variables measured at a 2.5 km buffer around each household. A p-value of < 0.001 is indicated with three stars (***), a p-value of < 0.01 is indicated with two stars (**), a p-value of < 0.05 is indicated with one star (*), and a p-value of < 0.1 is indicated with a period (.).

| Feature                  | Estimate  | Std. Error  | z value  | Pr( > |z|) |
|--------------------------|-----------|-------------|----------|------|
| (Intercept)              | -2.32576  | 1.000105    | -2.32552 | 0.020044* |
| Area Protected           | 1.04874   | 0.90963     | 1.152636 | 0.24906 |
| Forest Cover             | 0.460747  | 0.8355      | 0.48683  | 0.626379 |
| Grassland                | 0.02571   | 0.826946    | 1.240359 | 0.214843 |
| Head Gender              | 0.338702  | 0.291166    | 1.163264 | 0.244722 |
| Age                      | -0.3606   | 0.72616     | -0.49658 | 0.619486 |
| Years of Schooling       | 0.209777  | 0.83233     | 0.252036 | 0.801031 |
| Literacy                 | -1.2465   | 0.74164     | -1.68074 | 0.092814 . |
| Household Size           | -0.3466   | 0.520872    | -0.66541 | 0.505786 |
| Market Distance          | -1.05579  | 1.517361    | -0.69581 | 0.48655 |

(continued on next page)
Table A.2.1 (continued)

|                          | Estimate | Std. Error | z value | Pr(>|z|) |
|--------------------------|----------|------------|---------|----------|
| Population Density      | -2.98909 | 1.494319   | -2.0003 | 0.045468* |
| 12 – month SPI          | -0.09535 | 0.453257   | -0.21036| 0.833387  |
| Critical Food Shortage   | 0.372993 | 0.246321   | 1.514251| 0.129962  |
| HFIAS                   | 1.914254 | 0.980704   | 1.951919| 0.050948 . |
| Total Ag Production     | 2.093868 | 1.474662   | 1.419897| 0.155638  |
| Net Business Income     | 1.499649 | 1.471243   | 1.019312| 0.308055  |
| Wage Income             | 2.030284 | 1.711244   | 1.186438| 0.235449  |
| Nonfood Spending        | 0.372993 | 0.246321   | 1.514251| 0.129962  |
| Food Spending           | -0.09535 | 0.453257   | -0.21036| 0.833387  |

A.2.2. 5 km

Table A.2.2

Regression for nonfood NTFP with geographic variables measured at a 5 km buffer around each household. A p-value of < 0.001 is indicated with three stars (***) , a p-value of < 0.01 is indicated with two stars (**), a p-value of < 0.05 is indicated with one star (*), and a p-value of < 0.1 is indicated with a period (.) .

|                          | Estimate | Std. Error | z value | Pr(>|z|) |
|--------------------------|----------|------------|---------|----------|
| (Intercept)              | -2.10531 | 1.063251   | -1.98007| 0.047696* |
| Area Protected           | -0.17409 | 0.982921   | -0.17712| 0.859416  |
| Forest Cover             | -0.34256 | 0.962553   | -0.35589| 0.721922  |
| Grassland                | 0.7246   | 0.975684   | 0.742658| 0.457688  |
| Head Gender              | 0.338335 | 0.290267   | 1.167321| 0.243081  |
| Age                      | -0.2592  | 0.724444   | -0.34651| 0.725344  |
| Years of Schooling       | 0.153375 | 0.828423   | 0.187555| 0.852126  |
| Literacy                 | -1.2251  | 0.737777   | -1.66053| 0.096808  |
| Household Size           | -0.33946 | 0.518711   | -0.65444| 0.51283   |
| Market Distance          | -1.17598 | 1.475353   | -0.79708| 0.425402  |
| Population Density       | -3.00705 | 1.451267   | -2.11543| 0.034393* |
| 12 – month SPI           | -0.07233 | 0.443643   | -0.16304| 0.870484  |
| Critical Food Shortage   | 0.36907  | 0.245293   | 1.504608| 0.132425  |
| HFIAS                    | 1.878879 | 0.981403   | 1.94483 | 0.055559  |
| Total Ag Production      | 2.09227 | 1.479998   | 1.413697| 0.157451  |
| Net Business Income      | 1.42357  | 1.471667   | 0.976944| 0.328597  |
| Wage Income              | 1.996405 | 1.706160   | 1.170116| 0.241954  |
| Nonfood Spending         | 0.957612 | 1.382959   | 0.692888| 0.48838   |
| Food Spending            | -0.0373  | 0.907291   | -0.04111| 0.967208  |

