

# Endangered Potatoes: The Benefits of Traditional Farming Practices in Chiloé

Kristen Ardani

## **Introduction**

Where have all the native potatoes gone? Why is it that in the tuber's place of origin, one must search to taste this ancient delicacy? The majority of potatoes cultivated for commercial purposes in Chiloé are not endemic to the archipelago, but rather introduced varieties from North America and Europe. Foreign potatoes are most commonly grown for profit, despite the fact that Chiloé is home to a plethora of indigenous varieties. Typically, local farmers of Chiloé cultivate native potatoes for domestic-consumption and trade between villages, because foreign varieties have come to dominate the market since their introduction in 1940. This paper explores the drastic decline in the availability of indigenous potatoes that is gradually exacerbated by the large scale farming of introduced varieties. I assert that while the monoculture production of non-native varieties promises higher yields and economic return, it excludes traditional farming knowledge and practices that foster biodiversity needed for food security. The long term negative consequences of commercial production do not justify the immediate gains. Fortunately, Chiloé exhibits several successful recuperation programs that are combating genetic erosion and ensuring the survival of indigenous varieties for the future.

## **Chiloé**

The archipelago of Chiloé is located off the coast of Chile in the X region. The big island, referred to as *la isla grande de Chiloé*, is the fifth largest in South America and the second largest in Chile. The indigenous population is primarily Mapuche and Huilliche, and due to Chiloé's separation from the mainland, the indigenous sector has retained much of its cultural heritage. Relatively unscathed by mainland urbanization, *La isla grande de Chiloé* exhibits a large rural sector, with 54% of its population rooted in areas where subsistence agriculture is the primary means of livelihood. The people of Chiloé have relied on farming for centuries and cultivate hundreds of varieties of potatoes found nowhere else in the world.

Chiloé's ancestral mythology and traditional agricultural practices, based on the cultivation of native potatoes, are distinguished components of Chiloé's heritage. Due to the archipelago's long established history of potato production, many ancient beliefs related to potato cultivation have been passed down from generation to generation. Oftentimes visitors are struck by the grandiose quantity of Chiloé's indigenous agricultural folklore, though the preservation of ancient mythology has been challenged by the loss of the papas chilotas associated with them.

In addition, Mapuche means "people of the land", and much of the Mapuche religion emphasizes the reciprocal relationship between man and the Earth. Essentially, Mapuches believe that which befalls the Earth will also befall its people, and it is imperative to establish a harmonious co-existence with nature, as not to forsake the gifts of harvests provided by the Earth.<sup>1</sup> Taking into account Mapuche spirituality and the

---

<sup>1</sup>Ruether, Rosemary. "Women Healing Earth: Mapuche Roots". Orbis Books: New York, 1996.

emphasis placed on agriculture, it is evident that the cultivation of its original potato crops is culturally significant.

### **Origins of Potatoes**

The potato (*Solanum Tuberosum L.*), native to Latin America, has been cultivated since pre-Colombian times and is fundamental to the subsistence agricultural lifestyle of the Andean and southern coastal populations. *Solanum tuberosum* is a vital food source, that in recent years, has suffered drastic genetic erosion. The genus *Solanum L.* contains 1,000 species making it one of the vastest genera of angiosperms and most biologically diverse.<sup>2</sup> According to the International Center of the Potato (CIP), the majority of farmers in the Andean region cultivate with the goal of personal consumption and do not participate readily in commercialization of their product. In contrast, the non- Andean potato production found in Brazil, Argentina, Chile, Uruguay, and Venezuela is based on *Solanum tuberosum ssp tuberosum* varieties, and is highly commercialized. The broad-based commercialization of the potato in the non- Andean region has enabled the incorporation of corresponding countries into the global market. The increased economic activity is beneficial to the region, yet creates barriers between it and the Andean region.

