



**UNIVERSIDAD AUSTRAL DE CHILE  
FACULTAD DE FILOSOFÍA Y HUMANIDADES  
FACULTAD DE CIENCIAS AGRARIAS**

**VALORACIÓN DE LOS SERVICIOS ECOSISTÉMICOS CULTURALES:  
ESTIMACIÓN DE LA DISPOSICIÓN A PAGAR POR LA CONSERVACIÓN DEL  
PATRIMONIO AGRÍCOLA DE CHILOÉ**

**TESIS DE MAGÍSTER**

**JOSÉ ANTONIO BARRENA RUIZ**

**VALDIVIA-CHILE**

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de Magíster en Desarrollo Rural

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## INTRODUCCIÓN GENERAL

Toda actividad humana depende en su base de los ecosistemas y los flujos de bienes y servicios que éstos proveen (MEA, 2005; Heal, 2000). Diversos estudios, como los informes del Millennium Ecosystem Assessment (MEA) (2005) y The Economics of Ecosystems and Biodiversity (TEEB) (2010), han relevado la creciente degradación que pesa sobre un gran número de ecosistemas, la que en algunos casos llega a puntos críticos poniendo en riesgo la provisión de servicios fundamentales para el bienestar humano. De acuerdo con el informe elaborado por el MEA (2005), alrededor de un 60% de los servicios ecosistémicos evaluados a nivel mundial están siendo degradados o utilizados de forma no sustentable.

En este contexto, ha cobrado relevancia en la literatura científica el concepto de servicios ecosistémicos, en la medida que entrega un marco para analizar el valor que la sociedad atribuye a los ecosistemas, así como para la evaluación y cuantificación de los beneficios directos e indirectos que perciben los seres humanos desde la naturaleza (Wallace, 2007; Turner and Daily, 2008; Chan et al., 2012). Además, bajo el concepto de servicio ecosistémico, es posible alinear objetivos de producción y conservación, aumentando simultáneamente el bienestar humano y protegiendo la biodiversidad (Chan et al., 2006; Balvanera y Cotler, 2007; Mertz et al., 2007; Costanza, 2008).

En la literatura se recogen diversas definiciones y tipologías de servicios ecosistémicos (Costanza et al., 1997; Daily 1997; de Groot et al., 2002; MEA, 2005; Wallace, 2007; Haines-Young and Potschin, 2010). Mientras en algunas de estas definiciones, el concepto servicios ecosistémicos se presenta como equivalente a los beneficios entregados por los ecosistemas, en otras se asocia con atributos biológicos, físicos o químicos de los ecosistemas que en un paso posterior proveen beneficios a la sociedad (Nahlik et al., 2012). Por otro lado, y más allá de las diferencias existentes, todas

estas aproximaciones han incluido dentro de sus esquemas a los servicios ecosistémicos culturales y los valores de no uso.

Uno de los esquemas más aceptados es el del MEA (2005), según el cual los servicios ecosistémicos se clasifican en servicios de provisión (ej. comida, fibra, agua fresca), servicios de regulación (ej. regulación del clima, control de la erosión, polinización), servicios culturales (ej. recreación, relaciones sociales, diversidad cultural) y servicios de soporte (ej. formación del suelo, fotosíntesis, ciclo de nutrientes). De acuerdo con MEA (2005), los servicios ecosistémicos culturales son los “*beneficios no materiales que las personas obtienen desde los ecosistemas a través del enriquecimiento espiritual, desarrollo cognitivo, reflexión y experiencia estética*”. Algunos ejemplos son diversidad cultural, valores espirituales, sistemas de conocimiento, valores estéticos, relaciones sociales, valor del patrimonio cultural (especies culturalmente significativas), recreación y ecoturismo.

Desde el punto de vista económico, gran parte de los servicios ecosistémicos pueden ser considerados como bienes públicos (Nahuelhual y Núñez, 2011) para los cuales no está definido un mercado que registre su valor en términos monetarios (valores de no uso). Lo anterior cobra especial relevancia y es particularmente aplicable a los servicios ecosistémicos culturales (Gee and Burkhard, 2010; TEEB, 2010). Una consecuencia directa de esto, es que en los procesos de toma de decisiones que afectan a los territorios, los servicios ecosistémicos en general, y los servicios ecosistémicos culturales en forma particular, son constantemente subvalorados. Por ejemplo, en la determinación de usos de suelo o en la decisión de desarrollar proyectos con fines productivos o de conservación.

La forma más utilizada de enfrentar el problema de la subvaloración de los servicios ecosistémicos culturales y los valores de no uso en general, es a través de técnicas de valoración económica (Chiesura and de Groot, 2003; Martín-López et al., 2009), entre las

que se cuentan el método de costo de viaje, la valoración contingente y los precios hedónicos (para mayor detalle ver Vásquez et al., 2007).

En Chile son escasos los trabajos científicos en el ámbito de los servicios ecosistémicos (para mayor detalle revisar Nahuelhual y Núñez, 2011), y la mayor parte se ha orientado a la cuantificación y valoración de los servicios ecosistémicos que proveen los bosques nativos en la zona centro – sur del país. Entre estos trabajos destacan los de Núñez (2004), Oyarzún et al. (2004-2005), Núñez et al. (2006), Nahuelhual et al. (2007), Lara et al (2009), Little et al. (2009) y Cerdá (2011). También cabe destacar, el trabajo conjunto desarrollado por el Fondo para el Medio Ambiente Mundial (GEF), el Ministerio del Medio Ambiente de Chile (MMA) y el Programa de las Naciones Unidas para el Desarrollo (PNUD), para la valoración económica de las áreas protegidas de Chile (GEF-MMA-PNUD, 2010), en el marco del proyecto “Creación de un sistema nacional integral de áreas protegidas para Chile: Estructura financiera y operacional”.

El trabajo que se presenta a continuación, trata el tema de la subvaloración de los servicios ecosistémicos, particularmente, de los servicios ecosistémicos culturales que proveen los agroecosistemas. La importancia de los ecosistemas agrícolas como proveedores de servicios ecosistémicos culturales y valores de no uso, ha sido relevada por diversos autores, como Daugstad et al. (2002), Daugstad et al. (2006), Swinton et al. (2007), Poudel y Johnsen (2009), Chan et al. (2012) y Daniel et al. (2012), entre otros. A través de un estudio de valoración contingente llevado a cabo en tres regiones de Chile, se estimó el valor económico que los ciudadanos otorgan al patrimonio agrícola de Chiloé como un servicio cultural de los agroecosistemas del sur de Chile. El método de valoración contingente ha sido empleado para estimar el valor de varios servicios ecosistémicos asociados a la agricultura, incluyendo características visuales del paisaje (Ready et al., 1997), hábitat de vida salvaje (Brouwer y Slangen, 1998), impactos en la calidad del agua (Colomboa et al., 2006) y recursos genéticos cultivados (Poudel y Johnsen, 2009).

La encuesta de valoración contingente, fue aplicada en la Isla de Chiloé (región de Los Lagos), en la ciudad de Valdivia (región de Los Ríos) y en la ciudad de Santiago (región Metropolitana y capital nacional), considerando una muestra de 350 personas en cada una de las regiones. Con los datos obtenidos se estimó la disposición a pagar de las personas por la implementación de un programa de conservación de la papa nativa de Chiloé, *Solanum tuberosum*, especie culturalmente significativa del patrimonio agrícola de la isla, cuyo cultivo aporta a sostener sistemas de conocimiento y relaciones sociales en la agricultura local. El estudio incluyó el diseño de una encuesta con formato dicotómico doble, y las estimaciones se realizaron utilizando un modelo Probit Bivariado (Cameron y Quiggin, 1994; Alberini, 1995).

El archipiélago de Chiloé constituye un lugar de importancia por la calidad de sus ecosistemas y su diversidad vegetal. Entre otras cosas, el Fondo Mundial para la Naturaleza (WWF) lo ha incluido como una de las 25 áreas prioritarias para la conservación de ecosistemas del mundo, ha sido nombrado como uno de los centros Vavilov de origen de especies como la papa y la frutilla, e identificado por FAO como uno de los sitios piloto de los Sistemas Ingeniosos del Patrimonio Agrícola Mundial (SIPAM).

