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Collecting Sketch Maps to Understand Property Land Use and Land Cover in Large Surveys

ÁLVARO DE OLIVEIRA D'ANTONA,

Anthropological Center for Training and Research on Global Environmental Change/Indiana University and NEPO/Unicamp

ANTHONY D. CAK, and

Anthropological Center for Training and Research on Global Environmental Change/Indiana University

LEAH K. VANWEY

Anthropological Center for Training and Research on Global Environmental Change/Indiana University

Abstract

This article describes a method to collect data on the spatial organization of land use within a rural property as part of a large-scale project examining the linkages between household demographic change and land use and land cover change in the Brazilian Amazon. Previous studies used several different spatial approaches, including maps and satellite images, to improve the information collected in standard survey questionnaires. However, few used sketch maps to obtain information from the point of view of the survey respondent about the spatial organization of land use and infrastructure. We developed a method of creating sketch maps with respondents to describe their properties. These maps then provided a spatially referenced database of the social and land use organization of the properties from the perspective of the respondent. Systematic rules allowed sketches to be used in subsequent spatial analyses in combination with satellite images and Global Positioning System reference points

Keywords

sketch maps; land use; Brazilian Amazon; GIS

The method presented in this article was implemented as part of a large-scale survey of households designed to elicit information about household demography, economy, and land use. The larger project links these data to remotely sensed (satellite) data on land cover and to other biophysical data from a variety of sources. In doing so, it follows practices for linking social survey data to satellite data developed in the population and environment research community in the past two decades (Moran et al. 1994; Liverman et al. 1998; Castro et al. 2002; Fox et al. 2003; Rindfuss et al. 2004; Turner, Moran, and Rindfuss 2004; Evans, VanWey, and Moran 2005). Among these practices is using sketch maps during interviews to establish rapport between interviewer and respondent and to improve comprehension of land use in the survey (Turner et al. 2001; Bilsborrow, Barbieri, and Pan 2004; Brondizio 2005). Sketch maps have long been used in anthropology to help us understand the organization of production, though we are not aware of any published articles on this use. Here, we describe

a method intended to improve rapport and potentially improve accuracy of survey responses, but we go beyond this and provide comparable spatially explicit information on the organization of land use and infrastructure on surveyed properties.

The study of population and environment has depended on linked social survey and satellite data to understand the role of human demography in land use and land cover (LULC) change. Many researchers have developed methods for linking the two sources of data, particularly for accurately identifying the boundaries of properties (or fields) and linking these boundaries to satellite-based land cover classifications. These researchers have usually treated the survey data as spatially explicit only in the sense that they are linked to a property; they have not attempted to understand the spatial organization of the property with survey data. These boundaries are then overlaid on a classified satellite image, which provides information about the spatial organization of land cover within the property, with the classification based on ground truth points collected in the course of survey data collection but not necessarily in the survey itself.

This set of practices leads to a privileging of satellite data as a more accurate measure of land use (inferred from land cover classifications or from hybrid land use/land cover classifications). This can be problematic in practice, both because of the errors inherent in satellite image classification and because of the inability of satellite data to distinguish small objects and between certain types of land uses. For example, Landsat images with a resolution of 30 m $\times$ 30 m do not allow the analyst to effectively identify houses, particularly in distinguishing houses from barns or other infrastructure. In our study area, satellite image analysis is particularly difficult when considering cocoa plantations, which are indistinguishable from unmanaged secondary growth in imagery. Using land use data only from satellites is also problematic because the world looks different from a ground-based perspective and from a satellite-eye view. Respondents on the ground delineate boundaries between fields more precisely than pixel analyses of satellite data and they provide key information about the relative positions of important infrastructure (wells, barns, fences, houses, animal pens, and other structures used in the processing of agricultural products) and fields. This information is invaluable for understanding the social organization of production, including the intergenerational relationships embodied in the spatial positions of households, and for understanding and predicting LULC change.

