Agricultural household in the context of the household surveys and Agricultural Census: an methodological assessment in Brazil[1]

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Abstract

In Brazil, the agricultural household can be characterized by the household surveys and the Agricultural Census, both under the responsibility of the Brazilian Institute of Geography and Statistics (IBGE). However, there are particularities in the information available in such surveys and a divergence regarding some concepts and characteristics, starting with the investigation unit. In general, there is a good response to the listing of agricultural households among the household surveys and agricultural censuses, although "borderline" variables between the farm and the household (such as income, for example) are not clearly represented when the aim is to recognize the mixed activity characterizing the agricultural household.

The purpose of this paper is to evaluate the limits of the data in relation to gaining further information about the agricultural household and propose methodological alternatives to improve their characterization. With this aim in mind, five kinds of household estimates were prepared based on data collected in the Agricultural Census and National Household Sample Survey (PNAD): enumeration of agricultural households; agricultural income; the income from other sources (off-farm); total household income; and the farm area. Furthermore, it was possible to assess the results for the five regions in Brazilian territory, also to assess the accuracy of the estimates, which allowed to evaluate whether the sample of household surveys are representative to assess the household agriculture in more desegregated universes.

This is an brand new initiative to assess the potential of each survey to capture more consistently the types of incomes. The results provide an important contribution to the development of surveys specially designed to investigate the agricultural household and its particularities, such as the difference between generated and earned income. Besides this, it provides an analysis about the household surveys applied in Brazil, and it could be used as a basis for these more specific surveys.

Keywords: Agricultural household, PNAD, Agricultural Census, Household Survey, Agricultural and Rural Statistics.

1- Introduction

The Global Strategy to Improve Agricultural and Rural Statistics, approved by UNSD at their last conference, set the basic standards for the 21st-century agricultural statistics. Some of its key elements worth mentioning are the recent data requirements on going beyond the traditional domains of agricultural statistics and the call for linkage between the household and the agricultural holding, including both as statistical units in an integrated survey framework.

The current ongoing agricultural research system of the Brazilian Geography and Statistics Institute (IBGE) includes information on production, such as area, average yield and herds, and structural aspects regarding Brazilian agriculture can only be obtained from the Agricultural Census. Moreover, such a research system is based on registered surveys and subjective studies with informers skilled in agriculture, and there is, therefore, no error estimate or accuracy measurements (Bolliger, 2009).

IBGE has been studying a reformulation of these surveys, the key element of which is the implementation of a National Farm Sample Survey System, including the census and ongoing surveys. One of the major challenges of this integration lies in portraying the small farms that are responsible for approximately 30% of production and total 96% of all farms[2]. This requires a complex research model, mainly when the idea is to collection information on structural development of the farming activity, covering economic and social aspects of the organization of production, on the lines of ARMS (USDA, 2005), a study the combines farming practices, economic aspects of business management, such as characteristics of the agricultural household linked to the agricultural holding. The main feature of the purpose of a sample survey in progress discussed in the SNPA sphere is for it to be a multipurpose survey covering all farms in the country (Bolliger, 2009).

An alternative approach to provide such full information to guarantee the linkage between the household and the agricultural holding is based on the use of household surveys approach to characterize the agricultural household; it means select a household sample to achieve household and farm information.

Studies for analyzing the agricultural household based on household surveys have been performed in other countries as well as Brazil, although the use of such

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[2] Were small establishments with at least 200 ha and six fiscal modules, besides the structural characteristics (fewer workers, silos, etc.) or gross farming income less than US$ 91.899 per year.

surveys to portray the agricultural universe is questionable because of the low sample representation for rural and geographical extracts (Del Grossi & Graziano da Silva 2006). According the Global Strategy "household surveys are often conducted in isolation from production surveys with no coordination or with sample sizes too small to disaggregate the data into the rural/farm sectors. (Global…, 2010, p.41)

Diferently, in the Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA) approach is recommended draw "a valid and nationally representative sample and avoiding excessively large samples which would compromise the quality of the data and sustainability of the system" (Carleto, 2010, p.19)

On planning a integrate survey framework one challenge is to achieve a good balance among completeness, disaggregation and quality.

One further problem that arises is the integration of agricultural statistics in countries such as Brazil, in which corporate farming is very relevant. Another concerns the adaptation of study procedures and collection instruments to simultaneously provide more appropriate household information and that more applicable to the farm.

In an earlier study, which compared the enumeration and income of the agricultural households based on two IBGE routine household surveys – National Household Sample Survey (PNAD), the Family Budget Survey (POF) – and on the Agricultural Census (Soares et al., 2010), it was found basically that it would be necessary to bring closer concepts between the surveys, such as the concept of income, for example, and collection procedures could be more suited to collecting this kind of information[3]. This article not only re-addresses the questions in the earlier study but also brings further elements when assessing the feasibility of using the current sample survey design to investigate information regarding the agricultural household.

As mentioned above, in addition to the PNAD, IBGE also uses another household survey – the Family Budget Survey (POF) -, which permits some comparisons, such as income, for example, although it omits information about the area of the enterprise. However, in this article we choose to assess only the PNAD, since its sample is not only larger than that of the POF, thus permitting better coverage of the rural households, but also went into the field the same year as the Census, while the POF information is for 2003 and 2008/2009. Therefore, the study examines particularly the results of the PNAD and Agricultural Census, both referring to 2006.

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[3] The main differences between income aggregate in POF and PNAD can be assessed in annex.

The results bring subsidies in relation to the survey design focusing on portraying universes with mixed activity, as in the agricultural household case, checking how they can be carried out more suitably. It assesses the possibility of using the household surveys with the addition of more specific questions on agriculture and animal farming or even pointing to a re-dimensioning of the sample, giving more relevant to structural information of Brazilian agriculture and not only aspects on the productive activity.

Particular features of the information available in these surveys are emphasized, especially the non-convergence of some concepts and characteristics, starting with the unit of investigation. In some cases the simple comparison between census and estimated data obtained in the PNAD are not direct, which undoubtedly requires a little more caution when analyzing their results. Accordingly, the article also provides assessment elements of the potentials of each survey in more consistently capturing one or other type of information. In this sense, it also subsidizes those that use household sample data to portray the farming universe.

