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Retrieving Indigenous Knowledge to a Digital Map: the Case of the Traditional Farming System in a *Hñahñu* (Otomí) Community, Mexico

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Abstract

Indigenous classification systems represent cognitive experiences of human groups in the geographical space. Formalization efforts of indigenous knowledge impose their own concepts, and therefore, it is often decontextualized. This research aims to formalize the farm land management system of an *Hñahñu* (*otomí*) community into a map using their own geographical concepts. A semantic analysis with Participatory Geographical Information System and Google Earth visualization is proposed as a method. Results show that farm land management system developed by *Hñahñu* include a set of geographical categories and subcategories. It was found that the *Hñahñu* classify them using the plot location in the landscape and the technique for providing water to grow crops as attributes. Although this recognition allowed the drawing of boundaries, the *Hñahñu* conceptualization of space challenged the conventional map, this led into a Google earth map. Google Earth showed the potential for improving indigenous knowledge representations within the community.

1. Introduction

Language is a good starting point to understand the way indigenous people perceive, conceptualize and understand their geographical space (Giannakopoulou *et al*. 2013). Although numerous researches on indigenous knowledge formalization have been conducted most of them impose their own scientific and technical concepts. Therefore, indigenous knowledge is often decontextualized and incompletely represented (Chapin *et al*. 2005). Using the indigenous geographic concepts and terms to formalize knowledge is a reasonable way to approach the indigenous view of geographical space. This research took place in the *Hñahñu* community of Huitexcalco in the dry Mezquital Valley, Mexico. The low precipitation and shallow soils led to the *Hñahñus* to trap water and soil in terraces which are typically built in gullies or up hillsides for cropping. This research aims to formalize the *Hñahñu* farm land management system into a spatial representation using their own concepts and terms. The formalization process encompassed both the elicitation of the *Hñahñu* farm terms and concepts in workshops and the production of a conventional map into a GIS and then into Google Earth.

2. Methods

The research proposal was presented to the community, and then they selected the people who would participate in the whole process. This selection included five elders ranging in ages from 70 – 78 years and eight farm experts between 18 to 50 years of age. Six of them were men and the others were females. The *Hñahñu* farmland management terms were elicited in a workshop using the words provided by Granados et al. (2004). Participants wrote the terms in colorful papers and discussed their meanings verbally. Using the listed words we undertook three field trips to different farm plots in the community aiming to clarify the meanings of some terms. Participants related with more precision each term with their most distinguished attributes such as the plot location on the landscape and the technique for providing water to grow crops. Once there was mutual agreement on the meanings, the participants offered a generic translation of terms in the Spanish language in the fashion of the semantic analysis performed by Wellen and Sieber (2013).
The formalization process encompassed both the visual spatial allocation of the categories and the drawing of boundaries on a photomap with satellite image, scale 1:25 000, as a PGIS tool (McCall and Dunn 2012). Participants were involved in a lengthy process of comparing and contrasting the most distinguished characteristics of number of farm plots in order to define the category to which they belong and its spatial extent. Finally, boundaries were digitized into a GIS to produce a conventional map. However, it received negative feedback and hence the map was transformed into Google Earth visualization.

3. Results

The research revealed four farm land categories: *Ngat'i, Ngats'i, Ndants'i* and *Mothe*. All of them, except *Mothe*, are positional terms. For instance, *Ngat'i* refers to a farmland plot that is 'in the down slope and near a deep gully'. Also, for the *Mothe* category, four specific subcategories were distinguished: M*øinñe, Ngadñe, Ñøt'athee* and *Mothee*. Categories and subcategories are complementary terms both make sense to farmland management plots. For instance, in *Mothe – møinñe, Mothe* is a functional term that means 'where water is retained in gullies or caught by rain', whereas *Møinñe* may be translated as a farmland plot 'where water is retained in the gully' this is again a positional term. Table 1 summarizes the semantic analysis by each category and subcategory.

Table 1. Semantic meanings of the *hñahñu* farmland plot categories and subcategories.

