Overview and Preliminary Analysis of Nine Communities in the Huasteca Potosina

(Extracted from "México Indígena: Mexican Open-Source Geographic Information Systems (GIS) Project Final Report, Year One", By Peter H. Herlihy, Derek A. Smith John H. Kelly, Jerome E. Dobson

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Prepared by the Radiance Research Team
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This section consists of an overview of the geography of the communities that participated in our research project, and some preliminary analysis intended mainly to demonstrate some of the directions which may be taken with the data we collected and continue to compile. The project team in 2006 continues to explore the data to formulate and test hypotheses, with which to make predictions, as well as develop strategies for future data collection on what are found to be the key variables. Specific findings, rigorous statistical analyses, and thorough discussions will be published in academic journal articles, conference papers, and theses over in the next several years.

Data presentation formats

The data in *México Indígena* can be presented in many ways to characterize the study communities in the Huasteca, especially in tables, maps, and quantitative figures (such as bar charts or scatter plots). Any of these methods may present data at the community level throughout the entire study area, the larger Huasteca Potosina region, or at the parcel/household level within a single community.

Data sources

The sources and methods for the production of each table, map, or chart are explained after each one. The principal source used in this preliminary analysis was tabular data from the participatory parcel/household questionnaires. Additional sources included INEGI on-line thematic maps, the participatory community maps, notes taken by the team during field site visits and community assemblies, the "Historiales Agrarias" in the RAN archives, and basic spatial calculations performed using Arc Map. In the future, other sources collected by the project team will be used to expand the regional and community analyses sketched here, including government and academic sources, and primary documents created by the project team, such as minutes of the participatory workshops and assessments by the four student investigators.

Data analysis methods

Data may be presented and discussed as simple univariate explorations, or as multivariate relationships. This preliminary analysis emphasizes initial univariate explorations, which of course when mapped may also suggest spatial groupings and trends. In a few maps presented here, as well as in the two scatter plots, two or three variables are either mapped together, or side-by-side, so that some potential multivariate relationships may be tentatively observed. However, we emphasize that no rigorous multivariate statistical procedures have yet been performed.

Through the community and parcel/household questionnaires (Appendices 4 and 5), we collected a wide range of information on population, ethnicity, land tenure history, agriculture, economic orientation, forest use, land management regulations, land conflicts, environmental issues, community governance, inheritance practices, reliance on wage labor, public services, education, and migration, among other things. The possibilities for analysis are varied. As a point of departure, we have compiled – and in many cases mapped out – several variables in order to characterize the participating study communities.

After linking the questionnaire data to a shapefile of community or parcel polygons, it is possible in Arc Map to make a wide variety of spatial queries based on the attribute information of one or more shapefiles, thereby finding out what is occurring where and revealing new information about the spatial patterns in environmental and human phenomena. Overlay analysis can also be done to better understand the spatial relationships between various phenomena – for example, between land use and elevation, economic orientation and proximity to markets, or ethnicity and crop choice. Non-spatial quantitative analysis allows for similar investigations of the relationship between variables. A starting point might be the creation of a scatter plot to investigate potential trends, followed by more complex multivariate statistical analysis of a relationship between two variables, holding others constant.

Some of the variables derived from the questionnaire responses lend themselves to display in map form, after they have been transferred to attribute fields in a shapefile. We are currently creating joins at three different units of analysis:

- Parcel/household questionnaire variables were joined[1] to the parcel boundaries shapefile “parcelas_huas_study_area” (stored in the “Bare shapefiles” folder), to create “huastec_parcelas_mi” (stored in “Cartografia actualizada”).

- Other parcel/household questionnaire variables were aggregated to the community level (e.g., the proportion, by percentage, of each of the responses to a question), and then joined to the community boundaries shapefile “comunidades_huas_study_area”, for example to create the shapefiles “huastec_idiomas_mi” related to language. In the future, we will create

[1] It is important to remember five things when joining tabular data to a shapefile: 1. The table must be in “.dbf” format; 2. Only the first row can be used to store field names; 3. The best way to ensure that numbers are recognized as such is to copy from Excel and “paste special” (indicating “values”) in .dbf; 4. Long texts in a cell may be truncated; 5. After joining, the new fields in the shapefile will appear to be empty, until the “Export Data” command is performed.

additional shapefiles in this standardized manner, creating different shapefiles associated with different themes, but which contain several variables (e.g., "agriculture", "income", or "migration").

- Appropriate community questionnaire variables will be joined to the shapefile "comunidades_huas_study_area", to produce new shapefiles that complement the aggregated parcel data.

Dozens of potential trends and associations can be investigated using the participatory questionnaire data, and in turn linked and compared with census, land tenure, environmental and other information at regional and national scales, something we will do in the summer of 2006.

Discussion: PHYSICAL GEOGRAPHY

The nine communities in the Huasteca Potosina that participated in the *México Indígena* project are located along the far eastern edge of the calcareous Sierra Madre Oriental mountain range, and into the shale-and-alluvium coastal plain of the Gulf of Mexico (Figure 4.20). Our study area includes portions of the limestone range Sierra La Pila, which reaches elevations over 700 meters, part of the complexly-eroded hilly shale-sandstone formation known as the Sierra Tancanhuitz, as well as parts of the nearby plains.

Rainfall (Table 4.6) increases toward the southwest, for two reasons: increasing distance away from the subtropical high pressure band characteristic of arid northern Mexico, and orographic precipitation of Gulf-origin easterlies in the Sierra Gorda and, to a lesser degree, in the other hilly areas. Generally the rainfall regime favors a gradation from *selva mediana subcaducifolia* (medium-canopy moist forest with many deciduous trees during drier months) in the northeast to *selva alta subperennifolia* (high-canopy rain forest with mainly evergreen trees) in the southwest. Outside the study area, there is also *bosque mesofilo de montaña* (cloud forest) above about 1100 meters, where rainfall on east-facing slopes may surpass 3000 mm/year.

Soils (Table 4.6) are generally shallow toward the west, deepening to the east. Only one study community, Chuchupe, is nearly entirely in the limestone ranges, which are characterized by very thin, rocky lithosols. The other communities are partly or wholly dominated by rendzinas, which like lithosols are shallow leptosol soils over calcareous rock, but which can be moderately fertile. Part of La Pila includes vertisols, poorly-draining clay-dominated soils typical of the Gulf coastal plain. These very general descriptions are based on coarse soil data – a much better understanding of the diversity and variability of soil types would be obtained through further investigation and seeking any higher quality data that already exist.

Five of the nine communities are situated directly on the eastern edge of the last limestone range of the Sierra Madre Oriental, extending to various degrees eastward onto the coastal plain; of these, Santa Cruz and Tancuime are mostly on the plain. Only Las Armas is entirely on the plain (Figure 4.21). The southern boundary of Chuchupe runs along the Tampaon River, a major tributary of the Panuco; where the Tampaon emerges from the Sierra La Pila through a narrow canyon called the *Puente de Dios* ("Bridge of

God”). The southernmost three communities are in the densely and evenly-populated shale-sandstone Sierra Tancanhuitz. Cuatlamayan is a cirque-like self-enclosed bowl, while Tazaquil and Chimalaco are on the range’s perimeter slope.

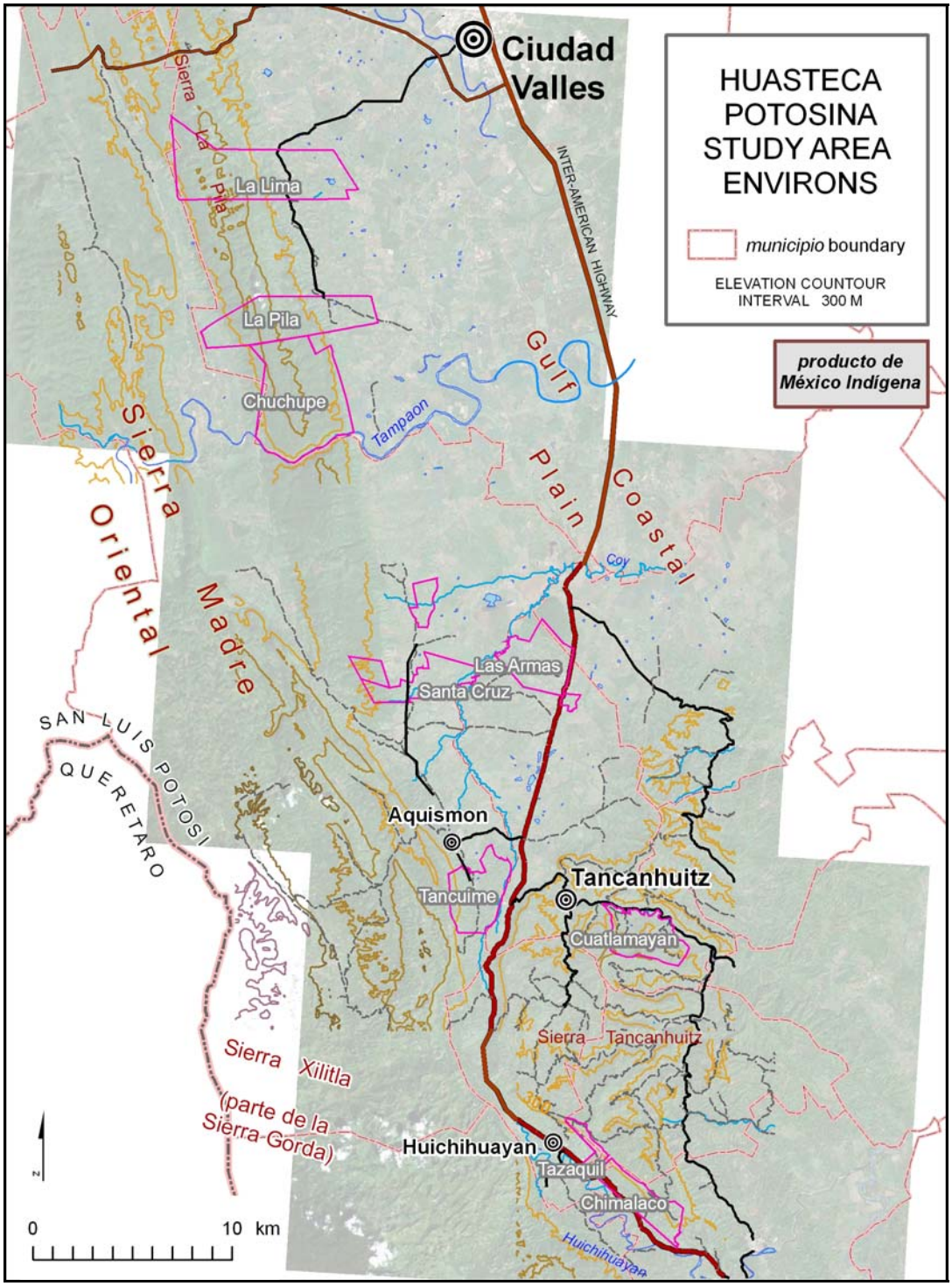

Figure 4.20. Huasteca Potosina study area (some information outside area of study area incomplete).

