Do household definitions matter in survey design? Results from a randomized survey experiment in Mali

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Abstract: Household definitions used in multi-topic household surveys vary between surveys, but have potentially significant implications for household composition and household poverty statistics. Standard definitions of the household usually include some intersection of keywords relating to residency requirements, common food consumption and intermingling of income or production decisions. Despite best practices intending to standardize the definition of the household, it is unclear which types of definitions or which intersection of keywords in a definition reveal different types of individuals listed as the household. This paper conducts a randomized survey experiment of four different household definitions to examine the implications for household-level statistics. This approach permits analysis of the tradeoffs between alternative definition types. We find that different household definitions have significant implications on household size and composition which increases estimates of household assets and consumption statistics relative to open-ended definitions of the household.

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I. Introduction

Household definitions used in multi-topic household surveys vary between surveys, but have potentially significant implications for household composition as well as statistics generated for household units. Standard definitions of the household usually include some intersection of keywords relating to residency requirements, common food consumption and common intermingling of income or production decisions. Many explicitly require that the listing of individuals cited as household members acknowledge a common household head. Despite best practices to standardize the definition of the household, it is unclear which types of definitions or which intersection of keywords in a definition reveal different types of individuals listed as household members or overall differences in household size. More problematically, the reported household listing may not capture the relevant economic unit, and this could bias household statistics such as consumption aggregates, assets or household production.

In Mali, where we conduct our empirical investigation, three recent national surveys have used three different household definitions. These surveys use different keywords including residency requirements, common food preparation, and common income generation and/or agricultural production. Implicitly all definitions require the acknowledgement of a common household head who responds for the members of the household. While different household definitions may be used to address different economic units of interest, it is unclear whether comparing results from differing surveys would affect the empirical analysis. Further comparisons within countries over time or across countries may be biased if alternative household definitions were used when collecting the data. The existence or extent of biases is difficult to assess, however, as there is no rigorous evidence on how sensitive household statistics are to the chosen definition.

This paper conducts a randomized survey experiment of four different household definitions to examine the implications for household statistics. This approach permits analysis of the tradeoffs between alternative definition types. The first definition requires only that members of the household live in the same lodging and acknowledge a common household head. The second includes the criteria of the first definition, while adding the criteria that households eat commonly prepared food together. The third definition includes the set of criteria from the first

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1 Fundamentally, we do not know what the “true” household size is when comparing alternative definitions.
definition, while adding that members must work together on at least one agricultural plot together or in one revenue generating activity. The fourth definition combines the eating and production requirements of the second and third definition with the criteria from the first definition. In our experimental framework, our two “treatments” are, first, the inclusion of a common food consumption requirement (definition 2) and second, the inclusion of a common agricultural or income generating activity (definition 3). The absence of these two treatments is definition one, while the interaction of treatments is definition 4.

We find that different household definitions have significant implications on household composition as well as assets and consumption statistics. In particular, household size changes when agricultural keywords (definition 3) are added to an open-ended definition (definition 1), and there is variation in the type of individuals listed as members of the household even among definition types that have no effect on total household size. Both definitions 2, 3 and 4 lead to more men and more prime-aged adults (16-60) reported within the household, relative to definition 1. These changes in household size and structure have consequences on household statistics, especially those statistics that are paramount to the measurement of household welfare.

Household asset holdings are higher in definition 3 households: on average these households have .6 more farm assets, 1.9 additional animals and .65 more non-farm assets. Households asked to use the common consumption definition (definition 2) also report more livestock holdings. Consumption of grains in the last 7 days increases as common food eating requirements are added in definition 2 or with common agricultural keywords in definition 3. We do not find statistically different results across the definitions for agricultural production and inputs. These patterns are largely consistent with an increase in household size and the change in the composition of the household altering measured assets, livestock and consumption figures.

The paper is organized by first describing the experimental design and the data collected. We provide an overview of the context, including previous experiences in Mali to collect household composition data and the definition of the household used by three major surveys fielded in close proximity to each other. In the third section, we present our results, and the fourth section concludes.
II. Experimental Design and Data

A. Context

While the most commonly used definition of the household is one which relates to the notion of consumption from the “common pot,” there are a range of ambiguities related to the definition in almost all developing country contexts. This includes issues such as whether part-time residents, boarding students, temporary migrants, and domestic help should be considered members of the household and if so, under what circumstances. The ambiguity of the definition of a household is particularly acute in many African settings. We know that households are flexible and fluid (Akresh, 2009; Hosegood and Timaeus, 2001), and polygamy furthermore introduces heterogeneity in how household decisions are taken.

