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Knowing native potatoes: finding local experts through innovative methods in the Peruvian Andes

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Abstract

Climate change is considered the most significant threat to agrobiodiversity. This is influencing not only the climate but also the socio- cultural structure and the loss of collective knowledge of diversity in the Peruvian Andes. In this regard, the identification and documentation of local ecological knowledge and recognition of the farmer's experience has recently taken on greater importance. This study was conducted in three rural communities in the district of Haquira (Pauchi, Queuñapampa and Huancacalla Chico) in Apurimac, Peru and aimed to identify and document the names of native potato and determine the real state of local potato landraces for long-term monitoring. This article focuses on the identification of local expertise and knowledge by the method of analysis of the Five Cells (FCA) and Participatory GIS to develop the Red List. Factors taken into account for the surveys were biological, ecological, economic, social and cultural suggested by the Community Biodiversity Register (CBR). Family focus groups household (n= 61) and quantitative methods (GIS) and qualitative (FCA), which complement allowing recognition of 174 names of local varieties, 45 varieties have different names and 42 varieties share 71 synonyms' names in the three communities. The results provide us information systematization of native potatoes to prepare a master list that can be evaluated against genetic information.
Keywords: Agrobiodiversity, FCA, genetic diversity, local knowledge, Red List, *Solanum*

Resumo

Conhecendo batatas nativas: encontrando especialistas locais através de métodos inovadores nos Andes peruanos. A mudança climática é considerada a mais importante ameaça para a biodiversidade agrícola. Isso está influenciando não só sobre as alterações climáticas, mas também a estrutura sociocultural, e a perda de conhecimento coletivo da diversidade nos Andes peruanos. Neste sentido, a identificação e documentação do conhecimento ecológico local e reconhecimento da experiência do agricultor adquiriu, recentemente, uma maior importância. O estudo foi realizado em três comunidades rurais no distrito de Haquira (Pauchi, Queuñapampa e Huancacalla Chico) em Apurimac, Peru e teve como objetivo identificar e documentar os nomes de batatas nativas e determinar o verdadeiro estado de variedades de batata locais para monitoramento de longo prazo. Este artigo centra-se na identificação de experiência e conhecimento local, o método de análise das cinco células (FCA) e GIS participativo para desenvolver a Lista Vermelha. Fatores tidos em conta para os inquéritos foram de natureza biológica, ecológica, econômica, social e cultural sugerido pelo Registo Comunitário da Biodiversidade (RCB). Aplicaram-se Grupos focais familiares (n = 61), métodos quantitativos (SIG) e qualitativos (FCA) se complementaram para a identificação. Os resultados de ambos os métodos nas três comunidades permitiram o reconhecimento de 174 nomes de variedades locais, 45 variedades têm nomes diferentes e 42 variedades que compartilham 71 sinônimos dos nomes. Esses resultados nos fornecem informações sobre a sistematização de batatas nativas para preparar uma lista mestra que pode ser comparada com a informação genética.
Palavras-chave: agrobiodiversidade, FCA, diversidade genética, o conhecimento local, na Lista Vermelha, *Solanum*

Resumen

Conocer las papas nativas: encontrar expertos locales a través de métodos innovadores en los Andes peruanos. El cambio climático se considera la amenaza más significativa para la agrobiodiversidad. Este influencia no solo la transformación en el clima sino también la estructura socio-cultural y la pérdida de conocimiento colectivo de la diversidad en los Andes peruanos. En tal sentido, la identificación y documentación del conocimiento ecológico local, así como el reconocimiento de la experiencia del agricultor ha tomado recientemente una mayor importancia. Este trabajo se realizo en tres comunidades campesinas en el distrito de Haquira (Pauchi, Queuñapampa y Huancacalla Chico) en Apurímac, Perú y tuvo como objetivos identificar y documentar los nombres de papa nativa y determinar el estado real de las variedades locales de papa para el monitoreo a largo plazo. Este artículo se centra en la identificación de expertos locales y sus conocimientos mediante el método de Análisis de las Cinco Celdas (FCA) y SIG Participativo para elaborar la Lista Roja. Los factores tomados en cuenta para las encuestas fueron biológico, ecológico, económico, social y cultural sugeridos por el Registro Comunitario de la Biodiversidad (CBR). Se aplicaron grupos focales familiares (n=61) y los métodos cuantitativo (SIG) y cualitativo (FCA) se complementaron para la identificación, los cuales permitieron en las tres comunidades el reconocimiento de 174 nombres de las variedades locales, 45 variedades que tienen diferentes nombres y 42 variedades que comparten 71 sinónimos de los nombres. Estos resultados nos proporcionan información sobre la sistematización de papas nativas y permite el preparar una lista maestra que se puede contrastar con la información genética.