COMMUNITY	ROCK TYPE(S)	PREDOMINANT TOPOGRAPHY AND ALTITUDE	SOIL TYPE(S)	RAIN-FALL (mm/yr)	AREA (ha)
1) La Lima	limestone, shale	partly flat (~150 m), partly hilly (to 650 m)	lithosol, rendzina	1600	2316
2) La Pila	limestone, shale	partly flat (~100 m), mostly hilly (to 750 m)	lithosol, rendzina, vertisol	1700	1578
3) Chuchupe	limestone	hilly (to 700 m)	lithosol, vertisol	1700	2275
4) Las Armas	shale	mostly flat (~50 m)	rendzina	1800	917
5) Cuatlamayan	shale-sandstone	mostly flat (~250 m), some steep slope (to 650 m)	rendzina	2200	398[2]
6) Santa Cruz	shale	mostly flat (~50 m), some hills (to 350 m)	rendzina, lithosol	1900	1075
7) Tancuime	shale, limestone	mostly flat (~100 m), some steep slope (to 550 m)	rendzina, lithosol	2300	886
8) Chimalaco	shale-sandstone	mostly steep slope (to 500 m), some flat (~100 m)	rendzina	2400	666
9) Tazaquil	shale-sandstone, shale	mostly steep slope (to 450 m), some flat (~100 m)	rendzina	2400	178

Table 4.6. Huasteca Potosina study area communities, physical geography. Sources: México Indígena database; "Galileo" GIS web server[3] screenshots of INEGI 1:250000 maps (geology, soils, precipitation (used to create temporary shapefiles "huasteca_geologia_inegi", "huasteca_suelos_inegi" and "huasteca_precipitacion_inegi"; INEGI 1:50000 elevation contours; and areas calculated in ArcMap.

In general, the study area could be considered a topographic microcosm of much of Mexico: coastal plains and rugged mountainous interiors. Mountain-plain boundary zones such as the Huasteca Potosina are often important **transportation or trafficking corridors**, for plants, animals, humans, legally or illegally; in the study area, this function is channeled by the Inter-American Highway to the north and south, with additional movement along excellent east-west roads from San Luis Potosí through Rio Verde and Ciudad Valles to Tampico on the coast.

[2] "Kuatlamaya" only; "Tuzantla," the eastern half of the *comunidad* which for most purposed is considered a separate community, was not included.
[3] http://galileo.inegi.gob.mx/website/mexico/viewer.htm

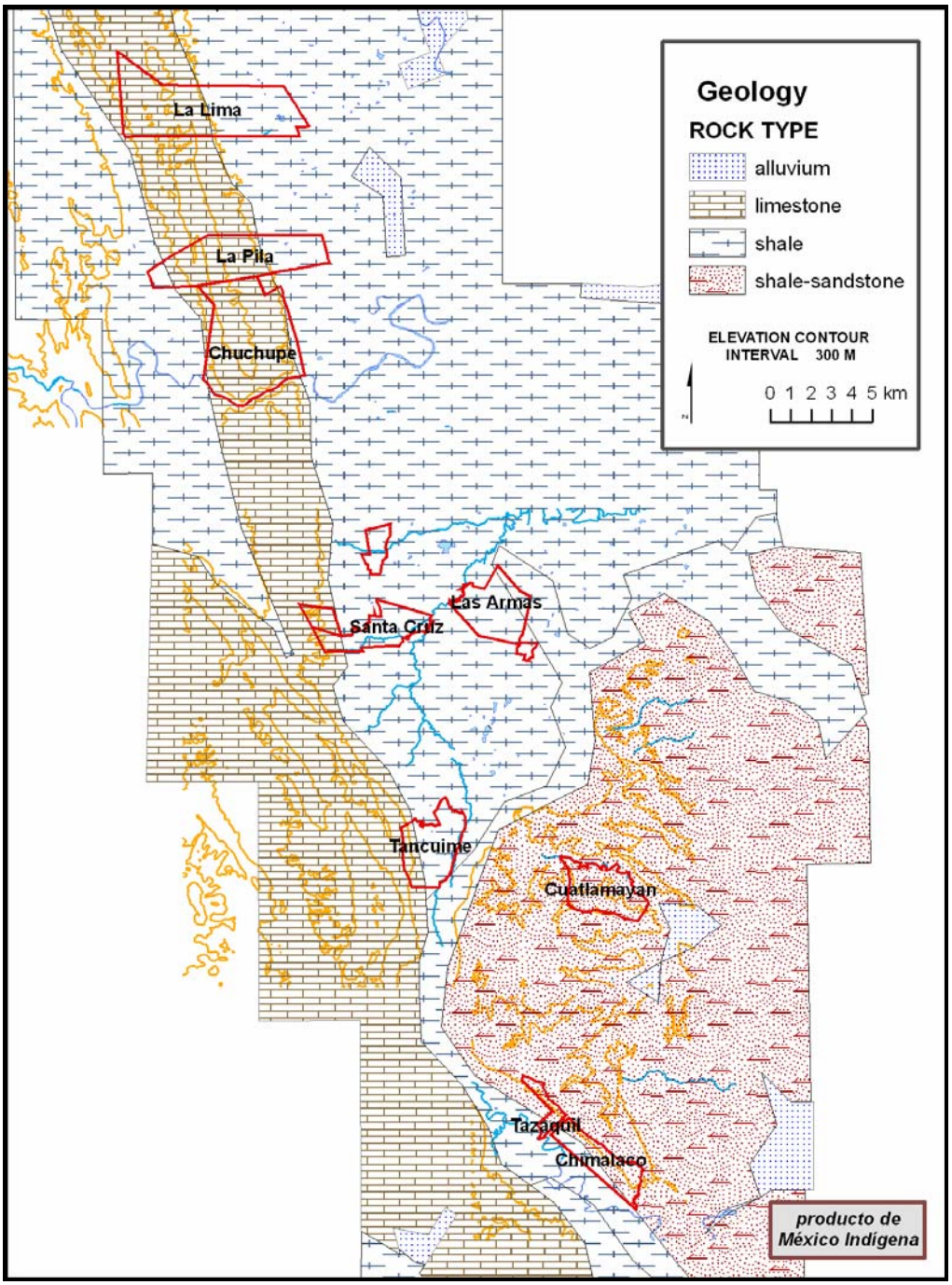

Figure 4.21. Huasteca Potosina study area: Surface geology (coarse resolution).

Discussion: ETHNIC GEOGRAPHY

Mexico does not legally designate specific territories as “indigenous”; it has neither an equivalent to Panama’s indigenous, semi-autonomous *comarcas*, nor an equivalent to the reserves of Brazil or the United States, areas under control of specific ethnic groups which are part of a normal state or province, but are subject to different laws at the

national level. Instead, Mexico simply recognizes that some *municipios* (counties) have more indigenous-speaking peoples than others, and offers some special services to predominantly indigenous communities through the *Comisión Nacional para el Desarrollo de los Pueblos Indígenas* (CDI), a federal agency.

The Huasteca Potosina includes residents who identify with at least four ethnolinguistic groups: the indigenous Teenek (Huasteco), Nahua, the Pamé and the non-indigenous Spanish-speaking *mestizo*. Of these groups, all but the Pamé are found in the nine study area communities. The spatial interdigitation of these groups is complex, reflecting a long history of shifts and interactions among culture areas. Table 4.7 and Figure 4.22 provide information on language distribution based on our parcel/household questionnaire information. We plan to administer more questionnaires in the region to increase the sample size for this type of analysis, and also draw from standard census information that we already have (organized by "localidad," which is not the same thing as ejidos or agrarian communities), as well as a special request for disaggregated data of the number of speakers of individual languages, rather than the total number of persons five years or older who speak any indigenous language. As is typical throughout Mexico, there is a wide range of "indigenousness" at the community level; in the study area, this ranges from about half in Las Armas to almost 100% in Tancuime.

The Teenek-Nahua geography is somewhat more complex than in other areas of Mexico. Most indigenous communities in the country smaller than about 10,000 in population are dominated by one ethnic group or another; for example, in the State of Oaxaca, despite its great ethnic variety and complexity, almost any village could be said to "belong" to the speakers of a single language. Most of the Huasteca Potosina study area also shows this community-level cultural identify: communities which about the limestone ranges of the Sierra Madre in the western and northern section are clearly Teenek, while communities along the edge of the shale-sandstone hills toward the south and east are clearly Nahua. However, Cuatlamayan and Las Armas, which include significant numbers of people of both language groups, are situated in a transition zone.