La tesis se estructura de la siguiente forma: la primera sección, presenta una introducción al tema de los servicios ecosistémicos culturales, y el patrimonio agrícola de Chiloé; la segunda sección, presenta el caso de estudio de Chiloé, sitio SIPAM piloto; la tercera sección presenta los métodos y datos del estudio; la cuarta sección presenta los principales resultados de las estimaciones económicas; y, finalmente, en la última sección, se discuten las implicancias de los resultados en el marco del desarrollo rural y la toma decisiones en políticas públicas sobre los servicios ecosistémicos, y se entregan las principales conclusiones. Se espera que los resultados de este trabajo contribuyan como información relevante para la toma de decisiones estratégicas sobre las especies culturalmente significativas para los territorios rurales, y se sume a otras iniciativas que

apunten a la conservación de los agroecosistemas, en particular del paisaje agrícola y el patrimonio agrícola de Chiloé.

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## CAPÍTULO 1

### VALUING CULTURAL ECOSYSTEM SERVICES: AGRICULTURAL HERITAGE IN CHILOÉ ISLAND, SOUTHERN CHILE.

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#### Abstract

Valuation of cultural ecosystem services (CES) remains one of the most difficult and least accomplished tasks in ecosystem services (ES) research. We estimated the economic value of agricultural heritage (AH), in Chiloé Island, Southern Chile. Specifically, we assessed how willingness to pay (WTP) for conserving AH might decrease with distance. We used the Contingent Valuation Method with the double bounded dichotomous choice format to elicit WTP, which was modeled using a Bivariate Probit specification. Results show no significant differences in WTP across locations with equivalent means of US\$50.8, US\$36.2 and US\$52.5 for Chiloé (where AH originates), Valdivia (at 379 km from Chiloé), and Santiago (at 1,198 km from Chiloé), respectively, suggesting that non-use values can be equally important for local as well as distant populations, particularly when the CES can be ascribed to distinctive areas of provision such as Chiloé. Aggregation of individual WTP demonstrates the importance of AH as a highly valued CES and sustains the recent denomination of Chiloé as a Global Importance Agricultural Heritage System (GIAHS) pilot site. The study might prompt authorities to generate the proper incentives to move from just a GIAHS denomination to a real conservation initiative in Chiloé Island.

Keywords: Cultural ecosystem services; willingness to pay; agricultural heritage; contingent valuation method; Chiloé native potato.

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## Resumen

La valoración de los servicios ecosistémicos culturales (SEC), constituye una de las tareas más difíciles y menos abordadas dentro de la investigación de los servicios ecosistémicos. En este estudio, se estimó el valor económico del patrimonio agrícola (PA) de la isla de Chiloé, en el sur de Chile. Específicamente, se analizó como la disposición a pagar (DAP) por la conservación del PA, puede disminuir con la distancia. Se utilizó el método de valoración contingente con formato dicotómico doble para obtener la DAP, la que fue modelada a través de la especificación Probit Bivariada. Los resultados no muestran diferencias significativas en la DAP a través de las distintas zonas, con medias equivalentes de US\$50,8, US\$36,2 y US\$52,5 para Chiloé (donde se provee el PA), Valdivia (distante 379 km de Chiloé) y Santiago (distante 1.198 km de Chiloé), respectivamente, sugiriendo que los valores de no uso pueden ser igualmente importantes tanto para la población local como para personas que habitan en zonas distantes, particularmente cuando el SEC es proveído en zonas con características particulares como Chiloé. La agregación de las DAP individuales muestra la importancia del PA como un SEC altamente valorado y sustenta la reciente denominación de Chiloé como de los sitios piloto de los Sistemas Ingeniosos del Patrimonio Agrícola Mundial (SIPAM). El estudio podría estimular a las autoridades a generar los incentivos adecuados para pasar de sólo una denominación SIPAM, a una iniciativa de conservación real en la isla de Chiloé.

Palabras clave: Servicio ecosistémico cultural; disposición a pagar; patrimonio agrícola; método de valoración contingente; papa nativa de Chiloé.

## 1. INTRODUCTION

While the provision of food, fiber, and fuel is the dominant aim of agriculture (MEA, 2005; Zhang et al., 2007), agricultural landscapes play unique roles in supplying other ecosystem services (ES) (e.g. soil conservation; species habitat) (Zhang et al., 2007). A growing amount of literature recognizes the crucial role of cultural ecosystem services (CES) provided by agricultural lands (Chan et al., 2012; Daugstad et al., 2002; Daugstad et al., 2006; MEA, 2005; Poudel and Johnsen, 2009; Swinton et al., 2007), such as knowledge systems and cultural heritage values (MEA, 2005; Raymond et al., 2009; Sodhi et al., 2010). It has been argued that CES represent one of the strongest incentives for people to become involved in natural capital conservation (Philips, 1998). Yet, CES remain largely underappreciated and unvalued (Swinton, 2007) and have been assessed only marginally in the ES literature (Bostedt and Lundgren, 2010; Chan et al., 2012; Daniel et al., 2012; Gee and Burkhard, 2010). This can be attributed to the fact that CES are generally less tangible than other ES, holding almost exclusively non-use values, which are both, difficult to estimate (Carson et al., 2003; Edwards, 1986) and to represent spatially (Maes et al., 2011). Yet, being able to place values on these services is fundamental to encourage agricultural land managers to provide and maintain ES at levels that are desirable to society.

In this work the Contingent Valuation Method (CVM) was used to estimate the willingness to pay (WTP) that stakeholders<sup>1</sup> from nearby and more distant locations have for the maintenance of agricultural heritage (AH), defined here as “a specific type of inheritance composed of the farmers’ way of life, production and agricultural activities” (Casanelles, 1994). As such, this is a combined CES which comprises three dimensions of non-use values (MEA, 2005): the heritage value associated to a species of cultural importance; the traditional systems of farming knowledge of the heritage keepers; and the social networks established among them. As a case study we chose Chiloé Island, in

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<sup>1</sup> In this paper, we follow the definition by Hein et al. (2006): “Any group or individual who can affect or is affected by the ecosystem’s services”, understanding the existence of a dynamic bidirectional relationship between the ecosystem services and the stakeholders.

Southern Chile, which in 2008 was proposed by FAO as a Global Importance Agricultural Heritage System (GIAHS) pilot site (FAO, 2008). GIAHS are selected based on their importance for the provision of local food security, high levels of agro-biodiversity and associated biological diversity, store of indigenous knowledge and ingenuity of management systems (FAO, 2003).

The study focuses on the conservation of native potato varieties (nationally denominated Chiloé native potato), being cultivated by small and medium farmers, following traditional agricultural practices. Willingness to pay would be expected to decrease as stakeholders change from nearby to more distant locations reflecting both less information to the ES being valued and less attachment regarding the agricultural landscape that provides the ES (see Sutherland and Walsh, 1985; Pate and Loomis, 1997).