Lastly, the article discusses the estimates in spatial divisions and their variation coefficients in order to assess the household survey's potential for portraying the regional diversity of a country like Brazil, with continental dimensions, whose policy objects and designs can vary enormously. The strategy of a regional analysis is adopted here to assess the representative samples in each stratum and, of course, to evaluate consistency of the information between the household surveys and Agricultural Census. Studies like this, which permit assessment of consistency and efficiency of statistical information, are important when assessing the possibility of studying the farming household based on a closer integration with household surveys in the sphere of the IBGE Integrated Household Survey System (SIPD/IBGE), and not just solely based on a system based on samples of establishments (SNPA/IBGE).

2 - Materials and Methods

From the micro-data of the National Household Sample Survey (PNAD/IBGE - 2006) and Agricultural Census (2006), we compare the estimates of the variables: i) enumeration of agricultural households; ii) agricultural income; iii) the income from other sources (off-farm); iv) total household income; v) and the farm area. Part of the results were estimated for the five regions in Brazilian territory, also to

assess the accuracy of the estimates based on a household survey in relation to the universe of agricultural households, in spatial divisions[4].

With regard to the agricultural household universe, the concepts of an agricultural household addressed herein were based on the Wye Group Handbook for OECD countries. The main reasons for working with the agricultural household universe lies in the fact that in some rural areas the decisions of production and consumption very often cannot be separated and in sequence; in other words, the families are not just families (the household in the Household Surveys) nor are the farms merely establishments (Agricultural Census), but a mix of both (Helfand; Singh et al., 1986).

Since the household surveys cover the families in particular, their relation with the agricultural census mainly relates then to the units corresponding to the household institutional sector in the sense of national accounts. On the other hand, in the Census we will only look at farms that can be properly associated with the families, leaving out farms with business or corporate characteristics, and which, apart from that, correspond to a better approach of the universe corresponding to the "agricultural household" concept. In this article, we restricted the universe of agricultural households to those farms whose legal farmer status is of an individual farmer[5]. In the PNAD data, however, we consider as an agricultural household universe employers and self-employed in farming, and the household CNAE (National Classification of Economic Activities) was used, considering the sectors of agriculture, cattle farming, and forestry[6].

There are, however, important issues in demarcating the concept of an agricultural household when using it as a unit of analysis, but its demarcation generally depends heavily on available information and on the subject to be studied, and is therefore not considered a closed criterion. Although the definition of agricultural household admits conceptual variations, we work with a concept for OECD countries[7]:

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[4] The calculation of the estimates and their accuracies were built by using the SUDAAN 9.1 application. To calculate the variances the post-strata of the survey were considered. The population totals for the post-strata were provided by the Coordination of Population and Social Indicators for the study's reference month. Households with no-answer for the variables were excluded from the sample, and the other households re-weighted.

[5] Therefore, the following categories were excluded from the analysis: Condominium, consortium or society of people; cooperative; limited liability or business corporation; public utility institution; government (federal, state or local) and other status. Moreover, we do not consider in the optional universe community exploration farmers that run the farm.

6 We selected the activities in the household CNAE ranging from 1101 to 1300 and that with code 2001. It should be stressed that in an earlier article (Soares et al, 2010) the activities 1101 to 2003 were considered, including the service activities in agriculture.

[7] The application to countries at different levels of economic development to the concepts and definitions of "agricultural household" and "income" are part of the proposals for a **SUPPLEMENT TO HANDBOOK ISSUES**

i) broad concept – includes any household that derives some income from agriculture, even when this is the smallest portion of the earnings or allocation of working hours;

ii) narrow concept – only includes households that depend primarily on agricultural activities for their subsistence, defined as those whose main part of their total income comes from their own activity in agriculture[8];

iii) marginal concept – when the main source of income comes from other non-agricultural sources, obtained by subtracting from the universe of households covered by the narrow concept, that which is included in the broad concept (i–ii).

The same handbook suggests obtaining these universes from algorithms based on income and its composition among the household members, although when this information is not available separately for all these individuals, the concept of the head or reference person should be used, this alternative being widely adopted in Europe (Hill, 2009)[9]. In the PNAD data, although the income and activities of each member of the household are available, we use the proxy concept of head of the household to enumerate the household in its narrow concept. Now, in relation to the census data, the main difference is that we use the income and not a proxy based on the head's main activity to apply these concepts. In this case, in the restricted household concept, the farming income must be the farm's main source of income and, therefore, we restrict to the universe those farms whose gross or net income is higher than off-farm income, calculated by adding off-farm wage earnings, retirement pensions, allowances and transfers from social programs. The interesting fact of these profiles used for agricultural household concepts (broad and restricted) is that inasmuch as conceptual restrictions are being considered, household universes will be established with an increasingly intensive agricultural activity in this sector.

The National Household Sample Survey (PNAD) on an annual basis adopts the household as the selection unit, which is not necessarily synonymous with family, since one or more family units may live there, although the survey does characterize

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FOR NON-OECD COUNTRIES appointed in the preliminary suggestions from the 2nd Wye Group Meeting, June 2009, Rome.

[8] Of the total 145,547 households in the PNAD, 7,441 and 8,226 were considered agricultural household in the restricted and broad concept, respectively.

[9] It should be mentioned that the person who has the largest portion of income in the household is not always the head or person of reference in that household (it depends on cultural aspects and in many countries the elderly are strong candidates)

these two conditions and regards both the household and family or person as units of analysis. In the article herein we restrict the concept of agricultural household to those whose head (narrow concept) or person in the household (broad concept) has main work in the week (September 24-30, 2006) as self-employed or employer in farming. Unlike the earlier article, which compared PNAD, POF and Census (Soares et al., 2010), we chose not to calculate the households with secondary work and those that did not have work in that week of reference, but that had worked in the previous 358 days, bearing in mind that this datum may be used as a proxy of the enumeration of the agricultural household in the period between harvests. In the article herein, we did not calculate these figures since it is not possible to estimate the income earned by these farmers and the area of the rural holding, considering that the survey does not ask these individuals for this information[10]. Moreover, two or more members in an agricultural household can report the same area of exploration and could then overestimate it. In this case, in order to prevent this, an analysis only considering the narrow concept of the agricultural household, namely, for the person of reference in the household, would be more convenient. This means that when we consider information regarding the area of the farm, we were even more restrictive, considering the area reported only by the head in his main activity enterprise, in order to prevent duplicating it in a single household.