Palabras clave: Agrobiodiversidad, FCA, diversidad genética, conocimiento local, Lista Roja, *Solanum*

Introduction

Peru, having a high genetic diversity, is the culmination of the origins of agriculture besides being the most important genetic resource of plants and animals. In Peru one can find super abundance heterogeneity of potato species (about 3000). In addition to Andean grains (quinoa, amaranth, cañigua), peppers, corn, Andean roots and tubers (Brack 2000).The origin of the modern potato crop, according to Vavilov (1951) had been due to the selectivity and farming of the potatoes between central Peru and central Bolivia. The most primitive specie that is very similar to wild species may had been the first to be domesticated and is called "*S. stenotomum*" which grows in the highlands, the Lake Titicaca in Peru and northern Bolivia (Hawkes 1990).The oldest potato that had been domesticated was found in the center of Peru about 7000 years ago (Tapia 1990). The cultivable specie most resistant to cold grow between 3450 - 4500 meters above sea level is *S. juzepczukii* (Hawkes 1990), according to Ochoa, in the department of Apurimac, also found the following species: *S. abancayense*, *S. velardei* (Ochoa 1963a and 1963b), *S. longiusculus*, *S. tenellum*, *S. aymaraense* and *S. chillonanum* (Ochoa 1987a, 1987b, 1989a cited in Ochoa 2004).

The threats to biodiversity, due to the variability (local instability) of communities which they occur, arise in various ways because direct or indirect result of human actions. There have been several attempts to develop numerous campaigns to counteract the threats to biodiversity, especially the programs developed by the Alliance for Conservation Measures (CMP) and Survival Species Commission (SSC) of the IUCN (CMP 2005 and IUCN 2005a, 2005b cited on Hunter and Heywood 2011). Additionally, they had to take into account that this high biodiversity is inextricably linked to traditional knowledge by communities possess. That is why according to the Convention on Biological Diversity (CBD), Article 8j said: “Traditional knowledge is knowledge, innovations and practices of indigenous and local communities around the world", the CBD aims to generate a series of tools to systematize and preserve this knowledge over time and promotes the countries with high biodiversity considering this legislation.

The Community Biodiversity Registers (CBR) process aims to empower local communities to develop better understanding of their own biodiversity assets, in this survey it was identified the main factors: Biological, Cultural, Social,

Economic and Ecological for the crop. Subedi (2012) refers to the concept of CBR to a record maintained by community members of the genetic resources in a community, including information on their custodians, passport data, agroecology, cultural and use values.

Whereas we deploy consistent efforts in monitoring the status of wild biodiversity, very limited is the investigation monitoring the diversity of plants used by farmers, concerns regarding traditional knowledge loss in relation to biodiversity damage in the context of local communities, the Five Cells Analysis (FCA) method helps to document this information (Padulosi and Dulloo 2012). The framework of categorizing agricultural crop species and the variety of landraces, to consider them whether they are under red list or not, are necessary to develop strategy for appropriate conservation. It is a major consideration for identify endangered list of crop landraces and its amount and distribution of genetic diversity. To answer questions such as: what process used to maintain diversity, people who maintain diversity and factors that influence farmer's decision making maintaining diverse variety (Sthapit and Jarvis 2002 cited on Joshi et al. 2004). The principal target of this method is to identify the most important local diversity that play a role in livelihoods of local people, distribution of local potato diversity; and to identify common, unique and rare potato landraces so that the community, politics, companies and the professionals might develop an array of livelihood options and conservation plans.

Another method, which contributes to documentation of biodiversity of the genus, is commonly known as Geographic Information Systems (GIS); this was used to analyze the trends of land use and design of rotation (Bussink 2003, Voss et al. 2004 cited on De Haan 2009).QuickBird satellite images were used to map each community. The latter method was used in Huancavelica and Apurimac- Peru by Chirapaq Ñan ("rainbow route" in Quechua) Initiative (International Potato Center), and De Haan (2009). It was observed that land use is very dynamic and diverse changes were identified in relation to land use trends, these changes affect long-term potato intraspecific diversity. However, it is more difficult to establish whether these changes will eventually be positive or negative for sustainable long-term preservation. This study allowed us to identify the principal stakeholders in the three communities by the GIS survey.

The Andean communities of Haquira are threatened by multiple factors that are classified as social, environmental and ecological apparently could be eroding the diversity of local varieties of native potatoes in the area. These communities are being considered the hot-spot of native potatoes and it is important to have a record of the variability of native potato names, based on the local perception as a record of the degree of threat to the diversity of native potatoes in the area and a strategy for monitoring the conservation of local varieties in the communities of Pauchi, Queuñapampa and Huancacalla Chico in Haquira (Apurimac).