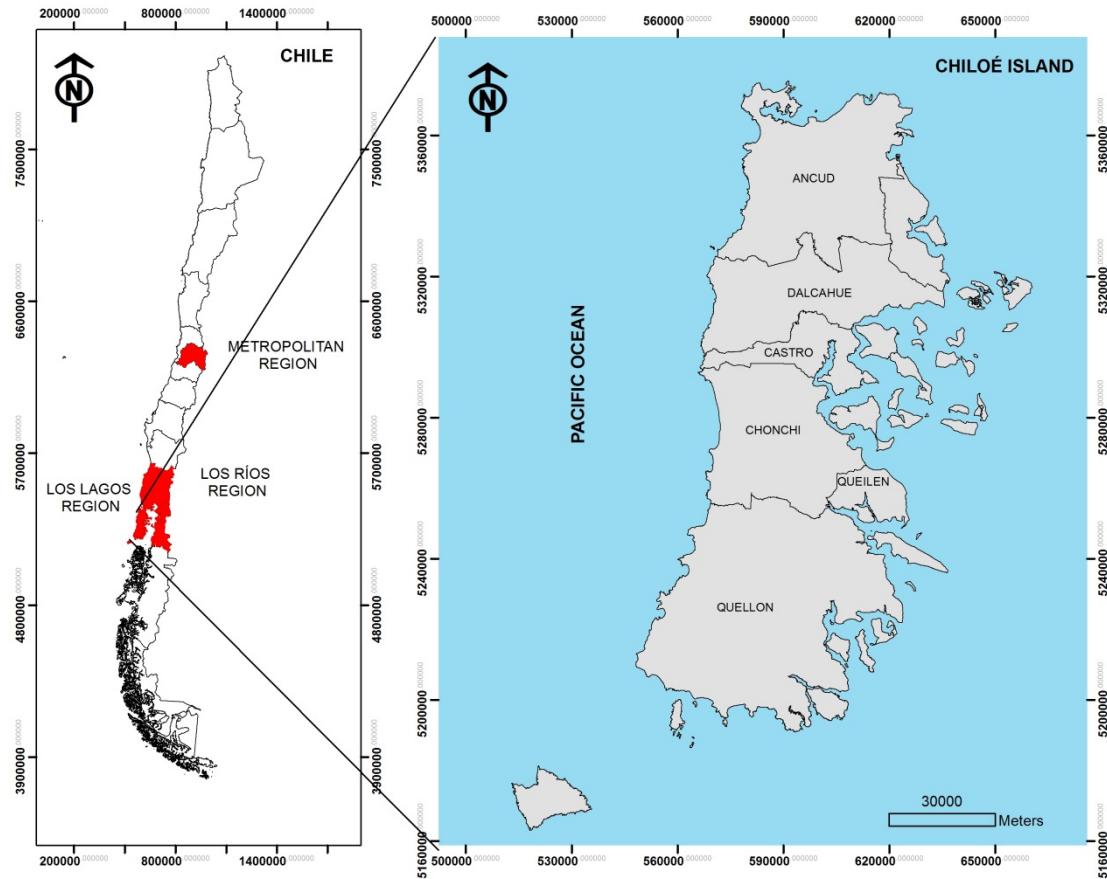
This study is of clear interest given the GIAHS denomination of Chiloé, which is based on the recognized importance of AH. Hence, the results obtained can be useful to ensure that the current decisions about the level of funding of traditional agriculture conservation are indeed informed decisions. Finally, this line of work is relevant in developing countries such as Chile where there are few studies exploring economic values of CES from traditional agriculture, which is threatened by rapid processes of urbanization and agricultural abandonment (Carmona et al., 2011; Díaz et al., 2011) and social transformations (Amtmann and Blanco, 2001; Salières et al., 2005).

## 2. STUDY CASE: CHILOÉ GIAHS PILOT SITE

Chiloé Archipelago is composed of the main Island of Chiloé and a group of 40 smaller islands in southern Chile ( $41^{\circ}$  -  $43^{\circ}$  S) (Figure 1). Administratively, Chiloé is divided in 10 municipalities that pertain to the Chiloé Province, in the Los Lagos region, and has an area of  $9,182 \text{ km}^2$  (INE, 2007). A large part of the Archipelago is covered by native forests (66.9%), while the remaining area (27.4%) corresponds to agricultural lands and shrubland (CONAF-CONAMA-BIRF, 1999). An important part of these forests are

protected under Chiloé National Park with (43,057 ha) and private conservation efforts, such as Tepuheico Park (20,000 ha) and the Tantauco Park (118,000 ha).

**Figure 1.** Map of Chile showing Chiloé Archipelago and the administrative regions where the survey was taken



The predominant farm structure in Chiloé is small peasant agricultural systems. These small properties continue to experience farm subdivision, leading to their increasing atomization which compromises their viability (CET, 2011; Salières et al., 2005). Inside the agricultural activity, Chiloé native potato is the principal crop, a vital part of the food security and sovereignty of Chiloé's inhabitants (CET, 2011), which converts this potato into a culturally significant species. Around 200 documented varieties of native potatoes

are still managed today which are highly adapted to the range of ecological conditions found in Chiloé and are of key importance for subsistence farming (CET, 2011). The conservation of this species in small farms is closely related to the oral transmission of traditional agricultural knowledge, and the existence of a network of social relationships among the generations of peasant families. However, in the last decades, the influx of new economic activities (forestry and fish-farming), urban expansion, migration of young people and the growing of more commercial potato varieties (due to their higher levels of productivity and homogeneity) have threatened the conservation of this patrimonial agriculture, and have produced deep changes in the socio-economic structure of the territory (CET, 2011; FAO, 2012; Salières et al., 2005).

Chiloé is considered a valuable geographical location on a national and international level, for diverse reasons. Among these reasons is being a place with landscapes of natural scenic beauty, possessing communities that harbour unique customs and traditions, having an important architectural patrimony, and being a reserve of agricultural heritage on a world context (FAO, 2012; UNESCO, 2012). For these reasons, over the years numerous conservation efforts have been developed in order to protect the natural, social and physical capital of Chiloé. In this context, World Wildlife Fund (WWF) has denominated Chiloé one of the 25 priority areas for ecosystem conservation in the world, given its outstanding biodiversity and degree of endemism (FAO, 2012). Also, in 2000, UNESCO declared some of Chiloé's wooden churches human patrimony (UNESCO, 2012). Finally, the denomination as a GIAHS pilot site is fundamentally due to the fact that it corresponds to one of the Vavilov centers of origin of potato (*Solanum tuberosum*) and strawberry (*Fragaria chiloensis*). The principal objectives of the GIAHS pilot program are to encourage the recognition of Chiloé as a source of culture, tradition, and genetic biodiversity; to stimulate sustainable development, and to alert society about the importance of protection and conservation of biodiversity (FAO, 2012).

### **3. METHODS AND DATA**

#### **3.1 CVM survey design and application**

Agricultural heritage combines different dimensions of non-use values (i.e. a species of cultural importance, farmers social networks, and traditional systems of farming knowledge), which makes its economic valuation particularly challenging. In this context and for most CES, stated preference methods are thought to be the only economic valuation techniques capable of measuring non-use values (Cameron, 1992; Harrison, 1995; Larson, 1992). In this study, we applied CVM, which has become the main tool for economic valuation of non-market goods (Arrow et al., 1993; Haab and McConnell, 2002; Martín-López et al., 2011; Poudel and Johnsen, 2008).

Following Portney (1994), the CVM questionnaire applied in this study consisted of three sections. In the first section it was explained to the respondent the worldwide relevancy of Chiloé native potato as a cultivated genetic resource, its traditional form of cultivation, and the threats to its conservation. This description was supported with extensive photographic material. This section also asked the respondent his/her level of knowledge of Chiloé's native potato and he/she was required to rank the most outstanding feature of Chiloé: i) site of natural beauty; ii) site of architectural patrimony; iii) a site of agricultural heritage; and iv) a site of customs and traditions.

The second section contained the presentation of the market, the payment vehicle and the WTP question. It was explained that the cultivation of the native potato has been fundamental for the conservation of this genetic resource, which at the same time has been possible thanks to the oral transmission of traditional agricultural practices through the generations of the farmers. It was suggested to the respondent that a Foundation would be created, which would operate with voluntary donations from across the country to carry out a conservation program for the native potato of Chiloé. After describing the market, the respondent was asked the screening question, which was:

*When this Foundation begins to operate, it will solicit funds from yourself and from other citizens on a voluntary basis. Taking into account your individual income and your expenses in other activities, would you be willing to make this contribution?*

People who answered that they would not contribute to a conservation initiative were excluded from the sample. For those people who answered that they would contribute to the initiative, the valuation question was worded as follows:

*Would you be willing to pay \$xx (Bid amount) for one year to the Foundation?*

If the answer to the first proposed price was negative, a lower amount was presented to the respondent and in the case of a positive answer, a higher amount was presented. The vector of prices faced by respondents is showed in Table 1.

**TABLE 1.** Price vector in Chilean pesos (USA dollars) offered to respondents for the double bounded dichotomous choice format<sup>a</sup>.

First Price	No to the first price	Second Price	Yes to the first price
2,000 (4)	1,000 (2)		4,000 (8)
4,000 (8)	2,000 (4)		6,000 (12)
6,000 (12)	4,000 (8)		8,000 (16)
8,000 (16)	6,000 (12)		10,000 (20)
10,000 (20)	8,000 (16)		12,000 (24)
12,000 (24)	10,000 (20)		15,000 (30)
15,000 (30)	12,000 (24)		20,000 (40)
20,000 (40)	15,000 (30)		30,000 (60)
30,000 (60)	20,000 (40)		50,000 (100)
50,000 (100)	30,000 (60)		70,000 (140)

<sup>a</sup> 1 US\$ = 500 Chilean pesos

While different CVM question formats have been proposed and used in previous studies (e.g. payment card, open ended), the double bounded dichotomous choice question format was selected (Carson et al., 2003), whose advantages are that it is less susceptible to

strategic behavior and proves easier for interviewees, thus reducing the number of non-responses or protest responses (Haab and McConnell, 2002).