MOTIVATION FOR THE METHOD

In our project, we wanted to expand the role of sketches for collecting information about the spatial organization within the property from the point of view of the respondent. The point of view of the respondent is used to indicate that the sketch was the result of information obtained by the interviewers from the respondents, as opposed to information obtained by the interviewer from walking around the entire property or from satellite images. Satellite data provide a view of the organization of land cover within the property, missing land uses that are indistinguishable spectrally or that are too small to perceive in imagery of standard resolution.

¹ We thus developed the “Spatial Sketch of the Property” (SSP) instrument to produce, with the help of surveyed farmers, property sketches that allow us to

1. *increase confidence in the information recorded in the questionnaires about land use and land cover by facilitating interaction between the interviewer and interviewee, particularly in recalling past land use and increasing the interviewers’ understanding of land use and management on the properties.*

¹More features would clearly be distinguishable with imagery of a finer spatial resolution (e.g., IKONOS) or hyperspectral imagery (e.g., MODIS), but these types of products are not yet widely used in studies of this sort because of the expense of the product or processing or other limitations of the data.

2. *obtain a spatial representation of agricultural land cover and use and infrastructure on the property* in relation to the property grid created by the Brazilian National Institute for Colonization and Agrarian Reform (INCRA), while minimizing interviewer bias and allowing interpretation and comparison of SSPs.
3. *spatially locate different types of land use in a manner consistent with other spatially referenced data* (e.g., satellite images) for improving satellite image classification by including other perspectives that help differentiate land covers and land uses.

In developing an instrument to accomplish these goals in a large-scale survey, we faced two main challenges. The quality of spatial information depends on the ability of the interviewer to adequately understand and record information while conducting surveys with farmers. Agricultural planting routines or crop combinations are potential sources of misunderstanding between questionnaire responses recorded (e.g., a farmer may have 5 ha of cocoa and 5 ha of bananas, and the sketch will help the interviewer understand that these are the same 5 ha). Survey responses also are subject to particular classification systems, hierarchies, and units of analysis: among different respondents in the Amazon, land uses can be described using several spatial units, such as the hectare, *braça* (2.2 *bracas* = 1 ha), *tarefa* (4 *tarefas* = 1 ha), and *pés* (1,100 *pés*/cacao trees = 1 ha, 1,600 *pés*/black pepper plants = 1 ha), requiring comprehension of each unit to fully understand their descriptions of space. In a large survey sample where a team of interviewers with different backgrounds is used, interviewer bias (i.e., differences attributed to education or experience) can add to such variation in survey responses.

FIELDWORK

The SSP was used as part of a group of survey instruments applied in 2005 in a rural colonization area near Altamira, Pará, Brazil. The settlement study area comprised approximately 403,000 ha and 3,916 rural lots along the Trans-Amazon Highway (BR-230) and secondary roads between the municipalities of Altamira and Uruará (Figure 1). In 1970, Altamira became one of the flagship centers for Amazonian development and colonization following construction of the highway and associated settlement plans by INCRA (Moran 1981). Colonists were transported into the region to settle on farm plots of roughly 100 ha, organized in a grid with property fronts along the highway or feeder roads (see Figure 1). Properties along feeder roads were designed to be approximately 500 m (of road frontage) $\times$ 2,000 m, whereas those on the highway were approximately 400 m $\times$ 2,500 m.

After nearly 30 years of development, population increased from 1,000 people (Moran 1981) to today's population of around 50,000 (Instituto Brasileiro de Geografia e Estatística 2000), not including the city of Altamira but including Medicilândia and Brasil Novo, two rural villages that have now developed into small cities. The overall area is predominantly rural, with small, familial properties that typically combine cattle ranching with annual crops for subsistence and local markets and/or perennial crops, mostly cocoa. The resulting development has changed land cover in the region from a predominantly forested landscape to a predominantly nonforested landscape, chiefly of pasture and agriculture (Brondizio et al. 2002). Yet the logic of colonization remains in the organization of properties. A small portion of the original lots deeded to colonists has experienced subdivision or aggregation, and even in these cases, residents think of their properties in terms of original INCRA boundaries.

