

Case study

Agritourism as a sustainable adaptation strategy to climate change in the Andean Altiplano

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ABSTRACT

The Andean Altiplano has a diversity of landscapes supporting rural livelihoods. Climate change historical trends and projections point to disruptions in the livelihoods of farmers in this region. This context of climate change requires system-wide analysis to determine socio-ecological adjustments. In response, we conceptualized agritourism as a climate change adaptation strategy capable of supplementing agricultural incomes and sustaining rural livelihoods in the Andean Altiplano. We operationalized the framework of change with data gathered from 134 households in Ancoraimes (Bolivian Altiplano) to identify attributes that could enable or constraint agritourism development at five intervention scales: production, livelihood, community/watershed, landscape/ecosystem, and government. By assessing the climate and socio-economic drivers and dynamics of change, and the local assets enabling agency in rural communities, agritourism is presented as a short-term strategy to increase household's revenues, reduce risks associated with agricultural production, and decrease the depletion of natural resources (soils, water, biodiversity) for the long-term sustainability of Andean agriculture-based livelihoods.

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1. Introduction

The Andean Altiplano is located in the central Andes (South America), spanning from southeastern Peru to about southwestern Bolivia and reaching small portions of northern Chile and Argentina (Guillermoprieto, 2008). Despite its high altitude, the Altiplano has a diversity of landscapes supporting rural livelihoods. In the Bolivian Altiplano, where data for this study were collected, 50% of the population is engaged in agriculture. Climate shapes the farming systems of the region as production systems are mostly rainfed. Agropastoral systems are mainly adopted in semiarid regions while crop and livestock production are integrated in sub-humid regions (García, Raes, Jacobsen, & Michel, 2007). Agricultural production is also impacted by droughts, frost, floods and pests (Gilles & Valdivia, 2009; Valdivia, Gilles, & García, 2010; Valdivia, Seth, et al., 2010).

Historical data show that the climate of the Altiplano is changing in terms of temperature and precipitation and forecasts indicate that such variations will continue in the next decades (Seth, Thibeault, García, & Valdivia, 2010; Thibeault, Seth, & García, 2010). Given the strong dependence of the Altiplano agricultural livelihoods on climate, climate variability challenges traditional relationships between locals and their

lands and imposes additional burdens to agricultural-based economies and their natural resources (Young & Lipton, 2006). For example, soils are losing their fertility and ability to buffer the effect of extreme temperatures as a result of shortening the fallow periods, inability to invest in fertilizers, and loss of amendment practices that build organic matter (Gilles, Thomas, Valdivia, & Yucra, 2013).

Traditional knowledge and practices, especially those contributing to the resilience of the ecosystem, may disappear as a result of climate change (Sperling et al., 2008). The vulnerability caused by climate change is even greater in developing countries, such as Bolivia, because of their limited institutional capacity, reduced technologies, and limited access to financial resources (Challenger, 2002 as cited by Becken, 2005). Thus, the urgency to develop adaptation strategies in these areas to reduce the effects associated with climate change (Howden, Soussana, Tubiello, Chhetri, & Dunlop, 2007). In this context, adaptation strategies are defined as long-term actions taken to modify ecological and social systems to adjust to persisting changes in the climate (Barnett, 2001), as occurring in the Altiplano.

Given this scenario of change in the Bolivian Altiplano, we conceptualized the suitability of implementing agritourism in the Bolivian Altiplano by operationalizing the framework of change that captures the complexity of socio-ecological systems (Valdivia, Gilles, et al., 2010; Valdivia, Jiménez, & Romero, 2007). We exercised this framework because adaptation strategies to climate change demand system-wide analysis and interventions (Barnett, 2001); we propose agritourism as an adaptation strategy because of its suitability as a sustainable

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economic activity to supplement agricultural incomes and enhance rural livelihoods. We used data gathered through household interview surveys in the Municipality of Ancoraimes (Bolivia) to identify attributes that could enable or constraint agritourism development using the framework of change.

The remaining sections of the manuscript provide a theoretical background by detailing the framework of change, presenting agritourism as a complementary economic activity and discussing issues related to its sustainability; contextualize the study setting by summarizing climate variations and forecasts for the Andean Altiplano and describing the agricultural and socio-economic context of the study communities; operationalize the framework of change by discussing Ancoraimes socio-economic data as enablers or constraints for agritourism development; conceptualize agritourism as a sustainable adaptation strategy; and provide final insights for its further development.

2. Theoretical framework

2.1. The conceptual framework of change

The framework of change (Valdivia, Gilles, et al., 2010; Valdivia et al., 2007) that is used to conceptualize the development of agritourism in Ancoraimes captures the multiple socio-ecological systems (assets and livelihoods strategies) that influence household decisions concerning their livelihoods efforts at five different scales: production, livelihood, community/watershed, landscape/ecosystem, and government (Fig. 1). Socio-ecological systems capture the complexity of natural and human systems and recognize a dynamic relation and interaction among these scales. The framework of change explains how climate affects ecosystems, impacting in turn, the social and economic conditions of communities and households which can themselves feedback into the process and impact climate change. Likewise, it is important to recognize the dynamics and interactions that the market causes at different scales affecting household livelihoods and decision-making (Ostrom, 2007).