In the Segou region of Mali, the context for this study, household structure is complex as it is in many parts of the world. Individuals exchange resources among multiple types of familial and social relationships. Oftentimes, a household lives in proximity to members of their extended family within a common area, or concession, enclosed by a single wall. Public goods such as food preparation, sanitation, and dwelling upkeep are provided by the “household”, and economies of scale in production are exploited. Two salient aspects of economic decision-making are food preparation and production. First, food consumption: individuals live in households that share concessions where food production may be centralized, at least for certain meals. In this gender-based division of labor, women may have use rights over multiple granaries, including a household and central concession granary, from which they may draw grain to prepare common meals. Men contribute to their own household’s granaries and may have obligations to contribute grains to communal granaries. With respect to production, a group of family members may work together on common familial lands, but the division of common plot harvests into individual granaries varies by family. Many families prepare their food separately out of these reserves, or completely store and consume the harvest communally. These complexities make identifying one definition for the household difficult: there are ethnic differences but also family-specific heterogeneity in the costs and benefits of aggregate living and preferences over household structure.
This problem is certainly not unique to Mali. As quoted by Udry (1995) in reference to the frequently used ICRISAT data from Burkina Faso:

An entirely unambiguous, consistent, and universal definition of the "household" for use in sampling, data collection and analysis, proved to be elusive.... As a working definition we defined the household as the smallest group of persons usually, but not exclusively kin related who form a more or less independent production and consumption unit during the cropping season. To operationalize this definition we set two conditions based on observed group behavior and consistent with farmers' own criteria for defining households: first, that members of the household work jointly on at least one common field under the management of a single decision-maker, and second, that members draw an important share of their staple foodstuffs from one or more granaries which are under the control of that same decision-maker. Because both of these criteria sometimes tended to vary in a continuous rather than discrete manner, for [ambiguous] individuals the final boundaries used to delimit household from nonhousehold members were drawn by the household heads themselves… (Matlon, p. 4).

In Ghana, there is a potential ambiguity around “consuming from a common pot” arises because sharing meals alone may not sufficiently define a relevant economic unit. In the enumerator manual for the Ghana Living Standards Survey, it is noted that “… sharing meals with each other is not the same as sharing the same housekeeping and cooking arrangements.” However, drawing the line between sharing meals regularly and shared cooking arrangements may be difficult. In Tanzania, a mixed method survey has suggested that household structure is complicated and varies by region within Tanzania, and that the 2004 DHS definition – with its emphasis on residency and a common source of food – is often inconsistent with the “true” household as determined by the in depth interviews (Leone et al, 2009).

As mentioned above, three recent national surveys in Mali have used different household definitions. The Demographic and Health Survey of Mali 2006 uses the following definition, “Please list the names of the people who normally live in your household and the visitors who passed the last night here, beginning with the head of household.” The Rapid Household Survey 2006 uses the following more extensive definition:

A household is a group of people who normally live and eat their meals together in the household. Members must acknowledge the authority of one person as
head of household and that person must actually live with the rest of the household members.

In polygamous households, each wife is treated as a distinct household when the wives live in different houses, cook separately and take decisions independently.

…The household is an economic unit in which the members possess certain economic ties. They may participate together in the same productive activity, earning income together. The survey permits the use of all information which includes key events which illustrate this type of economic behavior. It is essential that all people who participate in the decisions or are affected by the results of these decisions are included in the household.

While the Malian Agricultural Census of 2005 uses the FAO recommended definition of an agricultural holding defined as,

An agricultural holding is an economic unit of agricultural production under single management comprising all livestock kept and all land used wholly or partly for agricultural production purposes, without regard to title, legal form of households. Single management may be exercised by an individual or household jointly by two or more individuals or households, by a clan or tribe, or by a juridical person such as a corporation cooperative or government agency.

Households are then constructed around the agricultural holding sampled. Despite differences in household definitions, the Malian Agricultural Census reports a household size of 6, while the Demographic and Health Survey reports a household size of 5.7. The largest difference between the household surveys listed above is the Rapid Household Survey 2006 which reports a household size of 8.5. While there are other differences between these surveys, particularly sampling methodology, it does raise the question of whether the differences in measured household size are due to the different household definitions. Definitional differences in requirements of household membership, key words included in the definition or even the sequencing of these keywords could potentially influence the respondent in organizing the list of people included in a common household roster. The economic concept of the household, as in other contexts, may therefore not intersect perfectly with the social concept of the family or with any one definition of a household. The complexities in Malian household structure and observed differences in household sizes motivated our interest to test the consequences of using different definitions on household statistics.
B. Experimental design

To test differences in definition types on household composition, consumption and production, we created four different definitions which focus on keywords relating to two of the key factors often found in household definitions, namely common food sharing requirements and common agriculture or income-generating activity requirements. The inclusion or exclusion of these criteria creates four different definitions in our experimental design summarized in Table 1. In our experimental approach, we vary including common food requirements (treatment 1) and agricultural or other income generating requirements (treatment 2) in administering a standard questionnaire. This yields four definitions. The first definition is open-ended with none of the requirements, but the requirement that all members acknowledge the same household head and living in the same dwelling space. The second and third definitions impose one of the two requirements, either common food or common agriculture. The fourth definition is the combination of both requirements (the interaction of treatments).