Valuable information in the PNAD is that the income in the case of the employer or self-employed is equal to the concept of withdrawing the takings, deducting the expenses incurred in the economic activity. The value of the takings may be less than the results of the farm in the same period, meaning that any remaining portion of the earnings, reinforcing "cash" from the activity, is not included in the earnings calculated for the family or household. Similarly, takings can be verified even if the farm has a deficit net operating result, when expenses exceed income. PNAD, the entry of earnings from the activity of the employer or self-employed (takings) does not give negative values. The values calculated accordingly, therefore, must be considered to be a component of the "income earned" by the family or of the "disposal income".

Another point is that the individual in PNAD reports a monthly income, which in the present article was annualized by multiplying it by twelve. However, this annual value cannot capture its true value since, when addressing farming activities,

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[10]The survey did not ask about area and earnings by these people from the work that they did prior to the reference week, within the last 356 days. This question permits inclusion of economically active people and perhaps this has been its main purpose. When the secondary activity of a self-employed or employer, the PNAD asks about the income but not the area of the farm.

seasonality is a strong element in annual production. Another characteristic is that, although PNAD permits collecting the income received by each household member (whether they are from all work of the individuals, allowances, retirement pensions and government income transfer programs), this study endeavored to assess the income from the farming activity and annual household, excluding pensioner, domestic servant or relative. Therefore, when estimating both agricultural and household incomes, by a difference, we obtain the other household earnings, namely, equivalent to the family's off-farm earnings.

With regard to the agricultural census some particular features must also be emphasized. Although the investigated unit is the farm as a productive unit, studies reveal that there is a good relationship between the household (family) and the farm[11]. Accordingly, it is reasonable to establish a direct relationship, although a farm may have more than one enumerated household or family and one household more than one agricultural establishment. One problem of enumerating the establishments and associating them to a household in the agricultural census is the fact that this survey considered non-continuous areas, even subordinated to the same administration and farmer, when not in the same enumeration area as other farms, to the extent that in the household surveys the two farms are addressed as associated with one household. Another difference from PNAD is that the Census was able to compute as a rural establishment, families living and working on the farm that produced for their own consumption or even for the market, and were classified in the Census as "landless farmers", where around 75% lived on the farm itself and may be classified as agricultural households.

Concerning the enumeration of the agricultural household from the census data, we consider different procedures for its broad and narrow concepts. When there was some farming income, the broad concept was adopted, and two income concepts for enumerating all households were used: gross and net income. The former is calculated by adding the adjusted gross production value to the added value of agribusiness, and we deducted the current expenses from this value to obtain the net production value. Therefore, in the broad concept, we considered first the farms with agricultural gross income values higher than zero and then considered only those whose net income was positive. However, enumeration in the narrow concept occurred when the calculated

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[11] The PNAD (2006) reports that 99.4% of agricultural households are associated with a single production area. According to the last census survey, around 72% of farmers live on their own farm (Agricultural Census 2006).

portion of agricultural income is higher than the off-farm income of the household, as mentioned earlier. We also work here with another class in the narrow concept, when the result of gross income is positive and higher than the sum of the non-farming earnings (off-farm income and other non-farming income).

Before submitting the results, it is important to clarify that the Agricultural Census differs from household surveys in relation to the concept of income and the way in which it was obtained. The concept of income registered in the census adopts the productive viewpoint, calculated by the gross production value (GPV) in the rural establishment subtracted from the current expenses. When calculating income, the GPV is preferable to farm income since it includes the value of the goods produced for own consumption. However, it should be considered that part of this non-commercial production is for intermediary consumption on the actual farm, such as corn and animal food production, for example. So this value was subtracted from the GPV and is called adjusted GPV.

Therefore, farming income obtained in this way can be interpreted as "income generated" by the farm. One particular feature is that, if we consider the broad concept of an agricultural household where there is some income from the farming activity in the household-farm, there would be a considerable number of deficit farmers, whose expenditure is higher than their income, producing a net income that would be negative. These households with negative farming income would somehow not even be considered in the broad concept of an agricultural household (some farming income), although they produce and even have some commercial activity with this production.

It may be said that, unlike the other productive activities, agriculture would tend to negative net income. Undoubtedly, the risk of harvest losses due to agents exogenous to the production process, such as climate, pests and disease that can affect the plants and animals significantly reduce the GPV. Another characteristic is that the current expenses of a farm, principally with a smaller area, cannot be regarded strictly as a kind of intermediary consumption of the farming activity, since many of them are eventually consumed by the family or actual household, such as, for example, the use of electricity, wages paid to relatives, fuel, etc. In this case, elements that would be a kind of mix between household consumption and inputs for the production activity would be added to the expenses. It is, therefore, legitimate for us to use a concept of gross income, not deducting the current expenses required for the productive activity, in addition, of course, to the concept of net income.

In the census and in the PNAD, other family income was also examined, such as, for example, earnings from off-farm work, pensions, allowances and transfers received through social programs, it is found that the latter are not listed for each member, are the income from the agricultural household as a whole and there is no information that any member received this income. In this article we calculate the farming income, other farm income (rural tourism, processing, mineral exploration, etc.) and the off-farm income (allowances, pensions, transfer programs), as well as household income, result of the sum of these income portions.

3 – Results

Table 1 provides information on the enumeration and income of the agricultural households according to the prefixed concepts. As we move within the agricultural household concept, the net income from farming becomes more important in the total income of the household, contrary to what happens with off-farm income. When we only restrict the surplus agricultural households in the universe of positive gross farming income, around 1.4 million are excluded from this concept. It should be mentioned that the number of farms with net income of zero or less is approximately 1.9 million, where they have a negative net income from farming of around US$ 16 billion.

This figure becomes considerably important in the findings, since it is more than half the earnings of households with a net farming income higher than zero (around US$ 28.6 billion). The result is that when we assess the income in the universe of households with positive gross farming income (including those with surplus and deficit), its added value is lower (US$ 15 billion). However, here we will only stick to reporting this finding, since it would require a more in-depth investigation of the universe of deficit households, which is outside the subject of this study.