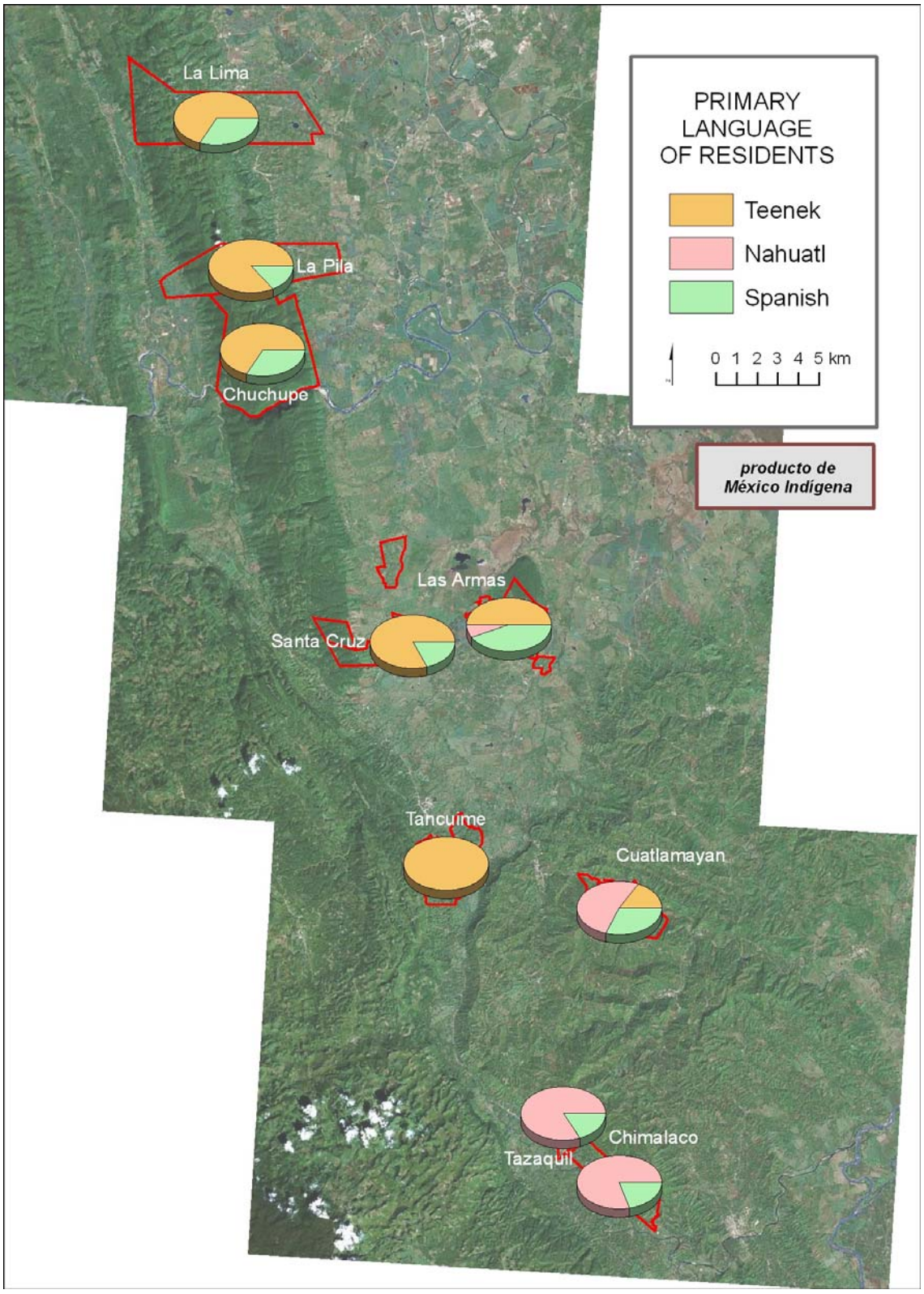

Figure 4.22. Huasteca Potosina study area, languages (Source: Preliminary analysis of information from parcel/household and community questionnaires of México Indígena.

Discussion: SETTLEMENT GEOGRAPHY, COMMUNITY COHESION

The research team made calculations derived from the participatory research mapping results for exploring human-environment interaction in indigenous communities and the degree to which each community retains its customary practices and exploits it surrounding environments. We are examining the interface between these practices and the neoliberal property regime changes brought by PROCEDE. One measure is of "**toponym density**" and another, an "**internal resolution**" index (Table 4.7). The toponym density consisting of the number of (mainly indigenous) toponyms per square kilometer was calculated to explore differences between communities that might be related to settlement and culture history. The "internal resolution" index simply measures the ratio of people who approach a local *comisariado* or *asamblea* to resolve conflicts as compared to those who state that their first choice would be to go to a government agency to resolve conflicts or conduct other tenure-related business. The index thus provides a quick assessment about the degree to which residents tend to consult the community assembly or leader(s) on disputes and problems regarding real property, rather then higher-level government agencies. Another measure of community cohesion is the prevalence of the *faena, tequio*, or other system of communal work, customarily mandatory for most *ejidatarios* and also common in many *comunidades agrarias*.

We **hypothesized** that communities that participated in **PROCEDE land reforms would tend to have fewer and weaker community customary practices**. Preliminary analysis (Figure 4.23) suggests that this is only sometimes the case: Chuchupe is the only clear example of a non-PROCEDE community that has indications of strong community cohesion. Tancuime is somewhat surprising: a proudly indigenous, well-organized, non-PROCEDE community with limited participation in *faenas*, as indicated by parcel/household questionnaire results (not shown here). There are indications that fewer of its residents work their parcels and those that do have seen a decline in income from them, perhaps related to the prevalence of remittances, although few respondents listed recent migrants from their households.

The present-day settlement patterns in the Huasteca Potosina vary from highly concentrated (e.g., Las Armas) to highly disperse (e.g., Cuatlamayan), but the most common pattern in both Nahua and Teenek communities[4] is somewhere between: several places with denser concentrations of houses, some houses in outlying parcels, and many parcels without houses. The two communities with most highly dispersed settlement, and most complex internal division hierarchies, are the two non-*ejidos*: Cuatlamayan and Tancuime. According to local informants, the most recent settlement pattern changes have occurred in Las Armas, where in the past ten years some previously dispersed

[4] Most *mestizo* communities in Mexico have concentrated settlements, while indigenous communities vary from more concentrated to more dispersed, in part depending on how deeply the Spanish colonial process of *congregacion* penetrated the region in question. Based on cursory observation of INEGI 1:50000 maps, it appears that the distribution of dispersed settlements in the Huasteca Potosina has less to do with the particular ethnolinguistic group, and more to do with topography: the entire Sierra Tancanhuitz, for example, appears to contain dispersed settlements, while the coastal plain settlements are mainly concentrated.

families have relocated close to the main settled area. Other informants confirm that greater nucleation occurred with the establishment schools and human settlement areas.

COMMUNITY	SETTLEMENT PATTERN	TOPONYM DENSITY (names/km^2)	SOCIAL PROPERTY CLASS	INTERNAL RESOLU-TION INDEX (0-100)
La Lima	2 somewhat dispersed (linear) zones + 1 isolated center	1.6	*ejido*	40
La Pila	2 somewhat dispersed (linear) zones + 1 isolated center + a few isolated homes	2.0	*ejido*	0
Chuchupe	1 concentrated center + a few isolated homes	1.1	*ejido*	50
Las Armas	2 mainly concentrated zones	0.7	*ejido*	8
Cuatlamayan	1 small concentrated center + large dispersed (continuous) zone	11.6	*comunidad agraria*	50
Santa Cruz	2 mainly concentrated centers + a few isolated homes	2.6	*ejido*	57
Tancuime	2 concentrated centers + large, mostly dispersed (rhizomous) zone	5.6	*comunidad agraria*	(no data)
Chimalaco	3 mainly concentrated centers + mostly dispersed (rhizomous) zone	5.9	*ejido*	57
Tazaquil	1 somewhat dispersed center	9.0	*comunidad agraria*	0

Table 4.7. Huasteca Potosina study area communities, settlement and community characteristics, preliminary analysis. Sources: México Indígena database.

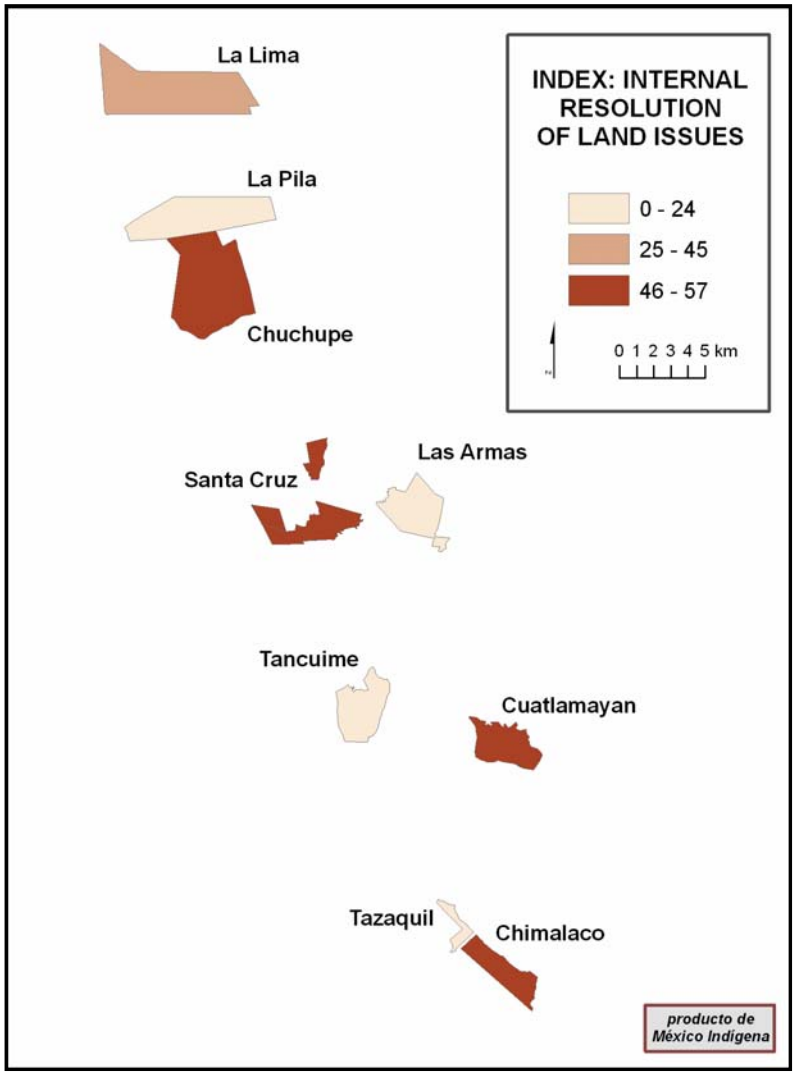

Figure 4.23. Huasteca Potosina study area: internal resolution of land issues, preliminary analysis.

Some communities that adopted PROCEDE tend to use the government legal system to resolve disputes, while continuing to oblige *ejidatarios* to participate in *faena* obligations – Las Armas is an example. Other PROCEDE communities do the opposite: they continue to rely on community authorities, while relaxing the *faena* obligations; Santa Cruz exhibits this to a degree. Chimalaco and Tazaquil (both PROCEDE communities) present interesting contrasts: despite their similar geographic structures and ethnic makeup, Chimalaco seems to have stronger community traditions than Tazaquil. If this is true (and not simply a statistical anomaly), is difficult at this time to identify why this is so. Patterns and relationships will become clearer as we continue our analysis and extend our research to other communities.