Enumerators were given instructions to read the definition to respondents. The definitions were translated into local languages, and enumerators were tested on their understanding of the definition before the fieldwork commenced. The definitions, translated in English, are below with the key differences between the definitions italicized for emphasis:

Definition 1: A household is composed of the group of people living in the same dwelling space and acknowledge the authority of a man or women who is the head of household.

Definition 2: A household is composed of the group of people living in the same dwelling space who eat meals together and acknowledge the authority of a man or women who is the head of household.

Definition 3: A household is composed of the group of people living in the same dwelling space who have at least one common plot together or one income

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2 The following instructions were given to each enumerator and listed on the cover pages of each questionnaire: “At the beginning of the interview, read the following definition to the head of household and other household members present. For the purposes of this interview, take the following definition as the definition of the household.”
**generating activity together (for example, herding, business or fishing)** and acknowledge the authority of a man or women who is the head of household.

Definition 4: A household is composed of the group of people living in the same dwelling space who **eat meals together and have at least one common plot together or one income generating activity together (for example, herding, business or fishing)** and acknowledge the authority of a man or women who is the head of household.

The sampling frame was developed based on the latest available census data in Mali, the *Recensement Generale du Population 1998*, and updated by local government officials for the purpose of this and a related study. Since the randomized survey experiment was conducted as part of a pilot for an evaluation of a large scale irrigation project, the intervention was stratified into three zones to include a small subsample of the intervention zone, the Alatona area and two additional areas nearby. The first are villages with access to a large scale irrigation scheme, the Office du Niger (ON), and the second is a set of villages with only rainfed plots in an area peripheral to the ON. Amongst the three strata, 32 communes in 3 administrative units called cercles (Macina, Niono and Segou) in the region of Segou are represented in the sample. 20 villages were randomly selected in the ON and 23 in the periphery groups (46 villages in total) with up to 20 households selected in each village. 10 additional villages were randomly selected from the intervention zone with up to 20 households selected per village. The definition of the household was randomized within each village at the finest sampling unit.

The survey instruments were designed with a common set of core modules on household composition, assets and livestock holdings, agricultural production and inputs, and food consumption. Since dwellings are organized into concessions, the definition was randomly assigned to selected concessions. When an enumerator entered the concession, he would speak to the head of the concession and read the selected household definition. Using that definition, the

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3 The Census information is summarized in the software package, Cartographie du Mali 1998, distributed by the Government of Mali, Mission for the Decentralization, produced by Fox Media and financed by UNICEF.

4 The Office du Niger was originally constructed in 1932 as a gravity irrigation scheme during French colonialism. Since Malian independence, the government of Mali has managed the system.

5 Some of the villages are very small and there were not 20 households (or concessions, which we discuss subsequently) in the village.
enumerator would write down a list of household heads within that concession and then randomly select one.\textsuperscript{6} An equal number of household definitions were allocated among the 20 concessions selected per village.

Despite the fact that definitions were allocated randomly to households, most empirical work attempts to establish that differences between treatment and control households are not statistically significant as evidence that the randomization “worked.” In our experiment, the household and descriptive statistics of the household is the object of our analysis. The nature of the treatment is that all characteristics collected in the household survey are endogenous. We did collect a limited amount of information on the concession – in particular the number of granaries - which is presented in Table 2. Concessions are a physical space defined by an outer wall, observable by all, and not subject to the definition of the household. When we compare the number of granaries found in the household’s concession, no significant variation exists between the four definitions types. This is consistent with the randomization generating balance across treatment and control, though this one result is of course far from a full randomization check. The results of the experiment are described in the next section.

