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## Potentials of Participatory Mapping to Approach Perceived Community Limits in the Central Andes of Ecuador

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Możliwości mapowania partycypacyjnego w zakresie postrzeganych granic społeczności  
w centralnych Andach Ekwadorskich

**Abstrakt:** W artykule przedstawiono, w jaki sposób mapowanie partycypacyjne może przyczynić się do zrozumienia lokalnych znaczeń w zakresie ograniczeń społeczności i postrzegania bezpieczeństwa posiadania wśród rolno-pasterskich społeczności Andów, które uczestniczą w programie płatności z tytułu świadczeń na rzecz ekosystemu (PES). Literatura przedmiotu wskazuje, że zwiększenie bezpieczeństwa posiadania może być dodatkowym elementem uczestnictwa w takich programach. Autorzy skupili się na programie ochrony „Socio Páramo” w celu przeanalizowania, w jaki sposób włączenie gruntów do tego programu wpłynęło na kwestię postrzegania limitów oraz bezpieczeństwa wśród lokalnych społeczności. Zostały zrealizowane dwa studia przypadków na wysoko położonych pastwiskach (*páramo*) w Ekwadorze. Najpierw użyto map szkicowych, aby dowiedzieć się, w jaki sposób obszar wpisany w program zmodyfikował struktury przestrzenne terytorium społeczności i jaki typ ograniczeń znajduje się w danej strukturze. Następnie przeprowadzono spacery narracyjne. Badanie ujawniło, że: a) tytuł własności gruntów uzyskany w ramach wdrażania programu jest postrzegany jako warunek wstępny uczestnictwa w programie; b) kwestia wiedzy na temat ograniczeń społeczności *páramo* jest głównym problemem w przypadku osób starszych, którzy uważają taką wiedzę za kluczowy aspekt, jeśli chodzi o utrzymanie spójności danej społeczności. Wnioskujemy, że mapowanie partycypacyjne jest skutecznym narzędziem służącym wyjaśnianiu obaw dotyczących ograniczeń, zasad i kontroli użytkowania gruntów oraz trwałości życia wspólnotowego, czyli elementów, które należy uwzględnić przy wdrażaniu PES.

**Słowa kluczowe:** mapowanie partycypacyjne; płatności z tytułu świadczeń na rzecz ekosystemu; postrzegane granice społeczności; Andy; Ekwador

**Abstract:** This paper presents how participatory mapping can contribute to the understanding of the local meanings of community limits and perceptions about tenure security in agro-pastoral communities of the Andes, which participate in the payments for environmental services (PES) program. Literature about PES sustains that increasing tenure security might be an additional element of participating in such programs. We focused on the “Socio Páramo” conservation program to analyze how the inclusion of land in this program has influenced perception on limits and tenure security for the local communities. With two case studies in the high grasslands (*páramo*) of Ecuador, we first used sketch maps to elicit how the area inscribed in the PES program has modified the spatial structures of the community territory and what type of limits are found in this territory. Then, we conducted narrative walking to track GPS points with descriptions of land uses, perceived communitarian limits and narratives about meaning or concerns with regard to limits for the community and the relation between the legalized area inscribed in the PES program and tenure security. Maps were produced through GIS support and narratives were analyzed through thematic coding. The study reveals that: a) legal tenure obtained in frame of PES implementation is perceived as a pre-condition to participate in the program and has influenced positively or negatively land tenure security for the entire community; b) knowledge about community limits of *páramo* is the main concern for elder members, who regard this knowledge as the key element to maintain community cohesion. We conclude that participatory mapping is a powerful tool to elucidate concerns about limits, rules and control over land use and persistence of communitarian life, elements that should be considered when implementing PES.

**Keywords:** participatory mapping; payments for ecosystem services; perceived community limits; the Andes; Ecuador

## 1. INTRODUCTION

Participatory mapping has become a widespread instrument among development agencies, planners or scholars (Chambers 2006). Maps produced under a communal view are instruments that provide features and symbols within a specific spatial context to realities that are perceived, desired or subjective. Applications of participatory mapping are very diverse, being socio-environmental relations or land tenure conflicts main field of use (Chapin *et al.* 2005; Reyes-García *et al.* 2012).

Specifically, participatory mapping has recently being used to evaluate ecosystem services (Palomo *et al.* 2013), among others within the frame of the implementation of programs of payments for environmental – also ecosystem – services (PES). These belong to the community-based conservation mechanisms, which explicitly recognize the need of connecting the interest of the land or resource tenants with the external beneficiaries. Despite the increasing attention to PES programs worldwide, it remains a highly contested approach, particularly regarding its implementation in the Global South (Bremer *et al.* 2014).

Most critics focus on the fact that the mechanism considers ecosystems in terms of service transaction between buyers and sellers (Wunder 2005). Currently, PES is defined as a voluntary transaction between service users and providers that are conditional on agreed rules, to promote conservation and off-site services (Wunder 2015). Pro-PES scholars and policy makers argue that their implementation could bring substantial livelihood improvements to poor, remote rural dwellers with few income opportunities (Pagiola *et al.* 2005) through off-site effects or additionalities, such as land tenure legalization or increase of tenure security.