Discussion: LAND USE[5]

Throughout the study area, as in most of Mexico, livestock (mainly cattle) is an important part of the local economy (Table 4.9, Figure 4.24). The Huasteca Potosina lies in the northern part of a 1500-kilometer swath of ranches across the Gulf Coastal Plain, from southern Tamaulipas State to southwestern Campeche State; until about the 1970's, much of this area includes extensive patches of tropical rain forest. Of the nine study area communities, Chuchupe depends most on ranching, and Tancuime the least (neither had its parcels surveyed by PROCEDE). Ranching is mainly conducted in enclosed parcels on flatter lands, but there is some free-range grazing in a few of the hillier, more forested common lands.

COMMU-NITY	MAIN LAND USES (2005)	pasture/ livestock	orange/ citrus	corn	sugar cane	lychee	coffee	mango
La Lima	livestock, sugar cane	A	-	-	B	-	-	-
La Pila	livestock, mango	B	-	B	-	-	B	B
Chuchupe	livestock[6]	A	-	-	-	-	-	-
Las Armas	sugar cane, livestock	B	-	B	A	-	-	-
Cuatlamayan	corn, livestock, citrus	B	B	A	-	-	-	-
Santa Cruz	livestock, sugar cane	A	-	B	B	-	B	-
Tancuime	corn	B	B	B	B	-	B	-
Chimalaco	citrus, livestock	B	A	-	-	-	-	-
Tazaquil	citrus, lychee	-	B	-	-	B	B	B

Table 4.8. Huasteca Potosina study area, land use, preliminary analysis. ("A" = prevalent or dominant among sampled parcels, "B" = significant but of lesser importance, "-" =

[5] For more information on the Huasteca Potosina, see, e.g., http://cdi.gob.mx/ini/perfiles/teneek/07_economia.html, which summarizes work by geographer Victor Toledo and others. For the greater Huasteca region, see, e.g., Ángela Ixkic Duarte Bastián et al., 2003, *La Huasteca ayer y hoy* **(**CD-ROM compilation of studies), CENDOC/INAOE/CONACYT/CIESAS/COLSAN.

[6] In Chuchupe and some other communities, parcel owners who cultivate forage grasses tend not to own their own livestock but rather informally "rent" their land for part of the year to private ranch owners.

absent or of negligible importance, based on frequency of observations). Sources: *México Indígena* database [parcel/household questionnaires].

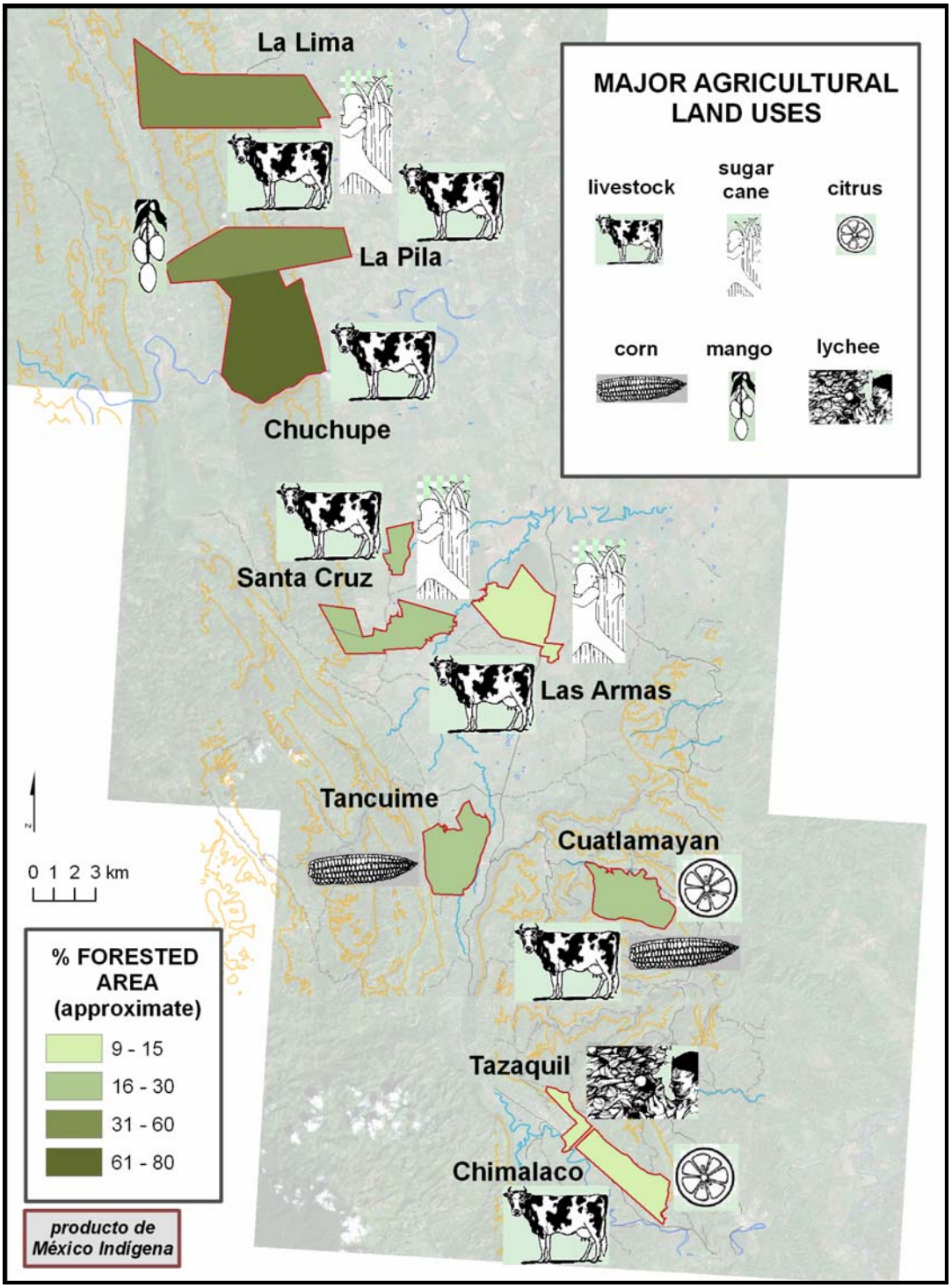

Figure 4.24. Huasteca Potosina study area: Major agricultural land uses, preliminary analysis.

Sugar cane, for home use as well as for sale, is important, especially in the Teenek-speaking northern communities with access to flatter land. Of the nine communities, Las Armas produces the most sugar, much of it through a cooperative *sociedad* to which most community heads of household belong, who maintain and harvest irrigated cane farm adjacent to the Coy River, covering about one-fifth of the community's land area. **Citrus** fruits and **lychee fruits** tend to be grown for sale mainly in the steeper-sloped Nahuatl-speaking communities of the Sierra Tancanhuitz, in the southern part of the study area; here, annual rainfall is higher. Some corn (maize) is grown for home use in most communities, but is not an important product except in the two *comunidades agrarias*, Tancuime and Cuatlamayan. Some swidden **corn** cultivation is practiced, especially in the hillier parts of the Teenek-speaking communities along Sierra La Pila, in both the upslope parcels and the common use areas, but there is less corn cultivation overall than the project team expected. There is likely to be even less in the future with the elimination of federal subsidies.

Table 4.10 and Figure 4.25 present data on land tenure and related variables from the **52 parcel-level questionnaires completed**. Within our sample, most respondents continue to work their own parcels, except in the community of Tancuime. Chimalaco, La Lima, and La Pila have the highest averages of parcels per owner. Las Armas and Tazaquil have the lowest parcels per owner average. Tazaquil, perhaps due to its small size in relation to population, and Las Armas, perhaps because its community-organized but more commercially-driven land use orientation had encouraged some consolidation of collective farming.

Based on studies of traditional **agroforestry** practices among indigenous groups in the Huasteca region,[7] one might have expected a more productive use of "managed forests" than what was observed and noted in the participatory research. Still, there are important areas, some quite large, in several communities, both Teenek and Nahua. All communities except Las Armas, Tazaquil, and Tancuime use their common-use forested areas for the collection of firewood. The best-developed productive forest management seemed to take place in La Pila and Tazaquil (in the south), where a mango canopy mixed with "primary forest" species[8], often with coffee[9] in the understory, dominates much of the steeper-sloped parceled area; in La Pila, this may extend in a few places into the common use area. Additionally, orchard-like managed forest patches are found around nearly all houses in all the communities, whether or not the lots are legally considered *solares*.

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[7] See, e.g., Janis Alcorn, 1983. *El Te'lom huasteco: presente, pasado y futuro de un sistema de silvicultura indígena*. *Biotica* 8(3):315-331.

[8] We caution that "primary forest" is used here to mean "trees not obviously planted by humans, and/or forest in areas not obviously cut over in the past forty years or so". It is *not* a precise term, has *not* been systematically researched by the project team, and perhaps is *not* a very useful concept. All forest patches in the study area have been "humanized" in one way or another, at some time in the past.

[9] This coffee is not an important commercial crop; the nearest true center of coffee production is Xilitla, in the higher mountains southwest of the study area

COMMU-NITY	NUMBER OF PRIMARY AGRICUL-TURAL PRODUCTS IN 2005	% OF OWNERS WHO WORKED THEIR OWN PARCEL IN 2005	AVERAGE # OF PARCELS PER OWNER	AVERAGE DISTANCE FROM INTER-AMERICAN HWY. (Km.)
La Lima	3	67	4.3	10.6
La Pila	4	67	4.2	14.1
Chuchupe	2	100	3.3	16.8
Las Armas	3	100	1.2	0
Cuatlamayan	3	86	2.1	8.0
Santa Cruz	4	64	2.3	11.2
Tancuime	7	25	2.4	5.4
Chimalaco	3	100	6.0	0
Tazaquil	3	100	1.0	0

Figure 4.10. Land use and other variables, preliminary analysis. Sources: Parcel/household and community questionnaires, participatory research mapping, RAN "Historiales Agrarios," distances measured in ArcMap.