### III. Results

All results are shown using the following specification:

\[ y_{ij} = \beta_0 + \beta_2 \text{Def}_2 + \beta_3 \text{Def}_3 + \beta_4 \text{Def}_4 + \delta X_{ij} + \varepsilon_{ij} \]

Where \text{Def2}, \text{Def3} and \text{Def4} are indicators for the definitions used in the interview of household \( i \) in village \( j \): definitions 2, 3 and 4 as defined in section II.B respectively. Definition 1, the open-ended definition that only requires common residency and acknowledgement of a household head, is the excluded definition. Coefficients are naturally interpreted as the consequence of adding additional keyword restrictions on the household listing. \( X_{ij} \) are village-level characteristics. Two specifications are shown: one with village indicators and the second with indicators for the type of village (Alatona, Office du Niger, or Periphery). Since randomization

\textsuperscript{6} The random selection of households within selected concessions implies that households who reside in large concessions are under-represented. Therefore, to compute village-level statistics, the observations would need to be re-weighted to correct for this sampling method.
was done within the village, these additional controls have little effect on the estimates. Specifications with the zone dummies are in odd columns in Tables 3-7 while the village dummy specification are in even columns. Summary statistics of the key variables across definition types are reported as an Appendix.

Our results illustrate some interesting differences in household definitions, primarily between the open-ended definition 1 and definition 3 which includes common agriculture and income generating activities, but does not include the common food preparation requirement. Adding additional requirements to the definition of the household increases the number of people listed in the household, perhaps because respondents are focusing on keywords in the definition which facilitates recall of particular people that the respondent may have otherwise overlooked. These additional keywords have consequences, not only for household size, but also household composition. In particular, both treatments increase the number of men reported in the household. Differences, not only in household size, but also household composition are the likely mechanisms through which we observe increases in assets, livestock holdings and consumption statistics among the definition types. However, we find no statistically significant effects among the definitions on agricultural variables including value of production of grains. To take a closer look, we investigate the implications of these results in four key variable categories: household composition, assets and livestock holdings, food consumption, and agricultural production.

Household Composition

Table 3a presents our results on the effects of different definition types on household composition. We use two different measures of household size and disaggregate household composition into different age categories including the number of household members aged 16-60 years old and the number of children aged less than 16. For the measures of household size, we use the full list of individuals listed by the household head and the list of individuals in the household listed by the household head who meet a residency requirement of at least 6 months in the previous year.

Household sizes vary across the definitions between 11 and 12 persons on average, which is rather large, but not unexpected in this area of Mali. We find that the effect of adding a common
agricultural requirement to the household definition increases the number of members listed in the household by one household member. These estimates are robust to zonal controls which account for potential differences in rainfall, farming systems, or access to infrastructure and the village dummy specification. Initially, we expected that an open-ended definition would produce larger household sizes, as respondents might seek to list more members of the household as larger households are generally associated with higher status in our survey area. However, additional keywords prompted respondents to increase the number of members listed in the household in comparison to the first, open-ended definition, though not all increases in household sizes are statistically significant.

The effects of definition type on household composition variables that identify the number of adults and the number of children are reported in columns 5-12 of Table 3a. Altering definitions in our household survey altered household composition, even for definitions where we did not necessarily observe increases in total household size. Across all definition types, we observe increases in the number of adults aged 16-60 (columns 11-12), with the effect varying between .6 and .9 people listed in this category. No statistically significant increases in the number of children under 16 or women were found nor in the number of adults over the age of 60 (results available upon request). The number of men (column 5-6) did increase significantly across all definition types in the fixed effects specification, with coefficient estimates close to those found in the number of adults aged 16-60 category. This suggests that adding keyword requirements to household definitions alters composition by increasing the number of men listed.

As mentioned in section II.A, one of the complexities of household structure is that food preparation may be shared within a household or a concession for at least some meals. Traditionally in Mali, when multiple married couples constitute the same “household,” women take turns in cooking food for the entire group. We therefore ask whether differences in household definitions would increase variation in the types of food preparation practices reported by households. Table 3b investigates how meal preparation practices are organized within the household and whether the cooking arrangement varies systematically with household definition. Columns 1 and 2 show estimates from a linear probability model where the dependent variable is an indicator for whether the main female respondent reports that she shares the responsibility of meal preparation for the household with another woman. We see that households which were
randomly assigned definition 3 are significantly more likely compared to the open-ended
definition to have multiple women within the same household sharing the duty of meal
preparation. This result combined with Table 3a suggests that an emphasis on common
agriculture, as in Definition 3, leads to larger households with a more complex structure.
Columns 3 and 4 look at whether, conditional on sharing meal preparation, the main female
respondent also cooks for a sub-group of individuals within the “household” when another
woman is responsible for cooking for the larger unit. While we need to be cautious in
interpreting these results, since they are conditional on sharing meal preparation which is
endogenous to the household definition used, we see that respondents assigned definition 3 are
more likely to report cooking independently within the shared meal preparation setting. We
interpret this as evidence that an emphasis on a common income activity generates reported
households where there is some autonomous decision-making that occurs within the larger
household structure.