A.2.3. 10 km

Table A.2.3

Regression for nonfood NTFP with geographic variables measured at a 10 km buffer around each household. A p-value of < 0.001 is indicated with three stars (***) , a p-value of < 0.01 is indicated with two stars (**), a p-value of < 0.05 is indicated with one star (*), and a p-value of < 0.1 is indicated with a period (.) .

|                          | Estimate | Std. Error | z value | Pr(>|z|) |
|--------------------------|----------|------------|---------|----------|
| (Intercept)              | -1.96171 | 1.106792   | -1.77242| 0.076324 . |
| Area Protected           | -1.7841  | 0.952647   | -1.87297| 0.061098 . |
| Forest Cover             | -0.83523 | 0.970466   | -0.86065| 0.389431  |
| Grassland                | 0.504079 | 1.111416   | 0.453457| 0.650155  |
| Head Gender              | 0.359377 | 0.29044    | 1.237352| 0.215957  |
| Age                      | -0.42715 | 0.722858   | -0.59092| 0.554572  |
| Years of Schooling       | 0.173456 | 0.82539    | 0.21015 | 0.83355   |
| Literacy                 | -1.23818 | 0.737157   | -1.67967| 0.093021  |
| Household Size           | -0.36074 | 0.51724    | -0.69743| 0.485532  |
| Market Distance          | -1.4531  | 1.37173    | -1.05932| 0.289454  |
| Population Density       | -3.11725 | 1.406617   | -2.21613| 0.066682* |
| 12 – month SPI           | -0.108   | 0.420577   | -0.25679| 0.797339  |
| Critical Food Shortage   | 0.368063 | 0.245247   | 1.500784| 0.133411  |
| HFIAS                    | 1.77515  | 0.989271   | 1.794403| 0.07249 .  |
| Total Ag Production      | 2.08933  | 1.488202   | 1.403929| 0.16034   |

(continued on next page)
Table A.2.3 (continued)

|                          | Estimate | Std. Error | z value | Pr(>|z|) |
|--------------------------|----------|------------|---------|----------|
| Net Business Income      | 1.31846  | 1.439155   | 0.916135| 0.359596 |
| Wage Income              | 1.912044 | 1.694815   | 1.128173| 0.259247 |
| Nonfood Spending         | 0.926001 | 1.381948   | 0.670069| 0.502814 |
| Food Spending            | -0.04431 | 0.903015   | -0.04907| 0.960861 |

A.2.4. 15 km

Table A.2.4

Regression for nonfood NTFP with geographic variables measured at a 15 km buffer around each household. A p-value of < 0.001 is indicated with three stars (***) , a p-value of < 0.01 is indicated with two stars (**) , a p-value of < 0.05 is indicated with one star (*) , and a p-value of < 0.1 is indicated with a period (.).

|                          | Estimate | Std. Error | z value | Pr(>|z|) |
|--------------------------|----------|------------|---------|----------|
| (Intercept)              | -2.3202  | 1.150867   | -2.01605| 0.043795 |
| Area Protected           | -2.12371 | 0.863384   | -2.4576 | 0.013903 |
| Forest Cover             | -0.94717 | 1.086216   | -0.87199| 0.383214 |
| Grassland                | 0.957735 | 1.181663   | 0.810497| 0.417654 |
| Head Gender              | 0.371083 | 0.72305    | -0.66548| 0.505746 |
| Years of Schooling       | 0.183229 | 0.823561   | 0.222484| 0.823937 |
| Literacy                 | -1.2255  | 0.73732    | -1.6181 | 0.06553 |
| Household Size           | -0.36005 | 0.517268   | -0.69606| 0.486389 |
| Market Distance          | -1.78771 | 1.300162   | -1.37499| 0.169134 |
| Population Density       | -3.07212 | 1.361984   | -2.25562| 0.024094 |
| 12 – month SPI           | -0.07209 | 0.401516   | -0.17955| 0.857503 |
| Critical Food Shortage   | 0.369701 | 0.245481   | 1.506023| 0.132061 |
| HFIAS                    | 1.816762 | 0.990745   | 1.833744| 0.066994 |
| Total Ag Production      | 2.129462 | 1.489305   | 1.42936 | 0.152764 |
| Net Business Income      | 1.33032  | 1.441326   | 0.922983| 0.356016 |
| Wage Income              | 1.934614 | 1.707304   | 1.133139| 0.257156 |
| Nonfood Spending         | 0.888392 | 1.390335   | 0.638977| 0.522838 |
| Food Spending            | -0.02371 | 0.904276   | -0.02623| 0.979078 |