Our investigations on forest use and forest cover are in the beginning stages. However, one trend is evident: steep slopes tend to be more forested than gentle slopes, probably more due to their generally rockier soils and low fertility than to their being less fertile or too steep to effectively cultivate. However, some gently sloped areas with significant forest cover are found in parts of Santa Cruz, northeastern Tancuime, and Las Armas.[10] The apparent exceptions to this rule are few, and perhaps worthy of further investigation. The distinction between "natural" and "managed" forest, however, is somewhat subjective, as well as between "primary" and old "secondary" forest, is unlikely to be easily discerned through remotely sensed data.

As a research team, we are interested in the relationships between ethnicity, land use and land tenure. At present, we are just beginning to explore these in a more systematic way. Figure 4.26 presents an example of how we can use the GIS database to display such relationships at the parcel level. This small sample, however, does not reveal a relationship between language and primary crop grown but we expect patterns to emerge with further and different types of analysis.

[10] This latter area belongs to the community as a whole, after claims to it were settled with the adjacent community. This appears to be the only relatively clear example of a community-level "forest reserve/ future potential parceled area extension," a (usually weakly) protected-area category more common in newer (1975-1990) *ejido*, such as those carved out of forested Calakmul region of Campeche State.

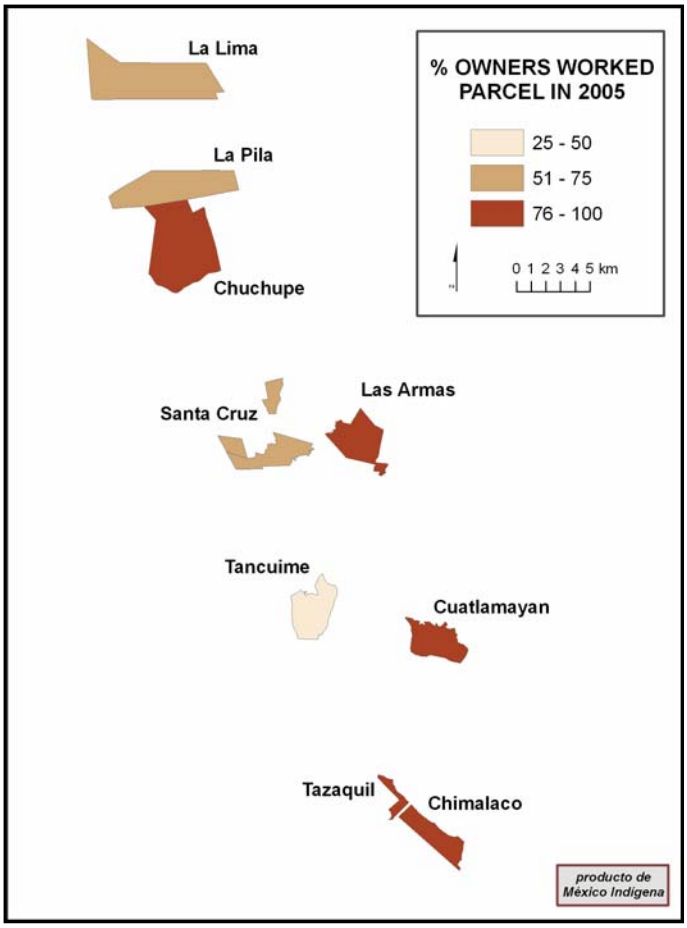

Figure 4.25. Huasteca Potosina study area, percentage of parcel owners who worked their parcel in 2005, preliminary analysis.

Discussion: LAND TENURE

As discussed in previous sections, a primary focus of our research in the Huasteca Potosina has been land tenure reforms implemented through the PROCEDE program. Table 4.11 provides a summary of PROCEDE work in the study area that was completed in seven of our nine study communities. Verification of area calculations found in the *Historiales Agrarios* based on our GIS analysis is ongoing, as we finish data processing for recently acquired PROCEDE maps. However, considerable variation exists between communities, with a large common use area in La Pila, smaller areas of common (and collective) use in Las Armas and Santa Cruz, and no areas of common use in Tazaquil and Chimalaco whose territories consist only of parceled areas and areas of human settlement (Figures 4.27, 4.28, 4.29, 4.30). It is important to note, however, that legally defined areas of common use differ considerably from what occurs on the ground. In Tancuime, for example, because the community rejected the delimitation of internal divisions, technically the entire community remains in common use, although in practice virtually the entire community is divided into parcels of individual use. Similar differences occur in other communities. Moreover, over time, new parcels are established in areas of common use for individuals on an ongoing basis, provided the *ejido* or community assembly accepts this.[11]

[11] Another way in which land may shift from one RAN-defined *área grande* to another is through the conversion of parceled areas to new human settlements. In Las Armas, the *ejidatarios* together purchased a parcel adjacent to the urban zone, and are now developing it with houselots for sale.

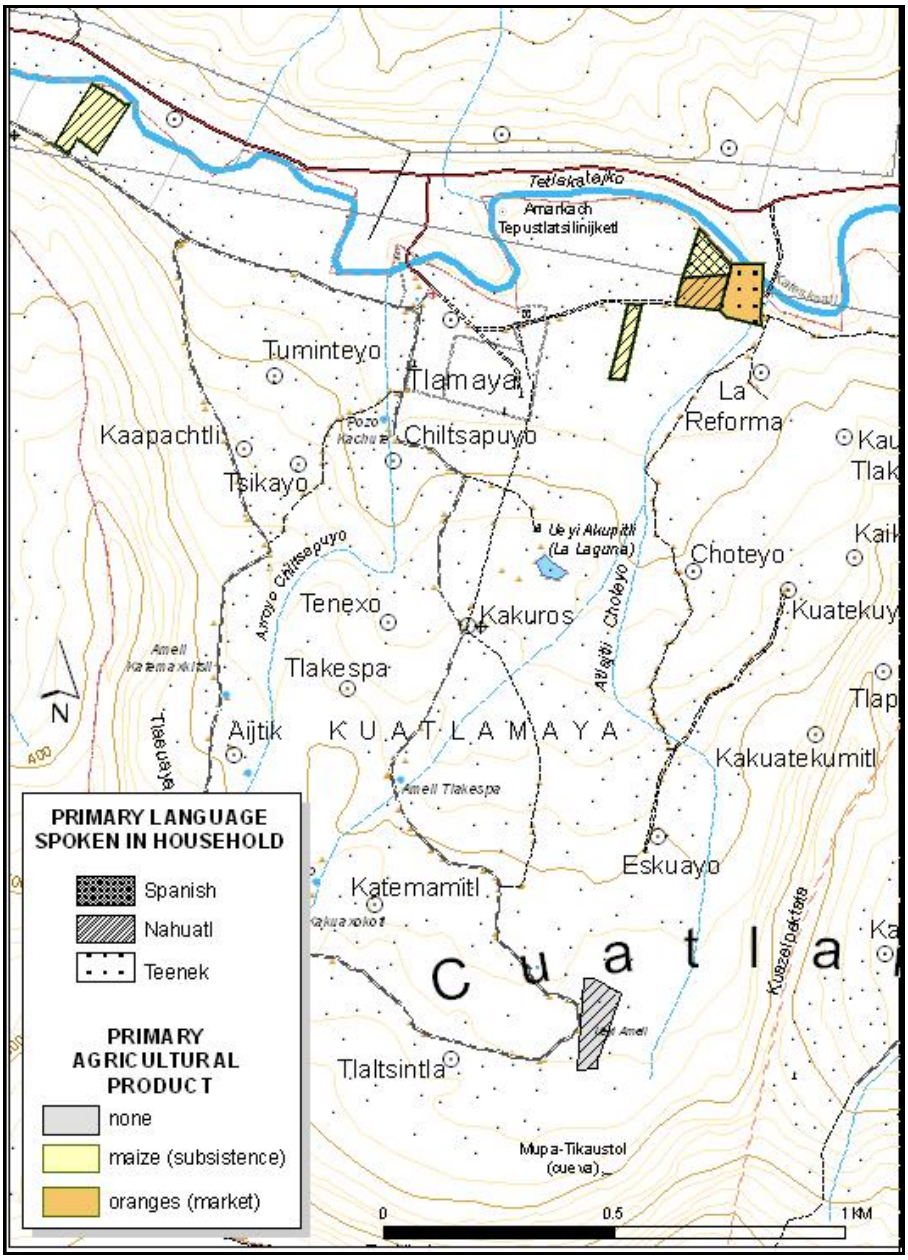

Figure 4.26. Community of Cuatlamayan, preliminary analysis. Primary household language and agricultural product of six parcels.

To better understand the importance of common use areas at a broader scale, we used the *Historiales Agrarios* to begin an analysis of the percentage of land area in common use for 136 ejidos and agrarian communities surveyed by PROCEDE in the five *municipios* of the Huasteca Potosina region (Figure 4.31). The analysis shows that many *ejidos* have no common use areas at all, while another group has all, or virtually all of their territory in common use. We continue our analysis to discern whether this reflects

actual practice on the ground, or whether this is an artifact of partial participation in the PROCEDE program.

COMMU-NITY	DATE OF PROCEDE COMPLETION	PROCEDE DIVISIONS DELIMITED AS OF 12/2005	TOTAL # OF EJIDATARIOS/ COMUNEROS (2005)	% AREA IN COMMON USE IN PRACTICE* (APPROX.)
La Lima	NA	NA	136	70
La Pila	August 1998	parceled areas, common use area, asentamientos humanos	167	65
Chuchupe	NA	NA	56	80
Las Armas	October 1994	parceled areas, collective & common use areas, one asentamiento humano	77	10
Cuatlamayan	June 1999	some parceled areas (partial), common use area, asentamientos humanos	330	0
Santa Cruz	March 1995	parceled areas, common use areas, asentamientos humanos	90	40
Tancuime	August 2005	perimeter only	272	< 1
Chimalaco	October 1995	parceled area, asentamiento humano	72	< 1
Tazaquil	May 2000	parceled area, asentamiento humano	51	< 1

Table 4.11. Common use areas and other land tenure divisions in the Huasteca Potosina study area. Sources: *México Indígena* database, parcel/household and community questionnaires, PRM; RAN "*Historiales Agrarios*," GIS analysis. *Note common use area in practice does not correspond directly to legal, PROCEDE-defined common use areas; in most communities, at the local level there are distinct understandings of what constitutes a common use area, and their delimitation.