Assets

Table 4 presents the treatment effect estimates of definition type on farm assets, livestock
holdings, and nonfarm assets. We find significant increases in the farm asset index, livestock
holdings and the nonfarm asset indices among households assigned a definition with a common
agriculture requirement. The effect of definition 3 on the asset indices is relatively large. The
farm asset index in columns 1-2 is the number of types of farm equipment, out of a potential 13,
that the household owns one or more of. The farm asset index increases by .6. Since the average
number of farm assets owned by households in the sample is 6.9; therefore, the agricultural
definition increased measured farm assets by approximately 10%. Columns 2-4 look at livestock
holdings measured in tropical livestock units, which is the number of animals owned by the
household weighted by FAO Tropical Livestock Units conversions. TLU livestock is higher
among definition 3 households compared to definition 1 by 1.9 units. Columns 5-6 show that the
emphasis on common agriculture increased the number of nonfarm asset types owned by the
household by .7. The average number of asset types owned by the household is 12, out of a
possible 25. Including a common food requirement (definition 2) also increases the farm assets
index reported by the household and livestock holdings. These effect of definition 2 are smaller
than those observed for definition 3 for farm assets, but much larger than the effect of definition
3 for livestock holdings. As both definition 2 and 3 were shown to increase the number of men listed in the household, these increases in asset holdings reported by the household are consistent with the findings in Table 3a, even if household size does not increase significantly among the definitions. This illustrates that even if household sizes are consistent over time within a country, fluctuations observed in welfare levels may be driven by changes in household composition caused by altering household definitions or the implementation of these definitions during survey administration over time.

Food consumption

In Table 5, we again observe significant differences across definitions with respect to consumption reported by the households. We calculate the seven day recall of grain expenditure (in FCFA, the local currency) and kilograms of grain consumed. Including keywords about common food requirements, as in definition 2, increases the seven day recall of grain expenditure by 1,740 FCFA. The differences in statistics generated by definition 3 that we have observed for other variables is absent with respect to household grain expenditure. However, the number of kilograms of grains consumed by the household over the previous seven days does increase significantly by including the common food requirement in definition 2 or the common agriculture requirement in definition 3. The effect of definition 2 increases the reported kilograms of grain consumed by 9 kilograms, while the effect of definition 3 is 8 kilograms. However, per capita measures of grain expenditure or kilos of grain consumed do not vary across the definition types. This is consistent with the small variations in household size that we observe differences in per capita estimates are not statistically significant.7

These results are consistent with the explanation that variations in definitional keywords may drive variation in household statistics. We find no precisely measured effect of increased total household size for definition 2 with includes common food requirements, but this definition does produced increased reports of grain expenditure and consumption by the household. If respondents fix on definitional keywords, especially with respect to consumption, these differences in definitions have potential implications on poverty statistics. As budget shares of food compose the largest class of expenditures included in consumption aggregates, even small

7 Tables with per capita results are available from the authors upon request.
increases in expenditures and quantities of grain are scaled which can produce large variation in consumption aggregates.

*Agricultural Production*

The last set of variables through which we investigate the implications of alternative household definition are agricultural statistics, shown in Table 6. We calculate the value of agricultural production of grains in FCFA reported by the household over the last agricultural season (columns 1-2) and the value of the same production condition on someone in the household undertaking farming in the last agricultural season (columns 3-4). Approximately 8% of the sample did not farm at all during the last season, reflective of the fact that there are a number of pastoral families in this geographic area. This emphasizes the importance of the livestock result already discussed, since pastoralism is an important livelihood for some households in the sample. We also analyze land size (columns 5-6) and the total value of inputs including seed, organic fertilizer, chemical fertilizer and herbicide (columns 6-7). Table 6 shows that there are no statistically significant differences in the agricultural statistics for any of the definitions. The lack of significant differences is difficult to interpret since this measure of agricultural production may simply be noisy. Alternatively, this may be because production statistics are reported at the plot level and reported landholdings are invariant to definition type, despite increases in the number of men reported in our household composition results. In the Segou region of Mali, the main agricultural work is done on communal family land. Therefore there may be little changes – or it may be difficult to detect relatively small changes - in production and inputs from the addition of one extra household member.

**IV. Conclusion**

In this paper, we present the results of a survey experiment designed to measure the effects of altering the definition of the household on a wide range of variables frequently collected in multi-topic household surveys. Despite the fundamental importance of the unit of analysis in any type of research, the “household” remains somewhat of a “black box” for economists. Efforts to standardize the definition using the commonly accepted “common pot” definition still meet operational complications in the field as noted by Udry (1995).
Our results tell a cautionary tale, suggesting that the selection of the household definition deserves more attention in the design of future surveys and the analysis of previously collected surveys, especially when researchers are interested in changes over time. Despite our results which show that not all household definitions alter the household size, all definitions did alter household composition which had implications on consumption and asset statistics in particular. A priori, we expected variations in household composition might be driven by variation in the number of children included or excluded as they may have less social standing in the eyes of household heads or may be more difficult to remember in large households. However, our results show that men are the main individuals included or excluded in variations of household definitions.