Because of the size of the study area and the magnitude of our study (we visited 971 households on 399 rural properties), we employed students and local residents as interviewers, while the primary research team served as supervisors. Interviewers included individuals with varying levels of experience with survey methods. Most were Brazilian undergraduate university students from local and other collaborating universities pursuing degrees in anthropology, environmental science, biology, agriculture, and social service. The interview team also

included local residents without university experience but with extensive experience in fieldwork. To ensure quality data, all interviewers completed 2 days of training on structured questionnaires, the SSP, and interpretation of satellite images, followed by 2 days of supervised interviewing before beginning independent data collection. Throughout fieldwork, supervisors (i.e., professors, postdoctoral researchers, and graduate students) accompanied interviewers during interviews.

Sketches were only one of several data collection instruments used in fieldwork and were applied to male heads of household (generally at the commencement of the interview), followed by a structured questionnaire covering land use, property characteristics, off-farm labor, and household economic characteristics. At the same time, information on household demographic and economic characteristics was collected from female heads of household using a separate survey questionnaire. Maps and satellite images were used to locate surveyed properties, orient interviewers and respondents in space, and foster discussion about LULC change both regionally and on the property. Each interview team carried a large map (Figure 2) showing a false color satellite image of the entire settlement study area and a smaller map (Figure 3) with two false color satellite images showing the surveyed property in 1996 and in 2003. Additionally, maps showing land cover in 2003 for the interviewed property without property boundaries were left with each interviewed household as a present.

SPATIAL SKETCH OF THE PROPERTY

The Sketch Worksheet

The blank SSP was printed on A4 paper, with information on both sides. The single sheet of paper made the completion of the sketch easier for the interviewers, as sketches often were completed while standing with a clipboard, sitting and drawing in the dirt, or crouching over the large map. The front page of the sketch map sheet (Figure 4A) contained instructions and fields for locating the interviewed property (i.e., municipality, village, street), relating the SSP to other survey instruments for a property (e.g., codes for property and interview number) and identifying the subjects who aided in the sketch map design. Additionally, this page included questions about property limits (e.g., area, perimeter, total number of INCRA lots comprising the property) and a table for listing registered global positioning system (GPS) coordinates of the property. These coordinates, marking houses and corners where the property touched the road, helped import the sketches into a geographic information system (GIS) for processing and linking data in the SSP with satellite data.

Because the majority of respondents owned one original INCRA lot (a rectangular shape of about 100 ha), the delimited area was sufficient to accommodate drawing most of the properties using the scale of 1 cm: 100 m, as 1 cm $\times$ 1 cm equaled 100 m $\times$ 100 m, or 1 hectare, the standard unit of area in the questionnaires and a unit known by the interview subjects. This allowed information on the sketches to be immediately compared with information in the questionnaires by interviewers and field supervisors. At the bottom of the back page was a legend with elements to be drawn on each sketch (e.g., streets, houses, bodies of water), providing both a checklist for the interviewer and standardized symbols for map elements, thereby reducing bias and dependency on the expertise of the interviewer as well as guaranteeing better comparability between sketches made by different interviewers.

Orienting in Space

At the start of each interview, a large map (130 cm $\times$ 66 cm) of the entire study area (Figure 2) was shown to the interview subjects. The interviewer described the locations of major urban centers and roads on this map, which displayed these features on top of a false color representation of a 2003 Landsat TM 5 satellite image.² The discussion of this large map helped

the interviewer locate the property within the study area (and determine which direction was north and the relative position of urban areas) and helped the respondents understand and visualize the process of land cover transformation, especially deforestation, in the entire study area. This process typically lasted about 15 minutes but was extended based on respondents' level of interest.