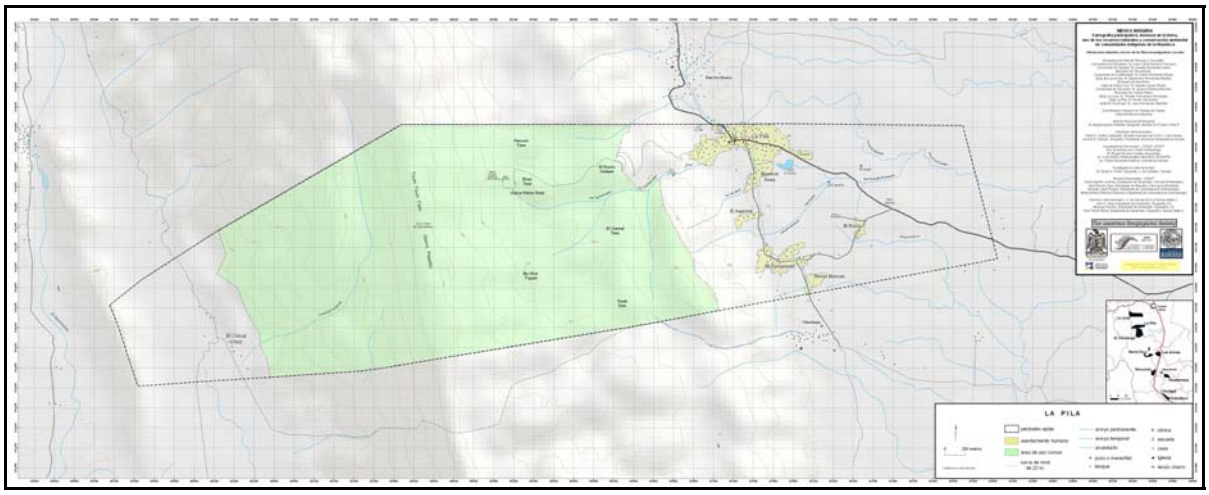

Figure 4.27. Map of the Ejido La Pila, with RAN-defined common use area shown in green (Source: *México Indígena* database, 2006, results from PRM). [To see map details, zoom in and enlarge]

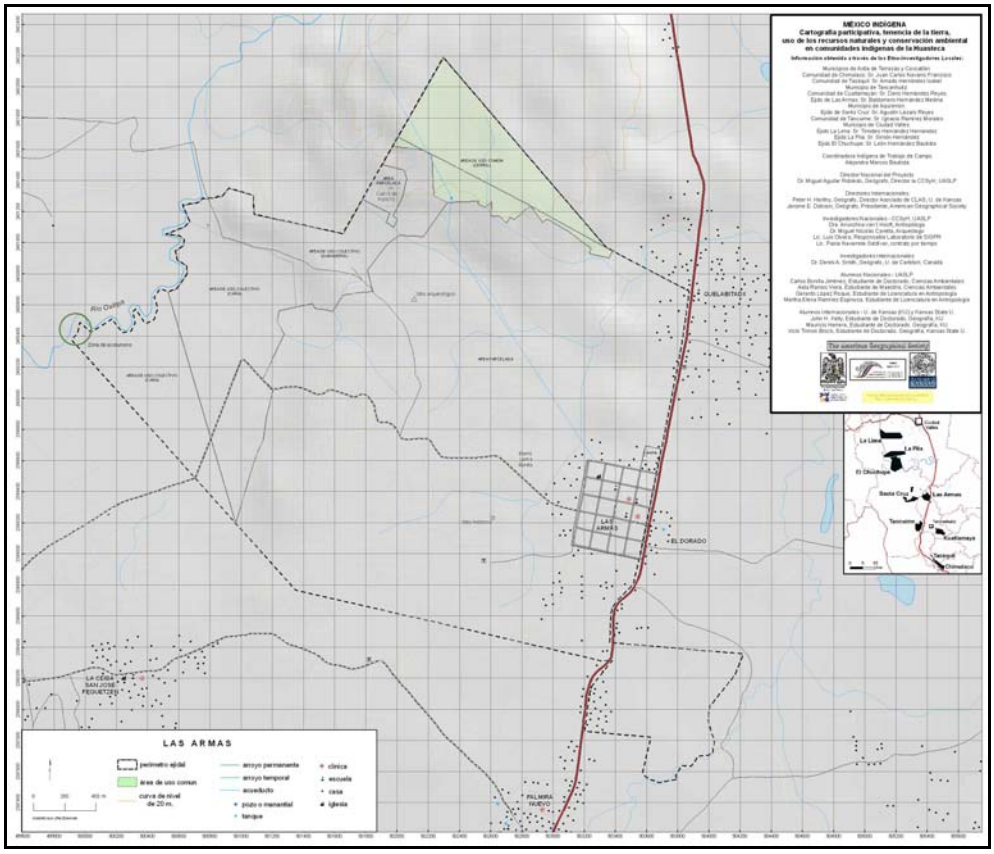

Figure 4.28. Map of the Ejido Las Armas, with RAN-defined common use area shown in green ("collective exploitation areas" not included). (Source: *México Indígena* database, 2006, results from PRM). [To see map details, zoom in and enlarge]

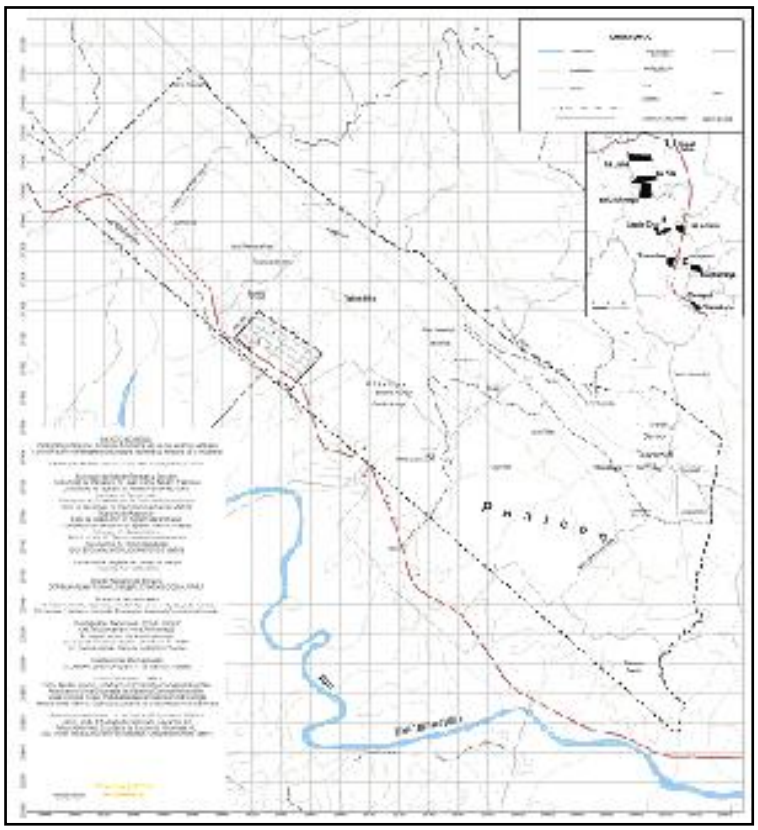

Figure 4.29. Map of the Ejido Chimalaco, which has no *área grande* defined by RAN as a common use area, but there are parcels titled to the entire community. (Source: *México Indígena* database, 2006, results from PRM). [To see map details, zoom in and enlarge]

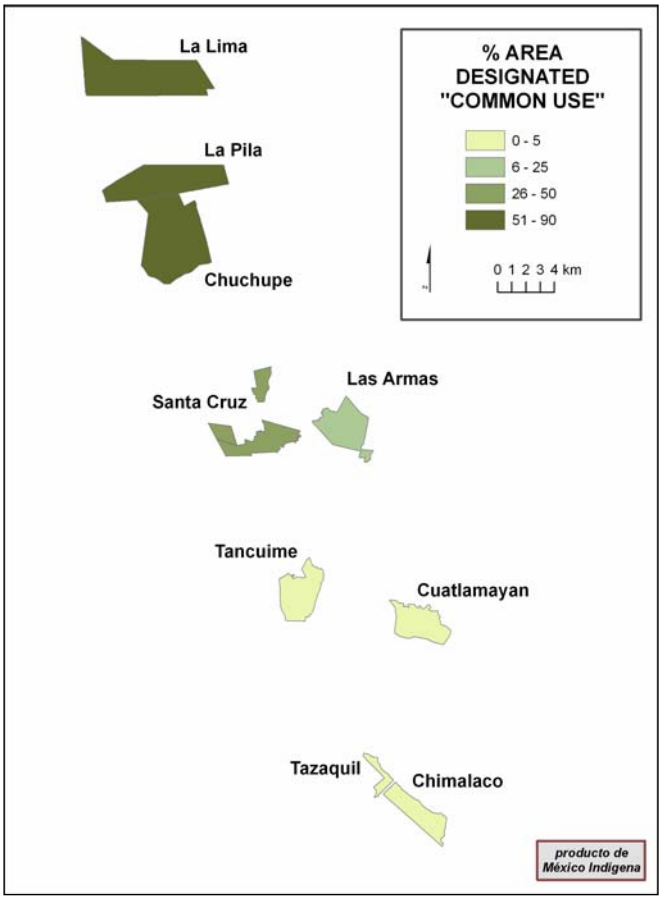

Figure 4.30. Huasteca Potosina Study Area, 2005, preliminary analysis. Percentage of total area of each community designated as common use areas according to local practice and

definitions (Source: *México Indígena* database, 2006, results from PRM)