In Valdivia et al. (2007), Valdivia, Gilles, et al. (2010), and Valdivia, Seth, et al. (2010) framework of change, production systems are placed as an inner scale within the larger dynamic system because household decisions can change the quality of natural and human systems causing future consequences at greater scales (e.g., changing the landscapes in a region) including feedback loops and thresholds (Liu et al., 2007). For example, a threshold of temperature can affect what is produced at a certain elevation (e.g., from potatoes to onions) or the households' actions (e.g., eliminating fallow practices to maximize market prices). Climate and global markets are placed at the highest scale because

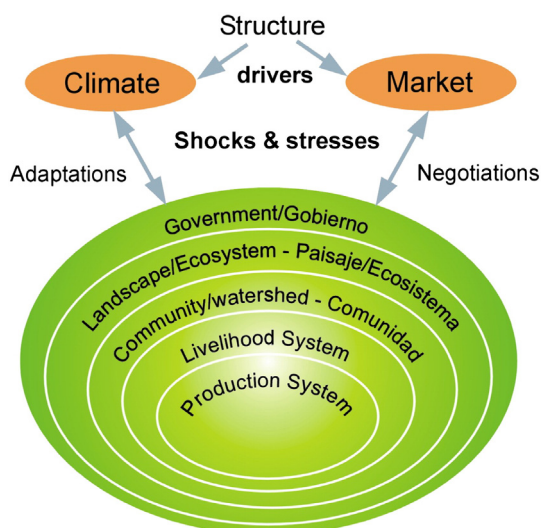


Fig. 1. The framework of change (Valdivia et al., 2007).

these represent the physical and socio-economic factors influencing household decision-making and livelihoods. In the case of agriculture-dependent communities, this model helps to understand how farming and livelihood decisions impact on the environment, and in turn how the conditions of the environment impact on the outcomes of household activities and strategies. For example, while the participation of community members in product (e.g., non-bitter potatoes) and labor (e.g., temporary immigration) markets in the region may contribute to the increase of households' income, they can deplete the natural resources (e.g., reduction of soil fertility) they have access to.

2.2. Agritourism as an adaptation strategy

Agritourism is usually defined as visiting a working agricultural setting (such as a farm, ranch) for leisure, recreation, or education purposes (Gil Arroyo, Barbieri, & Rozier Rich, 2013; Ollenburg & Buckley, 2007). Many types of activities offered on farms are typified as agritourism, including those related to the appreciation of nature and agriculture (e.g., orchard tours, wildlife observation), educational activities (e.g., school tours, culinary lessons), recreational harvest (e.g., pick-your-own; fishing for a fee), and general outdoor recreational activities (Barbieri & Mshenga, 2008; McGehee & Kim, 2004; Tew & Barbieri, 2012).

Such a breadth of activities has triggered attempts to classify agritourism according to different criteria. Leeds and Barrett (2004; as cited by Srikatanyoo & Campiranon, 2010) distinguished three types of operations based on the level of farmer's involvement: farms with a minimal farmer–customer interaction (e.g., roadside stands); farms programming activities toward meeting customers' needs (e.g., corn mazes); and complex and sophisticated operations (e.g., full service restaurants). Phillip, Hunter, and Blackstock (2010) classified agritourism operations based on the working status of the agricultural setting, the type of contact between the tourist and agricultural activity (passive, direct or indirect), and the genuineness of the visitor's experience (authentic or staged). Srikatanyoo and Campiranon (2010) proposed that three distinct agritourism products should be formulated to respond to agritourists' motivations: enjoying agricultural experiences; relaxation within a rural setting; and quality of life, relationships, and adventure. Thus, agritourism is not a standardized recreational activity, but it is adaptable to different contexts, visitors' motivations and farmers' desired involvement.

Agritourism has received a great deal of attention in the tourism and sociological literatures during the last decade as a strategy to help farmers adapt to the challenging agricultural context ruled by squeezed prices and enlarged corporations. Agritourism is not only promoted as an economic diversification strategy around the world, but to pursuit a complex set of entrepreneurial economic and non-economic goals (Nickerson, Black, & McCool, 2001; Ollenburg & Buckley, 2007; Tew & Barbieri, 2012) and promote rural development (Barbieri, 2013; Yang, 2012). For these reasons, and given its flexibility as a recreational activity, we propose agritourism as an adaptation strategy in Ancoraimes.