In turn, the selection of a donation to a Foundation as a payment vehicle was based on the fact that in Chile taxes are centralized, in which case their distribution towards regional needs cannot be ensured. Other payment vehicles such as environmental bonds, fines, and rewards have been proved more difficult for respondents to understand in a survey setting. The literature presents several other studies that have used voluntary contributions rather than other mechanisms (Bedate et al., 2009; Sanz, 2004). The second section also asked the respondent to prioritize which she/he considered to be the most important role of the Foundation. In this point the alternatives were in close relation to the non-use value dimensions of AH, namely: i) to conserve native potato genetic resources for strategic reasons such as food security; ii) to conserve traditional farming styles; and iii) to conserve native potato because they are part of Chiloé's identity and tradition. Finally, the third section included questions concerning demographic characteristics of respondents, such as gender, age, monthly income, education level, and occupation.

After extensive pre-testing in November and December of 2011 in the city of Valdivia (75 people in the first pretesting and 150 people in the pilot survey), the final survey was applied in January of 2012 in the cities of Castro and Ancud in the Los Lagos administrative region (350 people), the city of Valdivia (350 people) which is the capital of the Los Ríos administrative region (379 km distance from Chiloé) and Santiago Metropolitan region (350 people), which is the country's capital (1,198 km distance from Chiloé) obtaining a total of 1,049 complete surveys.

Only people who were over 18 years of age and were currently earning an income were subjected to the interview. Respondents surveyed in Castro and Ancud (henceforth Chiloé sub-sample) represented the nearby population and they were assumed to be the most knowledgeable and directly involved in protecting AH. Respondents interviewed in

Valdivia (henceforth Valdivia sub-sample), located further away from the CES provision center, were assumed to have partial knowledge of the CES being valued. Finally, interviewees from Santiago (henceforth Santiago sub-sample), represented the further away population and were assumed to be the least knowledgeable of the CES under valuation. In the three locations, we selected places with high traffic of a diversity of people in terms of social and economic conditions.

### **3.2 Theoretical and empirical model specification**

The random utility model provides the theoretical basis for CVM analysis. In this model and in the case at hand, an individual would choose to pay the donation fee for AH conservation over not paying the donation under the following condition (Hanemann, 1984):

$$\nu(1, Y - A; s) + \varepsilon_1 \geq \nu(0, Y; s) + \varepsilon_0 \quad (1)$$

where  $\nu$  is the indirect utility function, 1 represents paying the donation and 0 not paying it,  $Y$  is the person's individual income,  $A$  is the bid amount,  $s$  represents other socioeconomic characteristics affecting individual preferences, and  $\varepsilon_0$  and  $\varepsilon_1$  are the identically, independently distributed random variables with zero means. Paying the donation for conservation or not paying it, is determined by the utility difference  $\Delta\nu$ :

$$\Delta\nu = \nu(1, Y - A; s) - \nu(0, Y; s) + (\varepsilon_1 - \varepsilon_0) \quad (2)$$

The dichotomous choice format of CVM requires a qualitative choice model. Consistent with many previous studies, we assume a linear distribution of WTP using a Bivariate Probit (BP) model based on the one developed by Cameron and Quiggin (1994) which assumes that the error of the second dichotomous question is correlated with the error of the first. The possibility of imperfect correlation between the error terms of both equations of WTP make the BP model be the correct specification (Alberini, 1995), given

that the normal bivariate distribution permits the existence of a distinct correlation of zero between the terms of error, while the logistic distribution does not permit the same distinct correlation (Cameron and Quiggin, 1994; Jeanty et al., 2007).

Cameron and Quiggin (1994) propose to use a normal bivariate distribution of the form  $BVN = (x'_{1j}\beta_1, x'_{2j}\beta_2, \sigma_1^2, \sigma_2^2, \rho)$ , where  $x'_{1j}$  is a vector of explanatory variables and  $\beta_1$  the vector of parameters corresponding to the first equation;  $x'_{2j}$  corresponds to the vector of variables and  $\beta_2$  to the vector of parameters of the second equation;  $\sigma_1^2$  and  $\sigma_2^2$  correspond to the variances of the error term of the first and second equation, respectively; and  $\rho$  is the correlation coefficient between the two equations.

Modeling data generated by the double bounded question format relies on the formulation given by:

$$WTP_{ij} = x'_{ij}\beta_i + e_{ij} \quad (3)$$

where  $WTP_{ij}$  represents the  $j^{th}$  respondent's willingness to pay and  $i = 1, 2$  denote the first and the second question, respectively. In this way,  $WTP$  depends on a systematic component given by the observed characteristics of the respondent ( $x'_{ij}\beta_i$ ) as well as on a non-observable random component ( $e_{ij} \sim N(0, \sigma^2)$ ).

Following Haab and McConnell (2002), the  $j^{th}$  contribution to the likelihood function becomes:

$$\begin{aligned} L_j &= \Pr(x'_{1j}\beta_1 + e_{1j} > A, x'_{2j}\beta_2 + e_{2j} < A_u)^{YN} * \Pr(x'_{1j}\beta_1 + e_{1j} > A, x'_{2j}\beta_2 + e_{2j} > A_u)^{YY} * \Pr(x'_{1j}\beta_1 + e_{1j} < A, x'_{2j}\beta_2 + e_{2j} < A_l)^{NN} * \Pr(x'_{1j}\beta_1 + e_{1j} < A, \\ &\quad x'_{2j}\beta_2 + e_{2j} > A_l)^{NY} \end{aligned} \quad (4)$$

where  $YN = 1$  for a yes-no answer and 0 otherwise;  $YY = 1$  for a yes-yes answer and 0 otherwise;  $NN = 1$  for no-no answer and 0 otherwise; and  $NY = 1$  for a no-yes answer and 0 otherwise. Specifically,  $A$  is the amount offered in the first question of the double bounded model; faced with this question respondents decide whether they accept the amount or not.  $A_u$  is the amount offered in the second question of the double bounded model dependent upon a positive answer to the first question and therefore it is a value larger than  $A$ . In turn,  $A_l$  is the amount offered in the second question of the double bounded model in case the answer to the first question had been negative and therefore it is a value smaller than  $A$ .

Applying the natural logarithm to equation (4), we obtain:

$$\ln(L_j) = YN * \ln[Pr(x'_{1j}\beta_1 + e_{1j} > A, x'_{2j}\beta_2 + e_{2j} < A_u)] + YY * \ln[Pr(x'_{1j}\beta_1 + e_{1j} > A, x'_{2j}\beta_2 + e_{2j} > A_u)] + NN * \ln[Pr(x'_{1j}\beta_1 + e_{1j} < A, x'_{2j}\beta_2 + e_{2j} < A_l)] + NY * \ln[Pr(x'_{1j}\beta_1 + e_{1j} < A, x'_{2j}\beta_2 + e_{2j} > A_l)] \quad (5)$$

Once the BP regression is estimated, the WTP is calculated as  $\bar{X}\beta'/\beta_0$  using the Krinsky and Robb (KR) method (Krinsky and Robb, 1986), where  $\bar{X}$  is the mean of the explanatory variables,  $\beta'$  is the vector of the estimated coefficients of the explanatory variables, and  $\beta_0$  is the estimated coefficient for the bid.

The BP model was estimated using the econometric software STATA 10, which facilitates the manageability of large databases. In addition, the KR confidence intervals for mean and median WTP can be easily constructed using this program (see Cameron and Trivedi, 2005). The description of the variables used in the BP model is presented in Table 2.