### **Potatoes of Chiloé: Endangered**

The sub-set of the original *Solanum Tuberosum L.* is native to the island of Chiloé, and was formed by the hybridization of Peruvian potatoes, with Argentine and

---

<sup>2</sup>Spooner, David. "Phylogenetic Relationships of Wild Potatoes, *Solanum* Series *Conicibaccata*" (Sect *Petota*), *Systematic Botany*, Vol.22, Nov. 1st (Jan-March 1997.) pp 45

Bolivian varieties. Chiloé is home to 146 of the registered 280 Chilean potato varieties<sup>3</sup>. Moreover, the potatoes of Chiloé (*papas chilotas*) display a wide range of vibrant shapes and colors. Varying from deep purple in color with an elongated body, to buttery-yellow and round in form, *papas chilotas* are truly unique. However, at the beginning of the 1940s, the Chilean government supported the introduction of European and North American potatoes to Chiloé which transmitted diseases to the indigenous land races. For the first time, varieties such as “Desiree”, “Condor”, and “Ginecke” were being cultivated on the archipelago, but these varieties carried a deadly *Phytophora Infestans* pathogen that eliminated nearly all of Chiloé’s indigenous potato crops<sup>4</sup>. Having never been exposed to the foreign pathogen, the volume of *papas chilotas* was dramatically reduced. Such genetic erosion had never been experienced in Chile, and it became evident that the *papas chilotas* were in dire need of recuperation and conservation. The *Phytophora Infestans* outbreak coupled with increased governmental investment in commercialized production of foreign varieties, has displaced indigenous potatoes from the market. Currently, the *papas chilotas* demonstrate a low market demand and few avenues of increased production. With little economic opportunity to expand cultivation of ancient indigenous potatoes, the majority of *papas chilotas* are cultivated on personal plots.

In light of the competition between introduced and indigenous potato varieties, *papas chilotas* are at a great disadvantage. During the last twenty years, the Chilean

---

<sup>3</sup>“Decision Chilena de Registrar Papas de Chiloé No Implica Reclamo de Propiedad Genética”, CIP, <[HTTP://WWW.CIPOTATO/REGISTER.ORG](http://www.cipotato/register.org)>, MARCH 2007.

agricultural structure has undergone rapid modernization, encompassing the liberalization of international trade. Rapid economic growth, due to an increase in the real exchange and free trade, is favored by the national government. The implications of such changes include the introduction of high input agricultural technologies and crop specialization.<sup>5</sup> The problem is, that since Chile has become a primary exporter of agricultural products, a greater emphasis is placed on the derivation of a uniform, widely accepted, agricultural product, of high quality. The application of Agro-technologies in the commercialized, western variety tracks has stabilized their demand, thus limiting the papas chilotas potential for commercialization. Introduced varieties have displaced papas chilotas from the market, and large scale farming has marginalized Chiloé's subsistence farmers.

### **Traditional Farming Practices and Biodiversity**

Traditional farming practices are the result of hundreds of years experience in potato cultivation and promotes much needed biodiversity. Biodiversity is essential for food security, for a wide range of genetic material is needed for the development of cultivars that are adaptable to harsh growing conditions, have higher yields, and are resistant to disease. In essence, the depletion of biodiversity limits the amount of genetic resources available for hybridization, and destabilizes a working ecosystem by severing natural symbiotic relationships. The use of hybridization and the conservation of genetic material will be crucial in feeding a growing world population, for agricultural innovation

---

4. Venegas Carlos, "Organization of Farmers for the Conservation In-Situ of Native Potatoes in Chile", UC Berkeley: 1999.

is the primary means of expanding and improving yields under increasingly difficult growing conditions. However, the monoculture instituted by the commercialized farming of introduced potato varieties drastically erodes the archipelago's biodiversity of *Solanum tuberosa* subsets. According to Miguel Altieri of UC Berkeley's lab of Biological Control, large scale farming in Chile is characterized by a structure that does not promote the diversification of crops because it relies on the cultivation of a few, select varieties.<sup>6</sup> The commercial methods of farming homogenizes potato production and is a primary cause of genetic erosion of indigenous Chilota varieties. Indigenous potatoes display an astonishing array of genotypes not found in other parts of the world; thus once a certain variety of papa chilota has gone extinct, it cannot be recuperated.