2.3. The sustainability of agritourism: Potential benefits and stated challenges

Sustainability has been conceptualized in many ways, most likely due to the broadness of the original definition, the multidimensionality of the economic activity examined, and the analytical approach behind (e.g., political, environmental); yet, consensus exists regarding its three comprising dimensions: socio-cultural, environmental, and economic (Butler, 1999; Lozano, 2008; Pretty, 1996; Zhen et al., 2005). Within a sustainable agricultural context, as applicable to this manuscript, the socio-cultural dimension refers to self-reliance, equality and improved quality of life; the environmental dimension refers to the preservation of the natural environment through the cautious use of inputs; and the economic dimension refers to ensuring stable and profitable production activities (Rasul & Thapa, 2004; Zhen et al., 2005).

Agritourism has been suggested to be a sustainable entrepreneurial venture because it is capable of delivering an array of benefits in three dimensions of sustainability (Barbieri, 2013). Within the socio-cultural dimension, agritourism can strengthen the family farm institution, preserve rural heritage, minority customs and traditional architectural styles, increase community pride and farmers' social status, empower female farmers, and foster relationships across cultural groups (Barbieri, 2013; LaPan & Barbieri, 2013; Ollenburg & Buckley, 2007; Yang, 2012). From the environmental perspective, agritourism helps to protect natural habitats and ecosystems, conserve water resources, minimize environmental damage, improve the surrounding village scenery and built infrastructure (Barbieri, 2013; Carlsen, Getz, & Ali-Knight, 2001; Choo & Jamal, 2009; Yang, 2012). In economic terms, agritourism can create jobs, increase agricultural profits and farm household incomes, and create cross-marketing opportunities for other farm household products (Barbieri, 2013; Hegarty & Przezborska, 2005; McGehee, 2007; Tew & Barbieri, 2012; Yang, 2012).

Although the many claimed benefits of agritourism in the three dimensions of sustainability, this entrepreneurial venture is not exempt of challenges and obstacles, especially at their start-up phase. Lack of professionalism and appropriate training are two common human constraints to successful agritourism operations (Iorio & Corsale, 2010; Sharpley, 2002; Sharpley & Vass, 2006; Yang, 2012). Although the pivotal role of women in agritourism development (Brandth & Haugen, 2010; McGehee, Kim, & Jennings, 2007; McNally, 2001; Nilsson, 2002), their ventures tend to be less profitable than those run by male farmers (Barbieri & Mshenga, 2008), most likely because women tend to have fewer linkages to professional networks, less access to financial resources and subsidies, and a greater need to balance their household and business obligations (Bock, 2004; Little & Jones, 2000).

Financial resources for initial investment may be a burden for agritourism development, especially for operations involving some sort of accommodations (Sharpley, 2002; Yang, 2012). However, capital needed for marketing purposes seems to be critical for agritourism success (Barbieri & Mshenga, 2008; Sharpley & Vass, 2006; Yang, 2012). Location is also critical for agritourism development in terms of clustering of agritourism farms (Sharpley & Vass, 2006) and availability of beautiful surrounding sceneries (Yang, 2012). Evidence is inconclusive in terms of proximity to urban settings though; while Barbieri and Tew (2010) concluded that distance from a city is not associated to the economic performance of agritourism operations, Yang (2012) reported that proximity to the city helped the development of agritourism villages. Tourism seasonality, especially during summer and holidays, appears to challenge agritourism (Fleischer & Pizam, 1997; Yang, 2012), issue that may become critical if tourism seasonality coincides with farming intensive seasons.

3. The study setting: Climatological and socio-cultural contexts

The municipality of Ancoraimes (pop. 15,199), Province of Omasuyos, Department of La Paz in Bolivia (Bolivia – INE, 2013) was selected to examine how farmers are adapting to change, driven by social and environmental dynamics. Ancoraimes is geographically located in the Bolivian Northern Altiplano (Fig. 2). Four rural communities agreed to participate in this study: Chinchaya (3856 m; 215 households), Cohani (4095 m; 98 households), Calahuancani Baja (4080 m; 82 households) and Chojñapata (4313 m; 105 households); the community of Karkapata (3939 m; 40 households) declined to participate in the study (Bolivia – INE, 2013).

3.1. Climate variations in the Andean Altiplano

Historical data show that the climate is changing in the Altiplano and projections show that these changes are likely to continue through the 21st century. Records of 15 meteorological stations in the Altiplano

showed significant warming (almost 1 °C) and drying trends for the past 50 years (Seth et al., 2010). Some areas are registering higher maximum and minimum temperatures especially during winter, while others exhibit lower minimum temperatures (Valdivia, Seth, et al., 2010). While there has not been a change in annual precipitation, farmers are reporting a later onset of rains and more intense events (Valdivia, Gilles, et al., 2010; Valdivia, Seth, et al., 2010), also observed in the trends (Thibeault et al., 2010). Forecasts indicate that mean temperatures will continue rising especially during the nights, and less days of precipitation and more intense rainfall will occur during the Summer, resulting in loss of soil moisture toward the end of the century (2070–2099), even during the rainy season (Thibeault et al., 2010).