Category	Sub-category	Words	Translation meaning
Mothe		*Mo*= retains; *the*= water	Where water is retained in gullies.
	Møinñe	*Møin*= belly; *ñe* = gully.	Where water is retained in the gully (inside of the gully's belly)
	Ngadñe	*Ngad* = nex to; *ñe*= gully.	Where water is retained next to the gully.
	Ñøt'athee	*Ñøt'a* = flows; *thee*= water.	Where water flows from the gully.
	Mothee	*Mo*= retains; *the*=water	Where water is retained in gullies.
Ngat'i		*Ngat'i* = next to the gully.	In the down slope and near a deep gully
Ngats'i		*Ngats'i* = on the slope.	In the middle of the slope
Ndants'i		*Ndants'i* = on the top of the hill.	On the top of a hill

The semantic analysis provided useful insights to understand the way *Hñahñu* conceptualize their farmland plots. The farm plot location in the landscape, the water supplies strategies and the slope remains as the major attributes of the *hñahñu* farmland system. The central role given by *hñahñu* to those attributes can be explained by the rough environmental conditions in the community. Similarly, Barrera-Bassols *et al*. (2006) has pointed out that other indigenous groups have employed such attributes for soils and land uses classification purposes in central Mexico because they reflect their immediate potentials and constraints.

The conventional representation on a map of the farmland management categories and subcategories was at odds with the *hñahñu* view of geographical space. Participants experienced confusion in placing themselves on a map oriented north to south, and also faced difficulties to identify their own farm plots in a bi-dimensional projection. The *Hñahñu*, as other indigenous groups, have a direct relationship with the land. They use hilltops and gullies as the central spatial references (Oliveira 2005). In order to overcome this, the map was transformed into a Google Earth visualization provided with a digital terrain model. Such representation enabled participants to explore their farmland plots by categories and subcategories in a fairly realistic and detailed three dimensional view shown in Figure 1.

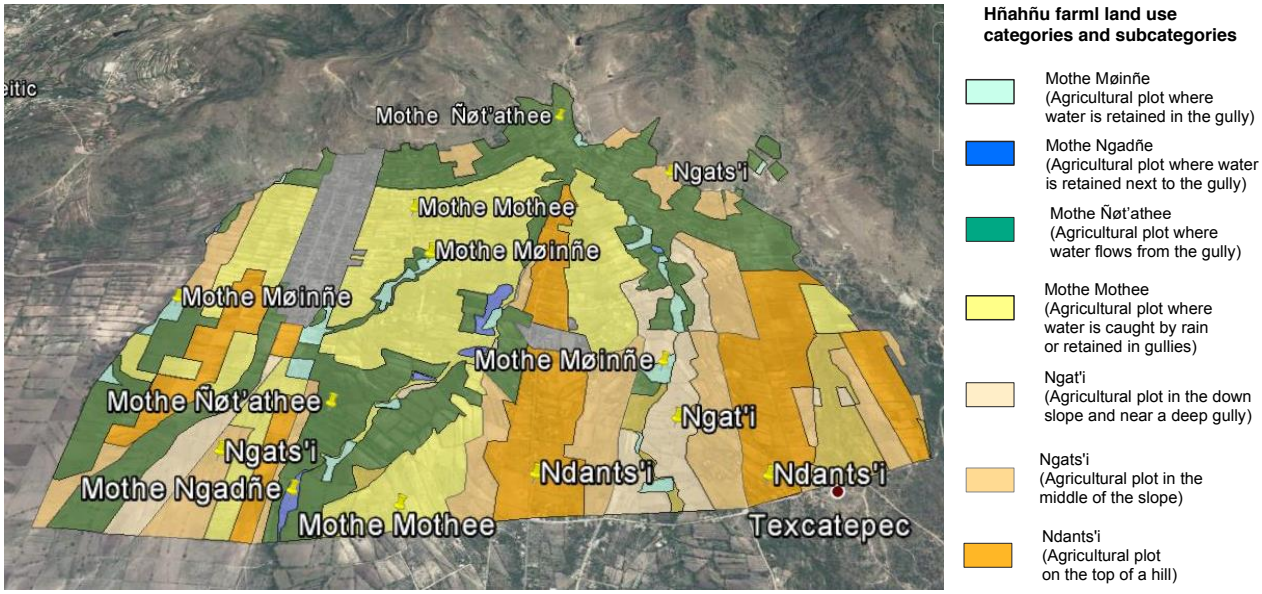

Figure 1. *Hñahñu* farm plot categories and subcategories represented in Google Earth.

4. Conclusions

The research revealed that *Hñahñu* classify their farms lands in categories and subcategories by combining two central attributes the farm plot location in the landscape and water supply strategies. It is show that *Hñahñu* indigenous knowledge representation in two dimensional maps was inappropriate and Google Earth proved to be more effective in communicating the *Hñahñu* cultural cognition around their farm lands. This methodology can be employed in similar researches, aiming to document and visualize traditional spatial indigenous knowledge in central Mexico.

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