**TABLE 2.** Description of the variables used in the BP model.

Variable	Description
<i>Price 1</i>	First amount of money proposed to the respondent as annual contribution (\$)
<i>Price 2</i>	Second amount of money proposed to the respondent as annual contribution (\$)
<i>Hiedu</i>	Binary variable equal to 1 if the respondent had a higher education level (over 12 years) and 0 otherwise
<i>Inc</i>	Individual net monthly income (\$)
<i>Kpot</i>	Binary variable equal to 1 if the respondent had previous knowledge of Chiloé native potato and 0 otherwise
<i>Kinit</i>	Binary variable equal to 1 if respondent knew about initiatives related to the protection of Chiloé native potato and 0 otherwise
<i>Custr</i>	Binary variable equal to 1 if the respondent considered that the most relevant characteristic of Chiloé was as a site of customs and traditions and 0 otherwise
<i>Agrhe</i>	Binary variable equal to 1 if the respondent considered that the most relevant characteristic of Chiloé was as a reserve of agricultural heritage and 0 otherwise
<i>Nabea</i>	Binary variable equal to 1 if the respondent considered that the most relevant characteristic of Chiloé was as a site of natural and scenic beauty and 0 otherwise
<i>Geres</i>	Binary variable equal to 1 if respondent considered that conserving genetic resources for strategic reasons was the most important role of the Foundation and 0 otherwise
<i>Rlife</i>	Binary variable equal to 1 if respondent considered that conserving rural traditional lifestyle was the most important role of the Foundation and 0 otherwise

Price and income are the basic variables determining demand. Education is also included in most valuation studies as a predictor of WTP. In this study, education was incorporated as a dummy variable that accounted for higher education level which in the case of Chile ranges between 14 and 20 years. The remaining variables were chosen as they accounted for knowledge of the Chiloé native potato (*Kpot and Knit*), perceptions regarding Chiloé (*Custr, Arghe, Nabea*), and the main role assigned to the Foundation (*Geres, Rlife*).

## 4. RESULTS

### 4.1. Respondent's socio-demographic characteristics and knowledge of AH

Of the total number of surveys applied and completed (1,049), an important percentage of people answered no to the screening question, specifically, 30.6% in Chiloé, 48.4% in Valdivia, and 41.7% in Santiago, which resulted in a total number of 627 usable respondents (general sample) for analysis and estimation, that represent 59.8% of the people originally surveyed. Table 3 provides frequencies and mean values associated to each sub-sample and the general sample for the interviewees who willing to contribute to the Foundation.

Most respondents (over 88% in all cases) were employed at the time of the survey. The higher education proportion (*Hiedu*) and the average monthly income (*Inc*), were shown to be the lowest in Chiloé (less than the general sample), and highest in Valdivia (more than the general sample). With respect to the level of knowledge of the ES being valued, the differences were very close to expected. While in Chiloé practically 100% of those who were willing to donate said to know of the native potato (*Kpot*), and more than 35% claimed to know about protection initiatives (*Kinit*), in Valdivia and Santiago those percentages fell to 66% and 12% and to 54% and 3%, respectively. By means of an ANOVA with a Tukey test for the numerical variables and a Pearson Chi-squared test for the binary variables, we determined significant differences for the sub-samples among the means of monthly income (*Inc*), higher education (*Hiedu*), previous knowledge of native potato (*Kpot*) and the knowledge of initiatives related to the protection of AH (*Kinit*).

In relation to what the respondents considered most important about Chiloé, in the three sub-samples the majority indicated that it was the quality of the site's customs and traditions (*Custr*), with percentages over 40% in Chiloé and Valdivia, and over 30% in Santiago. Regarding what people considered to be the most important role of the native potato conservation program, in Chiloé and Santiago conserving native potato as an identity

factor was the most frequent answer, while in Valdivia the answer was mostly conserving rural traditional lifestyles

**TABLE 3.** General characteristics of the sub-samples and general sample indicating percentages of people in the case of binary variables (for value 1) and mean values of each group of respondents for numerical variables.

Variable	Category	Sub-samples			General sample n=627
		Chiloé n=243	Valdivia n=180	Santiago n=204	
Sector ( <i>Sec</i> )	Urban	89%	98%	100%	95%
Gender ( <i>Gend</i> )	Male	54%	51%	39%	48%
Age ( <i>Age</i> )	Years	39	40	38	39
Currently working ( <i>Cwor</i> )	Yes	97%	98%	88%	94%
Higher education ( <i>Hiedu</i> )*	Yes	44%	70%	69%	59%
Knew about the native potato of Chiloé ( <i>Kpot</i> )*	Yes	99%	66%	54%	75%
Knew about initiatives relating to the protection of the native potato of Chiloé ( <i>Kinit</i> )*	Yes	35%	12%	3%	18%
Considered that the most relevant characteristic of Chiloé is:					
As a site of architectural patrimony ( <i>Arche</i> ) <sup>+</sup>	Yes	12%	22%	19%	17%
As a site of customs and traditions ( <i>Custr</i> )*	Yes	43%	42%	33%	40%
As a reserve of agricultural heritage ( <i>Agrhe</i> )*	Yes	24%	18%	17%	20%
As a site of natural and scenic beauty ( <i>Nabea</i> )*	Yes	21%	18%	31%	23%
The most important role of Foundation is:					
Conserving genetic resources for strategic reasons ( <i>Geres</i> )*	Yes	22%	23%	23%	23%
Conserving rural traditional lifestyle ( <i>Rlife</i> )*	Yes	32%	42%	23%	32%
Conserving native potato because it is part of the culture of Chiloé island ( <i>Cult</i> ) <sup>+</sup>	Yes	46%	35%	55%	46%
Monthly Incomes ( <i>Inc</i> )*	US\$	776	1083	1025	945

\* Used in BP estimation as independent variables besides donation amount (Price 1 for equation 1 and Price 2 for equation 2 as described in Table 2).

<sup>+</sup> These variables were excluded from the estimation to avoid perfect collinearity with *Custr*, *Agrhe*, *Nabea* and *Geres* and *Rlife*, respectively.

## 4.2. Bivariate probit estimation results

The results from the four BP regressions for the three sub-samples and the general sample are shown in Table 4. The upper part of the Table shows the estimation for the first equation, and the lower part the estimation for the second equation. As expected, in the four BP regressions the coefficient associated with price was negative and significant in both equations, indicating that as the price increased the probability of a positive answer to the WTP question decreased.

The results for the general sample indicate that WTP was influenced positively by the knowledge that people had about initiatives related to the protection of AH (*Kinit*), the level of education (*Hiedu*) and the net monthly income (*Inc*). However, in the case of the sub-samples, these variables were not simultaneously significant. In the case of Chiloé *Kinit* resulted significant, showing a positive influence on the WTP in both equations. In Valdivia, *Hiedu* positively influenced the probability of accepting the proposed price in both equations. Santiago showed that to have previous knowledge about the native potato (*Kpot*) was significant in both equations, negatively influencing the probability of accepting each of the proposed prices.

Other variables also influenced WTP in each of the sub-samples, but with statistical significance in only one of the two equations. This suggests the possibility that the answers to the first and second question were influenced by different variables. For example *Inc* resulted significant in Chiloé and Santiago only in the first equation; *Custr*, *Agrhe*, and *Nabea*, were significant and negative only for Chiloé in the first equation. In turn, *Custr* was significant and negative only in the first equation of Valdivia, whereas *Agrhe* and *Nabea* were significant and negative only in the second equation of Valdivia. Finally none of these three variables was significant in either equation of Santiago.

**TABLE 4.** Bivariate probit regression results: Coefficients and standard errors for each sub-sample and the general sample.