Recurrent droughts, floods and frosts have affected the Andean Altiplano, and thus their agricultural systems, throughout history (Sperling et al., 2008). However, current climate changes are presenting new challenges to the agricultural livelihoods of local communities in the form of losses in productivity of crops (e.g., potatoes) compounded by the increased pressure from pests and plant diseases (Valdivia et al., 2007). Further climate changes forecasted will likely increase the impact on agricultural productivity due to an increased runoff ratio resulting from rainfall rates that exceed the infiltration capacity of the soil.

3.2. The agricultural and socio-economic contexts of Ancoraimes

Ancoraimes presents a diversity of landscapes, agricultural systems, and farming practices and technologies resulting from their position in the Lake Titicaca watershed, high elevation (3800–4300 m above sea level), and varied topography. In higher elevations, farming is practiced on the hillsides and it is characterized by less crop diversity, a greater presence of alpacas and llamas, and intensive labor and animal-traction techniques. At mid-elevation, there are two agropastoral communities with less access to land per household, but higher crop diversity; their families grow potatoes along with other Andean tubers, peas, fava beans, and more recently quinoa. Near the Titicaca Lake, where there is more humidity, potatoes are grown for consumption and intensive onion production systems have been introduced to supply the markets. Cattle and sheep are part of the production systems in the lower and mid levels of the watershed.

Warming trends in this region are changing agricultural production in Ancoraimes. New crops less tolerant to frosts and potato varieties different than the bitter traditionally grown have been introduced and are sold in the local markets. Peas and quinoa are also being introduced and farmers are testing the production of onions and quinoa at higher elevations. Planting is being delayed and new short growing varieties of potatoes are being introduced because of the late onset of the rains. Climate change is also causing a greater incidence of pests. The losses reported as a result of both climate hazards and increased pests in this region are significant, and farmers have expressed a high degree of dread about these events (Valdivia, Gilles, et al., 2010; Valdivia, Seth, et al., 2010).

Other socio-economic changes associated with globalization have appeared in Ancoraimes. Communities are shifting from a production for consumption economy to a market based economy, where varieties of potatoes grown are chosen to better respond to market demands. However, these market-driven production shifts are occurring among communities that are unable to fully incorporate into a market-based economy because they lack power to negotiate prices and have limited access to local markets and technologies (Jimenez & Valdivia, 2009). At the same time, these communities are losing their ability to maintain labor intensive ancestral practices (e.g., traditional fallow practices) that have contributed to the resilience of their environment (Valdivia, Gilles, et al., 2010; Valdivia, Seth, et al., 2010). Table 1 summarizes the 2006 household's assets of the four Ancoraimes communities in terms of human, agricultural and social capitals, sources of income, and strategies to cope with food insecurity.

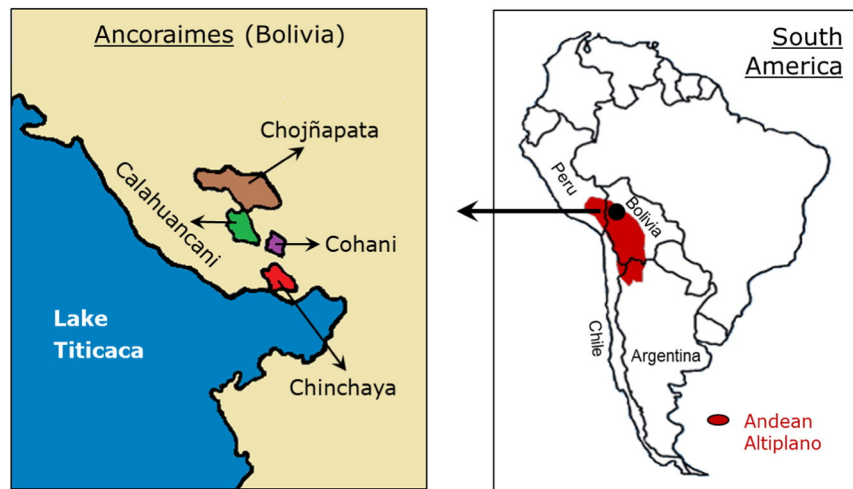


Fig. 2. Location of examined communities (Ancoraimes, Bolivia).

4. Operationalizing the framework of change: A pre-facto evaluation of agritourism in Ancoraimes

4.1. Operationalization procedures: Research methods

Socio-economic information gathered from 134 Ancoraimes households was used to operationalize Valdivia et al. (2007), Valdivia, Gilles, et al. (2010), Valdivia, Seth, et al. (2010) framework of change and evaluate whether agritourism could be a feasible strategy to diversify the households' economic portfolio and adapt to climate change. One-quarter of the households from Chinchaya (26.5%, $n = 57$ households), Cohani (27.6%, $n = 27$ households), Calahuancani (28.1%, $n = 23$ households), and Chojñapata (25.7%, $n = 27$ households) were randomly selected from a list of all families provided by the official representatives of each community; all selected households participated in the study.