The main goals of this work was focused on identifying local experts and their knowledge using FCA and Participatory GIS method for documenting the potatoes's name and contribute to a master list, this information could be contrastable by genetic analysis. Finally, these methods are complemented and contributing to database for monitoring of native potatoes each five years and it should be applicable to other landscapes on similar conditions.

Material and Methods

Study area and local community

The study was carried in three rural Andean communities Pauchi, Queñapampa and Huancacalla Chico which are located in the province of Cotabambas, Haquira distric in the Apurimac region. It is located at latitude 14.13º and 14.44º S, longitude 72.08º and 72.77º W at an altitude of 3800 meter above sea level. These areas were chosen as they belong to the microcenters of high diversity of native potatoes to the Chirapaq Ñan Initiative in the International Center of Potato (figure 1).The annual mean

temperature lies around 12-24ºC max and -4-20ºC min with annual precipitation varying between 500 and 1500 mm (SENAHMI cited on Flores et al. 2012). 200 to 700 mm can be described as the rainy season. This life zone is defined according to Holdridge as high tropical very moist Sub-alpine tundra ecosystem (INRENA cited on PEI Apurimac).

About 10437people live in the district of Haquira, which 1898 are male located in urban areas and 3317 in rural area; likewise the amount of women living in urban areas are 1966 and 3256 in rural area. The common language of the area is Quechua. In addition to the district of Haquira consists of five population centers and thirty-eight communities and the educational level of the local population is distributed as follows 1732 uneducated, 4345 with primary education, 2149 with secondary education,199 non-university full and finally 125 with advanced university (INEI 2007).

The main economic activity of the rural communities in Haquira is livestock and agriculture. The region's main responsibilities are in milk production, cultivated pastures, caring natural pastures and agricultural production of Andean crops and it is done with little technical knowledge in production of Andean crops (Municipality of Haquira 2013).