Appendix B. Summary statistics by country and landscape

B.1. Ghana

Table B.1

Summary statistics for Ghana. Note: For some surveys, only the month of interview was recorded, so we were unable to calculate a time span in days.

| Landscape                | Pwalagu  | Diari     | Atebubu   | Kuntanse | Mpataba  | Nsobri    | All       |
|--------------------------|----------|-----------|-----------|----------|----------|-----------|-----------|
| Fraction of Land Area    |          |           |           |          |          |           |           |
| within 7.5 km Falling    |          |           |           |          |          |           |           |
| Within A Protected Area  |          |           |           |          |          |           |           |
| Min                      | 0        | 0         | 0         | 0        | 0        | 0         | 0         |
| Max                      | 0        | 0         | 0         | 0        | 0        | 0         | 0         |
| Mean                     | 0        | 0         | 0         | 0        | 0        | 0         | 0         |
| Fraction of Land Area    |          |           |           |          |          |           |           |
| within 7.5 km that is    |          |           |           |          |          |           |           |
| Forest                   |          |           |           |          |          |           |           |
| Min                      | 0.193353 | 0.054212  | 0.805812  | 0        | 0.000933 | 0.000933 | 0         |
| Max                      | 0.323074 | 0.176881  | 0.948859  | 0.001766 | 0.056724 | 0.000535 | 0.948859 |
| Mean                     | 0.268184 | 0.101059  | 0.926847  | 0.000205 | 0.020944 | 4.07E-05 | 0.213127 |
| Fraction of Land Area    |          |           |           |          |          |           |           |
| within 7.5 km that is    |          |           |           |          |          |           |           |
| Shrubland, Grassland or  |          |           |           |          |          |           |           |
| Herbaceous               |          |           |           |          |          |           |           |
| Min                      | 0.236212 | 0.163636  | 0         | 0        | 0.004899 | 5.12E-05 | 0.418738 |
| Max                      | 0.36666  | 0.418738  | 0         | 0        | 0.004899 | 5.12E-05 | 0.418738 |
| Mean                     | 0.279614 | 0.274979  | 0         | 0        | 0.000818 | 1.8E-06  | 0.086073 |
| Average Age of Individuals Within a Household |          |           |           |          |          |           |           |
| Min                      | 13.75    | 14.1666   | 13.1667   | 12.71429 | 19.4     | 12.42857 | 12.42857 |
| Max                      | 65       | 45        | 82        | 71       | 53       | 79.6667  | 82        |
| Mean                     | 28.34256 | 21.19691  | 33.63778  | 34.4699  | 29.8013  | 33.27661 | 30.37991 |
| Average Years of Schooling Within a Household |          |           |           |          |          |           |           |
| Min                      | 0        | 0         | 0         | 3        | 1        | 0         | 0         |
| Max                      | 8.333333 | 9         | 13.5      | 13       | 9        | 12.4      | 13.5      |
| Mean                     | 3.260423 | 2.667445  | 4.195503  | 7.584606 | 5.708034 | 4.659085 | 4.659319 |
| Household Size           |          |           |           |          |          |           |           |
| Min                      | 1        | 3         | 1         | 1        | 2        | 1         | 1         |
| Max                      | 14       | 18        | 14        | 10       | 11       | 12        | 18        |
| Mean                     | 6.366667 | 7.37037   | 4.2       | 4.862069 | 5.6      | 5.447368 | 5.608696 |
| Fraction of Household Members That Are Literate |          |           |           |          |          |           |           |
| Min                      | 0        | 0         | 0         | 0        | 0        | 0         | 0         |
| (continued on next page)
### Table B.1 (continued)