Data were collected in June and July of 2006 (Universidad de la Cordillera, 2008) through face-to-face interview surveys, using a close-ended format questionnaire. Enumerators read questions and response options to farm household members following a structured questionnaire that was available in the local language (Aymara) and Spanish. Such method was selected to increase response rate, decrease the proportion of skipped and ambiguous (e.g., "I don't know") answers, and clarify questions if needed (Babbie, 1989); it was also chosen to collect information from participants with low levels of literacy. The instrument, pilot tested with families in the region, was developed to capture assets strategies, production systems, and livelihoods. Specifically, participants were queried about their socio-demographic information (e.g., age of household head, education level); agricultural assets (e.g., number of acres farmed, number of animal heads); income sources (e.g., access to credit, off-farm employment, production for self-consumption); and their strategies to cope with food insecurity (e.g., food preservation practices). Four survey enumerators (two men and two women) were trained to conduct the interview surveys; they also arranged visits with participating families. Enumerators were college students conducting their thesis or young Aymara professionals; they resided in the community for the length of the study.

The adult household head responsible for agricultural activities was surveyed; when s/he was not present, the available adult with decision-making responsibilities was questioned. When both household heads were present, they were queried about the activities they were responsible for. Subsequent visits were scheduled if at least one household head was not at home. About half (49.7%) of participating households were surveyed during the first visit. Survey interviews lasted on average one hour. Completed questionnaires were reviewed by a team leader to ensure data quality and completeness before entered into a database.

Sixty-nine percent of respondents were male, and 31% female. However, as aforementioned, in many cases the second household member was also present and responded to the survey. It is important to mention that there is gender egalitarianism among Ancoraimes households as both heads are involved in economic decisions. Traditionally, male and female can inherit land and assets and both share production and market decision-making. For example, women were the sole responsible for the commercialization of their potato production among 33% of the participating households. Average household income was 6823 Bolivianos, with 70% of the agricultural income derived from crops, 18% from livestock sales, and 12% from value added goods. On average, 11% of adults in these communities migrate to work off the farm. Most participants (58%) only had primary education. Female had even less formal education than men; on average, male had slightly over six years of schooling while female had only slightly over two years.

4.2. Agritourism enablers in Ancoraimes

Socio-economic analysis of Ancoraimes families showed several enablers for agritourism development according to the literature reviewed. At the production system scale, the greater enabler of Ancoraimes for developing agritourism is their natural capital in terms of agricultural production diversity. Most (52%) of the surveyed households reported growing at least five different types of crops, only 5% grew just one or two crops. Furthermore, 31% reported growing at least three varieties of potato, which different flower colors beautify the agricultural fields during the flowering season. Participating households also reported a relative large livestock asset; on average, they had 21 sheep, 11 camelids (llamas or alpacas) and three cattle. Importantly for tourism development, data showed that Ancoraimes households integrate crops and livestock production. In Chojñapata, 81% of the households reported incomes from the sale of crops and 56% from livestock; similar distributions were found in Cohani (81% and 63% respectively), Calahuancani (100% and 91%, respectively) and Chinchaya (98% and 61%, respectively). Such agricultural diversity, in terms of crops and varieties grown along with the mixture of camelids and livestock raised, adds to the visual appearance of the Ancoraimes landscape, increasing its beauty for tourism development. Such diversity should also be capitalized to prevent the standardization of the agritourism offerings and the commodification of the agricultural livelihood experience (Gao, Huang, & Huang, 2009; Henderson, 2009; Yang, 2012), and to maintain the resilience of the landscape.

At the livelihood scale, the major asset among the Ancoraimes communities is their agriculture-based economy which provides the capacity to offer authentic "working agricultural" experiences, attribute

Table 1
Household assets, earnings and coping strategies among the study communities in Ancoraimes.

Households' assets and earnings (2006) ¹	Study communities in Ancoraimes			
	Chinchaya (n = 57)	Cohani (n = 27)	Calahuancani (n = 23)	Chojñapata (n = 27)
<i>Human capital</i>				
Age of head of household (mean)	49	44	46	50
Education household head (number of years)	7.1	3.4	4.8	4.5
Labor available at the farm (number of adults)	3.5	3.1	4.4	2.9
<i>Agricultural capital</i>				
Area farmed in crops (hectares)	0.4	0.1	0.2	0.3
Diversity of crops (number)	5.8	3.9	4.5	3.7
Diversity of potato varieties (number)	1.9	1.6	2.5	2.7
Fallow fields (hectares)	0.8	0.2	0.4	0.3
Fallow fields (number of years)	4.6	2.6	3.2	4.1
Cattle (number of head)	3.7	1.3	2.0	3.5
Sheep (number of head)	15	11	19	43
<i>Social capital (% of households)</i>				
Access to formal credit	16	26	17	30
Borrow from friends	21	37	26	19
<i>Assets and income sources (in Bolivianos)²</i>				
Cash and in kind (e.g., self-consumption)	10,171	2416	6768	5910
Income from agriculture	6661	715	1972	1824
Income from migrant labor	4016	1633	3517	1692
Total	20,848	4764	12,257	9426
<i>Coping strategy food insecurity</i>				
Freeze dried potatoes – <i>Chuño</i> (kg)	55	21	32	52
Livestock sales (% of households)	82	63	74	73

¹ Source: 2006 Household Survey (Universidad de la Cordillera, 2008).