After discussion of the central elements of the study area map, the interviewer next moved to the scale of the rural property through the use of a second map (21 cm × 25 cm) that contained satellite images of the property taken in 1996 and 2003 (Figure 3).³ These satellite images were used simultaneously with the survey questionnaires and the SSP to relate each instrument to the other. However, it was important to allow time for the respondent to transition between these different survey instruments, given their differences in scale and concept. Almost all respondents had some level of difficulty associating the polygons on the property maps as representations of their properties. As with the large regional map, the respondent generally oriented him- or herself by the location of significant elements on the satellite image, such as streams and roads and their positions relative to each other.

Once the respondents were familiar with the satellite image and the property location, they often corrected problems with the maps we presented to them. For example, they would quickly notice imprecise property boundary limits or errors with the lot boundaries in relation to property access roads, helping us to fix eventual errors in our maps. Many respondents also quickly identified different types of land cover in the satellite image after a brief explanation or description of the image.

However, in many interview situations, we found that the respondents did not always have an exact notion as to the relative size, amount, and time period of used areas of a property. The interviewers' initial inclination was to privilege the "scientific" information contained in the satellite images. Nevertheless, we stressed in both interviewer training and in reviewing the sketches that when there were discrepancies between what the respondents stated and what was apparent on the satellite images, the interviewers should probe for additional information, rephrase questions, or in the end, accept what the respondents reported as accurate. Because the satellite images and our preexisting property boundaries have their own sources of error, including interviewer interpretations of the images and the fact that the latest available image at the time, a 2003 Landsat TM 5 image, predated the fieldwork by 2 years, we emphasized to the interviewers that during fieldwork, we must use the information provided by respondents so that we could later compare it to the other information collected during interviews. To avoid reproduction of the satellite image in the sketches, we monitored the interviewers' practices by comparing their completed sketches to the satellite images, looking for too much consistency between them as an indication that interviewers were not adequately representing the viewpoint of the respondent.

Drawing the Sketch

Although all interviewers were required to complete the sketch, they had the flexibility to choose the appropriate time for creating it, depending on the flow of the interview. It typically was completed at the start of the interview, often after presentation of the other maps and satellite images, but sometimes interviewers chose to develop the sketch throughout the entire interview, completing it before specific questions about land use and production.

²Original in color. Here, areas in gray indicate different types of land use, areas in white indicate clouds, and areas in black indicate cloud shadows and water bodies.

³Because of confidentiality, this figure is an illustration of the field instrument and does not show the exact property boundaries and scale. Original in color. Gray-scale representation is similar to that in Figure 2.

Instructions for drawing the sketch map were designed so that interviewers without previous experience in map making could create sketches according to the objectives of the project. However, interviewers were free to adjust these procedures in response to particular survey experiences. For example, some respondents did not want to use printed instruments to describe their properties, instead using other methods such as drawing on the floor with their hands (Figure 5A). Other respondents were very adept at using maps and satellite images to aid their descriptions (Figure 5B).