In contrast, traditional farming practices incorporate several varieties into one plot. By maintaining biodiversity in this manner the natural relationships between plant types are maintained; thus, yields are able to defend themselves more effectively against harsh environmental conditions and yields are more robust. The personal testimony of local farmer Emilia Millapinda of Chonchi, Chiloé, offers a firsthand account of the success of traditional mixed potato planting, "I plant different potatoes together, because it is a good way to plant. Upon mixing the potato seed I have noticed that we are able to produce more, and the seeds are better defended from frosts."<sup>7</sup> The heterozygous nature

---

<sup>5</sup>Altieri, Miguel. "Ecological Impacts of Chile's Neoliberal Policies, with Special Emphasis on Agroecosystems". UC Berkeley: 1999.

<sup>6</sup>Altieri, Miguel, "Agro-ecology Puts Synergy to Work to Create Self Sustaining Agro-ecosystems", Ceres No. 154, 1995.

<sup>7</sup> Papas Nativas de Chiloe, "Patrimonio de la Humanidad", <[www.ChilEpa.org](http://www.ChilEpa.org)> Oct. 2006.

of traditional potato cultivation is ignored by commercial farming practices, despite its advantages of maintaining much needed biodiversity.

Another characteristic of traditional agriculture is the use of polyculture systems in which the planting of two or more different plant species in close proximity results in a greater defense against disease. The phenomenon of increased resistance to illness is due to bio-complementation, which effectively promotes yield increases by enhancing nutrient cycling.<sup>8</sup> Additionally, polyculture systems use the land more efficiently. For example, two or three different crops with varying root depths can be planted on the same plot, and in closer proximity. When the same species is planted in a commercial, monoculture fashion, the distances between each plant must be greater in order to accommodate identical root depths. While polyculture is a more site specific and management intensive form of cultivation, it remedies the loss of biodiversity and inefficient land use associated with commercial methods.<sup>9</sup>

In addition, traditional Chilota farming methods are sustainable. The monoculture typical of commercial farms is detrimental to the environment for it relies heavily on external inputs and depletes the nutrients in the soil.<sup>10</sup> However, traditional rotation of crops, which has been practiced for ages by traditional Chilota farmers, maintains soil fertility. While large scale farmers may argue that traditional farming practices are successful simply because they tend to be deployed on a smaller scale, in the case of

---

<sup>8</sup>Rojas Alejandro, "Ecological Impacts of Chile's Neoliberal Policies, With Special Emphasis on Agroecosystems", University of California Berkeley, April 1999.

<sup>9</sup>Brian Halweil, "Eat Here". WW. Norton & Co.,2004.

<sup>10</sup>Zimmerer, Karl, "The Vicissitudes of Biodiversity's Fortune. Changing Fortunes": Biodiversity and Peasant Livelihood in the Peruvian Andes. California:University of California Press,1996.

Chiloé, it are the traditional methods of cultivation, unrelated to size of land plot, that foster environmental sustainability. However, traditional farming practices have been isolated to individual households and excluded from Chiloé's large scale agricultural systems. In excluding traditional farming techniques from the agricultural framework, government sponsored commercial farms further environmental damage and the endangerment of valuable genetic resources. If native farming methods were deployed in conjunction with commercial farming schemes, not only would native practices gain influence, but environmental degradation and genetic erosion would be quelled.

However, while the Huilliche are stewards of a rich legacy of knowledge of their natural environment, it is not the intention of this article to advance the notion of the "noble savage", as described by Rosseau. On the contrary, the theory that "non- Western primitives are innocent and free of corruption, in contrast to the West's destructive materialism"<sup>11</sup> ignores the underlying assumption that even the most primitive farming practices come into conflict with the environment. While the environment incurs less damage with the implementation of some traditional farming practices, many pristine places, like Pucon, Chile, have suffered environmental degradation at the hands of both indigenous farming and commercial farming alike.