² Exchange rate: US\$ 1 = 6.95 Bolivianos.

that some studies suggest sine-qua-non for the provision of agritourism (Gil Arroyo et al., 2013; Hegarty & Przezborska, 2005; McGehee & Kim, 2004; Nickerson et al., 2001; Tew & Barbieri, 2012). Among the Ancoraimes communities surveyed, a relative large proportion of their total annual household incomes (Bs. 13,831; US\$ 1990) comes from the sale of their agricultural products (Bs. 3684; US\$ 530), excluding their production for self-consumption that represents about half of their total assets. Some households in the Cohani (3%), Calahuancani (4%) and Chojñapata (5%) communities produce handicrafts for cash influx. Although the proportion of households involved in handicraft is very small, it is very specialized and well-recognized among some families; such activity can help to complement and diversify the tourism experience in Ancoraimes, thus reducing the competition among local providers (Yang, 2012).

At the community scale, the greater enabler for agritourism among Ancoraimes communities is their social capital. Most of the surveyed households in Calahuancani (94%), Cohani (87%), Chinchaya (70%), and Chojñapata (71%) actively participate in some type of community associations. The overall proportion of participation in producer organizations across these communities was smaller, being moderate in Chinchaya (39%) and Chojñapata (38%), and minute in Cohani (13%) and Calahuancani (11%); such minimal participation especially among Cohani and Calahuancani households may be associated with their reduced articulation with markets. Strong social capital, especially in terms of bonding is critical to develop a tourism destination with community participation and support (McGehee, 2007). Given the remote location of the four examined communities from major tourism destinations, especially in terms of access, it is critical that they orchestrate efforts to offer a robust attraction with sufficient pull capacity to draw visitors from surrounding greater tourism destinations, such as Lake Titicaca.

The landscape variety and splendor is at large the main enabler for the development of agritourism at the landscape/ecosystem scale. Ancoraimes topography, diverse agriculture production, ancestral practices and traditions, and the overall rural life-style of their community members synergistically interact to produce a magnificent landscape

capable to transport visitors to a past reality. Land fragmentation occurring in the region, usually assessed as an undesirable element of rural landscapes, becomes a beautification element as it adds to the visual appeal of Ancoraimes. Such landscape and cultural richness, magnified with the contrast of fragmented parcels, should be capitalized to diversify the tourism offerings through different activities, thus reducing the monotony experienced in similar contexts (Gao et al., 2009; Yang, 2012).

At the government scale, Bolivian government policies and interests to diversify the tourism offer, especially through rural tourism in less accessible regions, is the most salient enabler. However, such enabler maybe volatile given its dependency with political and economic contexts of the region. The importance of Lake Titicaca as a tourism destination for international visitors is also an enabler that Ancoraimes can capitalize on. As a case in point, 15% of the 2.8 million international tourists traveling to Peru in 2012, visited the province of Puno where the Lake Titicaca is located; some exit the country through the border with Bolivia (MINCETUR, 2013). The pull capacity of the region can get even stronger if UNESCO declares Lake Titicaca as a world heritage site, petition that the Peruvian and Bolivian governments have officially submitted in 2003 and 2005 respectively (UNESCO, 2013).

4.3. Agritourism constraints in Ancoraimes

Based on the literature reviewed and data analyzed, several constraints were identified in the five scales of the framework of change. The major obstacles to develop agritourism in the production system scale are the change in pest dynamics (e.g., increase of Andean Weevil affecting potatoes crops) due to climate variations, and the loss of soil fertility associated with the shortening of their traditional fallow periods to better respond to the market needs. Both threats are critical because agritourism is dependent on the agriculture activity (Gil Arroyo et al., 2013; Henderson, 2009); therefore, Ancoraimes communities need to provide a healthy agricultural landscape as to make it appealing for tourists.

At the production scale, the major barrier for agritourism is the recurrent temporary migration and off-farm employment of at least one household member associated with the need to increase the family incomes. Chojñapata is the community where fewer households reported off-farm employment (30%), proportion that increased in Chinchaya (35%), Cohani (37%) and even more among Calahuancani households (48%). The labor intense agricultural practices in Ancoraimes coupled with a large proportion of off-farm employment is problematic given that agritourists seek for the direct contact with the farmer (Gil Arroyo et al., 2013), desire that is even higher among experiential tourists (Cohen, 1979; Holden, 2008; Topp, 2011).