According to the instructions provided, the interviewer should

1. Position the street-facing side of the property at the top of the sketch page; draw and label the street, pointing the direction to Altamira (if on the Trans-Amazon Highway) or the direction to the Trans-Amazon Highway (if on a crossroad).
2. Using a compass, identify north in the sketch by facing the front of the property (i.e., the street-facing side) and indicate it in the legend of the sketch using an arrow.
3. Define the scale enough so that the entire property be shown, and write it in the legend. Ideally, the scale was 1 cm: 100 m or some multiple of 100 m (e.g., 1 cm: 200 m). Scales not involving even hundreds (e.g., 1 cm: 250 m) were discouraged, and scales not involving a multiple of 50 (e.g., 1 cm: 56 m) were prohibited.
4. With solid lines, draw the property boundaries to scale, writing the boundary length next to each boundary side. At the front right and left corners of the property and along the lateral boundaries, locate GPS points with Xs and point numbers.
5. Using dashed lines, relate the property boundaries to initial INCRA lot boundaries when necessary: If the sketched property is smaller than an INCRA lot, include the other part of the original lot in the sketch. If the property is larger than the original INCRA lot, draw the boundaries of all lots that form part of the property on the sketch.
6. Write outside references such as the names of neighbors to help locate the interviewed properties for future return.
7. Draw property features inside the boundaries, identifying each using local terminology:
 - a. Water bodies (e.g., *igarapés* [streams], flooded areas).
 - b. Forest and secondary forest succession, including the total amount of area they comprised. Describe the areas using as much detail as possible (e.g., *capoeira*, *capoeira velha* [old capoeira] or *capoeirão*, to note secondary succession areas, their “ages,” or composition).
 - c. Areas in agricultural use such as *pomar* (orchard), *roça* (field), and pasture. Identify the type of land use (e.g., manioc, beans and rice together), the name of the person responsible for this area, and the total size (in hectares) of the area. Also, note complementary information (e.g., the length of time in use and previous land use) as a form of data collection about past land use on the property.
 - d. Buildings and structures such as corrals, sheds, dams, houses, and so forth. Identify each structure with text explaining the structure and a GPS point number, if taken.
 - e. Other elements not listed on the original SSP design instructions but identified or described during the interview.

8. Verify the consistency of the SSP with other instruments. The elements included on the sketch should correspond to the information collected in the other survey instruments.

f. During the interview, revise the SSP according to information gathered using the questionnaires. Switch from one survey instrument to another to add or correct information in each. For example, if at the start of the interview, the respondent describes an area of 0.5 ha of manioc on the property sketch map but does not mention production or selling of manioc or manioc-related goods during the subsequent survey, compare the different responses and ask about the omission. Conversely, ask for clarification if the respondent declared having 10 ha of pasture on the property in the household survey, but pasture is not included on the sketch.

g. After completion of all questionnaires on the property, cross-check the elements on the SSP with other sources, verifying the number of questionnaires given on a property, as all of the interviewed houses needed to be represented on the SSP; the types of land use, as information about land use indicated on the questionnaires should be comparable to the information included on the SSP; and the size of the property.

To complement these rules, we developed a method of *feature placement by property subdivision* on the sketch for collecting the most precise information about the exact and relative positions of property features, without needing to locate these features using GPS or other on-the-ground measurements. The interviewers located property features on the SSP by dividing the property into quadrants (e.g., right and left sides of the property, front and back sides of the property), either mentally or on the sketch, and subdividing the quadrants into subsequent quadrants for locating features.

To locate a house, the interviewer asked if it was closer to the right-side boundary or the left-side boundary; if it was closer to the right side of the property, the interviewer then mentally divided the right side of the property into smaller sections and asked if the house was located closer to the right side, middle, or to the left side of a particular section. Using these quadrants and soliciting information about relative position and distances (and using the scale on the sketch to verify distances), the interviewer was able to locate each feature on the sketch. This methodical procedure allowed other property elements to be easily introduced into the discussion of property land cover; for example, is the manioc plantation closer to the house or to the corral? Is the corn planted closer to the stream or to the black pepper plantation? Questions such as these helped position one property element in relation to previously mentioned property elements.

The same approach also was used for drawing property element boundaries and areas, allowing for estimation of land cover that could later be crosschecked with information reported in the survey questionnaires. Figure 6 shows a typical property sketch produced following these rules, though elements that could help to identify the property or its owners were intentionally omitted.

EVALUATION

Although we used sketches with all of our respondents and therefore cannot quantify the amount of improvement in questionnaires as a result of using the sketch map, the experience gained by visiting 971 households during the fieldwork and by testing how to incorporate the resulting sketches to a GIS suggests that the SSP improved the survey. Below, we consider how the use of the instrument helped address our objectives.