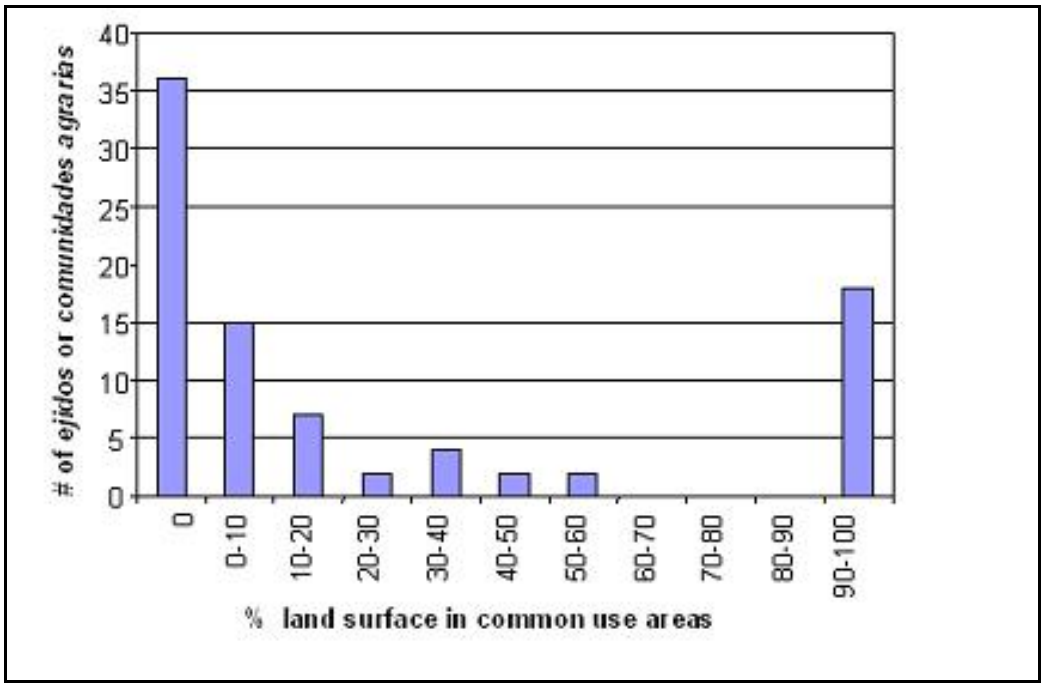

Figure 4.31. Percentage of land area in common use for 136 communities surveyed by PROCEDE in the Huasteca Potosina region. (Source: *México Indígena* database, 2006, RAN "Historiales agrarios," 2005). [To see map details, zoom in and enlarge]

The "common use area," a standard land tenure category of the *ejido* (and sometimes the *comunidad agraria*) with indigenous antecedents,[12] is an entity whose future is uncertain. Legally, all social properties were entirely "common use." Individual parcel divisions were a matter of internal community regulation, and were often temporary or informal, especially in areas farther from the community's urban center. "Leftover" land, often extensive in low-population areas, could be worked or grazed communally, treated as a forest reserve for the collection of fuelwood, medicinal plants, and other products, or reserved for the future expansion of *ejidatario/comunero* parcels. When the PROCEDE program mapped and divided community lands, these "leftover" lands were officially designated as "common use areas," while most of the more permanently worked agricultural lands became the official "parceled areas." As with the *asentamientos humanos*, this action made more precise and enduring what was in some communities probably a less clear distinction. From our participatory mapping work, we know that non-PROCEDE communities such as Chuchupe and Cuatlamayan recognize *spatially* precise property boundaries, but *conceptually* the distinctions between individual parcels and common use lands are sometimes ambiguous, for example, when it comes to rights to have individual farms within the common use area. Before PROCEDE and sometimes even afterwards, many communities are more creative and flexible about

[12] See, e.g., Barbara Mundy, 1996. *The Mapping of New Spain: Indigenous Cartography and the Maps of the Relaciones Geograficas.* Chicago: U of C Press.

"common use" areas than the legal term indicates[13]; parts of "individual" parcels, for example, might be collectively worked for part or all of the year for livestock or for coffee.

In addition to legal definitions, there are additional land divisions that are recognized at the local level. While there are some commonalities, each community divides its territory in different ways (Table 4.11). Closer analysis of the team's data (e.g., Figure 4.32, a sketch map from a local investigator's notebook) will be required to determine the historical development of each community's land division practice and the role of colonial and later tenure systems, including the initial formation of the ejidos.[14] We note again that there are differences between legal definitions and what occurs on the ground – e.g., settlement sometimes occurs outside of the PROCEDE-delimited *asentamientos humanos*, and individual farms are found within the legally defined common use areas. To use another example, when surveying an area with a small number of dispersed, secondary houses, PROCEDE might consider the area a small *asentamiento humano* and its lots as *solares*[15] (Figure 4.33), or it could consider it simply as part of the parceled area (Figure 4.34). These decisions are probably not arbitrary, in the sense that PROCEDE used previous census designations of what is and is not a *localidad.* One of the main short term consequences is that *solares* and parcels are treated differently; for example, a *solar* owner is given title right away, while a parcel owner first receives a certificate, which may be exchanged for a title later. These distinctions have real impacts in taxation and valuation of properties.

[13] PROCEDE should be credited with legally recognizing at least one unusual hybrid tenure category: individual parcels which contain only an important well or spring and its surrounding vegetation, as in Chimalaco, may be part of the "parceled area," but the parcel title is owned by the community as a whole, and so the land acts as a common use area.

[14] A prototype for these sorts of studies in Mexico is the monograph by Donald Brand, 1951. *Quiroga: a Mexican municipio*. *Publ. of the Institute of Social Anthropology*, 11. Washington: Smithsonian Institution.

[15] *Solares* often include some agricultural plots or orchard-gardens and poultry production.

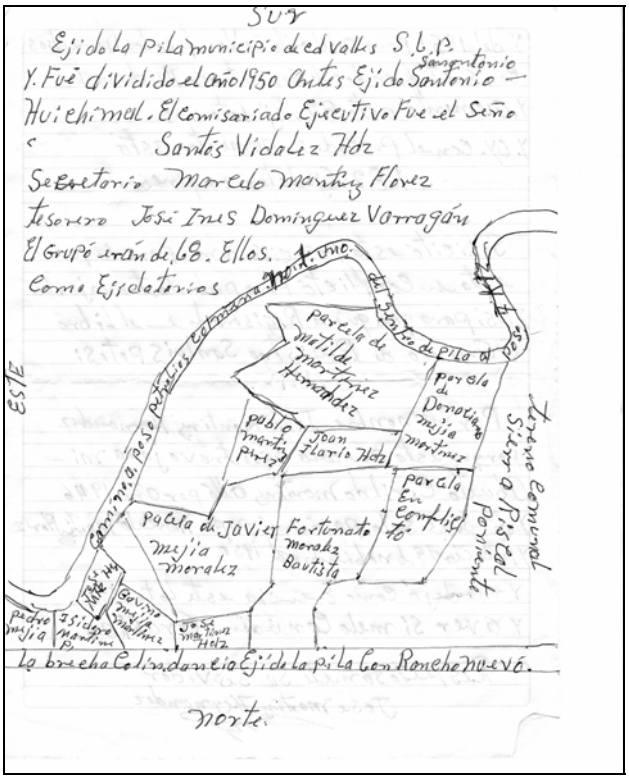

Figure 4.32. Local investigator's sketch map and notes (part) describing the land tenure history of La Pila. (Source: *México Indígena* database, 2006, results from PRM). [To see map details, zoom in and enlarge]

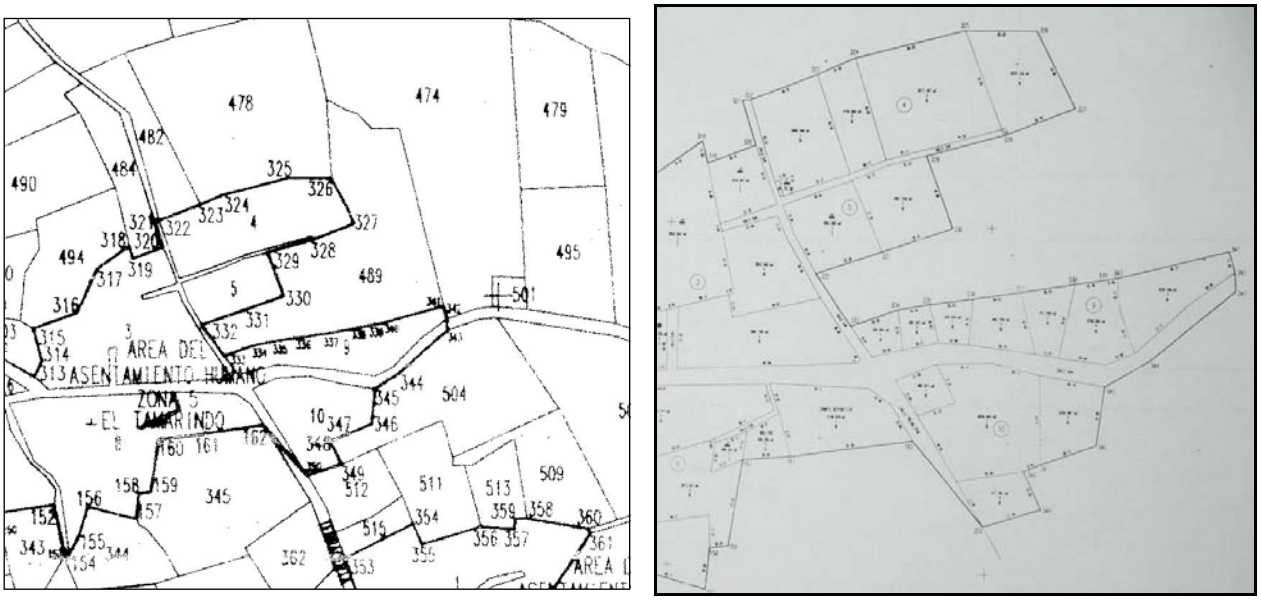

Figure 4.33. Ejido La Pila with the settlement El Tamarindo treated by PROCEDE as an *asentamiento humano* (left) containing *solares* (right). (Source: *México Indígena* database, 2006). [To see map details, zoom in and enlarge]