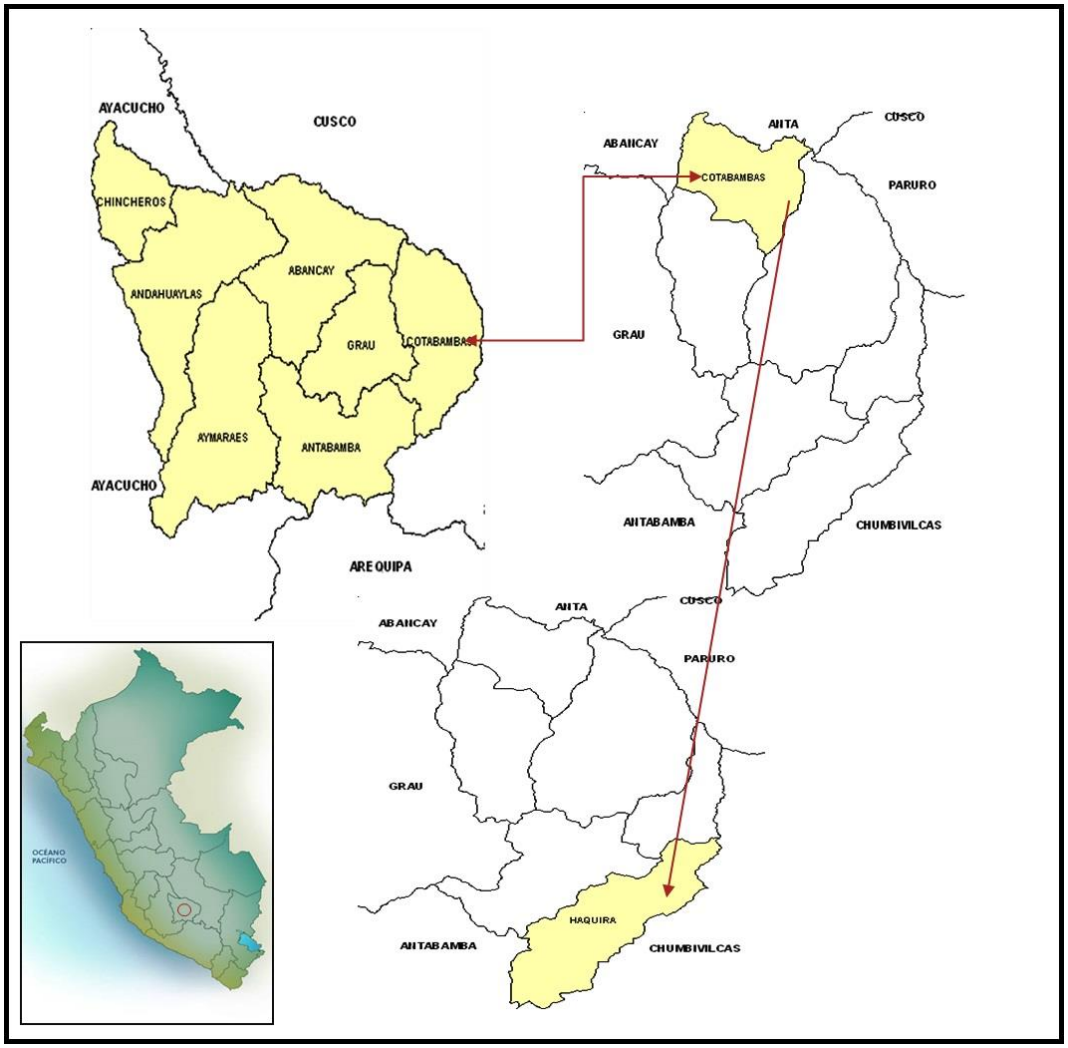

Figure 1. Location of the study area in Haquira, Cotabambas (Apurimac)

Ethics

Following practical guidelines of the Code of Ethics of the International Society of Ethnobiology (ISE 2008), the project was presented in assembly to each community and the community-based for its approval. The leaders of each community have signed a letter of authorization to access the community after the assembly.

Data Collection

The fieldwork was conducted from May to September 2013. The analysis and diagnosis of factors was conducted in May, permit applications with the authorities and compilation of secondary data was carried out in June, coexistence with communities and field data collection was conducted from August to September, and finally the validation of preliminary results in December.

Identification of local experts

In order to analyze the factors of the local organization and identify the proficiency of the experts, it selected and organized by CBR process. The diagnosis of the representativeness of native potato crop in the three communities of Haquira and the collection of data occurred in 2013 during the harvesting potatoes which it starts in May. It was done by means of a semi structured survey CBR (annex 1). Also, by interviewing eight subjects between the ages of 23-47 years living in the communities Pauchi, Queuñapampa and Huancacalla Chico, whose main livelihood is agriculture including the crop of native potatoes which they labored for many years and accepted as experts in their communities (annex 2).

The CBR process, the survey was adapted and identified because of these main factors: Biological, Cultural, Social, Economic, and Ecological for the crop of native potatoes this allowed a first approach to the community, the survey of Participatory GIS allows to identify the main producers with more varieties and most experienced and finally the FCA was adapted to the Andean context by family focus group because is sparsely populated and there are significant distances between one household and another, and finally, it was difficult to convene a participatory assembly.

To facilitate the process, a visit, to each household that lasted between 20-40 minutes, was conducted until stage of validation was satisfied; it was held against of a participatory consensus to reach preliminary results.

To identify the local names and knowledge

In field: Focus groups (≥ 2 potato's experts) whom checked the correct names presented by a photo catalog. To make a note of the different names mention and some additional meanings and potential uses of these varieties.

In office: Lists of potato names with photos were organized per each community. To review the details was listened an audio record to generate a matrix with common names and to recognize that its possible meanings and uses. The survey time range of 20-40 min per household (≥ 2 persons), with the support of a translator when was necessary. A scheme about the process for finding local names is showed in figure 2.

Identification of Regional potatoes

The recording the information and collecting the list of potatoes names, the secondary data recorded using GIS surveys, conducted as part of the Chirapaq Ñan Initiative in Pauchi (n=23), Queuñapampa (n=20) and Huancacalla Chico (n=28), the trends of land use and design of rotation can be investigated using participatory mapping, which is commonly called Geographic Information Systems (GIS) Participatory (Bussink 2003, Voss et al. 2004 cited on De Haan 2009). The interview aims to identify the farmers and household (men and women) out of 71 interviewees to selection the many native potatoes varieties that farmers possesses, based on information obtained by the Chirapaq Ñan Initiative (CIP 2013).