Objective 1: Increase Confidence in Information Recorded in Questionnaires

As in past research, the use of sketch maps constituted an effective means for exchanging information without significantly increasing the amount of time that each interview team spent on the property. The creation of each sketch lasted between 15 and 30 minutes, while the application of the household questionnaires lasted approximately 90 minutes (but could have lasted over 120 minutes for large households). On properties with many houses, some interviewers would spend an entire day conducting interviews with all of the residents of the property. If the interviewers had to walk the entire property to collect GPS points, the property interview could have lasted several days.

The sketches almost always encouraged vivid descriptions of past land use or household history that were difficult to capture by traditional survey processes (e.g., household characteristics during the period in which a particular part of the property was cleared). Such experiences were important for developing the interviewer-interviewee relationship and to improve understanding about the properties and families being studied.

Our experience observing interviewers elaborating the sketch suggests that sketches contributed to the improvement of the survey data, particularly during clarification of questions or discrepancies on the sketch or in the survey, in which the interviewer would engage the participation of the respondent to “fill in the blanks” for completing a sketch, rather than just asking what exists on the property in a questionnaire. This type of dialogue allowed the interviewer to include information normally not mentioned in the survey (e.g., elements such as small *roças* or agricultural plots without commercial value), indicating a positive effect in memory recall that needs further study and testing.

Objective 2: Obtain a Spatial Representation of Agricultural Land Use and Cover and Infrastructure on the Property

Subdividing the property, either mentally or physically on the sketch, to describe LULC allowed for a spatial understanding of the entire interviewed lot without necessarily having to survey the entire property on foot, essential for fieldwork with a large sample size. Sketches worked even if the interviewees had difficulty in answering questions about distances and areas using conventional measurement units. Finally, the use of scale and standard rules helped create a systematic method of acquiring information that otherwise would be difficult if the respondent was able to freely draw and describe the property.

Although drawing quality varied from one interviewer to another, given the diversity in education and experience, the use of standardized elements and rules for creating the SSPs (e.g., scale, positioning, and common symbology) resulted in fairly consistent property features, allowing revisions and corrections to surveys and sketches during fieldwork. The instructions for drawing were quickly learned by all during the short period of training and the first few interviews and revisions. Standardization transformed the sketches into an important tool for collecting and representing the spatial organization of property features (i.e., the relation between location of houses and the concentration of areas in use), something that could not be ascertained from the questionnaires or satellite images.

Objective 3: Spatially Locate Different Types of Land Use in a Manner Consistent with Other Spatially Referenced Data

Beyond LULC interpretation, the SSP served as a complement to the traditionally used methods of generating area of interest points for land cover classifications (e.g., ground-based knowledge of land cover at precise spatial location). Using our knowledge of property boundaries and GPS points taken on each property, we georeferenced a sample of these sketches to create a database within a GIS. We found that sketch maps could be imported into

a GIS, allowing for spatial analysis of the organization and management of properties that would be impossible without information about the positions of houses, fields, barns, and so forth (identifying reference). In this sense, data from the sketch maps provided information about land use and land cover that might not be apparent in satellite images with a fairly coarse resolution (e.g., 30 m × 30 m), such as Landsat.

The sketch maps also promoted the incorporation of local categories of LULC (e.g., *capoeira*, *juquirá*, new cocoa plantations, etc.), derived from the point of view of the interviewee. This experience highlighted a classification system that privileged land use over land cover, which has been the typical classification system in satellite image analysis. Although outside the scope of this article, differences between land use and land cover are significant issues in studies of LULC change, particularly between data obtained from surveys and from satellite images. At least some of the variation in data obtained from surveys and from satellite images is the result of this distinction in classifications between land use and land cover and used and nonused areas. For example, areas with a few trees could be classified as pasture by the respondent (e.g., an area in use for cattle ranching) but may be classified as secondary succession in satellite image classification (e.g., an area not in use/area of regrowth). The difference is not exclusively an error from one data source or another data source and could only be identified through the standardization and comparison of sketch maps through importation into the GIS.