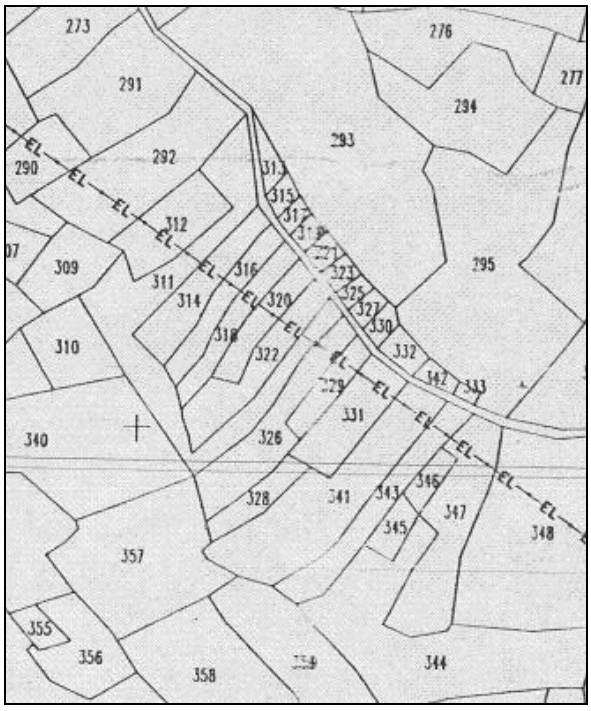

Figure 4.34. In the community Chimalaco: the settlement ("*barrio*") Cuamizatl, treated by PROCEDE as agricultural parcels. (Source: *México Indígena* database, 2006). [To see map details, zoom in and enlarge]

In the short term, the occasionally inconsistent delineation of "parceled" and "common use" areas by PROCEDE has consequences for *ejidatarios* or *comuneros*, and other community members, including whether or not one has collateral for securing loans, levels of taxation, and access to government assistance programs. Over the long term, however, areas of common use are converted to individual use based on decisions made in the *ejido* and *comunidad* assemblies. Eventually, one might predict that any common use area left may become essentially the equivalent of a "town park": land titled to the community as a whole, but no longer for the exclusive material benefit of a privileged group of *beneficiaries*.

There may be long-term environmental consequences of the location and use of today's common use areas. It would clearly be debatable whether any common use area should automatically be considered a "protected area" within the nationwide hierarchical system of *areas naturales protegidas*[16] administered through the federal agency SEMARNAT, which includes biosphere reserves, national and state parks and wildlife refuges, productive forest reserves and UMAs (ecotourist hunting reserves) often run by *municipios* or communities, and to some extent the informal ecological reserves generated via community-level, NGO-driven, semi-collaborative rural zoning exercises called "*ordenamientos territoriales.*" Within an active colonization front, some more recently formed *ejidos* near the Calakmul Biosphere Reserve in Campeche State, for

[16] See, e.g, Arturo Gómez-Pompa and Rodolfo Dirzo. 1995. *Las reservas de la biosfera y otras áreas naturales protegidas de México*. Mexico, D.F.: SEMARNAP and CONABIO.

example, have some "leftover" and not individually parceled lands that are clearly designated "Forest Reserve Areas" on PROCEDE/RAN survey maps, while other *ejidos* in the same region, these leftover lands have been apportioned among *beneficiarios*, perhaps not strictly legally.[17]

While acknowledging that "forest cover" is not a perfect proxy for "environmental health" of the landscape, it is interesting to see to what extent "common use areas" (by official designation) and "forested areas" coincide among the nine study area communities. Common use areas as a proportion of total community area (Figure 4.30) seem to be related to overall community area (size); larger communities, such as the three along Sierra La Pila in the northern part of the study area, have proportionately larger common use areas. There are exceptions: Santa Cruz, Las Armas, Tancuime, and Cuatlamayan are of similar size, yet the latter two communities have no official common use areas at all.

We see that, in general, percentage of forest cover does have a positive relationship with percentage of land in common use (this does not mean that the two categories *necessarily* coincide in space, but our observations and others indicate that that they usually do to a great degree, though not perfectly). The three exceptions are instructive. Tancuime and Cuatlamayan do not have a high percentage of forest cover, but what forest they do have is in rugged terrain and outside common use areas, which both communities lack. Nevertheless, a portion of Cuatlamayan residents (and a smaller portion of Tancuime residents) claim to have rights to and/or to work the community's "common use area". This apparent contradiction could have two explanations: by the post-Mexican-Revolution agrarian laws which created the *ejido* system, the entire *ejido* (or *comunidad agraria*) was considered "common use area"; i.e., social, inalienable property. In their community participatory questionnaire, for example, the residents of Cuatlamayan answered the question, "In the common use area, are there protected areas?" by listing three places, albeit without surface areas given: a spring, a cave (once used for curing the ill), and a fishing waterhole.

The other exception is Las Armas that has fairly large common use areas, but not much forest cover.[18] As mentioned previously, 73 of the *beneficiarios* of Las Armas belong to a *sociedad* (a kind of cooperative), which operates a large irrigated sugar cane plantation covering over half of the common use area[19] (the rest of the common use area is in forest or holds common livestock). One of the principal goals of Mexico's

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[17] "Creative" interpretation of agrarian law has been common in *ejidos* since their inception; according to one figure, 60 percent of *ejidatarios* worked their parcels in some sense illegally during the 20th century (Guillermo Zepeda. 2000. *Los Derechos de Propiedad en el Campo Mexicano bajo el Nuevo Marco Institucional.* Mexico: Centro de Investigacion para el Desarrollo, p. 34).

[18] Las Armas is the one representative within the study area of the situation common in drier *ejidos* of central and northern Mexico that often include extensive non-forested common use areas, generally livestock rangelands or unused land.

[19] According to the PROCEDE survey maps on file at the RAN, the Las Armas common use area actually consists of three separate, legally distinct kinds of property:

1. A pair of "special areas": land to which neighboring communities held claims until PROCEDE completed its work, shown with hactched lines on the map to show that its status, though now legally resolved, was (and may still be) a source of contentious ambiguity; the sugar *sociedad* cultivates on one of these areas, while the other area is mostly forested.
2. The "collective exploitation lands": mainly planted in sugar cane by the *sociedad*.
3. The "common use lands," a small leftover piece where the commonly-managed livestock range.

neoliberal land tenure reforms is to give these agrarian *sociedades* the same legal standing as any corporation or partnership. The community today regards the *sociedad* land as "common use," but this could change if the area were sold.

One key research issue is how the PROCEDE land reforms are affecting indigenous households and communities that participated in the program. The data we have collected will allow us to investigate whether or not there are relationships between the certification of parcels and such things as involvement in markets or the sale of land, keeping in mind that such processes are complex and influenced by many other variables. Figure 4.35 gives another example of the type of preliminary, exploratory analysis that can be done using the parcel questionnaire results. In this case, the economic orientation (i.e., subsistence versus market production) of parcels that have been certified through the PROCEDE program are compared to those that have not. As can be seen, the results are informative, but a clear, simple relationship is not evident. Further analysis could, however, include other variables, such as date of certification, household size, total area of landholdings, or ethnicity, to better examine the complex processes involved in changing land use in response to the land reform program.

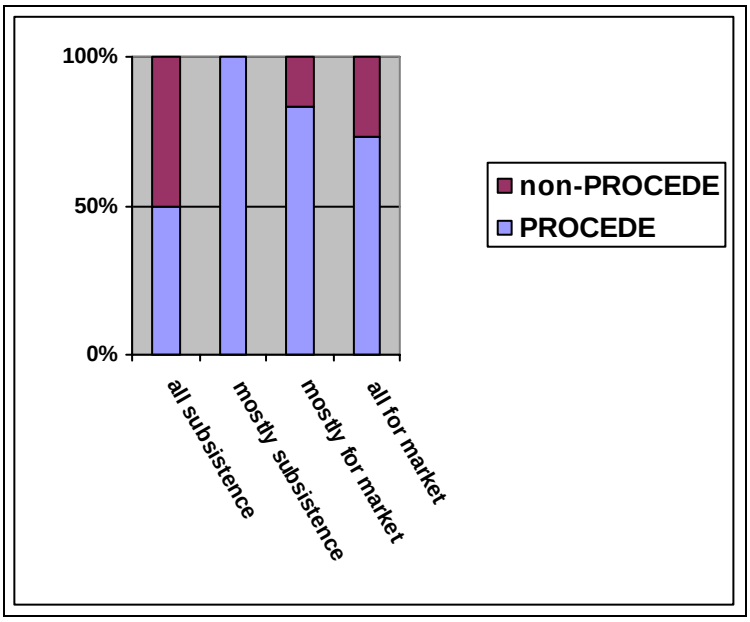

Figure 4.35. Percentage of parcels (n=47) in Huasteca Potosina study area which were measured by PROCEDE program, classed by whether agricultural products are destined for household subsistence or for market sale, preliminary analysis. (Source: *México Indígena* database, 2006, results from PRM). [To see map details, zoom in and enlarge]

Discussion: A FEW FURTHER OBSERVATIONS

Our work in the Huasteca Potosina, through participatory and other methods, reveals a complex region whose inhabitants face cultural and legal changes, and their responses and adaptations to these changes likely span a significant, though far from

exhaustive, subset of the responses to be found in other regions of Mexico. The people of the Huasteca are proud of their history; the indigenous legends preserved in many toponyms, the pride in Tancuime that their land was not given to them by the government as the was the case in *ejidos*, and Las Armas' role as the guardian of a weapons cache in the Mexican Revolution all speak of a living past. Yet, the communities are planning for the future: potential ecotourism in at least three communities (an "island" in Las Armas, a gushing spring in Santa Cruz, a campground and boat launch in Chuchupe); enthusiastic embrace of market agriculture in Las Armas and, less successfully, in Tazaquil; cautious determination to resolve a boundary dispute in Chuchupe. One community, Tancuime, is simultaneously more traditional than the average in its land uses and internal land divisions and materially more comfortable and "developed" than the average. The communities are firmly linked to the larger world, most obviously by the Inter-American Highway, by which any resident of the nine communities could reach the bustling city of Valles in under an hour. They are linked in less obvious ways as well, through ties of migration to Monterrey and thence to the U.S.; through their gradual exposure to national and even global markets for land and labor; and through their guardianship of an important humid tropical environment, including its increasingly valuable water -- the preoccupation of all the communities with water sources was evident on their community sketch maps, on which they located and named many springs.

We cannot make firm predictions about the future, as neoliberal reforms are just starting to show their effects; nor can we generalize from one community to the others, since their physical geographic contexts and their individual leaders are so distinct. However, we have compiled a baseline with complementary data of many sources and scales, and by combining the organizing, analysis, display, and updating capabilities of GIS with other expeditions to other regions of Mexico, we can at the very least identify which variables to track, and how to track them, in order to produce timely data relevant to the common concerns of Mexico and the United States.