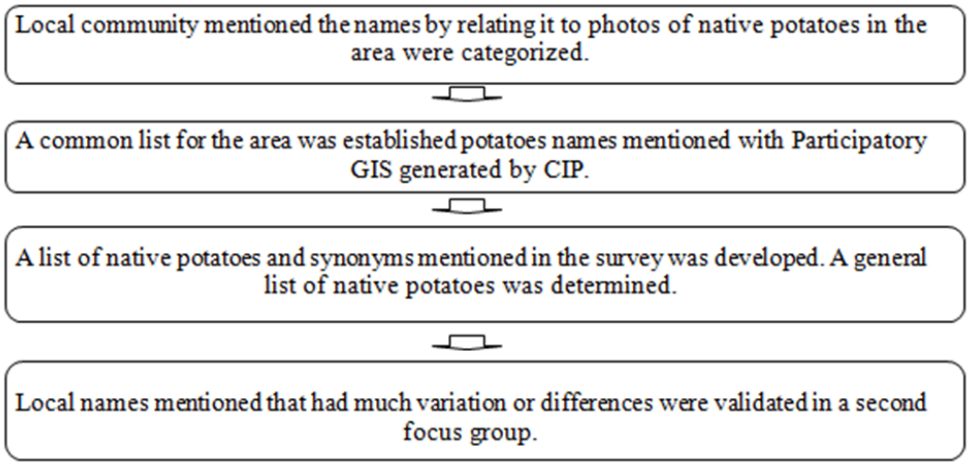

Figure 2. Process for finding local names

The recognition of number of varieties and similarity level and how many potatoes are shared, for which it underwent non-metric multidimensional scale (n-MDS) and SIMPER analysis (Similarity Percentages) using the Program Primer-E v6.1.13.2009 (Clarke and Warwick 2001).

Five Cells Analysis survey

FCA survey was occurred in September 2013, the parameters adopted were number of household per community (men, women and children), the total families were 115 that it was divided on Queuñapampa (n=30), Pauchi (n=40) and Huancacalla Chico (n=65) the area of native potato crop (large vs. small) and number of native potato varieties (many vs. few).This work carried out 3 to 12 local experts who were selected by Participatory GIS, the experts categorized the varieties of native potato in four quadrants for assigned to cell A,B,C,D and E. Where A (larges areas and many varieties), B (small areas and many varieties), C (larges areas and few varieties), D (small areas and few varieties) and E (the varieties that farmers believe lost).

Data Analysis

The database for each community evaluated was built in Microsoft Office Excel (2003) using records obtained by nonprofit services, going to the communities, and interviewing. This data was gathered for analysis. These were coded (mentioned= 1, no mentioned= 0) for each variety of native potato in each community analysis. The most important or conspicuous varieties of native potato were detected by plotting free lists the elements that were most frequently grown between the three communities.

To detect the pattern of similarity / dissimilarity between household and communities, many variables obtained in surveys red list (FCA) and Participatory GIS using a non-metric multidimensional scale analysis (n-MDS) was performed and detected features within each household / communities and discriminated between groups using an SIMPER analysis (Clarke and Warwick 1994) which is based on the calculation of an index of similarity between two samples in which the contribution is expressed that each species has the overall similarity index between a pair of samples.

Results

The principal factors were recognized and shared with the three communities were defined by the local experts using the CBR in biological, cultural, social, economic and ecological (table 1). A total of 128 names of native varieties of potatoes were identified by

GIS Participatory (Chirapaq Ñan) where was divided on Pauchi (n=28), Queuñapampa (n=42) and Huancacalla Chico (n=58) that each was codified with a photo (table 2, annex 3).

Table 1. Description of the factors mentioned by the local experts (May 2013)

Factor	Description
Biological (FACbi)	The conservation of native potatoes plays an important role in the process of dynamic evolution and maintenance to ensure the species and varieties of existing and future adaptation to biotic (such as new pests and diseases) and abiotic stresses (such as causes of climate change)
Cultural (FACcu)	Conservation of native potatoes allows the maintenance of a localized form of many species or varieties, in addition to helping preserve the incredible wealth of traditional knowledge associated with them.
Ecological (FACec)	Conservation of native potato plays an important role in the conservation of ecosystems and landscapes as these are an integral and representative part
Social (FACso)	Strengthening local capacities to ensure the conservation of native potatoes associated traditional knowledge of the culture as a strategy of empowerment, this is in line with Article 8 of the CBD
Economic (FACeco)	The high cost associated with conservation is more related to the ex situ conservation; however it is important to consider the in situ conservation of native potatoes and local importance

Table 2. List the local names of the three communities Haquira collected in the first stage of the study for photo catalog in May 2013*

Pauchi	Queuñapampa	Huancacalla Chico
Azul ñawipasña	Asancaya	Accocha papa
Cuchiacaña	Ccachina	Asno ccorota
Huallpahaka	CcalaNunri	Azul canchillo
Waqrillo	Chaquiña	Azul ñawipasña
Isacaña	Checchico	Callhua
Linli	Huallateras	Ccachira
Michisenqa	Huamanhuma	CcoeSullyo
Muro alqqa	Linli	Chaquiña
Pakus	Michisenqa	Charcas
PucaÑawiPasña (1)	Mirccaylla	Checchico
PucaÑawiPasña (2)	Muro lerqqay	Duraznillo (1)
PucaQulluna	Muro waqrillo	Duraznillo (2)
Puca rosas	Peruanita	HapuPucuchu
PukaSuhuallulla	PucaÑawiPasña	Huallateras
Putis	PucaÑawi (1)	Isacaña
Qachunwacachi	PucaÑawi (2)	Lercacy
Qara Chuchillo	PucaQachunwacachi	Llama Ruru
Qompis	Pucasuso	Lores
Revolucion	PukaSuhuallulla	Makustin