Since 2008, the “Socio Bosque” national program was implemented in the Ecuadorian Andes to conserve forest and other key ecosystem remnants, both privately and communally owned (Farley *et al.* 2011). The program was developed to reinforce conservation efforts of the high Andean grasslands ecosystem (locally known as *páramo*), through the subprogram “Socio Páramo” (SP). Among other factors motivating participation, expectations on acquiring land tiles of communal *páramo* were important for indigenous and peasant communities to participate in the program (Bremer *et al.* 2014). To enter it, the legal title deed of the area to enter the program is demanded. Nonetheless, there is no evidence that legalized surfaces of *páramo* inscribed in the program have increased land security for the overall community. Land tenure security is the assurance a landholder feels that property or tenure rights will be upheld by society (Sjaastad, Bromley 2000); tenure security increases, for example, as risk of eviction is minimized (van Gelder 2010). In the case of countries where legal frameworks are weakly supported, land regularization might not necessarily secure land tenure (Ma *et al.* 2015). Furthermore, land security might be perceived by land tenants if surrounding conditions and other informal elements allow them to believe that rights to land are being respected.

Under the foregoing, the main objective of this article is to explore the potentials of participatory mapping to understand the subjective concerns about communal limits and tenure security of Andean communities, in the context of the implementation of a PES program. To achieve this goal, we use a study case of two adjoining indigenous communities in the central Andes of Ecuador around mounts Chimborazo and Carihuayrazo. First, we approached the spatial organization of the community through sketch maps, in order to elicit the spatial structure of the community territory, and within this, the importance of the limits of different zones. Second, we established the location of the perceived limits of communal territory and identified the concerns about the limits and about tenure security through narrative walks. The outcomes of these analyses are used to explore the relationship between the perceived limits of communal territory, the legal limits of the area registered in the SP

program and the values and meaning of limits for local communities. In the background section, we present: a) basic information of the SP program; b) the conceptual frameworks used, which include, van Gelder's (2010) tripartite view of tenure security that recognizes a legal, *de facto*, and perceived land security; and Chambers's (2006) approach to participatory mapping. The study reveals that legal tenure obtained within the frame of PES implementation is seen as a means to participate in the program, but has not changed the conditions of land tenure security for the entire communal *páramo*. It also shows that knowledge about community limits of *páramo* are a main concern, particularly for the elder, who regard this knowledge as a key to maintain community cohesion. We conclude that participatory mapping is a powerful tool to elucidate values and concerns about limits, rules and controls over land uses and persistence of communitarian life.

## 2. BACKGROUND

### Socio Páramo program in Ecuador

The *páramos* are the grasslands above the timberline in the humid tropical Andes and range from approximately 3,200 to 4,700 m above sea level. This region is known for its high levels of biodiversity and endemism (Luteyn 1992), and currently also for its role as a regulator of hydrologic budgets as well as for its rapid rates of soil carbon accumulation (Buytaert *et al.* 2006; Chimner and Karberg 2008). It is estimated that *páramo* coverage represents 5% of the national territory (PND 2017). Grazing has been a main economic activity since the Spanish colonial times, while agriculture has been traditionally practiced in the lower limits of the *páramo* under forms of long fallow cultivation, which are now undergoing the process of intensification (López-Sandoval 2004). In the regulations for spatial planning in Ecuador, *páramo* conservation and its sustainable use are national priorities (PND 2017) and, therefore, are included in national conservation programs such as SP.

This is based on a conservation-agreement scheme between the Ecuadorian government and the beneficiaries participating in the program. It consists in the direct transfer of a payment per hectare of native forest and other native ecosystems to individual or communal landowners, who protect these ecosystems, through voluntary conservation agreements, which are monitored on a regular basis for compliance (de Koenig *et al.* 2011). The program also aims at contributing to poverty alleviation through direct monetary compensation. A fundamental requirement to participate in the program is to have a legal title deed of the surface

that will enter the program. SP was created in 2013 and it demands control over grazing, reduction of grasslands burnings and control of agricultural expansion as means of conservation. In this year, SP had 47 beneficiaries, all of them being communal organizations (e.g. communities, associations, communitarian water administration groups); these organizations represented 14,607 households and covered 32,770.29 ha. The average compensation payment for 2013 was 30 USD/ha (MAE 2013). Among communal participants of SP, several are located in the central provinces of the Andes of Tungurahua and Chimborazo, where *páramo* covers more extended zones and it is mostly held under communal tenancy or ownership. Several studies were devoted to the analysis of the conception, implementation or impact of SP, including its influence on rules for conservation (Farley *et al.* 2011; Bremer *et al.* 2014; Hayes *et al.* 2017).

### **Tripartite view of tenure security**

Land tenure security is associated to the “risk of losing rights” to land (Sjaastad and Bromley 2000), which depends both on the expectations of individual and social contexts, like laws and/or customary intuitions and mechanisms of normative application. Van Gelder (2010) proposes a tripartite view: a legal (*de jure*), an actual (*de facto*) and a perceived tenure security. The first sees security as a legal construct, only under formal and statutory terms. The *de facto* security regards the actual control property, beyond the legal status; it is related to factors like the length of tenure, or the degree of community cohesion, within the frame of norms and social controls. The perceived tenure security is understood as dwellers’ or individual’s perceived probability of eviction of external actors (e.g. the state). *De facto* tenure security is often mediated by the length of occupation or levels of cohesion of community organization, which influence, for example, neighbor relationships. Perceived tenure security reveals the subjective interpretation of limits of the land claimed by an individual or a group. The legal tenure security provides alienation rights, legal possibilities to access credits, or to use land as an asset (van Gelder 2010). Land tenure security is a perception, a fact or a legal condition.