While some of the household definitions produce little variation in household statistics (see Appendix 1) such as land cultivated or the number of females listed in the household, variation in livestock holdings and grain consumption is striking and economically meaningful. Since food expenditure composes 60-80% of a household’s budget share (Duflo and Banerjee 2007), our findings on grain consumption and the variation that different definition types may have on poverty statistics is cautionary and merits further investigation.

References


**Tables**

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Table 2: Number of Greniers in Concession

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Notes
1 The omitted definition is Definition 1: Common Dwelling and Authority.
2 Zone controls include a dummy variables for the different agro-climatic regions: the irrigated zone, the northern remote villages and the periphery.
### Table 3a: HH Size

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<th>Number of Adults 16-60</th>
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| N                | 1021          | 1021                                  | 1021          | 1021                   |
| Zone controls    | Yes           | No                                    | Yes           | No                     |
| Village FE       | No            | Yes                                   | No            | Yes                    |

**Notes**

1. The omitted definition is Definition 1: Common Dwelling and Authority.
2. The remaining household members are comprised of individuals >60. They represent approximate 5% of total household size.
3. Zone controls include a dummy variables for the different agro-climatic regions: the irrigated zone, the northern remote villages (Alatona) and the periphery.
Table 3b: Cooking Arrangements

<table>
<thead>
<tr>
<th></th>
<th>Share Meal Preparation</th>
<th>Cook Independently</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Def 2: Common Food, Dwelling, Authority</td>
<td>0.057</td>
<td>0.056</td>
</tr>
<tr>
<td></td>
<td>(0.041)</td>
<td>(0.040)</td>
</tr>
<tr>
<td>Def 3: Common Agriculture, Dwelling, Authority</td>
<td>0.097 **</td>
<td>0.096 **</td>
</tr>
<tr>
<td></td>
<td>(0.042)</td>
<td>(0.040)</td>
</tr>
<tr>
<td>Def 4: Common Agriculture; Common Food, Dwelling, Authority</td>
<td>0.054</td>
<td>0.056</td>
</tr>
<tr>
<td></td>
<td>(0.042)</td>
<td>(0.040)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.176 ***</td>
<td>0.552 ***</td>
</tr>
<tr>
<td></td>
<td>(0.049)</td>
<td>(0.028)</td>
</tr>
<tr>
<td>N</td>
<td>1016</td>
<td>1016</td>
</tr>
<tr>
<td>Zone controls</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Village FE</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Notes**
1. The omitted definition is Definition 1: Common Dwelling and Authority.
2. Zone controls include a dummy variables for the different agro-climatic regions: the irrigated zone, the northern remote villages and the periphery.
<table>
<thead>
<tr>
<th></th>
<th>Farm Assets (1)</th>
<th>Livestock (TLU) (3)</th>
<th>Assets, Non-Farm (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition 2: Common Food, Dwelling, Authority</strong></td>
<td>0.262 (0.163)</td>
<td>2.700 *** (0.882)</td>
<td>2.652 *** (0.808)</td>
</tr>
<tr>
<td></td>
<td>0.272 (0.157)</td>
<td>0.444 (0.314)</td>
<td>0.465 (0.298)</td>
</tr>
<tr>
<td><strong>Definition 3: Common Agriculture, Dwelling, Authority</strong></td>
<td>0.567 *** (0.163)</td>
<td>1.875 ** (0.883)</td>
<td>1.889 ** (0.809)</td>
</tr>
<tr>
<td></td>
<td>0.561 *** (0.157)</td>
<td>0.650 ** (0.809)</td>
<td>0.655 ** (0.315)</td>
</tr>
<tr>
<td><strong>Definition 4: Common Agriculture; Common Food, Dwelling, Authority</strong></td>
<td>0.158 (0.163)</td>
<td>0.645 (0.883)</td>
<td>0.232 (0.809)</td>
</tr>
<tr>
<td></td>
<td>0.166 (0.157)</td>
<td>0.254 (0.809)</td>
<td>0.298 (0.315)</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>5.115 *** (0.193)</td>
<td>13.317 *** (1.046)</td>
<td>6.861 *** (0.570)</td>
</tr>
<tr>
<td></td>
<td>6.682 *** (0.111)</td>
<td>6.396 *** (0.570)</td>
<td>11.668 *** (0.373)</td>
</tr>
<tr>
<td><strong>P value: Test of Definition 2 = Definition 3</strong></td>
<td>0.062</td>
<td>0.351</td>
<td>0.514</td>
</tr>
<tr>
<td></td>
<td>0.066</td>
<td>0.346</td>
<td>0.525</td>
</tr>
<tr>
<td><strong>P value: Test of Definition 3 = Definition 4</strong></td>
<td>0.013</td>
<td>0.179</td>
<td>0.187</td>
</tr>
<tr>
<td></td>
<td>0.012</td>
<td>0.126</td>
<td>0.181</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>1021</td>
<td>1021</td>
<td>1021</td>
</tr>
<tr>
<td><strong>Zone controls</strong></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Village FE</strong></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**Notes**