| Landscape                      | Pwalagu | Diari | Atebu Diari | Kuntanse | Mpataba | Nsobri | All   |
|--------------------------------|---------|-------|------------|----------|---------|--------|-------|
|                                | Max     | Mean  | Max        | Mean     | Max     | Mean   |       |
| 12 - Month Standardized Precipitation Index |         |       |            |          |         |        |       |
| Min                            | −1.3498 | −1.4982 | −0.92656 | 0.62435  | 0.48072 | −2.61529 | −2.61529 |
| Mean                           | −1.3498 | −1.4982 | −0.92656 | 0.62435  | 0.48072 | −2.61529 | −2.61529 |
| Household Food Insecurity and Access Score (HFIAS) |         |       |            |          |         |        |       |
| Min                            | 0       | 0     | 0          | 0        | 0       | 0      | 0     |
| Max                            | 18      | 7     | 10         | 3        | 20      | 20     |       |
| Mean                           | 0.833333 | 0.259259 | 1.206897 | 0.1  | 0.48072 | 0.434141 |       |
| Total Agricultural Production Value (In 2015 USD) |         |       |            |          |         |        |       |
| Min                            | 40.1141 | 67.78244 | 88.15159 | 0      | 0      | 0      | 0     |
| Max                            | 4376.083 | 11,693.34 | 9998.421 | 6734.545 | 51,428.37 | 23,710.27 | 51,428.37 |
| Mean                           | 960.3247 | 2133.721 | 2401.148 | 1869.752 | 5994.188 | 3190.848 | 2792.148 |
| Net Income from Businesses (in 2015 USD) |         |       |            |          |         |        |       |
| Min                            | 0       | 0     | 0          | 0        | 0       | 0      | 0     |
| Max                            | 235.2145 | 75.31382 | 35.83206 | 266.2295 | 331.0488 | 570.1325 | 570.1325 |
| Mean                           | 26.49961 | 7.419806 | 3.857918 | 16.21475 | 37.90509 | 39.47235 | 22.96204 |
| Income from Wages (in 2015 USD) |         |       |            |          |         |        |       |
| Min                            | 0       | 0     | 0          | 0        | 0       | 0      | 0     |
| Max                            | 3993.176 | 5154.625 | 121.2737 | 126.3118 | 13.55455 | 277.6241 | 277.6241 |
| Mean                           | 939.176  | 7.419806 | 3.857918 | 16.21475 | 37.90509 | 39.47235 | 22.96204 |
| Annual Nonfood Spending (in 2015 USD) |         |       |            |          |         |        |       |
| Min                            | 0       | 0     | 0          | 0        | 0       | 0      | 0     |
| Max                            | 235.2145 | 75.31382 | 35.83206 | 266.2295 | 331.0488 | 570.1325 | 570.1325 |
| Mean                           | 26.49961 | 7.419806 | 3.857918 | 16.21475 | 37.90509 | 39.47235 | 22.96204 |
| Annual Food Spending (in 2015 USD) |         |       |            |          |         |        |       |
| Min                            | 0       | 0     | 0          | 0        | 0       | 0      | 0     |
| Max                            | 4376.083 | 11,693.34 | 9998.421 | 6734.545 | 51,428.37 | 23,710.27 | 51,428.37 |
| Mean                           | 960.3247 | 2133.721 | 2401.148 | 1869.752 | 5994.188 | 3190.848 | 2792.148 |
| Household Interview Date       |          |       |            |          |         |        |       |
| Latest                         | 2/2015  | 11/2014 | 9/2014     | 8/2014   | 3/2015  | 7/2015 | 3/2015 |
| Earliest                       | 2/2015  | 11/2014 | 9/2014     | 8/2014   | 3/2015  | 1/1/2014 | 1/1/2014 |
| Span                           | –       | –      | –          | –        | –       | –      | 183 days |
| Market Distance - Distance to a town with > 50k people, in hours | 1.699824 | 2.342495 | 4.574964 | 1.076525 | 3.533333 | 1.129825 | 2.345889 |
| Population Density (People per 100 sq. km) | 171.1808 | 112.4805 | 310.2312 | 2332.233 | 4310.007 | 1391.947 |       |
| Total Number of Households     | 30      | 27      | 30         | 29       | 30      | 38     | 184     |