Salamanca	Putis	Michisenqa
Suso	Qachunwacachi	Moro foccoya
Wakarunrun	Qara cuchillo	Moro linle
Yanasuallulla	Qompis	Paccos (1)
YanaPitusiray	Qoquerana	Paccos (2)
YuracHuaqrillo	Salamanca	Palta suso
YuracPitusiray	Sipa	PucaChuhillo
Yuracwaña	Sunchu papa	PucaHuaccuillo
	Tallacmactillo	PucaJarhua
	Wacaqallu	Pucañawihuachalla
	Wakaruru	Pucañawipasña
	Yanañawipasña	Pucañawisuyto
	Yanapucuya	PucaSuhuallulla
	Yanaruntus	PucaSuso
	Yanasuso	Puma maki
	YuracKalhua	Qachunwacachi
		Q'ellochocllo
		Qoccerani
		Qulluna
		Risco
		Runtus
		Ruquiwaña
		Sapo ninri
		Simpa waña
		Suso
		SuytoFoccoya
		Yana botija
		YanaChuyllo
		YanaHuacchillo
		YanaLinlin
		Yanañawipasña
		YanaPutis
		Yanasuallulla
		Yuraccanchillo
		Yurachuachalla
		Yurac palta
		Yuracsuallulla
		YuracSunchus
		Yuracsuso
		Yuracsuyto
		Yuracwaqrillo
		Yuracwaña

Note: (1) and (2) corresponds to the same variety but with morphological difference (see annex 3).
* The capital letters in the name indicate the accent and aggregation of words to give the name in Quechua.

The difference between writing and spoken language, this variation names by the local experts had to be taken into account, such variations allowed for more than one synonym. This can be seen in table 3.The Quechua language confer the distinguishing feature with each other (e.g. color, flavor, size, etc.) so, that 42 varieties with 71 synonyms in total were identified.

Table 3.List the local names of native potatoes with synonyms drafting collected for the three communities Haquira (2013).

Local name	Synonyms			
Alcaña	Allcaaña	Allcacaña		
Asnocorota	Asnocolota			
Azul ñawipasña	Azul ñawapasña			
AzulSonqo	Azul Soncco			
Cachira	Jachira	Q'achira		
Calancucha	Q'alahucucha			
Chaska	Chasca			
Checchico	Checcheco	Chicchico		
Coesuyllo	Ccowisullu	Cuysullo		
Cuchi aca	Culliaca			
Huallatera	Huallareta			
Huallpaaca	Huallapaaca			
Huayro	Huairo			
Jarhua	Ccarhua	Jarwa		
Lercay	Llercaylla	Llyrcaylla	Mercaylla	
Michisenqa	Michisencca			
Moro cachira	Moro q'achira			
Pacus	Pacush			
Poccoya	Foccoya	Puccaya		
Pucasuallulla	Pucashualilla			
Pucasuso	Puccasusu			
Qarahuanas	J'arawanas			
Qoquerana	Q'oq'erana	Ccoquerana		
Qulluna	Ccullina	Cculluna	Julluna	Kullona
Suallulla	SuaLlulla	Suwalulla	Sucwayllulla	Yanasuwallulla
Sunchus	Sonchus			
Suso	Susu			
Tallacmacta	Tallaemaqta			
Wachala	Wachayla			
Waña	Huaña	Wuaña		
Waqrillo	Yuracwaqrillo			

By FCA survey were 85 names, divided on Pauchi (n=50), Queuñapampa (n=40) and Huancacalla Chico (n=55).The names obtained by FCA are based on what most people relate their memories, their daily life, instead GIS data provides information of a field sampling of varieties that might not always be used and why are not mentioned once in the FCA survey.

The fusion obtained with GIS and FCA survey, it was identified in total 174 names of potatoes in the three communities of Haquira, where only 25.8 % of all potato varieties are not synonymous, figure 3.The n-MDS and SIMPER analysis allowed us to understand the values of synonyms (names of native potatoes) and what percentage involved in that certain varieties are more cultured or not between allowing respondents to identify their current status, figure 4 (we showed the results for Pauchi as instance, for the others representations contact to the authors).