However, variation in the quality of sketch maps, such as an imprecise scale or an omission of a land cover type, resulted in the need for selecting sketches with the highest clarity to be used in our GIS analyses. We selected sketches that had clearly outlined several different land cover types on a property, with well-defined proportions and boundaries; ideally, a property with a variety of land covers and land uses was important for capturing the variation in LULC in our study area. Sketches that did not provide satisfactory information (approximately 5% of the sketches), such as those with imprecise, unclear, or improperly labeled property or land cover polygons and boundaries, were not used as part of the GIS and were largely a factor of interviewer error and not of property characteristics. The quality of sketches improved over the course of fieldwork, and some interviewers were consistently worse at making the sketches than others.

CONCLUSIONS

The SSP supplied the information and services that we needed, increasing our confidence in the quality of data collected with other instruments and our ability to interpret results from those data. It provided an additional spatially referenced database of social and land use organization of properties. Analyses of these data from the perspective of respondents have the potential to not only offer important results about the spatial organization of properties but also to further our understanding of the relationships between scientific understanding and local knowledge and between land use (i.e., from the perspective of farm managers) and land cover (i.e., from the perspective of the satellite).

For future field campaigns, we plan only slight modifications to the instrument we used. Although the SSP can be georeferenced and used in a GIS, this process would be better facilitated with more accurate information about property boundary locations. In areas where researchers have high-quality and up-to-date cadastral maps, property limits could be predrawn on the SSP. However, where boundaries are not known (or are not sanctioned by government) or where the respondents need time to orient themselves, the process of drawing the boundaries (including defining the scale, orienting the sketch, and determining the property limits) will improve data collection. To improve georeferencing in the future, we plan to incorporate grids on the sketch map design page to facilitate more spatially accurate designs. In other study areas with irregularly shaped properties, we also plan to explore ways of measuring the angles

between edges of the property, using both high-tech (GPS) and low-tech solutions (protractors, rulers), without increasing the time and cost of fieldwork.

We expect this instrument to be useful in delineating the boundaries and organization of a variety of types of areas, including communal areas with fluid use rights (potentially completing the SSP with a group of users rather than an individual) or areas with very different land uses (e.g., extractivist reserves with all forest). The procedures we have developed are designed to produce a spatially explicit representation of a particular land area, including land uses and infrastructure. There is no reason why this approach would not work in areas with very different social, political, or ecological characteristics. However, future comparative work is necessary to determine the effectiveness of the instrument in such areas, especially for testing the precise benefits in accuracy that may be provided by the instrument.

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Biographies

ÁLVARO DE OLIVEIRA D'ANTONA, MA in anthropology and PhD in social sciences, is a research associate at ACT/Indiana University and NEPO. His research interests include population and environment, land use in the Amazon, and people and parks. Among his most recent published articles (all written with various coauthors) are "Property Size and Land Cover Change in the Brazilian Amazon" (Population and Environment, 2006), "Embodied Decisions: Reversible and Irreversible Contraceptive Methods among Rural Women in the Brazilian Amazon" (Human Organization, 2007), and "Household Demographic Change and Land Use/Land Cover Change in the Brazilian Amazon" (Population and Environment, 2007).

ANTHONY D. CAK, MS in biological sciences, is a graduate research assistant at ACT and PhD candidate in the School of Public and Environmental Affairs at Indiana University. His research interests include land use in the Amazon, stream and river ecology, and human-environment interactions. His most recent published articles as coauthor include "Integrando desenhos e imagens de satélite no estudo de mudanças no uso e cobertura da terra" (Ambiente e Sociedade, forthcoming) and "Inter-Annual Variation in Responses to Water Chemistry and Epilithon to Pacific Salmon Spawners in an Alaskan Stream" (Freshwater Biology, 2007).