### **Participatory mapping**

The analysis of the perceived or *de facto* tenure security, particularly in rural communities, has highly relied on the use of participatory mapping (PM) to capture community limits, internal systems of regulation, land resources, or claims over land and resources (Barry and Meizen-Dick 2008). PM belongs to participatory methodologies, which represent an inventive and eclectic

pluralism (Chambers 2006); it is also called “community-based mapping”. “Participatory mapping” is a general term used to define a set of techniques and tools that combine the devices of participatory methods with modern cartography to represent the spatial knowledge of local communities. It is based on the premise that local inhabitants have expert knowledge about their local environments, which can be expressed in a geographical way (IIED 2006). The main concern about these methods is the degree to which participation in the mapping process is involved: it might only involve data collection up to involvement in the design, report or ownership of the information (Cochrane *et al.* 2014). In PM, the mapping process is even more central than the map itself. Results of PM are highly dependent on the attitudes or interest of facilitators and also on the position (social, political, economic) of the participants (Chambers 2006); the outcomes can elucidate multiple specialities within a single group and, therefore, they have certain constraints in formal legal contexts (e.g. solve land conflicts or being used as evidence of land claims). Nevertheless, PM is often used to elicit local knowledge, to facilitate communication between insiders (e.g. local communities) and outsiders (e.g. researchers, government or NGO officials) (Rambaldi *et al.* 2006). Therefore, PM must be used carefully. While official-legal cartography produce maps that allow land security in the context of functioning legal frameworks, participatory cartography allows to assess perceived and *de facto* tenure in the areas where local cohesion is needed to grant land security.

### 3. STUDY AREA

The definition of communitarian limits was a previous step of a broader study that looks at the impacts of PES in land use/land cover changes, in 12 communities participating in the SP program. In this context, the two study cases we present in this article belong to a more integrative research that was conducted in all study sites. Because of informed consent agreements with these local communities, we keep their names anonymous and use their codes. This study was conducted in YAT and TAM. Both are adjoining communities, and both have the highest altitudinal landmark, the peak of mount Carihuayrazo (5,018 m), in Tungurahua province and close to the city of Ambato (Fig. 1). They are located in the northern area of volcano Carihuayrazo at elevations between 3,500 m up to the mountain peak. Because of the effects of mountain shadow, bunch grasses (*Stipaichu*) locally called *pajonales* are abundant, unlike the southern area of the volcano that has larger areas of arid soils. According to Sierra *et al.* (1999), *páramo herbáceo* is the dominating vegetation, combined with patches



of scrubs and montane forests, mainly along streams and gullies. The *páramo* areas of both communities are located in the buffer zone of Chimborazo Reserve (Reserva de Producción de Fauna Chimborazo).

Both communities belong to the highland indigenous Quechua groups, politically organized in *comunas*; which are kinship-based groups with their own legal authorities – *cabildos* (Korovkin 2001). YAT got its legal recognition in 1934. As of 2018, 194 families were part of the community. TAM has 351 families, and it was legally recognized in the 1980s. YAT embraces ca. 38 km<sup>2</sup>, while TAM – 29 km<sup>2</sup>. The two communities currently belong to Pilahuín parish. As mostly everywhere in the Andean region of Ecuador, the land adjudications for the *comunas*, including adjudications of *páramo* grasslands, took place during the agrarian reforms of the 1960s and 1970s, which promoted the disintegration of the former large agrarian holdings, the *haciendas* of colonial origin (López-Sandoval 2004). In the case of both communities, claims over *páramo* tenure derived from the customary grazing practices inherited from the former *haciendas*. The livelihoods are typically determined by the altitudinal variation, and consist in the interaction between agriculture, livestock keeping and *páramo*