### B.2. Rwanda

Table B.2

Summary statistics for Rwanda.

| Landscape                      | Nyungwe | Volcanoes | Akagera | Gishwati | Muhanga-Kamonyi | Bugesera | All   |
|--------------------------------|---------|-----------|---------|----------|----------------|---------|-------|
|                                | Min     | Mean     | Min     | Mean     | Min            | Mean   |       |
| Fraction of Households that Collect Wild Foods | 0.666667 | 0.518519 | 0.533333 | 0.344384 | 0.133333 | 0.5  | 0.402174 |
| Fraction of Households that Collect Nonfood NTFP | 0.5 | 0.62963 | 0.733333 | 0.233333 | 0.789474 | 0.680696 |
| Fraction of Households with a Male Head | 0.933333 | 0.233333 | 0.5  | 0.379286 | 0.48072 | 0.434141 |
| Fraction of Households Who Experienced a Critical Food Shortage in the Past Year | 0.133333 | 0.133333 | 0.133333 | 0.133333 | 0.133333 | 0.5  | 0.402174 |
| Average Age of Individuals Within a Household | 14.125 | 15      | 12.1667 | 12.42857 | 16         | 12.42857 | 12.42857 |
| Average Years of Schooling Within a Household | 0.041772 | 0.001746 | 0.031834 | 0.059883 | 0.37135 | 0.37135 | 0.37135 |
| Household Size                  | 2       | 2        | 3       | 2        | 2            | 2       | 2     |

(continued on next page)
Table B.2 (continued)

| Landscape                  | Nyungwe | Volcanoes | Akagera | Gishwati | Muhanga-Kamonyi | Bugesera | All |
|----------------------------|---------|-----------|---------|----------|-----------------|----------|-----|
| Max                        | 11      | 10        | 9       | 9        | 11              | 10       | 11  |
| Mean                       | 5.66667 | 4.86667   | 5.23333 | 5.7      | 4.33333         | 5.16667  | 5.16111 |
| Fraction of Household Members That Are Literate | Min | 0      | 0       | 0        | 0               | 0        | 0   |
|                            | Max     | 1       | 1       | 1        | 1               | 1        | 1   |
|                            | Mean    | 0.408354 | 0.555397 | 0.589749 | 0.566257        | 0.551039 | 0.539749 |
| 12 - Month Standardized Precipitation Index | Min | -0.40994 | 0.670096 | -0.30882 | 0.174328        | -0.66107 | -0.32331 |
|                            | Max     | 0.822075 | 1.689018 | -0.30882 | 0.542929        | -0.50796 | 0.32331 |
|                            | Mean    | 0.186615 | 1.506217 | -0.30882 | 0.334055        | -0.59983 | 0.132488 |
| Household Food Insecurity and Access Score (HFIAS) | Min | 0      | 0       | 0        | 0               | 0        | 0   |
|                            | Max     | 31      | 21      | 31       | 29               | 41       | 28  |
|                            | Mean    | 13.03333 | 5       | 11.53333 | 10              | 7.23333  | 15.4 |
| Total Agricultural Production Value (in 2015 USD) | Min | 0      | 19.47508 | 19.21156 | 11.38609        | 0        | 28.69262 |
|                            | Max     | 1069.585 | 3960.784 | 1228.555 | 3162.582        | 3850.835 | 2448.631 |
|                            | Mean    | 391.124  | 775.6163 | 409.8512 | 620.9853        | 677.1648 | 371.4404 |
| Net Income from Businesses (in 2015 USD) | Min | 0      | 0       | 0        | 0               | 0        | 0   |
|                            | Max     | 49.9632 | 16.4436 | 32.36082 | 24.7695         | 231.6818 | 8.098217 |
|                            | Mean    | 5.374029 | 2.13723 | 1.078694 | 0.82565         | 10.91561 | 3.445958 |
| Income from Wages (in 2015 USD) | Min | 0      | 0       | 0        | 0               | 0        | 0   |
|                            | Max     | 1879.876 | 9341.697 | 2509.466 | 1291.553        | 4305.041 | 1575.297 |
|                            | Mean    | 406.035  | 645.7212 | 225.3669 | 103.1126        | 607.4689 | 347.0989 |
| Net Income from Nonfarm Sources | Min | 0      | 0       | 0        | 0               | 0        | 0   |
|                            | Max     | 2268.887 | 1414.799 | 1248.97  | 2017.62         | 2600.102 | 8.098217 |
|                            | Mean    | 55.7704  | 41.85762 | 18.14419 | 22.5489         | 677.1648 | 371.4404 |
| Annual Nonfood Spending (in 2015 USD) | Min | 0      | 0       | 0        | 0               | 0        | 0   |
|                            | Max     | 3884.277 | 8599.775 | 3586.879 | 4101.092        | 6679.994 | 1503.204 |
|                            | Mean    | 5.57704  | 9.31887  | 1.84119  | 2.25489         | 110.7449 | 5818.593 |
| Household Interview Date | Latest | 1/16/   | 5/28/   | 7/29/    | 2/17/           | 11/14/   | 8/25/ |
|                            | Earliest| 10/20/  | 2/29/   | 7/12/    | 1/18/           | 10/1/2015| 8/9/2016 |
|                            | Span    | 88 days  | 89 days  | 17 days   | 30 days         | 44 days   | 16 days |
| Fraction of Households that Collect Wild Foods | Min | 0      | 0       | 0        | 0               | 0        | 0   |
|                            | Max     | 0.8     | 0.66667 | 0.7      | 0.66667         | 0.7       | 0.722222 |
| Fraction of Households that Collect Nonfood NTFP | Min | 0      | 0.062862 | 0       | 0               | 0.070638 | 0   |
|                            | Max     | 0.63333 | 0.343483 | 0.00        | 0.058955        | 0.585955  | 0.585955 |
| Average Age of Individuals Within a Household | Min | 9.5    | 11.5     | 11.85714 | 12.33333        | 12        | 9    |
|                            | Max     | 44.33333 | 79       | 67.5      | 42              | 36        | 38.1667 |