	Equation 1								
	Chiloé		Valdivia		Santiago		General		
Variable	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	
<i>Constant</i>	1.4414	(0.8981)	2.2828	(0.6213)	***	0.7510	(0.3278)	**	
<i>Price 1</i>	-0.0319	(0.0041)	***	-0.0676	(0.0106)	***	-0.0197	(0.0036)	***
<i>Kpot</i>	0.1117	(0.8121)	0.0359	(0.3161)		-0.3932	(0.2083)	*	
<i>Kinit</i>	0.3989	(0.2304)	*	1.0518	(0.5939)	*	-0.5446	(0.7051)	0.3747
<i>Custr</i>	-0.7051	(0.3508)	**	-0.8590	(0.4413)	*	0.0214	(0.3069)	-0.3237
<i>Agrhe</i>	-0.6576	(0.3780)	*	-0.6977	(0.4793)		-0.1250	(0.3335)	-0.2982
<i>Nabea</i>	-0.8636	(0.3946)	**	-0.6363	(0.5112)		0.0973	(0.3087)	-0.2994
<i>Geres</i>	0.3840	(0.2684)		0.1884	(0.4219)		0.4940	(0.2759)	*
<i>Rlife</i>	0.1499	(0.2311)		-0.8071	(0.3569)	**	0.2568	(0.2516)	0.0260
<i>Hiedu</i>	0.2512	(0.2210)		1.2380	(0.3342)	***	0.0568	(0.2349)	0.3201
<i>Inc</i>	0.0004	(0.0002)	*	0.0001	(0.0002)		0.0005	(0.0001)	**
	Equation 2								
Variable	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	
<i>Constant</i>	-0.0540	(0.8510)	0.8620	(0.4524)	*	-0.2805	(0.2966)	0.2046	
<i>Price 2</i>	-0.0155	(0.0042)	***	-0.0290	(0.0070)	***	-0.0107	(0.0030)	***
<i>Kpot</i>	0.3412	(0.7864)	0.4662	(0.2489)	*	-0.4529	(0.1903)	**	
<i>Kinit</i>	0.5527	(0.1906)	***	0.2679	(0.3648)		-0.2793	(0.6004)	0.4890
<i>Custr</i>	-0.0554	(0.2887)		-0.5164	(0.3541)		0.0325	(0.2734)	-0.1140
<i>Agrhe</i>	-0.0135	(0.3091)		-1.0576	(0.3717)	***	0.2872	(0.3048)	-0.1558
<i>Nabea</i>	-0.3773	(0.3263)		-1.0923	(0.3839)	***	0.2853	(0.2729)	-0.3353
<i>Geres</i>	-0.0077	(0.2282)		-0.0573	(0.2972)		0.0522	(0.2405)	0.0171
<i>Rlife</i>	-0.1829	(0.2024)		0.1256	(0.2690)		-0.0115	(0.2316)	0.0959
<i>Hiedu</i>	0.2424	(0.1926)		0.9037	(0.2624)	***	0.4211	(0.2216)	*
<i>Inc</i>	0.0002	(0.0001)		0.0000	(0.0001)		0.0002	(0.0001)	0.0001
N	243		180		204		627		
Log Likelihood	-247.59		-138.01		-222.53		-674.09		
Chi-square (20)	102.10	***	96.020	***	55.45	***	235.58	***	
$\rho(1, 2)$	-0.3071	**	-0.0172		0.5583	***	0.1634	**	

\*\*\* p-value<0.01, \*\* p-value<0.05, \* p value<0.10

For the group of variables that accounted for the most important role of the Foundation, the parameter associated with the variable *Geres* was positive and significant for Santiago and in the general sample in the first equation. Meanwhile, the parameter associated with the variable *Rlife* resulted negative and significant for Valdivia only in the first equation. Contrarily, none of these variables presented statistical significance in the second equation for any of the sub-samples.

It is important to remark that Valdivia was the only sub-sample where the value of the  $\rho$  did not allow the rejection of the null hypothesis of independence among the errors of both equations ( $H_0: \rho = 0$ ), which theoretically acknowledges the existence of two functions of WTP associated with the two phases of the interview. On the contrary, in the case of Chiloé, Santiago and in the general sample  $\rho$  resulted significant, which would implicate that the behavior of the respondents is guided under the same WTP function in the different phases of the interview.

Table 5 shows the estimates of mean WTP obtained by the KR method for each sub-sample and the general sample. In Chiloé, as well as in Santiago, the mean WTP was slightly superior to the value that was obtained in the general sample, while in Valdivia WTP resulted to be 30% inferior to the value of the general sample. However, the overlapping KR confidence intervals for the sub-samples suggest that there were no significant differences in WTP among people from Chiloé, Valdivia and Santiago.

**TABLE 5.** Willingness to pay values for each sub-sample and the general sample.

	Mean annual WTP (US\$)	Lower bound	Upper bound	ASL*	CI/MEAN
Chiloé	50.8	37.3	66.9	0.000	0.6
Valdivia	36.2	31.6	41.8	0.000	0.3
Santiago	52.5	36.8	73.1	0.000	0.7
General sample	50.5	45.8	56.0	0.000	0.2

Krinsky and Robb (95%) confidence interval for WTP measures

\*Achieved significance level for testing  $H_0: WTP \leq 0$  vs.  $H_1: WTP > 0$

Mean WTP values were projected over the work force (employed and unemployed) of each administrative region associated with the sub-samples as a way to add the social benefits for the protection AH, keeping the proportions of respondents willing to contribute to the Foundation ( 69.4% in Chiloé, 51.6% in Valdivia and 58.3% in Santiago) . Also and as stated by NOAA (1994), Harrison and Rutström (2005), Harrison (2006), and Bedate et al. (2009), we incorporated the hypothetical bias and decided to divide the aggregated benefits by three, to make the extrapolation more realistic. Given this adjustment, and taking official data of work force for each region from INE (2012), the aggregated values obtained were US\$4,409,491 for Los Lagos region (Chiloé sub-sample), US\$1,086,326 for Los Ríos region (Valdivia sub-sample) and US\$34,865,303 for the Metropolitan region (Santiago sub-sample), totaling US\$40,361,120.

## 5. DISCUSSION AND CONCLUSIONS

Contrarily to what we expected, the results from our study showed no significant differences in WTP for the conservation of AH, when respondents were segmented by distance to the CES being valued and the agricultural landscape that provides it. This in spite of the fact that previous knowledge of AH decreased as the distance from Chiloé increased (see *Kpot* and *Kinit* variables in Table 3). Previous studies have found dissimilar results in the relation between WTP and distance to the good or service being valued. Pate and Loomis (1997) analyzed the effects of distance on WTP for the implementation of three proposed programs designed to reduce various environmental problems, finding that in two of them (pollution control, and a wetland improvement program) the WTP declined as the distance increased, while in the third (salmon improvement program), WTP did not have significant variations with distance. Kim et al. (2012) established that WTP for the preservation of the spotted seal of Baengnyeong Island in South Korea was higher for residents than for nonresidents. In turn, studies by Duffield et al. (1992), Lockwood (1996) and Kniivilä (2006) found that local respondents WTP was smaller than that of nonresidents. Blaine and Lichtkoppler (2004) found no statistical differences between mean

WTP for conservation programs in Cuyahoga County Ohio, between soil and water district clientele and the voting public. These results show that for certain ES, distance does play a role in the determination of WTP, and for others it does not, supporting that the particular characteristics of the ES being valued as well as those of the stakeholders involved, will determine the magnitude and direction in which distance can influence WTP.

In the case of CES, the task of economic valuation and the determination of the relevant stakeholders, represent an especially complex challenge. The benefits that people obtain from the CES are subject to permanent cultural and moral considerations (Aldred, 1994) and depending on their nature, these benefits derive from non-use values, unlike the case of provisioning and regulating ES where the benefits derive from direct and indirect use values, respectively (Hein et al., 2006). The AH of Chiloé is a CES that in its ecological dimension exists first from the inherent characteristics of the agricultural landscape of Chiloé, and whose benefits are derived from its non-use value in an ample spatial scale. In this context, the distinct stakeholders value AH for its existence (based on the utility that it generates for them just because it exists), its altruistic (based on the utility for someone else who benefits), and/or in terms of its legacy value (based on the utility that it generates to know that future generations will benefit from this CES) (Kolstad, 2000).

The above makes it possible that stakeholders that are near or far from the agricultural landscape that provides the CES have similar WTP for its conservation, given that their criteria of valuation is not influenced by the use (direct or indirect) of AH, and can be an explanation for the results obtained. On the other hand, the special characteristics of Chiloé that were described earlier (Section 2), transform this place in an icon of worldwide importance, which could positively influence the valuation that people far away and with less knowledge of AH have for the CES.

The results also acknowledge that WTP is influenced by different variables according to the relative distance to the agricultural landscape of Chiloé and the phase of

the CVM survey in which the respondent is. In particular, *Kinit* positively influenced WTP in Chiloé, *Hiedu* positively influenced WTP in Valdivia and *Kpot* had a negative influence over WTP in Santiago. This last result is somehow unexpected, but could in part reflect the fact that in general people from the farther regions obtain the knowledge of the Chiloé native potato in a decontextualized form (i.e. through sales in supermarkets or in food festivals), separate from the rest of the aspects involved with AH (i.e. traditional systems of farming knowledge, farmers social networks). For this reason AH might be being valued establishing a closer bond with its use value dimension rather than with its heritage non-use value characteristics.