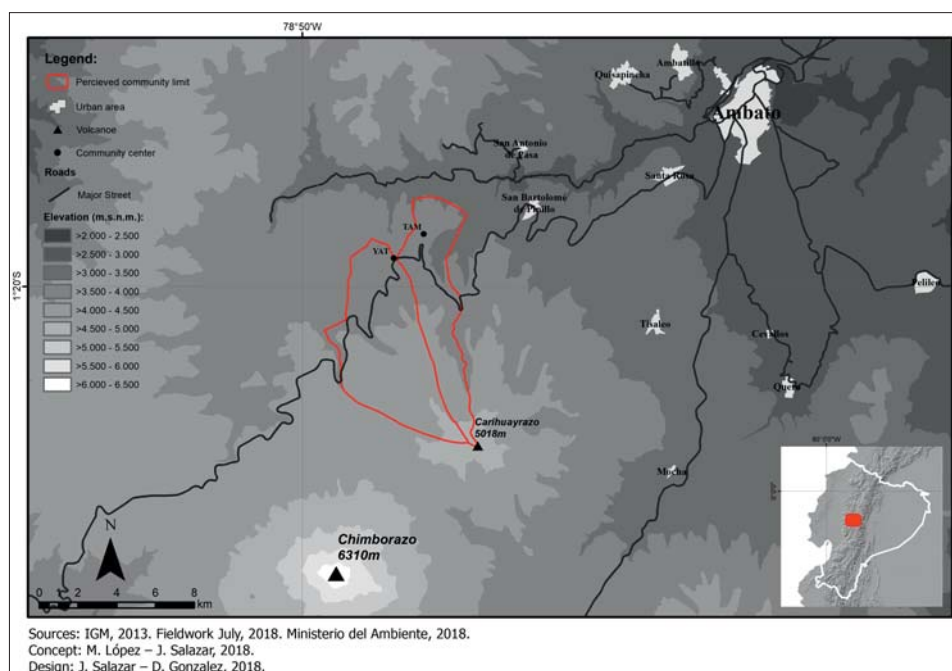


Fig. 1. Study sites with communities TAM and YAT around mount Carihuayrazo (Central Ecuadorian Andes)

Source: Field work (2018); IGM maps 1:50 000, ÑIV-A4-3890-II, ÑIV-C1-3880-IV.

grazing, which results in complex agro-pastoral vertical livelihood systems. These are nowadays highly influenced by non-farm income and strong links to urban centers (e.g. Ambato or Riobamba).

#### 4. MATERIAL AND METHODS

We use two techniques of participatory mapping: sketch maps and walking interviews. While sketch maps were conducted in the first phase of the research in 2013; the narrative walks were done in 2018. For participative appraisal methods, an oral informed consent was agreed between researchers and participants prior to the research activities.

*Sketch maps* is a method for mapping on paper; it consist of a process of drawing the areas being analyzed, with no accurate locations, directions, distances or scales. Elements of the maps are not systematically linked to symbols. Two additional features are key for obtaining good results: appropriate facilitation and recording or documenting both the drawing process and the dialogues and impressions of the participants; the latter enhance a proper interpretation of the map (Rambaldi *et al.* 2006). In this study, sketch maps were used to analyze the spatial structure and zones in the community territory, taking into account the importance of limits, including those of the SP area.

For the sketch maps, blank A1 paper sheets were used for drawing as well as colored marker pens. The drawing activity was conducted with a focus group, consisting of voluntary participants, both members and leaders of the communities: YAT (N = 6); TAM (N = 3). To achieve the goal of mapping, the facilitator provided guideline questions regarding: basic landmarks for localization of community limits (e.g. road, rivers, gulches, neighboring communities), zones of agricultural and grazing activities, as well as location of settlements, distances in time to the *páramo* area. In the case of YAT, guiding questions about uses and conservation actions in the SP area were included.

*Walking interviews* (also narrative walking) is an interview made while the researcher and participants walk together through the area being assed; it is an innovative instrument within the method, referred to as the mobility paradigm (Scheller and Urry 2006). In comparison with sedentary techniques, walking allows rich narratives about places or spatial/environmental features; interviews are deeply connected with the surrounding landscapes and there is more emphasis on the spatial features approached in the interview (Evans and Jones 2011). Walking interviews encourage to depict connections with the environment, whereby researches can understand how, for example, places are created or perceived (Ingold and Lee 2008).



Before the narrative walks, focus groups with community leaders were made, to identify the limits on maps or orthophotos. Some younger community members were familiar with the use of that material. Maps were prepared on the basis of national topographic data, available online in Geographical Institute of Ecuador. Participants review the names of rivers, towns, settlements or elevations to identify the community area. After this first delimitation, the walks began. These consisted in two main activities: first, tracking land use/cover in the SP area and outside of it, and second, tracking perceived limits using a GPS device. Location points were in both cases collected every 100 meters; ground horizontal photographs in the four cardinal points were taken and narratives of participants were recorded. In YAT, the walk was made with the current president (42 years old) and the former presidents of the community and another community member (41, 64 and 63 years old, respectively). Three days were needed to track limits, land use/cover, both in the SP area and out of it. The narrative walk in TAM was conducted with a former community president (56 years old) and one community member (36 years old). The community considers the *páramo* zone as a protected area and they want to enter the SP program, and, therefore, they prefer not to carry out maintenance of roads or trails in the *páramo* to let natural regeneration. After collecting the GPS points and the qualitative information, this was introduced in a GIS project database. Qualitative information was analyzed through thematic coding (Flick 2009).

## 5. RESULTS

### **Spatial organization of the community (sketch maps analysis)**

Participants of sketch mapping, following the guidelines of the facilitator, enthusiastically draw and narrated the way the communities organize their livelihoods within the community's territory, drastically influenced by the altitudinal variation. Perceived communal limits correspond to specific landmarks of relief or water bodies or man-made signs, such as trenches (*zanjas*). Given that both communities are located in the higher parts of mount Carihuayrazo, communal limits are usually watershed lines, gullies (*quebradas*) or ridges. Through the narratives, the interface between agriculture and grazing in *páramo* became evident, as well as the internal distribution of settlements depending on the elevations. In the case of YAT community, the area included in the SP program became a new spatial element of territorial structure, where communal rules concerning conservation and sanctioning pastoral uses are important. Drawings and narratives about the community territory shaped the

importance of four spatial features (analyzed as codes): limits, zones, land uses and settlements. The SP conservation area has become a new element in the community's spatial organization (Fig. 2, 3).