B.3. Uganda

Table B.3
Summary statistics for Uganda.

| Landscape                  | Yumbe | Bududa | Butambala | Kisoro | Masindi | Otuke | All |
|----------------------------|-------|--------|-----------|--------|---------|-------|-----|
| Fraction of Land Area within 7.5 km Falling Within A Protected Area | Min | 0      | 0.062862  | 0      | 0       | 0.070638 | 0   |
|                            | Max   | 0.63333 | 0.343483  | 0.00    | 0.058955 | 0.585955 | 0.585955 |
| Fraction of Land Area within 7.5 km that is Forest | Min | 0.623982 | 0.012726  | 0      | 0.177784 | 0.057168 | 0.490966 |
|                            | Max   | 0.945402 | 0.054838  | 0.037061 | 0.306267 | 0.229435 | 0.726289 |
|                            | Mean  | 0.752456 | 0.031018  | 0.003829 | 0.256285 | 0.145689 | 0.645033 |
| Fraction of Land Area within 7.5 km that is Shrubland, Grassland or Herbaceous | Min | 0.003272 | 0        | 0.000461 | 0.001093 | 0.004362 | 0.192248 |
|                            | Max   | 0.035043 | 0.025799  | 0.002732 | 0.167627 | 0.489238 | 0.489238 |
|                            | Mean  | 0.023052 | 0.002401  | 0.00187 | 0.118497 | 0.25476 | 0.06749 |
| Average Age of Individuals Within a Household | Min | 9.5    | 11.5     | 11.85714 | 12.33333 | 12      | 9    |
|                            | Max   | 44.33333 | 79       | 67.5      | 42       | 36      | 38.1667 |