1. The omitted definition is Definition 1: Common Dwelling and Authority.
2. Zone controls include a dummy variables for the different agro-climatic regions: the irrigated zone, the northern remote villages and the periphery.
3. The farm asset index in columns 1-2 is the number of equipment types, out of a potential 13, owned by the household. It is not the total number of farm assets as households were only asked if they owned one or more of each of the 13 tools. The livestock TLU in columns 3-4 is the number of animals owned by the household weighted according to FAO Tropical Livestock Units conversions. Non-farm assets, in columns 5-6, is an analagous measure to the farm asset index. Households were asked if they owned 25 different types of assets.
Table 5: Food Consumption

<table>
<thead>
<tr>
<th></th>
<th>Grain Expenditure (FCFA)</th>
<th>Kilos of Grains Consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Def 2: Common Food, Dwelling, Authority</td>
<td>1760 *</td>
<td>1740 *</td>
</tr>
<tr>
<td></td>
<td>(990)</td>
<td>(961)</td>
</tr>
<tr>
<td>Def 3: Common Agriculture, Dwelling, Authority</td>
<td>1580</td>
<td>1580</td>
</tr>
<tr>
<td></td>
<td>(992)</td>
<td>(962)</td>
</tr>
<tr>
<td>Def 4: Common Agriculture; Common Food, Dwelling, Authority</td>
<td>1530</td>
<td>1540</td>
</tr>
<tr>
<td></td>
<td>(992)</td>
<td>(962)</td>
</tr>
<tr>
<td>Constant</td>
<td>7110 ***</td>
<td>10100 ***</td>
</tr>
<tr>
<td></td>
<td>(1170)</td>
<td>(677)</td>
</tr>
<tr>
<td>N</td>
<td>1011</td>
<td>1011</td>
</tr>
<tr>
<td>Zone controls</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Village FE</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes
1 The omitted definition is Definition 1: Common Dwelling and Authority.
2 Zone controls include a dummy variables for the different agro-climatic regions: the irrigated zone, the northern remote villages and the periphery.
<table>
<thead>
<tr>
<th>Def 2: Common Food, Dwelling, Authority</th>
<th>Value of Grains (FCFA), all HHs</th>
<th>Value of Grains (FCFA) conditional on HH Farming</th>
<th>Land Size (Hectares)</th>
<th>Total Plot Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>-9,903</td>
<td>-7,655</td>
<td>-17,718</td>
<td>6,663</td>
<td>-0.152</td>
</tr>
<tr>
<td>(76,986)</td>
<td>(71,690)</td>
<td>(82,133)</td>
<td>(76,436)</td>
<td>(0.666)</td>
</tr>
<tr>
<td>Def 3: Common Agriculture, Dwelling, Authority</td>
<td>12,988</td>
<td>6,639</td>
<td>-7,460</td>
<td>-840</td>
</tr>
<tr>
<td></td>
<td>(76,683)</td>
<td>(71,345)</td>
<td>(81,523)</td>
<td>(75,958)</td>
</tr>
<tr>
<td>Def 4: Common Agriculture; Common Food, Dwelling, Authority</td>
<td>-72,758</td>
<td>-73,517</td>
<td>-107,761</td>
<td>-92,188</td>
</tr>
<tr>
<td></td>
<td>(76,834)</td>
<td>(71,499)</td>
<td>(81,611)</td>
<td>(76,012)</td>
</tr>
<tr>
<td>Constant</td>
<td>168,829*</td>
<td>733,545***</td>
<td>236,546**</td>
<td>801,703***</td>
</tr>
<tr>
<td></td>
<td>(90,670)</td>
<td>(50,452)</td>
<td>(104,730)</td>
<td>(53,981)</td>
</tr>
</tbody>
</table>

| N                                      | 1010                          | 1010                          | 926          | 926          | 1021       | 1021       | 1021       | 1021       |
| Zone controls                          | Yes                           | No                            | Yes          | No           | Yes        | No         | Yes        | No         |
| Village FE                             | No                            | Yes                           | No           | Yes          | No         | Yes        | No         | Yes        |