### TAM community

- *Limits*: references to landmarks and to the neighbor communities were used to identify their communal limits: Pucará, San Antonio, Yatzaputzan, Mullanleo (neighbors); the gulch Chiquicahua, mount Carihuayrazo (landmarks).

- *Zones and land uses*: participants identified two main zones within the communal territory: settlement-agriculture zone and reserve zone, the latter located inside the Chimborazo Reserve (*zona de reserva*); the zones are divided by the line of the agricultural frontier (*frontera agrícola*) located in altitudes between 3,700 m and 3,800 m. While in the settlement-agriculture zone, agriculture and pasture parcels, roads and paths are main land uses, the reserve zone is mainly covered by *páramo* vegetation. The map reveals qualitative information

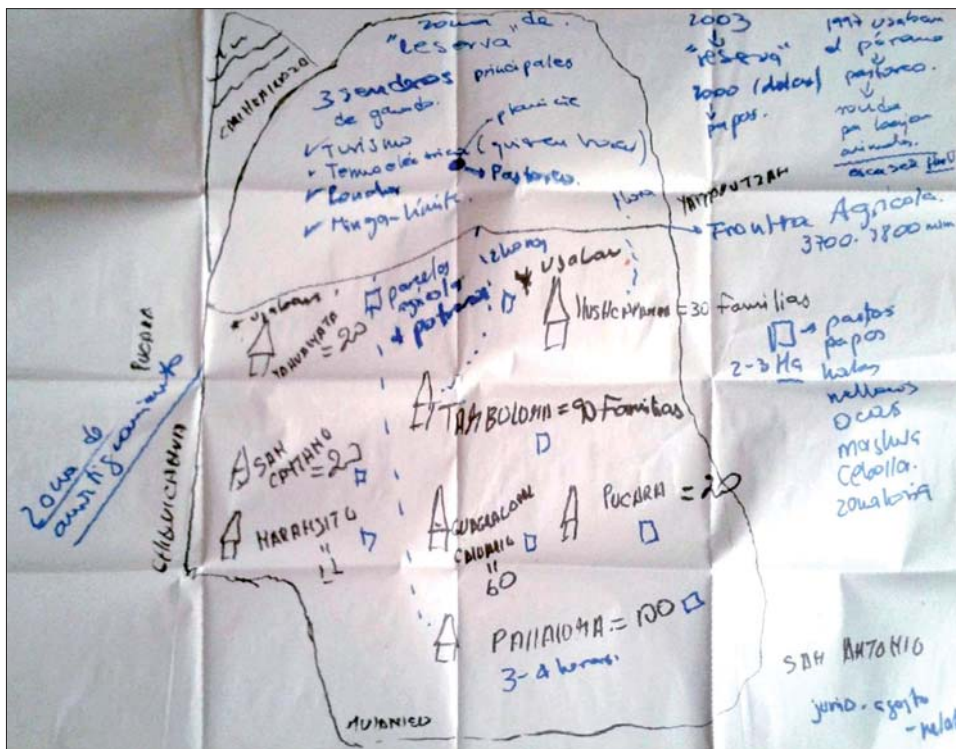


Fig. 2. Sketch map of TAM community; spatial organization of the community  
Source: Field work (2013).

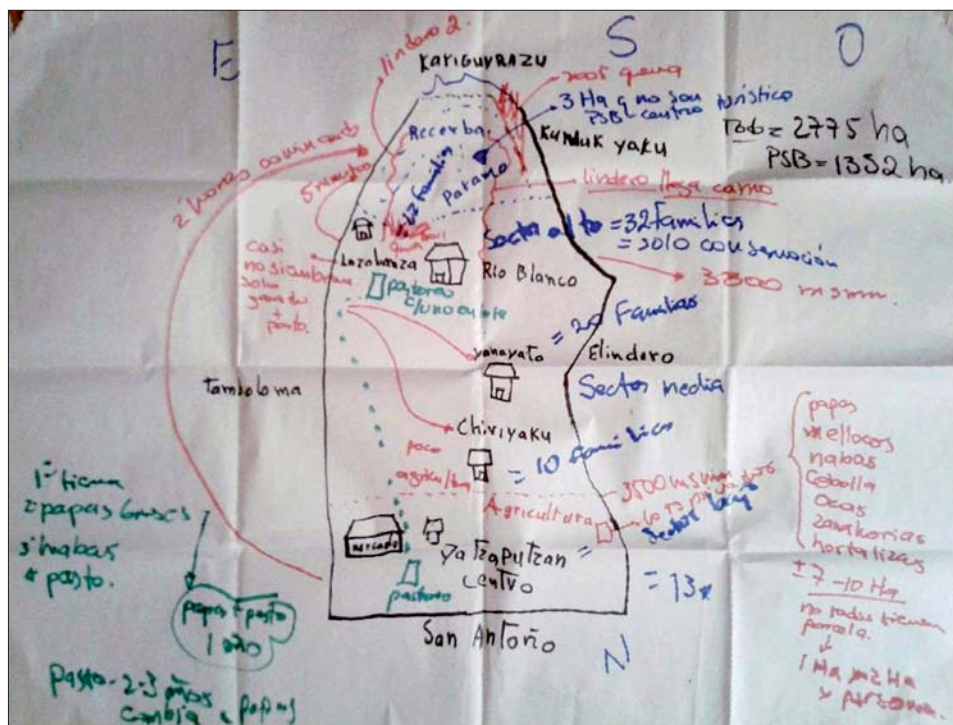


Fig. 3. Sketch map of YAT community; spatial organization of the community

Source: Field work (2013).