The greater challenge for developing agritourism at the community scale is the lack of information and infrastructure, which has been reported as major constraints in other developing regions (Gao et al., 2009; Henderson, 2009; Yang, 2012). Data collected in Ancoraimes aimed at understanding their perceived risks of climate change and resilience for adaptation strategies. It is yet to know, at the basic level, household interest to diversify their portfolio through tourism activities; such information is critical as it is important the commitment of the farm household members (Nickerson et al., 2001). The lack of nearby tourism activities indicates that if such adaptation strategy is desired, capacity building and infrastructure development are needed to cater agritourists seeking for the agricultural livelihood experience as suggested in other developing countries (Gao et al., 2009; Yang, 2012).

At the landscape/ecosystem scale, changes in the climate and market shifts pressing over Ancoraimes diverse landscape were identified as the main constraint for the sustainability of agritourism. Change of ancestral agricultural livelihoods (e.g., shift to more market-oriented crops and livestock, less fallow periods), especially at larger scales, may be tracing the future of this region toward a more specialized agricultural production and/or more permanent migration. As a result, the experience of agricultural livelihoods as romanticized by visitors (McNally, 2001) may not be sustained over time. Aligning incentives created by agritourism such as appreciation of biodiversity and farming practices that build soil organic matter, contribute to build the resilient of the ecosystem as an asset for a rural way of life.

At the government scale, limited access to credit was identified as the major constraint for agritourism development initiatives. Only 22% of the responding households reported having accessed a credit in the last five years. Family and friends were the main sources for most (70%) of those credits as compared to formal financial institutions including banks and NGOs (30%). Reduced access to financial resources has been reported in similar contexts as a major constraint, being even more burdensome when some sort of accommodations is provided (Gao et al., 2009; Sharpley, 2002; Yang, 2012), which may be the case in Ancoraimes. This constraint could be ameliorated by increasing the awareness of climate change impacts in this ecosystem at the national level, which in turn can gain support toward climate change adaptation and mitigation policies and initiatives. For example, programs fostering the adoption of soil amendments to improve water retention capacity can be coupled with reduced interest loans to support agritourism development as a way to sustain the rural livelihoods of this population.

5. Conceptualizing agritourism development in Ancoraimes: Implications for sustainability

Given the capacity of agritourism to produce an array of benefits in the three dimensions of sustainability and Ancoraimes' ancestral agricultural lifestyle as outlined in the previous sections, we propose that agritourism can be developed in this region as a strategy to diversify their families' economic portfolio while adapting to climate change in a sustainable manner. Agritourism can specifically be suitable to increase farm incomes and reduce covariant risks in the household livelihood portfolio while posing minimal burden to their natural and agricultural resources (Choo & Jamal, 2009; Tew & Barbieri, 2012; Yang, 2012). This is especially critical for Ancoraimes families given the steady

decrease of their agriculture-derived incomes and the fertility loss of their farmlands in their attempt to respond to new market opportunities (Jimenez & Valdivia, 2009; Valdivia, Gilles, et al., 2010; Valdivia, Seth, et al., 2010). Agritourism can also serve as a marketing tool to increase the direct sale and price of other local products (Tew & Barbieri, 2012), which is especially applicable in those communities selling high-quality handcrafts.

Taking into consideration the mosaic of activities labeled as agritourism, ranging from pure contemplation to extractive and hands-on experiences (Gil Arroyo et al., 2013; Phillip et al., 2010), we suggest that agritourism in Ancoraimes specializes on providing the "experience" of agricultural lifestyles by enabling a direct contact with the natural, socio-cultural, and other unique attributes of their agriculture-based livelihood. In doing so, Ancoraimes would capitalize on the pivotal experiential aspect of agritourism, thus catering to those tourists who largely aim toward experiencing a guest culture (Cohen, 1979; Holden, 2008; Nickerson et al., 2001; Phillip et al., 2010; Srikatanyoo & Campiranon, 2010; Topp, 2011). By experiencing first-hand agricultural practices and livelihoods and their associated natural (e.g., landscapes) and cultural resources (e.g., ancestral practices), agritourists would move beyond the notion of appreciating the agricultural way of life to immersing into the idealized rural way of life of farming communities (Bebbington, 1999, 2000; Nilsson, 2002); thus, exploring the authenticity of value systems that are foreign to their own (Holden, 2008). As a result, agritourism could help to protect local heritage by reinforcing the knowledge and practice of ancestral traditions (e.g., crop rotation, fallow periods), and strengthening cultural identity as these would become the main attraction of the tourism immersion experiences. The interaction with tourists can also help to recognize the contributions of these communities as stewards of the land and natural resources and to acknowledge the impacts of climate change on their rural livelihoods, as agritourists would be aware of their otherness as their experiences are placed within their own world view (Cohen, 1979).