### **Traditional Taxonomic Knowledge**

The disappearance of indigenous farming knowledge is detrimental to the agricultural production in Chiloé, for while traditional taxonomic identification of indigenous *Solanum tuberosum* varieties has enabled genetic research, the traditional



knowledge of breeding has also contributed by and large to the maintenance of a stable food supply. Having refined potato cultivation for centuries, farmers naturally gravitate towards the varieties that fare the best. Moreover, because the rural population is dependent on potato harvests to meet their nutritional needs, farmers have selected potato plants that survive and produce under adverse conditions, year after year . Potatoes that demonstrate resilience to harsh weather and growing conditions take precedence over varieties that are less adaptable to the climatic conditions of the archipelago. In this manner, weaker cultivars are eliminated from the gene pool, thus ensuring a more successful harvest. Traditional farming knowledge facilitates effective breeding and preservation of ancient cultivars that, if lost, place the food supply in a precarious position.

Huilliche and Mapuche taxonomic knowledge, in addition to the utilization of traditional farming practices, are crucial in slowing genetic erosion of indigenous potatoes. It wasn't until the first seed collecting expeditions lead by Russian geneticist Nikolai Vavilov, that the classification and documenting of the over 1000 potato species became a priority within the agricultural genetics arena. The local knowledge of potato varieties facilitated Vavilov's research and subsequent studies that followed. In actuality, the Huilliche, Mapuche, and indigenous populations of the Andes, exhibit a complex and organized system of seed identification.<sup>12</sup> With over 146 indigenous *Solanum Tuberosum* varieties on the island of Chiloé alone, the identification of potatoes according to

---

<sup>11</sup>Conklin Beth, "The Shifting Middle Ground: Amazonian Indians and Eco-Politics", *American Anthropologist*, New Series, Vol.97, No 4 (Dec.,1995).

<sup>12</sup>Brush, Stephen, " The Dynamics of Andean Potato Agriculture" Lima:CIP 1983.

phenotype is common amongst native farmers. Although the identification system is based on visual assessment, it demonstrates clarity and consistency amongst different communities.<sup>13</sup> The indigenous taxonomic system is legitimized by the continuity in indigenous potato names across farming districts. This consistency increases the viability of using indigenous taxonomy for genetic research and conservation projects. Additionally, because the identification of papas chilotas is extremely localized, like Chiloé's myths and farming practices, the indigenous names given to *Solanum Tuberosum L* retain cultural significance. Some traditional names of potatoes are Michuna, Kila, Huicana, Ichipsa, and Huayru.<sup>14</sup>

It is estimated that the indigenous farmers of Chiloé cultivated nearly eight hundred different types of potatoes prior to the expansion of commercial, monoculture. In the years between 1970 and 1989 the availability of papas chilotas reduced from 600 to the current number of 147, though not all 147 types are commonly found. Typically, five variety of papas chilotas are cultivated: Clavelas, Comimos, Murta, Michunas, and Chilca.<sup>15</sup> Sadly, much of the knowledge maintained by elders in the community and experienced farmers has been lost over the past fifty years due to genetic erosion. At this point in time, it is difficult to be certain as to how many native potatoes have already gone extinct, for the decreased cultivation of indigenous varieties, coupled with the passing of the elder generations, has lead to the disappearance of such information.

---

<sup>13</sup>Ibid.

<sup>14</sup>Villarroel Carla, "Factibilidad de Un Sistema Productivo y Comercializacion de Papas Chilotas con Pequeños Agricultores de la Comuna de Quemchi, Chiloé", Universidad Austral de Chile, Valdivia:2002.