Finally, the distribution of native potato varieties for quadrants A, B, C, D and E in the three communities according the SIMPER analysis (contribution ≥10 percent per each cell) was in Cell A*:* **suallulla** (35,77%), **suso** (15,28%), **michisenqa** (14,90%) and **pucañawi** (12,77%), Cell B: **suallulla** (55,59%) and **suso** (16,99%) for Cell C: **linle** (50,75%) and **qachunwacachi** (12,99%), for Cell D: **linle** (42,94%) and Cell E: **checchico**

(30,45%), **waqrillo** (13,01%) and **linle** (11,47%). In addition to this information, the local experts identified potato landraces that do not have a yearly planting cycle. The local insight has identified many varieties as resistant to the main climatic change (frost and hailstorm), which is known as **wañas** (bitter potato), in contrast to the varieties are not resistant as **suallulla**, **checchico** and **linle**.

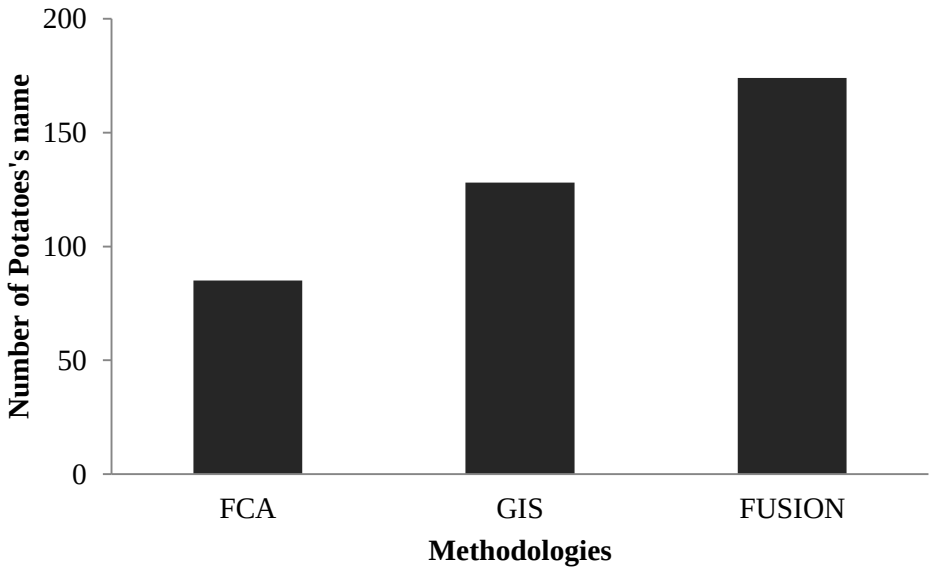

Figure 3. Number of native potato names in the communities of Pauchi, Queuñapampa and Huancacalla Chico (2013).

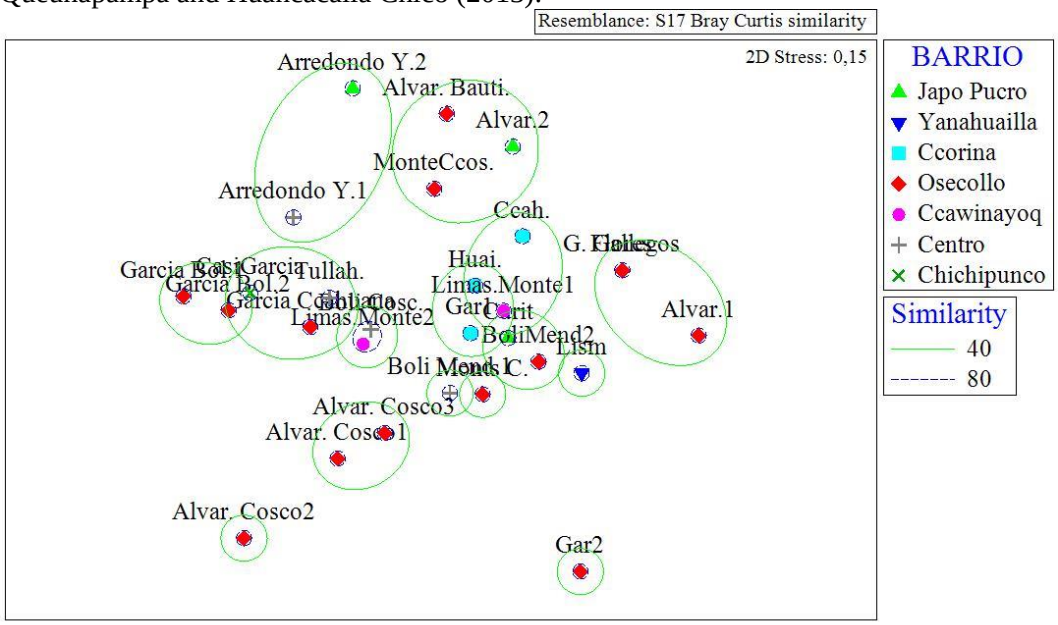

Figure 4. Two-dimensional n-MDS ordination using Bray-Curtis similarity index (stress= 0.15) of number of native potato varieties (n=28) data distributed in seven sectors (barrio) mentioned by 23 farmers in the community of Pauchi (2013)