about these zones and land uses. In the settlement-agriculture zone, crop rotation is typically the one of the agriculture frontier zones in *páramo*: there can be found potatoes, broad beans (*Vicia fava*), Andean tubers (melloco – *Ullucus tuberosus*, oca – *Oxalis tuberosa*, mashua – *Tropaeolum tuberosum*), bunching onions, carrots. Plot sizes are between 2 and 3 ha. In the reserve area, tourism is practiced (e.g. trekking to mount Carihuayrazo); there is also a small thermo electrical plant.

- *Settlements*: the participants identified nine settlements (*sectores*) and their correspondent number of families living within the community territory: Yahualtya (20 families), Lluscapamba (30), San Cayetano (20), Naranjito (11), Pallaloma (100), Guagracorral (60), Tamboloma Centro (90), Pucará (20), Hushucuma (30).

- *Qualitative information*: the reserve zone is inside the Chimborazo Reserve; this has influenced the fact that between 1997 and now there have been changes in the pastoral uses of *páramo*. In the past, more intensive cattle ranching was practiced in *páramo* as well as cultivation of potatoes

and communitarian pastoral practices (*rodeos*) were more common until the creation of the reserve.

### YAT community

- *Limits*: participants recognize neighbor communities (Tamboloma, San Antonio), and landmarks, (gulch Kumuk Yaku, mount Carihuayrazo) as limits of the community territory.

- *Zones and land uses*: participants identified three zones: lower, middle and higher (*sector bajo*, *sector medio*, *sector alto*, respectively). These zones are differentiated both by altitudes (lower than 3,500 m; between 3,500 m and 3,800 m; above 3,800 m) and by land uses (lower zone is characterized by more intensive agriculture; middle zone – by less intensive agriculture and more pasture parcels; higher zone, conservation and tourism in SP area and grazing in areas outside SP). Crop rotations in the lower zone with intensive agriculture include: potatoes, broad bean, Andean tubers (melloco, oca, mashua), bunching onions, carrots, other vegetables; land properties with an area between 7 and 10 ha, but not every community member has a parcel in this zone. In the middle zone, crop rotation includes mainly potatoes (one crop), broad beans (one crop) and pastures (2–3 years).

- *Settlements*: in the lower zone, the settlement (*sector*) Yatzaputzan Centro (134 families) is located; this settlement is the center of the community and has communal service facilities such as markets, schools, communitarian buildings; in the middle zone, there are Chiriyán (10 families), Yanayata (10); higher zone – Labranza (22), Río Blanco (10), that practice mainly grazing in pasture parcels. The higher zone has no settlements.

- *Socio Páramo area*: located in the higher zone, but it does not cover the whole *páramo* of the community. Out of 2,775 ha that the community occupies, 1,353 ha are inside the SP area; in this area 3 ha are excluded because of an existing communal building for tourism purposes. From the community center to the lower part of the SP area there is a two-hour walk, but it is also possible to get to this location by car. There are some paths created because of the need for conservation control; there is a group of community rangers who periodically visit the area.

The elements analyzed in both maps as well as the narratives collected in the mapping process reveal a differentiated structure of community territory between the community participating in the PES program and the one which did not participate in it. Figure 4 shows this differentiated structure, in which the existence of the polygon registered in the PES program (C area) set official

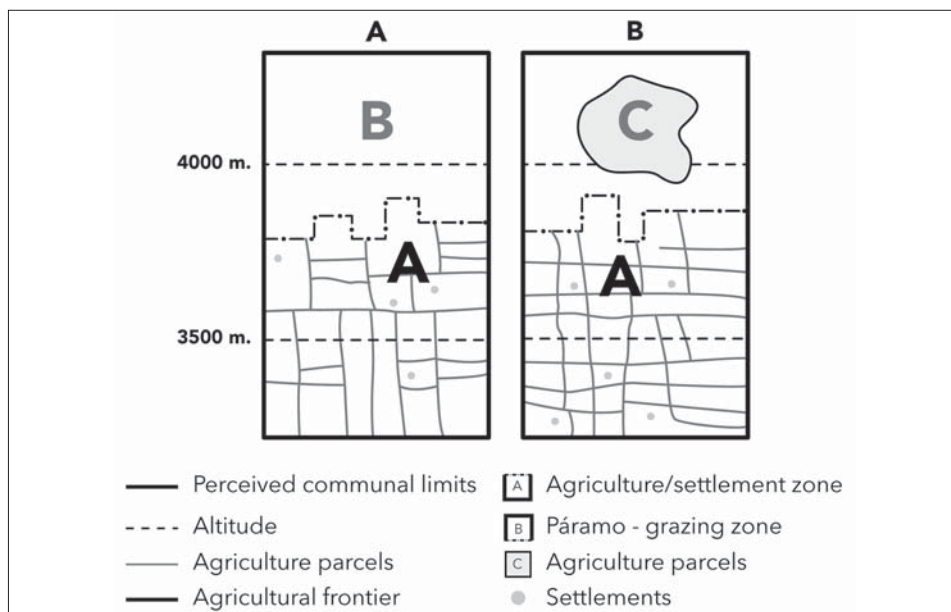


Fig. 4. Zonation of community territory: traditional (a); including conservation area of PES (b)  
Source: Field work (2018); Fig. designed by D. Carvajal (2019).

limits for specific conservation practices and communarians' rules to control activities attempting at environmental conservation. The traditional zones for agriculture/settlements (A area) and for grazing (B area) are divided by the line of agricultural frontier, while general limits between neighbor communities remain as a collective perception of community members.