While advocates of commercial farms claim that traditional farming knowledge is obsolete in modern times with the development of agricultural innovation and technology, this claim is not reliable. Traditional knowledge of breeding, that has evolved over the course of generations, serves as a model of hybridization and seed selectivity which does not depend on sophisticated technology. Long established knowledge cannot be discarded without severe repercussions like loss of crop variety. Numerous sustainable development experts, like Xu Jianchu of the Center for Indigenous Knowledge and Biodiversity in Kunming, China argue that the best solution for a sustainable eco-agricultural framework is the combined use of traditional knowledge and modern agro-technological schemes. While modern technology, such as genome mapping and the derivation of improved seed via genetic modeling are effective, they are often expensive and inaccessible to developing countries where they are needed most.

Currently, in Chiloé, traditional knowledge of genetic lineage and long established breeding methods is vanishing at an alarming rate. While the negative consequences may not be evident right now, in the years to come increased fragility of agricultural production will make Chiloé vulnerable to food shortages. It is tragically ironic that an archipelago, considered to be one of the places of origin and home to the greatest quantity of potatoes, may potentially suffer from a lack of food.

### **Benefits of Commercialized Production vs. Traditional Farming**

Upon evaluating the detriment to genetic resources caused by large scale production of introduced potato varieties, the question arises: what benefits are there to

---

<sup>15</sup>Venegas, Carlos. "Biodiversidad y Papas Nativas de Chiloé", Chiloé:2002.

commercial methods of production? Firstly, for those who choose to participate in the commercialized farming of introduced varieties, higher yields can be expected and a product of uniform quality, fit for resale is obtained. While basic indigenous farming systems implement fewer external inputs, thus reducing environmental impact, they are simply not as efficient in regards to volume of production. In Chiloé, the majority of papa chilota cultivation has been reduced to household land plots which demonstrate a lower productive efficiency in comparison to large scale farms. The small yields result in a greater economic cost to the producer, for with scarce market avenues for resale, there are little means of generating profit with the production of indigenous cultivars<sup>16</sup>. Hence, the small scale agricultural producer of indigenous potatoes is forced to adopt the cultivation of the introduced varieties, or seek work in different sector.

The quality of papas chilotas tends to be less predictable due to the absence of quality standards imposed by external intermediaries. The result: smaller potatoes with a non- uniform shape. In past years, Chiloé's potatoes were not readily accepted in mainland farmers markets, simply because the population was not accustomed to their elongated body and varying colors. Unfortunately, the typical consumer has come to accept the western varieties as the norm. In market analysis studies where the indigenous varieties were made available, the consumer has preferred the introduced varieties over the native product. In addition, the consumer was not willing to pay more for the papas

---

<sup>16</sup>Cardenas, Ruben. Estudios Agrarios Ancud, personal interview.

chilotas<sup>17</sup>. Farmers of indigenous varieties have struggled with the lack of development and rejection of their product. Taking into account the revered cultural ties that farmers have with papas chilotas, the discrimination of their time honored crop leads to a feeling of embarrassment. At this point in time it is not feasible to make a living with the production of papas chilotas, and once prideful farmers of indigenous varieties must abandon their cultivation.

Gaps in production between subsistence agricultural producers and commercial agricultural producers have risen during the last fifty years, and small scale producers find themselves struggling to compete in a market with commercial growers.<sup>18</sup> Moreover, subsistence agricultural producers do not have access to the same technologies and resources that commercial growers do. Commercial growers, with established international contracts and stricter exportation standards, tend to produce larger potatoes and dominate the local market. These divisions increase the hardships in already poor communities and intensify social and economic disparity.

### **Conservation Efforts**

While the national government has done little in terms of conservation and recuperation of agricultural biodiversity, the islanders of Chiloe have advanced the conservation of their ancestral potatoes via the practice of Trafinktu, or seed exchange.<sup>19</sup>

---

<sup>17</sup>Soto Jessica, Thesis: Feasibility of Papas Chilotas in Temuco, Universidad Austral Valdivia: Chile, 2001.

<sup>18</sup> Ceno y Romero. Evaluacion Economica y Financiera de Inversiones Agrarias. Mandi-Prensa: Madrid. 1982.