Although few studies have examined agritourism development in traditional communities in developing regions (Henderson, 2009; Yang, 2012), it is imperative that lessons attained from those endeavors are recognized when implementing agritourism activities in Ancoraimes. It is apparent that government support through subsidies (e.g., loans), policies (e.g., tax exemption), and infrastructure development (e.g., road construction) is not only critical to develop agritourism, but also to sustain and market those activities through time (Henderson, 2009; Sharpley, 2002; Yang, 2012). Although agritourism development in developing countries is usually driven by government initiatives, it is important that such interventions do not inhibit the genuineness of the agricultural livelihood experience or the diversity of the offerings within the region (Gao et al., 2009; Henderson, 2009; Yang, 2012). Finally, it is important to recognize that the reduced levels of education and technical skills (e.g., customer service, hospitality management) are major obstacles in agritourism development (Nickerson et al., 2001; Yang, 2012).

6. Concluding thoughts

Historic trends and projections indicating changes in the Andean Altiplano along with market pressures are shaping the agricultural practices and rural livelihoods of the region. In this manuscript, we have entered socio-economic data gathered from four communities located in the Bolivian Altiplano into a framework of change (Valdivia et al., 2007; Valdivia, Gilles, et al., 2010; Valdivia, Seth, et al., 2010) to a-priori examine the feasibility of agritourism as a sustainable adaptation strategy. By examining five different scales of intervention (production, livelihood, community/watershed, landscape/ecosystem, and government) we conclude that agritourism, with a strong emphasis on experiencing ancestral agricultural livelihoods, appears as an adequate adaptation climate change strategy to support Ancoraimes' rural lifestyles in a sustainable manner.

Based on the literature reviewed we argue that agritourism is capable to produce in Ancoraimes many benefits in the three realms of sustainable development, if identified enablers in the five scales of intervention are maximized and their constraints negotiated. Thus, agritourism is presented as one short-term adaptation strategy that will facilitate Ancoraimes households to capitalize on their natural, agricultural, cultural and social capitals to invest in the long-term sustainability of their livelihoods. Developing a new source of household income may reduce the need of migration, practice that stresses their families' quality of life by separating family members and leaving the elderly and women alone to farm. At the same time, it may reduce families' privacy and freedom to undertake other activities. Agritourism also represents a market mechanism to incentivize and reward farmers in their efforts to protect their landscape and environment by adopting, maintaining or strengthening ancestral agricultural practices that preserve crops diversity (germplasm) and build soil organic matter, which in turn enables carbon sequestration and water capture.

6.1. Limitations and considerations for moving forward

As a pre-facto conceptualization of an adaption strategy, the authors recognize that further examination is needed before it is considered for actual on-the-ground application. This is especially critical related to two study limitations. First, socio-economic data for this study was collected in 2006, thus the authors acknowledge that the operationalization of the framework of change in Ancoraimes will need to be updated, especially related to the production and livelihood scales. Second, although the interview survey method was used to maximize participation and completion rates especially among a sample with reduced literacy levels, the use of local enumerators may have constrained the respondents' freedom (Babbie, 1989).

The utmost priority to move forward with this adaption strategy is to assess the local interest among household members in the communities of the Ancoraimes watershed, and the level of support of the community as a whole. At the farm level, this assessment is critical taking into consideration that agritourism is not a suitable activity for every farmer; high levels of commitment and a genuine interest are key factors for success (Nickerson et al., 2001; Tew & Barbieri, 2012). The identification of potential agritourism providers should be inclusive to all families as it has been previously reported inequality among local residents (Yang, 2012). At the community level, it is important to identify local agencies and organizations (e.g., NGOs) supporting this development, as their networks are critical to strengthening the marketing capacity of agritourism initiatives (McGehee, 2007).

Information is also needed to assess the actual and potential resources in Ancoraimes communities, especially in terms of human capital. Gender roles in household and farm responsibilities are critical given the active role that women have in agritourism development (McGehee et al., 2007; McNally, 2001), while migration patterns need to be addressed because of the need of visitor–farmer interaction (Gil Arroyo et al., 2013; Nilsson, 2002). Such complexity of human resources coupled with labor intensive agricultural practices need a detailed programming of the most suitable seasonality to offer agritourism, so as to maximize the tourist experience during less demanding agricultural responsibilities. Finally, to move forward if the precedent suggested stages hold for the suitability of agritourism, major effort is to be placed in capacity building among interested households in Ancoraimes especially related to business management and customer service skills, as suggested in other studies (Iorio & Corsale, 2010; Yang, 2012).

This manuscript presented the application of the framework of change to evaluate the feasibility of developing agritourism in a developing region, which although rich in cultural, natural, and agricultural resources, is being challenged with changes in the climate and market pressures resulting from globalization. In doing so, this manuscript

adds to the very limited information available for agritourism development in developing countries, as Yang (2012) reported.

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