#### Perceived limits of communal territory: Narrative walking analysis

For most communities in the central Andes of Ecuador, printed maps of communal land are needed. However, generating such maps is complex given that the limits of the communal land in *páramo* are often not legally registered. In the agriculture-settlement zones no communal proprieties exist. Nonetheless, the perception of community limits corresponds to those of the private parcels that belong to their members. Figure 5 presents the perceived limits of both community territories. In the case of TAM, these limits were traced during a focus group discussion, while for YAT they resulted from the narrative walk explained in section 4.

The GPS points recorded during the walk allowed to map the limits of YAT and to compare them to the perceived limits of TAM, collected through the drawings on the orthophoto. The legal limits of the SP area in YAT (Fig. 5a) are



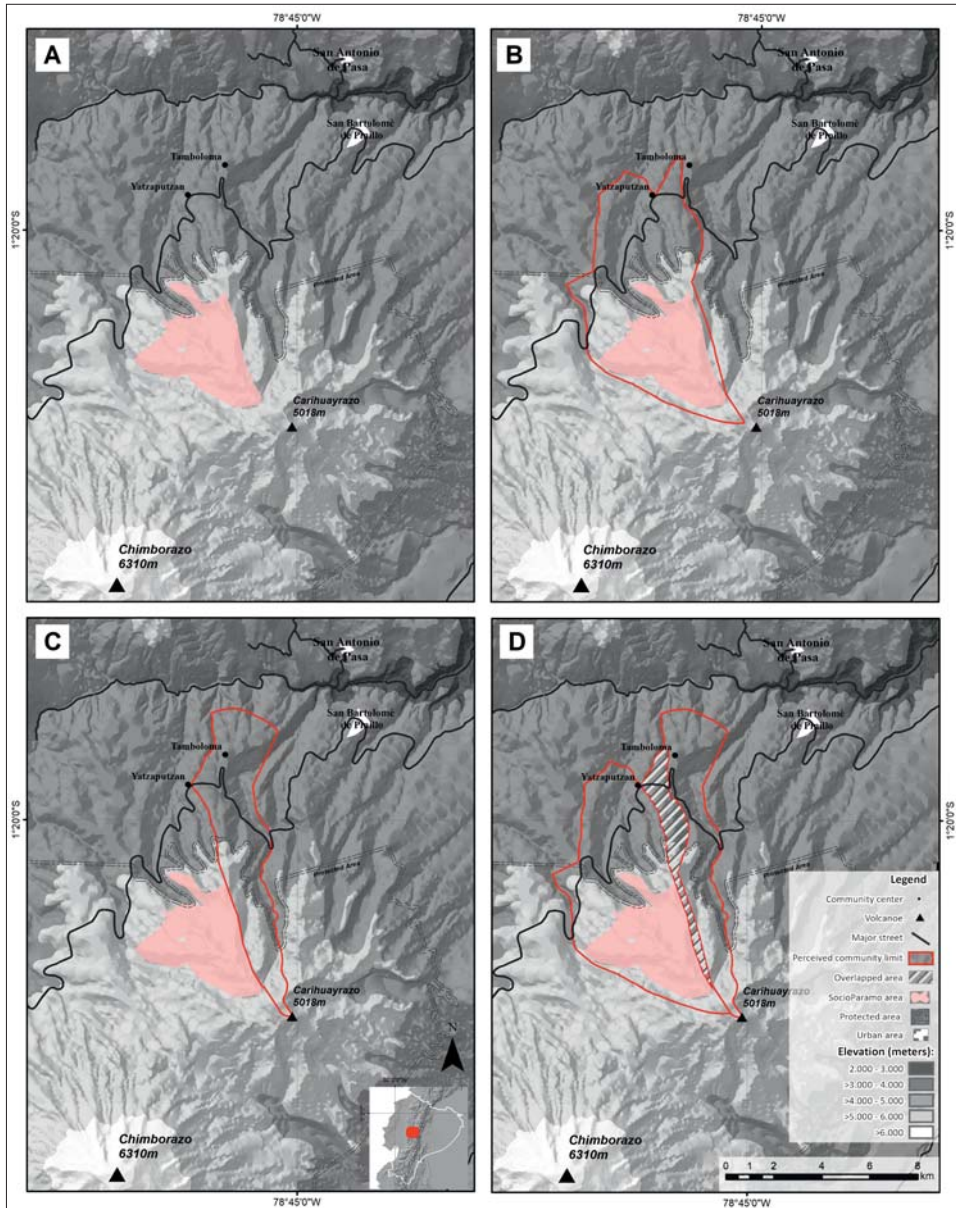


Fig. 5. a) limits of SP area in YAT (legal limits); b) perceived community limits of YAT; c) perceived community limits of TAM; d) overlap area of perceived communal lands, YAT and TAM  
Source: Field work (2018).