<sup>19</sup>Manzur, Isabel. "Experiencia en Chile de Acceso a Recursos Geneticos Protección del Conocimiento Tradicional Y Derechos de Propiedad Intelectual." Fundación de Sociedade Sustentables": June 2004.

Trafinktu is common amongst Mapuche and Huilliche communities; it consists of seed trade between neighbors or villages. Oftentimes, women have the honor of choosing the seed that shall be traded or stored, thus women have come to the forefront in the fight to protect endangered papas chilotas. Trafinktu, though it mixes plant varieties and fosters agricultural partnerships, is not sufficient if papas chilotas are to be regenerated on a massive scale. Hence, non governmental organizations and universities have taken it upon themselves to protect Chiloé's agricultural biodiversity. Thus far, there are three main programs that have contributed to the classification of the numerous papas chilotas, the protection of genetic resources, and the increased cultivation of endangered genetic material. The first program that this article examines is the inscription of Chiloé's native potatoes by the Universidad Austral in Valdivia, Chile. The second program is headed by the Centro de Educación y Tecnología en Chonchi Chiloé. I will then explain the efforts by Estudios Agrarios in Ancud, Chiloé, and highlight my independent research conducted both on the main island of the archipelago and Pucon, Chile.

In an effort to register Chiloe's potatoes as national patrimony, the Universidad Austral and the Fundación de Inovación Agraria have prioritized the entry of 286 papa Chilota varieties into the legal agronomic database, known as SAG. The registering of the germplasm raises awareness about the need for conservation, and prevents the genetic material from being claimed by another country. Prior to the initiation of the project in 2005, papa chilota germplasm was unprotected and subject to unauthorized use. There was one instance, when papas chilotas were taken from the archipelago by an Australian

botanist, and registered as Australian genetic material.<sup>20</sup> Legal protection is very necessary in avoiding such injustice. Currently, the Universidad Austral retains a vast seed bank, in which many papa chilota varieties are protected, and not available to the public until properly inscribed. Each variety retains its indigenous name, as not to be renamed by third parties, and is sorted according to shared characteristics. The seed bank is also utilized in cross breeding and the derivation of illness free varieties. The Universidad Austral has made enormous strides in deriving illness resistant varieties via in vitro propagation and has used the dissection of apical meristems that are then used for planting.

Another seed bank that retains papa chilota germplasm is the Centro de Educación y Tecnología (CET) near Chonchi, Chiloé. CET's work began in 1988, when technicians explored the principle agricultural areas of Chiloé and collected hundreds of native potato seed samples. At this point in time, the rate of cultivation of papas chilotas was lower than that of pre 1940 levels, but several small scale farmers, concentrated on the large island, contributed to the Centro de Educación y Tecnología's project. The resulting bank was one of the first live collections of seed, and currently possesses 96 seed varieties. The collection has enabled CET to launch a program of unrivaled in-situ conservation, for it integrates the local population. The 96 varieties are planted in rows of 5-10 plants in an orchard setting measuring ½ hectare. Seeds in the orchard are used for germplasm maintenance, cultivar improvement, and provides potatoes to communities in the area. After achieving the successful live seed collection, in 1990, CET initiated a program in

---

<sup>20</sup>. Soto Jessica, Thesis: "Feasibility of Papas Chilotas in Temuco", Universidad Austral, Chile. OCT. 2005.

which it distributes endangered varieties to five local communities: Dicham, Petanes, Huitaque, Notue, and Huicha.<sup>21</sup> To the farmers of these communities, CET gives a sample of five different native varieties that are then included in the participant's routine harvest. A portion of the seed rendered is returned for CET for conservation, while the remaining portion is exchanged with other farmers, or re-planted. While CET's means of in-situ conservation are simple, they are effective for the structure focuses on the involvement of the local population. At the beginning of the program, CET incorporated 21 farmers, and currently, more than double that amount are involved.<sup>22</sup> The Centro de Educación y Tecnología's in-situ germplasm storage and distribution program demonstrates that basic conservation schemes are reliable, despite the fact that they do not implement advanced technology.