Table 1: Enumeration and income of agricultural households in the Agricultural and Cattle Farming Census - Brazil - 2006

Agricultural household	Enumeration	Farming income (a)		Other Income (b)		Total Household Income	
		Aggregate (million US$)	Average (US$)	Aggregate (million US$)	Average (US$)	Aggregate (million US$)	Average (US$)
CENSUS 2006							
1 - Broad Concept							
1.1 - Gross Farming Income > 0	4,363,980	15,440	3,538	4,653	1,066	20,251	4,640
1.2 - Net Farming Income > 0	2,991,689	28,633	9,571	2,709	906	31,342	10,476
2 - Narrow Concept							
2.1 - Gross Income > Other + Off farm	3,302,699	16,243	4,918	1,343	407	17,585	5,325
2.2 - Net Income > Other farm earnings	2,797,359	28,408	10,155	1,931	690	30,339	10,846
2.3 - Net Income > Off-farm Income	2,279,574	28,070	12,314	741	325	28,812	12,639
3 - Marginal Concept							
(1.2 - 2.2)	194,330	226	1,163	778	4,003	1,003	5,161
(1.2 - 2.3)	712,115	563	791	1,967	2,762	2,531	3,554
PNAD 2006							
4 - Broad Concept							
4.1 - Household	3,994,618	14,184	3,551	12,673	3,172 0	26,857	6,723
5 - Narrow Concept							
5.1 - Boss	3,606,086	12,377	3,432	11,071	3,070 0	23,448	6,502
6 - Marginal Concept							
6.1 - (1.1 - 2.1)	388,532	1,807	4,651	1,602	4,124 0	3,409	8,775
POF 2003							
7 - Broad Concept							
7.1 - Household	4,418,335	9,208	2,084	20,881	4,726	30,089	6,810

Source: 2006 Agricultural and Cattle Farming Census; National Household Survey; PNAD 2006; Family Budget Survey; POF 2003 - (micro-data)

Note 1:

Net farming income - (Adjusted GPV considering the additional for agribusiness – current expenses)

Other farming income – (rural tourism, mineral exploration, processing for third parties, non-farming activity

Off farm income - (income from other non-farming work and pensions, allowancse, social programs)

Definition of Agricultural Household: 4.1 - At least one person in the household has thE

principal occupation of self-employed or employer in agriculture (POF includes the universe of workers in production for own consumption)

5.1 - The head has principal activity of self-employed, employer in agriculture

(a) In 5.1 the main income of the head in agricultural activity. In 4.1 the income of people in the household occupied in the main farming activity is added;

(b) It was obtained by a difference between the total household income and farming income. POF includes pensions, allowance, scholarship, alimony, rent,

minimum income, school allowance, food allowance, transportation, fuel, other receivables and income, loans.

PNAD comprises pension, allowance, staying allowance, rent, donation, interest on savings and other investments

Note 2: US$ 1 = R$ 2, 1763, currency rate at 07.01.2006

However, it must be stressed that both the gross production value and the expenses refer to 2006, the year which was somehow atypical in Brazilian agriculture, with a long drought in the South, reflecting the production of this important agricultural region. Moreover, a large portion of this expense is allocated to the summer harvest the following year, which was a record, with 133 million tonnes of grain production, 13.7% higher than in 2006 (IBGE/PAM, 2007). Although these facts partly reveal the high operational deficit computed by the agricultural census (Production ..., 2007), since we are in some way comparing 2006 income with a large part of the 2007 expenses, it is worth considering that there is some evidence of under-reporting of the income and production figures of the farms, especially those dedicated to cattle farming. Plus the fact already mentioned that the production figure does not consider the variation in inventories or head of cattle, and that farm expenses may somehow be increased by the presence of elements representing the family's general living expenses, and may not necessarily reflect the financial income of the farm.

Another point is that the negative household income figure, which totals more than US$ 13 billion, cannot reflect the actual living conditions of the families, since such a result is incompatible with a family's reasonable budget. However, since self-subsistence was included, it is up to us to explain further that the agricultural census data would not be accurately and comprehensively registering off-farm earnings. This argument is corroborated with the results found in the household survey, which calculated much higher values than those in the Agricultural Census. While the off-farm earnings found in the Census are around US$ 4.6 billion in the broader concept of an agricultural household in PNAD, this figure actually gives values of US$ 13 billion. In relation to POF, they are approximately seven billion more in off-farm income when compared to PNAD (Soares et al., 2010). In POF, the contact between researcher and the household may be in up to nine days, permitting collection of slightly more accurate information, in addition to including in a more fragmented form the other income of the members of the household.

It must be mentioned that, contrary to the analysis based on agricultural census data, the concept of an agricultural household used in the household surveys was not based on farming income and its comparison with other incomes as a key element to demarcate the agricultural household universe but rather the main activity, such as self-employed and employer in agriculture as proxy of the income received from agriculture. Accordingly, when some household dweller was self-employed or an employer in agriculture, the household was considered to be agricultural in the broad concept, which is very close to the broader concept of an agricultural household considered by the Census. It is found that the enumerations are quite close, 4.36 million and 4.25 in the Census and PNAD, respectively.

When we consider only the main farming activity of the head (narrow concept – 2.1 and 5.1), a close enumeration is also found between the two surveys (3.3 and 3.8 million). However, when we compare it with the narrow concept of an agricultural household using net and not gross income, a very different enumeration is found from that obtained in the Agricultural Census, which covers a much smaller universe than that of the household surveys, 2.8 million against 3.8 million in PNAD. This result is partly explained by the farming income obtained in this survey, which corresponds to the operating income of the business, therefore admitting a negative net income as financial result. In PNAD, on the other hand, used in the case of the self-employed and employer, the concept of takings that, although the handbook

recommends discounting current expenses from the business, has the basic idea of assessing what was taken for family subsistence, closer to the concept of earned income, regardless of whether the farm has had a deficit or surplus that current month. So, in the census, when we adopt the narrow concept of a household, which compares the off-farm earnings with the net farming income, it excludes from the enumeration the large number of farms with negative or zero farming income. In fact, precisely because a measure was not obtained equivalent to net income in the household surveys, we chose in this study not to adopt the same criterion in the analysis of the data of the household surveys, but choosing the proxy.