LEAH K. VANWEY, PhD in sociology, is an assistant professor of sociology at Indiana University and faculty affiliate of ACT on Global Environmental Change and the Center for the Study of Institutions, Population and Environmental Change. Her research interests are in population and environment relationships, household demography, and intergenerational relations in developing countries. Recent articles include "Intergenerational Coresidence among Small Farmers in Brazilian Amazônia" (with Kara B. Cebulko, Journal of Marriage and Family, forthcoming), "Rural Household Micro-Demographics, Livelihoods and the Environment" (Global Environmental Change, 2007), and "Confidentiality and Spatially Explicit Data: Concerns and Challenges" (Proceedings of the National Academy of Sciences, 2005).

FIGURE 1. Study Area

NOTE: INCRA = National Institute for Colonization and Agrarian Reform.

FIGURE 2. Large Field Map of Study Area

SOURCE: Courtesy of the Anthropological Center for Training and Research on Global Environmental Change (ACT), Indiana University, Bloomington. Fieldwork instrument; original produced by Scott Hetrick for ACT/Indiana University, 2005.

FIGURE 3. Example of Small Field Map

SOURCE: Courtesy of the Anthropological Center for Training and Research on Global Environmental Change (ACT), Indiana University, Bloomington. Fieldwork instrument; 2005.

A

Land Use and Household Structure
ALTAMIRA, PA – JULHO / SETEMBRO 2005

Spatial Sketch of the Property

Entr. 97/98 | | |

PROPERTY LOCATION

Date (Day, Month, Year) | | | | | |

Interviewer _____

Municipality _____

Village or Community _____

Road/Street _____

Clebe _____

Lot _____

☐ Old Family ☐ Same Location ☐ New Family

Property | | | | |

Name of property owner _____

GENERAL INFORMATION

1. This spatial description is in respect to

1. ☐ the same property interviewed in 1997/98

2. ☐ multiple properties that exist on the property interviewed in 1997/98

3. ☐ multiple lots that exist on an identified property in 2005

4. ☐ other property that exists in a different location

2. List the people that are helping to respond to the questionnaire _____

3. Dimensions of this property

3.1 Total Area (ha)	
3.2 Front (m)	
3.3 Back (m)	
3.4 Sides (m)	

Use the table below to mark the points that you register with the GPS. Remember to indicate the points on the property drawing. Register points on the front of the property (right and left), one point on each existing house and, if possible, other important points for understanding the drawing (cleared areas, forested areas, pasture, benefactors, buildings, etc). In defining the 'right' and 'left' of the lot, sit there inside the property and look at the street. Describe the points on the form as precise as possible: if it is a house, whose house is it? If it is a cleared area, what is cleared? If there is construction, what is it about/for?

Location	Point #	Cod.	UTM X	UTM Y
Lot – right-side street limit		D	0	
Lot – left-side street limit		E	0	
Principal house (owner of lot)		C	0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	

B

— Roads — Property ↑ House

----- Paths — Intra lot □ Land use/cover

~~~~~ Water bodies   × GPS points   △ Structures

Scale

Team _____

Date _____

FIGURE 4. The SSP

SOURCE: Courtesy of the Anthropological Center for Training and Research on Global Environmental Change (ACT), Indiana University, Bloomington. Fieldwork instrument; produced by the authors for ACT/Indiana University, 2005.

NOTE: On the back of the SSP page was space for drawing the property sketch (Figure 4B). The borders of the blank space contained a series of tick marks, each 1 cm apart (twenty total horizontal marks and twenty-four total vertical marks), to serve as a scale (with the real equivalent of each cm to be defined by the interviewer) for drawing the property limits and internal features of the property. The nature of the study area, particularly its history as an area of government-planned settlement, had important implications for the design of the SSP.

FIGURE 5. Creating Sketch Maps

SOURCE: Courtesy of the Anthropological Center for Training and Research on Global Environmental Change (ACT), Indiana University, Bloomington. Altamira fieldwork, 2005.

FIGURE 6. Example of a Property Sketch

SOURCE: Courtesy of the Anthropological Center for Training and Research on Global Environmental Change (ACT), Indiana University, Bloomington. Fieldwork document created by Douglas Tyminiak, 2005 for ACT/Indiana University; adapted by the authors.