Finally, Estudios Agrarios in Ancud, Chiloé is addressing the need for the commercialization of papas chilotas. The center, headed by Ruben Cardenas, retains tracks of 68 different seed types and distributes papa chilota seed for planting, resale, or consumption. Apart from the diffusion of papa chilota cultivation, Estudios Agrarios is also working to educate the local campesinos about quality control and the specialization of native potato production. With the use of pamphlets, books, and on sight training, Estudios Agrarios is advancing the production of native potatoes. The theory behind Cardenas's work is that if the native product can achieve the quality of the

---

Valdivia: Chile, 2001.

<sup>21</sup>Food and Agricultural Organization United Nations, "Globally Important Agricultural Heritage Systems," <<http://www.FAO.ORG>>, UN, Nov. 2006.



commercialized varieties, market possibilities will become readily available by attracting a wider base of consumers, and then, more investment will be directed to the further development of indigenous cultivars. Estudios Agrarios has galvanized the demand for the native product in surrounding areas, and has begun to target the restaurant industry as a possible market avenue. A major accomplishment of their promotion initiative is the re-sale of papas chilotas to mainland, upscale restaurants that market exotic purple puree.

With the assistance of Ruben Cardenas and Estudios Agrarios, I obtained one hundred and seventy nine kilograms of five different papa chilota varieties: Clavela Lisa, Michunas Negras, Michunas Colorada, Murtas, y Comimos. In December of 2005, the one hundred and seventy nine kilograms were planted, ex situ, and without the use of chemical aids in order to assess the feasibility of harvesting the genetic material near the region of Pucon, Chile. While Michuñas Negras can be found near Pucon, they are the only type of papa chilota available, and are scarce in comparison to the introduced varieties.

The pilot project, in addition to advancing the conservation of endangered chilota species in a biodiversity research center, determined that due to similar climatic conditions between Pucon and Chiloé, the papas chilotas thrive when harvested ex-situ. Additionally, it was the first medium scale project in the area in which the papas chilotas were cultivated organically. The study concluded that with an effective integrated pest management plan in place, the use of fertilizers and pesticides is not necessary when growing Chilota seed. While the study did not detail how the organic cultivation could be

---

<sup>22</sup>Manzur, Isabel. "Experiencia en Chile de Acceso a Recursos Geneticos Proteccion del Conocimiento Tradicional Y Derechos de Propiedad Intelectual".Fundacion de Sociedades

carried out on a large, commercial scale, never the less, it demonstrated that despite the papas chilotas susceptibility to pests, chemical agents are surpluous during the cultivation process. As a result of my work, Pucon retains tracks of papas chilotas that can be introduced into the local market for resale, cultivated in the years to come, and distributed amongst farmers in the area. Though currently the potatoes are not being distributed for re-sale, with further cultivation and promotion, it is a potential prospect that would greatly assist the recuperation of Chiloé's cultural legacy and biodiversity.

### **Conclusion**

In the future, the potato will play a critical role in feeding a burgeoning world population. The potato contains more calories per area planted than any other cereal or fruit, and with 226 kg protein/ hectare produced, *Solanum Tuberosum* has an adequate balance of the eight essential amino acids.<sup>23</sup> As environmental challenges intensify, developing countries will become areas of interest, for at least 80% of the world population increase will be experienced by nations in transition of agricultural societies to industrialized societies. Today, nearly seventy percent of the world's poor live in rural areas where agriculture is the basic of economic activity, and "more than one third of the global potato output now comes from developing countries, up from just eleven percent in the early 1960s".<sup>24</sup> Thus, in accordance with the years past, the people of the world will continue to depend on the potato for sustenance and genetic erosion must be halted.

---

Sustentables: June 2004.

<sup>23</sup>Nutrition Facts, <<http://www.cipotato.org>> Nov 2006.

<sup>24</sup>Centro Internacional de la Papa, Potato: Master of Efficiency, <<http://www.cipotato.org>> Nov.2006.