The aggregated benefits obtained as a measure of social wellbeing reflect the importance that society from the three regions places on Chiloé AH conservation. Adding the aggregated benefits across regions (see Section 4.2), produced a value of US\$40,361,120. This value is considerably high compared to government expenditures directed to support small and medium farmers. For example, the main division of the Chilean Ministry of Agriculture (the Institute for Agricultural Development) handles at least 8 nation-wide programs to support family agriculture (including indigenous farmers), whose 2012 budget for the Los Lagos region alone reached US\$13,300,350 (INDAP, 2012). This implies that the benefits from AH conservation are three times higher than the government investment towards the maintenance of peasant agricultural systems in Los Lagos region, investment that is also supposedly intended to maintain agricultural heritage.

It is important to highlight the efforts to value complex ES such as the case of CES from agricultural landscapes; the information that such studies can provide is important to assist the design and implementation of public policies oriented towards their conservation. Such policies also need to know that CES influence the welfare not only of local populations where these ecosystem services are generated but also of distant stakeholders. Hence the precise determination of beneficiaries and the importance they give to a particular ES provides should be important criteria in land use planning and management

policies that affect the maintenance of agricultural heritage. Specifically, the results obtained in this study sustain the denomination of Chiloé as a Global Importance Agricultural Heritage System pilot site based on its valuable AH and might prompt authorities to generate the proper incentives to move from just the denomination to a real AH conservation initiative in Chiloé Island, along with the management of its agricultural landscape.

Finally, given the limitations described in relation to economic valuation of the CES, and in particular the non-use values, it is necessary to consider these results with caution. In this sense, the challenge of valuing CES involves expanding the vision beyond purely economic assessment and incorporate methods from a wide range of social sciences. Progress is needed on the development of a transdisciplinary view on CES valuing, which can address the challenges of analyzing and assessing ecosystems in a comprehensive manner, despite the new methodological complications that they might entail. Exploring new theoretical frameworks and methodologies in the valuation of the CES, could provide better approaches that recognize the importance that different stakeholders give to these ES. Authors such as Chan et al. (2012) and Daniel et al. (2012) have made important contributions in this area. Thus, the present study is a contribution in relieving the value of the CES for decision-making, but it also recognizes the limitations that a purely economic assessment can have.

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## DISCUSIÓN GENERAL Y CONCLUSIONES

En las últimas décadas, el concepto de servicios ecosistémicos se ha posicionado como un nuevo paradigma bajo el cual comprender y analizar el vínculo que mantienen los ecosistemas con el bienestar humano. Un aporte fundamental del concepto, ha sido la generación de debates en torno a la gestión del capital natural y la importancia fundamental que tienen los bienes y servicios que provee el capital natural para el desarrollo social y económico. El análisis de servicios ecosistémicos ha permitido abrir la discusión entre desarrollo económico y conservación del ecosistema, reconociendo que la inversión en conservación, restauración y uso sustentable del ecosistema, genera amplios beneficios ecológicos, económicos y sociales (de Groot et al., 2010). Numerosos trabajos científicos se han enfocado en el desarrollo de nuevos avances teóricos y metodológicos sobre el tema, lo que ha llevado a un acercamiento de conceptos y metodologías provenientes de la ecología y de la ciencia económica. Particularmente, la valoración económica ha permitido situar en términos monetarios a los servicios ecosistémicos en el marco de los análisis costo-beneficio para la toma de decisiones territoriales, aportando con información relevante a gestores de política y actores locales. No obstante, la valoración económica de los servicios ecosistémicos es un proceso complejo, tanto desde el punto de vista conceptual como metodológico. En este sentido, es fundamental reconocer las limitaciones propias del trabajo de valoración de los servicios ecosistémicos, sobre todo de aquellos que generan valores de no uso como es el caso de gran parte de los servicios ecosistémicos culturales. Dado lo anterior, es necesario avanzar en el desarrollo de una mirada transdisciplinaria sobre el tema, que permita hacer frente a los desafíos del análisis y valoración de los ecosistemas de forma integral, superando la sola mirada económica. Aportes importantes en esta línea han sido los de Chan et al. (2012) y Daniel et al. (2012).

El presente trabajo se ha propuesto estimar el valor económico de un servicio ecosistémico cultural de no uso complejo, como es el patrimonio agrícola. Los resultados indican que la valoración de las personas por la conservación del patrimonio agrícola, es independiente del nivel de conocimiento previo sobre el servicio cultural como del vínculo

con el ecosistema agrícola que lo provee, pero que distintos factores influyen en la valoración de los grupos de personas según sea su cercanía/lejanía con el paisaje agrícola de Chiloé. La extrapolación de los resultados y la obtención de beneficios agregados, dan cuenta de la importancia relativa que la sociedad entrega a la conservación del patrimonio agrícola de Chiloé, lo que comparativamente supera los recursos que el Estado invierte en programas de apoyo y fomento de la pequeña agricultura en la región de Los Lagos. En este sentido, tal vez el principal aporte de este trabajo va en la línea de entregar evidencia económica sobre la importancia de los servicios culturales que proveen los agroecosistemas, y contribuir con esto a orientar las decisiones en los ámbitos de la conservación de formas de agricultura tradicional. El estudio también evidencia la importancia de dar una mirada multifuncional al paisaje agrícola, como proveedor bienes y servicios colectivos de carácter intangible (como el patrimonio agrícola), más allá de reconocerlo como un espacio que provee sólo alimentos y fibra (Daugstad et al., 2006). Avanzar en una mirada integral de los espacios rurales como proveedores de servicios ecosistémicos, entregará nuevas alternativas de desarrollo para sus habitantes, lo que adquiere especial relevancia en el caso de Chiloé, lugar nominado como uno de los sitios SIPAM piloto a nivel mundial, dada su alta diversidad genética e importancia cultural y tradicional de su paisaje agrícola.

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**ANEXO 1**  
**ENCUESTA DE VALORACIÓN CONTINGENTE**

**ENCUESTA SOBRE ESTIMACIÓN DE LA IMPORTANCIA (VALOR) DE LOS RECURSOS GENÉTICOS CULTIVADOS (CROP GENETIC RESOURCES)**

(Preguntas de Filtro: 1. ¿Reside en la región? 2. ¿Percibe o Genera usted ingresos de forma directa?)

**PRIMERA PARTE: RECURSOS GENÉTICOS CULTIVADOS Y CONOCIMIENTO GENERAL DE LA PAPA NATIVA DE CHILOÉ**

Se entiende por recursos genéticos cultivados (*diapositiva 1*). Algunas de estas especies vegetales son además culturalmente significativas para la sociedad, contribuyendo a la seguridad y soberanía alimentaria (*diapositiva 2*).

Un ejemplo de tales recursos genéticos es la papa nativa de Chiloé, cuya distribución se concentra en la zona sur de Chile principalmente en la Isla de Chiloé (*diapositiva 3 y 4*). Esta especie y su forma tradicional de cultivo, se enfrentan a una serie de procesos que constituyen una amenaza para su conservación (*diapositiva 5*).

1. ¿Dónde reside usted habitualmente?					
1.1 Comuna			1.2. Sector		
				1. Urbano	
				2. Rural	
2. Ha visitado o vivido en Chiloé? (sólo para las encuestas fuera de Chiloé)		3. ¿Conocía la papa nativa de Chiloé? (si la respuesta es No, pasar a pregunta 5)			
1. Sí <input type="checkbox"/> 2. No <input type="checkbox"/>		1. Sí <input type="checkbox"/> 2. No <input type="checkbox"/>			
4. ¿Usted ha consumido papa nativa de Chiloé?		5. ¿Conoce alguna iniciativa relacionadas con la protección de la papa nativa de Chiloé?			
1. Sí <input type="checkbox"/> 2. No <input type="checkbox"/> 3. No sabe <input type="checkbox"/>		1. Sí <input type="checkbox"/> 2. No <input type="checkbox"/> Si la respuesta es Afirmativa puede indicarnos ¿Cuál o cuáles?: _____			
6. Ordene los siguientes aspectos relacionados con Chiloé en una escala del 1 al 4, de acuerdo al grado de importancia que tienen para usted (1 más importante; 4 menos importante).					
Patrimonio Arquitectónico	<input type="checkbox"/>	<input type="checkbox"/> Sitio de costumbres y tradiciones	<input type="checkbox"/>	<input type="checkbox"/> Patrimonio agrícola	<input type="checkbox"/> Sitio de belleza natural y escénica

**SEGUNDA PARTE: PRESENTACION MERCADO** El cultivo de la papa nativa de Chiloé en predios de pequeños agricultores, ha sido fundamental para la conservación de este recurso genético. Esto ha sido posible, gracias a la transmisión oral de conocimientos y prácticas agrícolas tradicionales entre generaciones de agricultores.