Notes
1. The omitted definition is Definition 1: Common Dwelling and Authority.
2. Zone controls include a dummy variables for the different agro-climatic regions: the irrigated zone, the northern remote villages and the periphery.
### Appendix Table 1: Descriptive Statistics

<table>
<thead>
<tr>
<th>Definition:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Household composition</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household size Mean</td>
<td>11</td>
<td>11.9</td>
<td>12.1</td>
<td>11.7</td>
<td>11.7</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(5.7)</td>
<td>(6.3)</td>
<td>(6.6)</td>
<td>(5.4)</td>
<td>(6.0)</td>
</tr>
<tr>
<td>HH size of 6 month residents Mean</td>
<td>11</td>
<td>11.8</td>
<td>12.1</td>
<td>11.7</td>
<td>11.6</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(5.7)</td>
<td>(6.3)</td>
<td>(6.6)</td>
<td>(5.4)</td>
<td>(6.0)</td>
</tr>
<tr>
<td>Number of males listed Mean</td>
<td>5.7</td>
<td>6.2</td>
<td>6.3</td>
<td>6.1</td>
<td>6.1</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(3.1)</td>
<td>(3.4)</td>
<td>(3.6)</td>
<td>(3.1)</td>
<td>(3.4)</td>
</tr>
<tr>
<td>Number of females listed Mean</td>
<td>5.4</td>
<td>5.6</td>
<td>5.8</td>
<td>5.6</td>
<td>5.6</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(3.4)</td>
<td>(3.5)</td>
<td>(3.6)</td>
<td>(2.9)</td>
<td>(3.4)</td>
</tr>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm asset index Mean</td>
<td>6.7</td>
<td>6.9</td>
<td>7.3</td>
<td>6.8</td>
<td>6.9</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(1.9)</td>
<td>(1.9)</td>
<td>(2.2)</td>
<td>(1.7)</td>
<td>(1.9)</td>
</tr>
<tr>
<td>Livestock TLU Mean</td>
<td>6.4</td>
<td>9.1</td>
<td>8.2</td>
<td>7</td>
<td>7.7</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(8.4)</td>
<td>(12.8)</td>
<td>(10.4)</td>
<td>(9.3)</td>
<td>(10.4)</td>
</tr>
<tr>
<td>Nonfarm asset index Mean</td>
<td>11.7</td>
<td>12.1</td>
<td>12.3</td>
<td>11.9</td>
<td>12</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(3.9)</td>
<td>(3.8)</td>
<td>(3.7)</td>
<td>(3.6)</td>
<td>(3.7)</td>
</tr>
<tr>
<td><strong>Consumption Statistics (previous 7 days)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kilos of grains consumed Mean</td>
<td>47.5</td>
<td>56.6</td>
<td>55.3</td>
<td>53.8</td>
<td>53.3</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(43.5)</td>
<td>(60.1)</td>
<td>(47.8)</td>
<td>(52.1)</td>
<td>(51.3)</td>
</tr>
<tr>
<td>Grain expenditure (FCFA) Mean</td>
<td>10,092</td>
<td>11,861</td>
<td>11,698</td>
<td>11,645</td>
<td>11,319</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(9095.0)</td>
<td>(12455.0)</td>
<td>(10556.0)</td>
<td>(12419.0)</td>
<td>(11219.0)</td>
</tr>
<tr>
<td><strong>Agricultural statistics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value of grain produced (FCFA) Mean</td>
<td>794,726</td>
<td>974,737</td>
<td>752,029</td>
<td>735,976</td>
<td>814,623</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(1,118,141)</td>
<td>(2,353,717)</td>
<td>(944,861)</td>
<td>(1,138,551)</td>
<td>(1,500,268)</td>
</tr>
<tr>
<td>Land cultivated Mean</td>
<td>6.7</td>
<td>6.7</td>
<td>7.1</td>
<td>6.5</td>
<td>6.7</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(8.8)</td>
<td>(7.6)</td>
<td>(8.3)</td>
<td>(7.3)</td>
<td>(8.0)</td>
</tr>
<tr>
<td>Input value (FCFA) Mean</td>
<td>198,550</td>
<td>257,494</td>
<td>273,080</td>
<td>212,890</td>
<td>235,438</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>(410,547)</td>
<td>(596,547)</td>
<td>(1,449,147)</td>
<td>(456,825)</td>
<td>(839,563)</td>
</tr>
<tr>
<td>N</td>
<td>257</td>
<td>256</td>
<td>254</td>
<td>254</td>
<td>1021</td>
</tr>
</tbody>
</table>