As the government continues to support international trade agreements and massive agricultural production, traditional agricultural practices and knowledge must be adequately incorporated into Chile's modernized farming framework. For, as traditional farming practices and knowledge are depleted via crop homogenization, the rural sector questions their identity and comes into conflict with the national context. Left with a sensation of being unjustly slighted by commercialized agricultural methodology, farmers are less inclined to advocate Chiloé's ancient farming heritage, thus resulting in its disappearance<sup>25</sup>. Chiloé, then, is not only culturally degraded, but loses valuable knowledge needed for the maintenance of biodiversity. As stated by Isabel Manzur, "the recuperation of biodiversity cannot be separated from systems of traditional farming knowledge and insight. Indigenous systems support the evolution of sustainable farming practices needed for the future."<sup>26</sup>

The negative repercussion of introducing a foreign species to an area must be evaluated before the species is established. By anticipating the harmful effects of alien species on native species, diseases that lead to genetic erosion can be avoided. It is evident that genetic erosion in Chiloé encompasses the environmental sphere as well as the cultural sphere, for the reduction in the supply of indigenous potatoes leads to a loss of ancient beliefs and practices. Chiloé is the quintessential paradigm of a currently productive agro-ecosystem that faces the threat of food shortages in the future, due to the elimination of cultivars needed for present and future crop improvement. If mankind is to

---

<sup>25</sup>Cardenas, Ruben. Estudios Agrarios Ancud, personal interview

<sup>26</sup>Manzur, Isabel ".Experiencia en Chile de Acceso a Recursos Geneticos Proteccion del Conocimiento Tradicional Y Derechos de Propiedad Intelectual".Fundacion de Sociedades Sustentables:June 2004.

meet his increasing demand for agricultural resources, methods of production that discourage homogenized crops must be implemented. Traditional farming practices promote biodiversity, and serve as an example of crop diversification. Though, such practices need to be promoted, as they are severely undermined. Agricultural production affects everyone on the planet, producers and consumers alike. No one is immune to the negative cultural affects of monoculture or the subsequent extinction of plant species, thus it is imperative that conservation be prioritized and persistently executed.

## Works Cited

- Brush, Stephen, "The Dynamics of Andean Potato Agriculture". Lima: Centro Internacional de la Papa (CIP), 1980.
- Centro Internacional de la Papa (CIP), "Seed Production Technology: Report of the International Potato Center's Planning Conference on Seed Production Technology". Lima: CIP, 1974.
- Ceno y Romero "Evaluacion Economica y Financiera de Inversiones Agrarias". Mandi-Prensa: Madrid. 1982
- Horton, Douglas. " The Potato as a Food Crop for the Developing World". Lima: CIP, 1980.
- Rhoades, Robert, "Breaking New Ground: Agricultural Anthropology". Lima: CIP, 1984.
- Salaman, Redcliffe, "The History and Social Influence of the Potato". Great Britain: Cambridge University Press, 1949.
- Manzur, Isabel "Experiencia en Chile de Acceso a Recursos Geneticos Proteccion del Conocimiento Tradicional Y Derechos de Propiedad Intelectual".Fundacion de SociadadeSustentables:June 2004
- Ochoa, Carlos, "Universal Gift". Lima: CIP, 1987.
- Soto Jessica, Thesis: "Feasibility of Papas Chilotas in Temuco", Universidad Austral Valdivia: Chile, 2001.
- Venegas Carlos, "Organization of Farmers for the Conservation In-Situ of Native Potatoes in Chile", UC Berkeley: 1999.
- Villarroel, Carla, " Factibilidad de un Sistema Productivo y Comercializacion de Papas Chilotas con Pequeños Agricultores de la Comuna de Quemchi-Chiloe", Valdivia, Chile: Universidad Austral de Chile,2002.
- Zimmerer, Karl, "The Vicissitudes of Biodiversity's Fortune". Changing Fortunes: Biodiversity and Peasant Livelihood in the Peruvian Andes. California: University of California Press,1996. 218-232.