Although the enumeration compares fairly well and converges between all these surveys, the same cannot be said for incomes. For example, enumeration in the broad concept of gross income in the Census is similar to that of PNAD. However, its income is not comparable, starting with the differences mentioned above where one represents generated income (operating result of the farm) and the other earned income (takings). In this way, the comparison between the 15.4 billion of the Census and the 15.0 billion of dollars in PNAD must be regarded with considerable caution.

The overall household income also eventually incurred this problem for comparison purposes, since the farming income is part of its result. However, it is interesting that they are quite close in all two surveys, which merely confirms that the census data succeeds in more accurately calculating the farming income; in other words, the income of the household linked to the farm, as a production unit and its operating result, while the coverage of off-farm earnings, less associated with the production activities, leaves a lot to be desired. Bearing in mind that the opposite occurs with household surveys, the result obtained in the overall household income eventually converges between both surveys, creating the wrong impression that these values are equivalent.

A more detailed comparison between the PNAD and the Census can be obtained in table 2, where we compare the results for the five regions of the country, and we estimate the coefficients of variation for these variables. In general, we find good coverage for the agricultural households throughout Brazil, with emphasis on the Midwest region, whose enumeration is quite close to the broad concept of the agricultural household. On the other hand, in this region a negative net income is found from the Census data in agricultural, as a result of the expenses exceeding the income in

this activity. It must be mentioned that this is the main grain producing region in the country.

Table 2: Enumeration, Income and Coefficient of Variation (CV) of agricultural households - Census X PNAD - Brazil - 2006

Agricultural household Concept	Enumeration	Farming income (a) Aggregate (million US$)	Household Income Aggregate (million US$)	Agricultural household Concept	Enumeration	Farming income (a) Aggregate (million US$)	Household Income Aggregate (million US$)
	CENSUS 2006				PNAD 2006		
BRAZIL							
1 - Broad Concept				**4 - Broad**			
1.1 - Gross Farming Income > 0	4,363,980	15,440	20,251	4.1 - Household	3,994,618	14,184	26,857
1.2 - Net Farming Income > 0	2,991,689	28,633	31,342	CV (%)	(3.4)	(4.7)	(3.6)
2 - Narrow Concept				**5 - Narrow**			
2.1 - Gross Income > Other + Off farm	3,302,699	16,243	17,585	5.1 - Boss	3,606,086	12,377	23,448
2.2 - Net Income > Other farm earnings	2,797,359	28,408	30,339	CV (%)	(3.5)	(5.0)	(3.8)
2.3 - Net Income > Off-farm Income	2,279,574	28,070	28,812				
NORTH							
1 - Broad Concept				**4 - Broad**			
1.1 - Gross Farming Income > 0	393,938	1,013	1,262	4.1 - Household	369,928	1,204	2,170
1.2 - Net Farming Income > 0	291,381	1,749	1,901	CV (%)	(8.6)	(7.7)	(7.4)
2 - Narrow Concept				**5 - Narrow**			
2.1 - Gross Income > Other + Off farm	340,675	1,049	1,128	5.1 - Boss	337,282	1,063	1,931
2.2 - Net Income > Other farm earnings	277,411	1,734	1,842	CV (%)	(8.9)	(7.8)	(7.8)
2.3 - Net Income > Off-farm Income	254,111	1,714	1,768				
NORTHEAST							
1 - Broad Concept				**4 - Broad**			
1.1 - Gross Farming Income > 0	2,128,441	5,325	7,076	4.1 - Household	1,967,828	2,665	7,555
1.2 - Net Farming Income > 0	1,484,238	7,276	8,346	CV (%)	(5.5)	(7.0)	(5.3)
2 - Narrow Concept				**5 - Narrow**			
2.1 - Gross Income > Other + Off farm	1,463,135	5,466	5,783	5.1 - Boss	1,772,987	2,359	6,604
2.2 - Net Income > Other farm earnings	1,382,148	7,221	8,061	CV (%)	(5.6)	(7.4)	(5.6)
2.3 - Net Income > Off-farm Income	1,043,490	7,071	7,271				
SOUTHEAST							
1 - Broad Concept				**4 - Broad**			
1.1 - Gross Farming Income > 0	723,012	4,327	5,202	4.1 - Household	604,333	3,647	6,551
1.2 - Net Farming Income > 0	465,992	8,122	8,599	CV (%)	(5.7)	(10.8)	(8.8)
2 - Narrow Concept				**5 - Narrow**			
2.1 - Gross Income > Other + Off farm	584,890	4,454	4,731	5.1 - Boss	531,468	3,091	5,488
2.2 - Net Income > Other farm earnings	435,980	8,067	8,368	CV (%)	(5.8)	(11.5)	(9.4)
2.3 - Net Income > Off-farm Income	378,466	8,019	8,158				
SOUTH							
1 - Broad Concept				**4 - Broad**			
1.1 - Gross Farming Income > 0	879,379	6,150	7,490	4.1 - Household	807,962	4,750	7,599
1.2 - Net Farming Income > 0	620,231	8,492	9,333	CV (%)	(8.2)	(8.9)	(7.2)
2 - Narrow Concept				**5 - Narrow**			
2.1 - Gross Income > Other + Off farm	711,474	6,263	6,823	5.1 - Boss	737,504	4,125	6,788
2.2 - Net Income > Other farm earnings	581,404	8,416	9,016	CV (%)	(8.2)	(9.5)	(7.4)
2.3 - Net Income > Off-farm Income	493,624	8,309	8,610				
MIDWEST							
1 - Broad Concept				**4 - Broad**			
1.1 - Gross Farming Income > 0	239,210	-1,375	-779	4.1 - Household	244,567	1,918	2,981
1.2 - Net Farming Income > 0	129,847	2,994	3,163	CV (%)	(8.4)	(13.7)	(11.2)
2 - Narrow Concept				**5 - Narrow**			
2.1 - Gross Income > Other + Off farm	202,525	-988	-881	5.1 - Boss	226,845	1,739	2,637
2.2 - Net Income > Other farm earnings	120,416	2,969	3,052	CV (%)	(8.5)	(14.4)	(12.4)
2.3 - Net Income > Off-farm Income	109,883	2,957	3,004				