(continued on next page)
### Table B.3 (continued)

| Landscape         | Yumbe      | Bududa       | Butambala   | Kisoro     | Masindi    | Otuke      | All         |
|-------------------|------------|--------------|-------------|------------|------------|------------|-------------|
| Average Years of Schooling Within a Household | Mean 21.29366 | 27.18761 | 27.94485 | 23.52429 | 20.28477 | 22.48562 | 23.76492 |
|                   | Min 0.8 | 0 | 1.625 | 0 | 1.428571 | 1.75 | 0 | 0 |
|                   | Max 6.071429 | 11 | 8.5 | 8.66667 | 9 | 10 | 11 | 11 |
| Household Size    | Mean 2.425978 | 4.114387 | 4.318733 | 4.078695 | 4.155225 | 4.318733 | 4.155225 |
|                   | Min 3 | 1 | 2 | 2 | 2 | 2 | 2 | 1 |
|                   | Max 16 | 11 | 10 | 10 | 12 | 13 | 16 | 16 |
| Fraction of Household Members That Are Literate | Mean 0.642857 | 0.311811 | 0.514299 | 0.398495 | 0.433909 | 0.366441 | 0.371327 |
| 12 - Month Standardized Precipitation Index     | Mean 0.536668 | 0.382087 | 0.65505 | 0.333761 | 0.586303 | 0.586303 | 0.398495 |
| Household Food Insecurity and Access Score (HFIAS) | Mean 0.452464 | 0.190165 | 0.84122 | 0.53064 | 0.054 | 0.283039 | 0.096311 |
| Total Agricultural Production Value (In 2015 USD) | Mean 4.26667 | 2.33333 | 1.20689 | 0.53064 | 0.236382 | 0.09708 | 0.09708 |
|                   | Min 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|                   | Max 0.642857 | 1 | 1 | 1 | 1 | 0.714286 | 0.714286 |
| Net Income from Businesses (in 2015 USD) | Mean 4.26667 | 2.33333 | 1.20689 | 0.53064 | 0.236382 | 0.09708 | 0.09708 |
|                   | Min 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|                   | Max 0.642857 | 1 | 1 | 1 | 1 | 0.714286 | 0.714286 |
| Household Food Insecurity and Access Score (HFIAS) | Mean 4.26667 | 2.33333 | 1.20689 | 0.53064 | 0.236382 | 0.09708 | 0.09708 |
| Annual Nonfood Spending (in 2015 USD) | Mean 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|                   | Min 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|                   | Max 0.642857 | 1 | 1 | 1 | 1 | 0.714286 | 0.714286 |
| Household Interview Date | Mean 4.26667 | 2.33333 | 1.20689 | 0.53064 | 0.236382 | 0.09708 | 0.09708 |
|                   | Min 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|                   | Max 0.642857 | 1 | 1 | 1 | 1 | 0.714286 | 0.714286 |
| Annual Food Spending (in 2015 USD) | Mean 4.26667 | 2.33333 | 1.20689 | 0.53064 | 0.236382 | 0.09708 | 0.09708 |
|                   | Min 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|                   | Max 0.642857 | 1 | 1 | 1 | 1 | 0.714286 | 0.714286 |
| Household Interview Date | Mean 4.26667 | 2.33333 | 1.20689 | 0.53064 | 0.236382 | 0.09708 | 0.09708 |
|                   | Min 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|                   | Max 0.642857 | 1 | 1 | 1 | 1 | 0.714286 | 0.714286 |
| Household Interview Date | Mean 4.26667 | 2.33333 | 1.20689 | 0.53064 | 0.236382 | 0.09708 | 0.09708 |
|                   | Min 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|                   | Max 0.642857 | 1 | 1 | 1 | 1 | 0.714286 | 0.714286 |
| Population Density (People per 100 sq. km) | Mean 4.26667 | 2.33333 | 1.20689 | 0.53064 | 0.236382 | 0.09708 | 0.09708 |
|                   | Min 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|                   | Max 0.642857 | 1 | 1 | 1 | 1 | 0.714286 | 0.714286 |

**B.4. Tanzania**

Table B.4

Summary statistics for Tanzania.

| Landscape         | Sumbawanga | Mufindi | Ludewa | Kilolo | Kilombero | Mbarali | Rufiji | All         |
|-------------------|------------|---------|--------|--------|-----------|---------|--------|-------------|
| Fraction of Land Area within 7.5 km Falling Within a Protected Area | Min 0.15751534 | 0.065715 | 0.80733 | 0.024597 | 0.04117 | 0.001081 | 0.477349 | 0.001081 |
|                   | Max 0.2983656 | 0.297375 | 0.900286 | 0.641851 | 0.632093 | 0.008013 | 0.861439 | 0.900286 |
|                   | Mean 0.240994 | 0.179029 | 0.84343 | 0.200385 | 0.276262 | 0.004755 | 0.637894 | 0.340699 |
|                   | Min 0.1588905 | 0.060831 | 0.018655 | 0.292981 | 0.03596 | 0.475732 | 0.030417 | 0.018655 |
|                   | Max 0.5100406 | 0.197286 | 0.049237 | 0.795787 | 0.40498 | 0.835244 | 0.036328 | 0.835244 |