those considered in the cadaster register and, therefore, are official. The condition of having legal tenure over the area participating in the SP is fulfilled through the legal inscription of the title deed to this plot. However, the legalization of

tenure of the SP area does not include the entire communal lands in *páramo* (Fig. 5b). Community members refer to the perceived limits of community territory as those that embrace the parcels, dwells and grassland (e.g. *páramo* for conservation or grazing) both in YAT (Fig. 5b) as well as in TAM (Fig. 5c). The perceived limits resulting from the GPS points recorded during the narrative walk in YAT showed that there is an area which overlaps with an area claimed by TAM (Fig. 5d).

The narratives that accompanied the walk allowed understanding the meanings of community limits for the participants and also the importance of identifying them in the terrain. Community limits intermingle with other concerns, such as the “knowledge” of young members about those limits, the “confusion” about the exact location of these limits or the “intrusions” of livestock of neighbor communities. Limits are clear for the elders (above 60 years old), particularly for those who were actively involved in getting the land adjudications during the agrarian reforms, given that to get access to *páramo* became a main achievement or their “fight for land” (*lucha por la tierra*). That is why they are worried about the fact that younger members, e.g. their children or grandchildren, are not well informed about the location of those limits, and furthermore, they are not even interested in taking care of *páramo*. Taking into account that younger people are strongly involved in off-farm activities, to conduct walks under unconformable climatic or relief conditions is not attractive. Nonetheless, participants of the walk explained that at least the leaders of the *cabildo* must do walks of limit recognition, as part of their formal duties. Occasionally, these walks are combined with *mingas* (collective work) for clearing natural landmarks (e.g. cutting vegetation) or to set visible marks (e.g. paint rocks, dig or clear up trenches) in order to identify the limits; this is very important to avoid “confusions” with neighbors. These confusions can bring troubles with people or with the *cabildos* of neighboring communities. Common conflicts derived from these confusions are “intrusion” of livestock in the grazing or establishment agricultural parcels or even infrastructure. Participants of the walk considered that these conflicts exist because of the lack of knowledge of the individual persons about the location of those limits.

When asking about the perception of tenure security of the *páramo* grasslands related to the participation in SP, participants responded that the legal definition of limits and deed of the area enrolled in the SP program were needed as the condition to participate in the program. Boundaries were demanded to monitor prohibited activities (e.g. grazing or fires). However, it did not influence the limits of the entire community. The existence of legal limits of the SP area has not stopped confusions related to unclear perceived limits of the individual



members of neighboring communities. Although the desire to establish definite communal limits of the entire *páramo* zone was explicit, overall, participants did not have concerns about losing rights to the *páramo* lands. *De facto* tenure security exists due to the mutual acknowledgment at the communal level of the *páramo* areas belonging to the neighbors. However, this form of security has no relation to the participation in the PES program. While *de facto* tenure security is important for daily communitarian life, legal security of the SP area is needed to participate in the program and to get financial support through it.

## 6. DISCUSSION AND CONCLUSIONS

For the community members, limits (of zones, community, SP area or agricultural frontier) are important concerns because they set borders to certain practices, land uses, neighbor relationships and recall hard work of elder members that fight to access land. Participatory mapping, in this study, sketch maps, helped to understand how the inclusion of an area under the PES program has changed the traditional spatial structure – agriculture-settlement zone, agricultural frontier line and grassland zone – to a modern one that includes a conservation area in the grasslands of *páramo*. Here specific rules operate in order to control prohibited activities, related mainly to grazing, but also to agriculture. From the technical point of view the legal limits of the PES area are demanded to keep track of the achievement of the conservation agreements. This also required the establishment of rules, regulations, and control mechanisms within the community members, which are not always accepted by all of them (Hayes *et al.* 2017).

The narrative walks showed that the legal limits achieved for participating in the PES program has not increased or decreased tenure security; minor conflicts like intrusive grazing by neighbors are still occurring, but *de facto* security exists given long-term historical neighbor relations between communities. GPS points tracked along the walk allowed to map the perceived community limits, in which it was possible to visualize an overlap of tenure perception; these results have to be carefully interpreted, then they represent a specific perception of a group of informants. For the purposes of this paper though, it is clear that overall regularization of land tenure to participate in PES has not influenced minor conflicts regarding limits or major concerns about knowledge of limits by young people. This is interpreted as lack of interests of younger people in communitarian life.

Participatory mapping becomes a powerful tool to unveiled values and concerns about community limits from the perspective of the community members. The study showed that sketch maps have the potential to identify main spatial features related to limits or boundaries of zones, land uses, and uses or

restrictions, which are important for local people, in relative short time. Narrative walks demand more time investment, but can create a more pleasant communicative atmosphere to talk about the environment as it takes place outdoor. Visiting places and observing spatial features in the terrain recall memories, concerns and expectation about limits and community life. When evaluating the collateral effect of PES in tenure security and land legalization, implementers should consider these tools to evaluate what tenure security and limits mean for local people, to improve mechanisms of implementation of PES programs and, therefore, its outcomes.

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