Source: 2006 Agricultural and Cattle Farming Census; National Household Survey - PNAD 2006 - (micro-data)
Note 1: Net farming income - (Adjusted GPV considering the additional for agribusiness – current expenses)
   Other farming income – (rural tourism, mineral exploration, processing for third parties, non-farming activity income)
   Off farm income - (income from other non-farming work and pensions, allowancse
Definition of Agricultural Household: 4.1 - At least one person in the household has thE principal occupation of self-employed or employer in agriculture
5.1 - The head has principal activity of self-employed, employer in agriculture
Note 2: US$ 1 = R$ 2, 1763, currency rate at 07.01.2006

In relation to the PNAD coefficients of variation, low values are seen, with estimates varying between 3% and 14%, indicating excellent and good accuracy, respectively. The estimates for enumerating the agricultural household are excellent in the five geographic strata, while for farming and household incomes, the CVs now increase slightly at 14% and 12%, respectively, in the Midwest region. In this region, unlike the South and Southeast regions, the households, when agricultural, are generally

separate from the rural holding, which in the selection of households in the PNAD sample can be separated from this activity, mainly among the large farmers, where this is more common. In this case, establishing direct correspondence between household and production unit based on the PNAD sample now becomes more problematic

The same rationale applies if we look at groups of income and area, where the larger farmers, namely, those with larger area and income, tend to be worse represented in the selection of the household sample. In this specific case, we compare these variables in table 3 for the agricultural households in the narrow concept, approaching the concepts 2.1 and 5.1 in table 1. In fact, as already mentioned, in the case of PNAD we enumerate only the main work of self-employed or employer in agriculture, leaving aside the secondary work and those who were unemployed during the reference week, but not in the 365 days previous to the survey, since the area is only surveyed for the main work and use of the head as self-employed and employer helps greatly in solving the problem of duplication of the same area in a single establishment.

Table 3 shows that, for Brazil, the enumeration of households is close to that in the Census and PNAD, 3.3 and 3.6 million, respectively. Important information is that the PNAD sample does not permit enumeration of any agricultural household whose income is higher than 500,000 dollars a year, although it does enumerate households show area is larger than 500 hectares. Although the enumeration of the households is very close between the surveys, when broken down in gross income figures, the PNAD enumerates much fewer households when the income is positive and more than 10,000 dollars a year, while the contrary happens with the enumeration in the $1000-10,000 range. On the other hand, the enumeration based on the stratification in groups of area is very similar in both surveys, recalling that the Census is able to enumerate 170,000 farmers (landless) more than the PNAD.

The result obtained, when assessing in groups of income and area, may suggest that in the PNAD under-enumeration and underestimates are found in the results for the income bracket with more than $200,000, which is a widespread problem in every region in the country. This pattern of best enumeration in the area strata and precarious enumeration in those of income seems to apply to all regions, which again

raises the question of incompatibility of the income concepts between the two surveys, even when addressing gross income.

Table 3: Enumeration, farming income, area and Coefficient of Variation (CV) of agricultural households (Narrow Concept) Census X PNAD - Brazil and Region, 2006.

Agricultural Household (Narrow Concept)	CENSUS Enumeration	CENSUS Net farming income ($ million)	PNAD Enumeration	PNAD CV (%)	PNAD Net farming income ($ million)	PNAD CV (%)	Agricultural Household (Narrow Concept)	CENSUS Enumeration	CENSUS Area (million ha)	PNAD Enumeration	PNAD CV (%)	PNAD Area (million ha)	PNAD CV (%)
Brazil													
Total	3,302,699	16,243	3,606,086	(3.5)	12,377	(5.0)	**Total**	3,302,699	195.7	3,606,086	(3.5)	361.1	(13.1)
Gross Income*							**Area Group***						
$1- $1000	1,368,676	-1,305	1,241,297	(5.6)	646	(5.6)	**without area**	170,051	-	-	-	-	-
$ 1000 - $ 9.999	1,391,694	-338	2,023,037	(3.9)	5,814	(4.1)	**0.1 a 9.99 (ha)**	1,494,175	4.9	1,972,462	(4.5)	6.1	(4.2)
$ 10.000 - $ 199.999	516,338	7,070	221,686	(7.1)	5,555	(8.5)	**10 - 100 (ha)**	1,333,163	42.5	1,294,079	(4.5)	42.4	(4.9)
$ 200.000 - $499.999	17,128	1,192	1,225	(60.9)	362	(60.6)	**100 - 500 (ha)**	245,115	49.7	261,171	(7.3)	50.5	(7.3)
>= $500.000	8,863	9,624	-	-	-	-	**> 500 (ha)**	60,195	98.6	76,258	(10.2)	262.1	(18.0)
North													
Gross Income*							**Area Group***						
$1- $1000	131,296	-165	47,069	(18.2)	30	(17.7)	**without area**	25,239	-	-	-	-	-
$ 1000 - $ 9.999	177,646	91	266,221	(8.9)	766	(8.6)	**0.1 a 9.99 (ha)**	92,465	0.3	97,119	(7.1)	0.3	(9.1)
$ 10.000 - $ 199.999	30,854	667	14,421	(22.4)	267	(21.7)	**10 - 99 (ha)**	161,537	6.5	166,980	(14.5)	7.6	(14.4)
$ 200.000 - $499.999	620	139	-	-	-	-	**100 - 499 (ha)**	50,706	9.2	66,237	(18.8)	11.1	(17.7)
>= $500.000	259	317	-	-	-	-	**>= 500 (ha)**	10,728	19.3	6,484	(16.0)	20.0	(45.6)
Northeast													
Gross Income*							**Area Group***						
$1- $1000	893,021	-153	977,704	(6.8)	479	(7.0)	**without area**	118,485	-	-	-	-	-
$ 1000 - $ 9.999	468,500	423	712,778	(7.1)	1,456	(6.5)	**0.1 a 9.99 (ha)**	869,888	2.2	1,306,695	(6.2)	3.3	(5.8)
$ 10.000 - $ 199.999	97,601	2,263	15,313	(19.0)	423	(27.7)	**10 - 100 (ha)**	394,793	12.4	386,725	(8.1)	11.5	(9.4)
$ 200.000 - $499.999	2,355	478	-	-	-	-	**100 - 500 (ha)**	67,389	13.4	60,128	(17.4)	11.6	(18.8)
>= $500.000	1,658	2,455	-	-	-	-	**> 500 (ha)**	12,580	16.6	18,961	(26.7)	91.5	(34.3)
Southeast													
Gross Income*							**Area Group***						
$1- $1000	164,772	-306	87,649	(10.9)	52	(11.8)	**without area**	11,873	-	-	-	-	-
$ 1000 - $ 9.999	279,436	-100	357,401	(6.6)	1,193	(8.1)	**0.1 a 9.99 (ha)**	240,145	1.0	220,271	(7.8)	0.9	(9.3)
$ 10.000 - $ 199.999	132,956	1,366	66,943	(12.3)	1,846	(17.5)	**10 - 100 (ha)**	271,493	8.9	242,766	(7.3)	8.3	(8.1)
$ 200.000 - $499.999	5,074	-130	-	-	-	-	**100 - 500 (ha)**	53,140	10.8	56,031	(12.7)	11.6	(14.0)
>= $500.000	2,652	3,624	-	-	-	-	**> 500 (ha)**	8,239	9.5	11,818	(29.1)	35.9	(53.0)
South													
Gross Income*							**Area Group***						
$1- $1000	117,678	-214	97,689	(15.1)	64	(15.5)	**without area**	12,308	-	-	-	-	-
$ 1000 - $ 9.999	361,858	275.1	535,136	(8.9)	1,938	(9.1)	**0.1 a 9.99 (ha)**	261,128.0	1.3	314,401.0	(9.7)	1.5	(10.0)
$ 10.000 - $ 199.999	223,522	2,936.4	86,900	(13.5)	1,952	(13.5)	**10 - 100 (ha)**	396,131.0	10.4	366,840.2	(10.0)	9.9	(9.5)
$ 200.000 - $499.999	6,276	723.0	597	(100.3)	171	(100.3)	**100 - 500 (ha)**	34,695.0	7.4	39,204.6	(12.1)	8.0	(12.5)
>= $500.000	2,140	2,542.1	-	-	-	-	**> 500 (ha)**	7,212.0	7.8	16,462.6	(19.6)	57.8	(38.6)
Midwest													
Gross Income*							**Area Group***						
$1- $1000	61,909	-467	31,187	(17.8)	20	(17.1)	**without area**	2,146	-	-	-	-	-
$ 1000 - $ 9.999	104,254	-1,028	151,501	(10.4)	462	(10.3)	**0.1 a 9.99 (ha)**	30,549	0.1	33,976	(14.1)	0.1	(17.2)
$ 10.000 - $ 199.999	31,405	-161	38,110	(14.3)	1,067	(17.0)	**10 - 100 (ha)**	109,209	4.2	130,768	(11.6)	5.1	(14.6)
$ 200.000 - $499.999	2,803	-18	628	(71.1)	191	(71.6)	**100 - 500 (ha)**	39,185	8.9	39,571	(13.4)	8.3	(15.2)
>= $500.000	2,154	686	-	-	-	-	**> 500 (ha)**	21,436	45.4	22,531	(15.4)	56.9	(29.0)