(continued on next page)
Table B.4 (continued)

| Landscape | Sumbawanga | Mufindi | Ludewa | Kilolo | Kilombero | Mbarali | Rufiji | All |
|-----------|------------|---------|--------|--------|-----------|---------|--------|-----|
| **Fraction of Land Area within 7.5 km** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| that is Shrubland, Grassland or Herbaceous | 0.3396921 | 11.2 | 13.8 | 13.25 | 14 | 65.4383 | 1.193417 | 65.6782 | 0.033624 | 28.9696 | 0.289696 |
| **Average Age of Individuals Within a Household** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| **Fraction of Households that Are Literate** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Household Food Insecurity and Access Score (HFIAS) | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Total Agricultural Production Value (In 2015 USD) | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Net Income from Businesses (in 2015 USD) | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Income from Wages (in 2015 USD) | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Annual Nonfood Spending (in 2015 USD) | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Annual Food Spending (in 2015 USD) | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Household Interview Date | **Latest** | **Earliest** | **Span** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Fraction of Households that Collect Wild Foods | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Fraction of Households that Collect Nonfood NTFP | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Fraction of Households with a Male Head | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Fraction of Households Who Experienced a Critical Food Shortage in the Past Year | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Market Distance - Distance to a town with > 50 k people, in hours | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Population Density (People per 100 sq. km) | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |
| Total Number of Households | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** |

| Fraction of Land Area within 7.5 km that is Shrubland, Grassland or Herbaceous | 0.3396921 | 0.115382 | 0.031382 | 0.654383 | 0.193417 | 0.656782 | 0.033624 | 0.289696 |
| Average Age of Individuals Within a Household | 11.2 | 13.8 | 13.25 | 14 | 13 | 12.57143 | 11.75 | 11.2 |
| Mean | 64 | 53.66667 | 69 | 43.66667 | 51 | 41.6 | 56.5 | 69 |
| Max | 25.86128 | 24.82095 | 32.3781 | 25.20139 | 25.59893 | 22.15307 | 26.9832 | 26.14503 |
| Mean | 0 | 1.166667 | 0 | 0 | 0.6 | 0 | 0 | 0 |
| Average Years of Schooling Within a Household | 11.5 | 6.5 | 8.833333 | 9.6 | 8 | 9 | 8 | 11.5 |
| Mean | 3.917462 | 3.334061 | 4.777937 | 4.596349 | 4.160345 | 3.264371 | 3.160114 | 3.885927 |
| Household Size | 2 | 3 | 1 | 2 | 1 | 2 | 1 |
| Mean | 11 | 9 | 7 | 8 | 8 | 17 | 11 | 17 |
| Max | 5.566667 | 5.333333 | 3.633333 | 4.8 | 5.06966 | 7.2 | 5.066667 | 5.239234 |
| Mean | 0 | 0.333333 | 0 | 0.2 | 0 | 0 | 0 | 0 |
| Total Agricultural Production Value (In 2015 USD) | 42.34982 | 23.83796 | 32.28449 | 12.06405 | 0 | 44.01729 | 41.33025 | 0 |
| Mean | 12.59934 | 1854.285 | 3198.63 | 2685.785 | 6759.372 | 42,367.23 | 1057.469 | 42,367.23 |
| Max | 874.9965 | 320.8736 | 602.4073 | 721.9336 | 1415.735 | 41.05149 | 341.945 | 1188.933 |
| Mean | 10.637622 | 150.7105 | 40.35562 | 150.6741 | 0 | 14.64404 | 14.38232 | 150.7105 |
| Max | 10.345874 | 17.25559 | 3.406543 | 8.537746 | 0 | 1.463967 | 1.235752 | 4.629787 |
| Mean | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