Discussion

The use of complementary methods has allowed identifying native potatoes from the local knowledge, thus allowing a fine contribution to the construction of a master list for monitoring. Before building conservation strategy and monitoring is important to determine sufficient information about the taxa *Solanum* spp. This information can be obtained from literature, gene banks, as well as from the field surveys, so as establish a knowledge baseline. To obtain this information is something referred to as an ecogeographical survey (IBPGR 1985, Maxted et al. 1995, Dulloo et al. 2008 cited on Hunter and Heywood 2011), the survey aims determine distribution of particular taxa in a particular region, the patterns of infra specific diversity and the relationships between survival and frequency of varieties associated an ecological conditions. This information was obtained by GIS Participatory and FCA in this work and provides the genetic variation through the local names, uses, resistant varieties, non-resistant, and practices that will provide a baseline from which to start and compare the data collected. The development to a master list that contains information collected for local names, synonyms and features that purpose the definition of their names in Quechua, it allows developing a monitoring system of local diversity of native potatoes recognizing the current diagnosis of local varieties and their threat. Holling (2001) mentions that to achieve sustainability of a system, it is necessary among other criteria or have a dynamic and prescriptive framework, not only static and descriptive. In this regard mentioned that monitoring the present and the past is static unless you connect with concrete policies and actions, long-term monitoring.

On the other hand, traditional knowledge associated with agrobiodiversity resources are important in conservation on farm, however rapid erosion evident agrobiodiversity is observed throughout the world, particularly in the case of neglected and underutilized crops (King, Nambi and Nagarajan 2009 in Padulosi et al. 2012). Local knowledge become just story if the plant genetic resource is not available while the knowledge is lost if there is no knowledge to pass down the information to next generation (Subedi et al. 2012) in this case many young farmers abandon agriculture to work in the mines or migrate to search for more income attractive options in larger towns and toward knowledge loss. The farmers that speak Quechua in the Peruvian Andes have employ a classification system based on hundreds of years of intense genetic resources management of potato, that influence in the family structure, the food and the environment (De Haan 2009), which means is a particular biosystematics to classify local varieties of potatoes that consists of the following subsystems: taxonomy, local descriptors and nomenclature even differing between communities within the same district as in the case of communities in Haquira and coincides with what was mentioned by Berlin (1973) in his study of biological classifications.

Conservation programs can be articulated with local authorities in the development of agriculture, knowledge and maintenance of varieties of potato germplasm and a conservation management in the future. As a prerequisite for the conservation of germplasm is essential to know the extent and distribution of genetic diversity of a species (Ramanatha and Hodgkin 2002), and the identification of varieties of native potatoes through the local perception allows towards community approach to contribute to documentation and conservation.

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Annex 1. Survey for diagnosis in the first stage

- What area of the territory is distributed native potato cultivation in Situ Conservation?
- What is the level of importance and use you have in the lifestyle of the people?
- What are the threats to this diversity for several reasons including the marginalization of markets and climate change?
- How local communities retain their diversity of native potato and challenges have?
- What challenges and opportunities obtain the sustainable use of its diversity of native potatoes?
- What legislation and laws supporting the communities in the conservation and use of native potatoes in situ?

Annex 2. Names of local experts (May 2013)

Name	Age	Job	Community	Additional experts
Celedonio Limasca	40	Farmer	Pauchi Marcallac	Maximiliano Alvarez
Daniel Ticllahuanaco García	43	Farmer	Pauchi Marcallac	Mauricio Alvarez
Susana Anaupa Cusiatau	32	Farmer	Pauchi Marcallac	Mario García Julio García
Walter Mallcu	47	Farmer	Queuñapampa	Nazario Flores
Maximiliano Flores	23	Student	Queuñapampa	Leonardo Jauja
Gabriel Sarmiento	20	Freelance	Huancacalla Chico	Juvenal Sarmiento y Enrique Cruz
Cinthya Anali Cruz Negro	23	Farmer	Huancacalla Chico	
Marina Huanáco	24	Merchant	Huancacalla Chico	

Annex 3. Photo catalog of potatoes (same variety) with morphological differences mention by the locals. Source: Chirapaq Ñan Initiative (CIP 2013) from the communities Huancacalla Chico: **duraznillo** (1 & 2) and **paccos** (1 & 2), Pauchi: **pucañawipasña** (1 & 2) and Queuñapampa: **pucañawi** (1 & 2)