* Note: was not considered the households with incomes equal to zero and the area.
Source: 2006 Agricultural and Cattle Farming Census; National Household Survey - PNAD 2006 - (micro-data)
Note 1: Net farming income - (Adjusted GPV considering the additional for agribusiness – current expenses)
Definition of Agricultural Household:
(Narrow Concept) - The head has principal activity of self-employed, employer in agriculture
Note 2: US$ 1 = R$ 2, 1763, currency rate at 07.01.2006

Leaving aside the enumeration and assessing the income and area for the classes used in table 3, it is found that the estimated area is quite close to that obtained in the Census for the area classes of up to 500 ha, while PNAD overestimates the figure in the classes of area over 500 ha. In the country's aggregate the estimates for areas diverge widely for the two surveys, with PNAD estimating almost 164 million hectares more. This also results in over-estimation of the total agricultural area in the country

level. The estimate of the PNAD, albeit restricted to agricultural households (360 million ha) exceeds even the total area calculated by the 2006 Agriculture Census (330 million ha).

Now when we assess net income for the census data, a concentration of deficit figures is found for the individuals who are in the lower gross income brackets (10,000 dollars and under). There are few cases where expenses exceed income in households with income over 10,000 dollars a year, which only happens in the Southeast and Midwest regions. With regard to the latter region, it is found that only households with a gross income of more than 500,000 dollars have a positive net income, and it is the only region where the net total income is negative. This result opens up a series of questions for the information collected on the income of the farms in that region, since the average area of the farms is the largest in the country, around 290 hectares, and the farms in general are considerably capitalized.

Concerning the calculation of the coefficients of variation it is generally found that excellent and good estimates for groups of income and area represent small and midsize rural farmers with income and area of up to $200,000 and 500 ha, respectively. The CVs for the income groups of $200-500,000 and area over 500 ha are 61% and 18%, respectively, this latter figure still acceptable. The income, when categorized and distributed among the regions, shows very poor estimates for high income brackets and, as already mentioned for over $500,000, there is no information in the sample. In these rarer strata, representing around 0.3% of the farms in the Census, yet 55% of the net income, the PNAD sample does not permit estimates and, when it does, in the case of households with income of $200-$500,000, the estimate is quite poor, bearing in mind that this bracket is also rare since it represents only 0.51% of the farms in the Agricultural Census. For example, the CVs for this income bracket are 100% and72% in the Midwest and South, respectively.

In relation to area slightly more consistent estimates are found, considering that the strata considered are better represented and are not such rare events. For example, in the Agricultural Census the area strata of 100-500 hectares and over 500 ha represent approximately 7% and 2%, respectively, which is reflected in the coefficient of variation. For these groups of area the coefficients for enumerating the agricultural household were 7% and 10% for Brazil, while for the estimate of total area this figure was 7% and 18%, respectively. When we examine the regions, we find non-consistent estimates of agricultural household and area for the group of area with over 500 ha, with

CVs varying from 16% to 29% in the case of enumeration and 29% and 53% in relation to total area of the farm. Generally the results indicate that there is little density in the PNAD sample to represent slightly rarer events, as in the case of the farms over 500 ha in area. In the Midwest, where according to the Agricultural Census there are a greater number of these farms (10% of all farms that represent 77% of the total area) the enumeration CV is considered good, representing 15% of variation. On the other hand, in the Southeast region these farms are 1.5% of the total, according to the census data, and the enumeration CV is as much as 29%.

4 – Final comments

This study emphasized that, although there is a good response on the question of enumeration of agricultural households among the household surveys and agricultural census, the income does not accompany this. The results indicate that we can use it as an analytical unit in both surveys and characterize them correctly, based on the household surveys and family-related attributes, while using the characteristics of the Brazilian production sector for census data. However, "borderline" variables between the farm and the household, such as income, for example, are not clearly represented when the aim is to recognize the mixed activity characterizing the agricultural household. When first glancing at the agricultural household, this article shows that the Agricultural Census and household surveys manage to assess what is closest to their domains, and the analyses of their borderline variables are harder to measure more completely and reliably.

In the example of income addressed herein, conceptual problems in both types of survey were the main reason for the non-convergence of the findings, and this duality in the context of the agricultural household is, to a certain extent, poorly demonstrated. As a result, the analysis of income proved to be more suitable in PNAD and POF to examine them, looking at the family's own earned income, regardless of its farming performance, while the Agricultural Census had a better measurement of the earnings of the production activity and its operating and financial result. In short, this ability of both types of survey – Agricultural Census and household – to measure variables that mingle within these two contexts of the agricultural household, farm and family, requires therefore conceptual approaches between these surveys to be able to more clearly portray this universe. Another point concerns the non-coverage of PNAD

for self-employed and employers with an annual income of more than $ 200,000, which requires this population group to be more representative, considering that it represents more than 70% of the income earned in agriculture. On the other hand, in relation to area, a good coverage by PNAD is found, showing close approximations of this variable in most of the regions and sub-groups considered, although it needs better sample representation when the farm is more than 500 ha in area.

Another aspect concerns the efficiency of the collection procedures. It is found that PNAD permits better collection of household income data when compared with the Census, bearing in mind that each household member is asked the question separately and not about the farm or household as a whole. It should, however, be emphasized that when we compare the PNAD data with those of another IBGE household survey, POF – whose concept of income is the same – the income variable seems to require more complex collection procedures, which permit longer and more detailed contact in completing the questionnaire, which to a certain extent is unfeasible in a short on-the-spot collection. This result shows that in a survey by sampling a farm or even household, as in the PNAD example, perhaps it is necessary to set income collection procedures similar to those of POF, in addition to also adopting procedures to collect the income earned and the income appropriated. This raises a further challenge for structuring a survey model that measure correctly (and permits relations) while at the same time figures that are hard to measure relating both to the household and family income, the farm, as in the variables relating to the farm's finances. A third important point worth mentioning is that the concepts of an agricultural household addressed herein were based on the Wye Group Handbook, which defines guidelines for agricultural statistics for developed countries. However, in the case of Brazil, perhaps more appropriate definitions should be considered that reveal the particularities of the country's land ownership and family structure. This is the case in recent policies applied to the family farmer, income transfer programs and compensatory policies, as in the case of the universality of rural pensions. In the context of the results herein, where there is a very large universe of farms with lower farming income than the off-farm income, and a very broad universe of deficit farms, the off-farm wage earnings of the head of the household and his family are now an interesting element for investigation in the Brazilian case.

Lastly, the sample survey proved quite relevant for characterizing the agricultural household, principally with regard to enumeration, although it requires

better representation of farms in higher brackets of income and area. As mentioned, in a household sample survey in this bracket of income and area, it is hard to establish direct associations between the farm and household. However, as a first assessment, the results generally suggest that the PNAD is quite representative with regard to farms under the responsibility of very representative small and midsize farmers, but responsible for a smaller portion in the income earned and total area of the country, considering a table plan with regional details to large regions. It is, therefore, possible to consider the adoption of a household survey strategy to portray structural attributes of agriculture for a significant portion of the agricultural households and Brazilian farming activity, but not for all of it and for a certain limit of detail data.

In conclusion, we can consider a household sample drawing to represent the regional differences of the small and midsize Brazilian farmer, using the lists and all the tradition and expertise of IBGE in planning and running a household sample survey along the lines of PNAD, but with similar characteristics in relation to some collection instruments of POF and the Agricultural Census. This is the case of income, for example, that in the Census is able to measure the operating income of the business, while POF enables better collection of off-farm income data, and thus problems inherent to the farming activity, such as seasonality, are more easily bypassed.

The integration of agricultural and household survey in the way proposed by the *Global Strategy* demands research effort in many aspects, including ways to achieve good balance among completeness, disaggregation and quality. Here is possible to indicate at least two topics: the conceptual conciliation, operational investigation, calculation and report of farm (generate) income and household (disposal) income; frame options and sample design for a integrate farm and household survey system.

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Annex

Difference between household surveys to capture income (POF X PNAD).

In both surveys, the entry of earnings from the activity of the employer or self-employed (takings) does not give negative values. The values calculated accordingly, therefore, must be considered to be a component of the "income earned" by the family or of the "disposal income". However, the monthly earnings available in the POF are calculated using the product of the value received in money and/or in benefits in the last month and the number of months when there were earnings within the annual period, divided by twelve. In this case, the monthly income represents a twelfth of the annual income. In PNAD, the reported income is monthly, in the survey's reference month. Therefore, to obtain annual earnings, information concerning the time worked in the occupation/activity during the year may be used (12 x monthly income). In some way, the POF method of using the annual income permits a better adjustment than that of PNAD when addressing agricultural activities, since seasonality is an outstanding feature in the annual production. Moreover, POF goes into the field throughout the year, investigating households at harvest time and between harvests, while employment and income in the PNAD is investigated only in the reference week.

PNAD and POF permit registering the earnings of each member of the household, whether from each job of individuals, allowances, pensions and government

income transfer programs. However, the off-farm income is more detailed in POF than PNAD (the off-farm income in POF has a large share in the household income). Another point is that in POF, the questionnaire stays in the household for a nine-day period, which make the investigated variables more accurate, thereby reducing problems of memory, which are more common in surveys completed in a short space of time by the enumerator.