Con el objeto de potenciar esta forma de conservación y como una manera **resguardar las formas de conocimiento local campesino** que actualmente se **encuentran amenazadas**, se creará una **Fundación** la cual operará con aportes voluntarios recaudados nacionalmente para llevar a cabo un **Programa de conservación de la papa nativa de Chiloé (diapositiva 6)**

Cuando esta Fundación comience a funcionar, se le **solicitará a Ud. y otros ciudadanos realizar un aporte monetario voluntario** (transferible de la forma que a Ud. más le acomode) **Teniendo en cuenta su ingreso individual y sus gastos en otras actividades:**

7. ¿Estaría dispuesto/disposta a realizar este aporte? (marcar solo una opción). (Si responde afirmativamente pasar a la pregunta 7.1, sino pasar a pregunta 8.)

1. Sí  2. No

7.1. ¿Podría indicarnos si estaría dispuesto(a) a contribuir por un año a esta Fundación con **\$2.000**?



7.2. ¿Estaría dispuesto(a) a contribuir con **\$4.000** por un año?

1. Sí  2. No

7.3. ¿Estaría dispuesto(a) contribuir con **\$1.000** por un año?

1. Sí  2. No

7.4. ¿Podría indicarnos con cuanto estaría dispuesto a contribuir? (en caso de respuesta No, No)

\$ \_\_\_\_\_

7.5. ¿Contribuiría por más de un año con el monto señalado anteriormente?

1. No  2. Sí

Por cuantos años: \_\_\_\_\_

7.6. Ordene los siguientes aspectos asociados al Programa de Conservación de la papa nativa que llevará a cabo la Fundación, en una escala del 1 al 3, de acuerdo al grado de importancia que tienen para usted (1 más importante; 3 menos importante).

Conservar los recursos genéticos  
por razones estratégicas

Conservar las formas  
de vida campesina

Conservar las papas nativas de Chiloé  
porque son parte de la cultura Chilotá

Pasar a parte III

8. De las siguientes alternativas ¿Cuál es el motivo más importante de por qué NO está dispuesto a contribuir? <b>(Pasar a pregunta 8.1)</b>		8.1 Ya que usted NO contribuiría monetariamente ¿Estaría Ud. dispuesto a contribuir con su tiempo a apoyar actividades de la Fundación ya sea administrativas o de campo?
1. Ya contribuyo con mis impuestos-Labor del Estado		<input type="checkbox"/>
2. Necesito más información sobre la Fundación y sus funciones		<input type="checkbox"/>
3. Prefiero emplear mi dinero para otros fines		<input type="checkbox"/>
4. No creo en ese tipo de contribuciones		<input type="checkbox"/>
5. Creo que ya existen Fundaciones que cumplen esta labor		<input type="checkbox"/>
6. No me encuentro en condiciones económicas de contribuir en este momento		<input type="checkbox"/>
Otra ¿cuál? _____		<input type="checkbox"/>
		1. No <input type="checkbox"/> 2. Sí <input type="checkbox"/>
En caso de respuesta afirmativa: ¿cuántas horas a la semana estaría dispuesto a contribuir?: _____ ¿por cuántos meses? _____		
<b>(Pasar III parte)</b>		

9. Sexo:	10. Edad: _____	11. ¿Usted es miembro activo de alguna Organización ciudadana o Fundación con fines públicos?
1. Hombre <input type="checkbox"/>		1. Sí <input type="checkbox"/>
2. Mujer <input type="checkbox"/>		2. No <input type="checkbox"/>
		¿Cuál? _____
14. ¿Cuál de las siguientes categorías define mejor su situación actual?		15. ¿Cuál es su ingreso líquido mensual individual? Por favor mire la siguiente cartilla e indique la letra que más se acerque a su ingreso.
1. Asalariado <input type="checkbox"/>		Número <input type="checkbox"/>
2. Desempleado <input type="checkbox"/>		
3. Independiente o empresario <input type="checkbox"/>		
4. Jubilado-retirado (solo pensión) <input type="checkbox"/>		
5. Jubilado- Retirado (otros ingresos) <input type="checkbox"/>		
16. ¿Cuántas personas conforman su grupo familiar (incluido usted)? Nº _____		

17. En una escala de 1 a 7. ¿Qué tan seguro(a) se siente de poder pagar el monto que expresó anteriormente?  
(Sólo para el caso de que conteste a una cifra distinta de cero).

Poco cierto	1	2	3	4	5	6	7	Muy cierto
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#### **CUARTA PARTE: PERCEPCIÓN DEL ENTREVISTADOR** (Contestar inmediatamente terminada la encuesta)

18. El encuestado ha comprendido el cuestionario	1. Bien 1_____	19. La actitud del participante fue:	1. Buena 1_____
	2. Regular 2_____		2. Indiferente 2_____
	3. Mal 3_____		3. Mala 3_____
20. Presión de tiempo que el entrevistado(a) pareció sentir	1. Muy presionado -3_____		
	2. Normal 0_____		
	3. Relajado 3_____		

## ANEXO 2

### MATERIAL GRÁFICO DE APOYO

Lamina 1

#### **ENCUESTA SOBRE ESTIMACIÓN DE LA IMPORTANCIA (VALOR) DE LOS RECURSOS GENÉTICOS CULTIVADOS**

**Recurso Genético Cultivado:** El valor económico, científico y social del material heredable contenido dentro y entre especies vegetales. Estos recursos tienen importancia para el mejoramiento genético, para la industria alimenticia y farmacéutica, entre otras cosas. Muchos de estos recursos genéticos se encuentran vinculados a formas tradicionales de conocimiento rural, fortaleciendo la economía de estas familias a través de la comercialización y autoconsumo

Industria Farmacéutica



Industria Alimenticia



Formas Tradicionales de agricultura



Formas Tradicionales de agricultura

Recurso Genético cultivado



Recurso Genético cultivado



Mejoramiento genético



## Lamina 2

### ENCUESTA SOBRE ESTIMACIÓN DE LA IMPORTANCIA (VALOR) DE LOS RECURSOS GENÉTICOS CULTIVADOS

Los recursos genéticos cultivados, tienen una vital importancia para asegurar la seguridad y soberanía alimentaria

**Seguridad Alimentaria:** “Cuando todas las personas tienen en todo momento acceso físico, social y económico a los alimentos suficientes, inocuos y nutritivos que satisfagan sus necesidades energéticas diarias y preferencias alimentarias para llevar una vida sana y activa” (FAO).

**Soberanía Alimentaria:** Se entiende como la facultad de cada Estado para definir sus propias políticas agrarias y alimentarias de acuerdo a objetivos de desarrollo sostenible y seguridad alimentaria.



## Lamina 3

### ENCUESTA SOBRE ESTIMACIÓN DE LA IMPORTANCIA (VALOR) DE LOS RECURSOS GENÉTICOS CULTIVADOS

#### Papas nativas de Chiloé



Papa Bruja



Papa Murta



Michuñe Negra



Michuñe Roja

Es una papa alargada, de pulpa color crema amarillo con tonos rojos. De sabor nogado, es bastante firme, moderadamente harinosa. Especial para preparar al horno o como ensalada.

[www.papasnativasdechiloe.cl](http://www.papasnativasdechiloe.cl)



Michuñe Negra

Papa alargada, de pulpa color morado crema, medianamente firme, seca, grano intermedio. Es de sabor tierno, olor deseable, escasa desintegración. Ideal para preparar al horno o como ensalada.

[www.papasnativasdechiloe.cl](http://www.papasnativasdechiloe.cl)



Cabra

Papa redonda, de pulpa parcialmente violeta, medianamente firme, desintegración escasa. Sabor moderado, olor deseable. Ideal para ser usada como papa frita.

[www.papasnativasdechiloe.cl](http://www.papasnativasdechiloe.cl)



Clavela Lisa

Papa ovalada, de piel amarilla y rosada. Posee ojo superficial y pulpa de color crema. Su sabor es agradable, tubérculo firme a la cocción. Ideal como papa cocida y para cazuela.

[www.papasnativasdechiloe.cl](http://www.papasnativasdechiloe.cl)



Murta

Es una papa redonda y achatada, de pulpa color amarillo. Es de sabor natural, moderadamente firme y ligeramente harinosa. Apta para toda preparación.

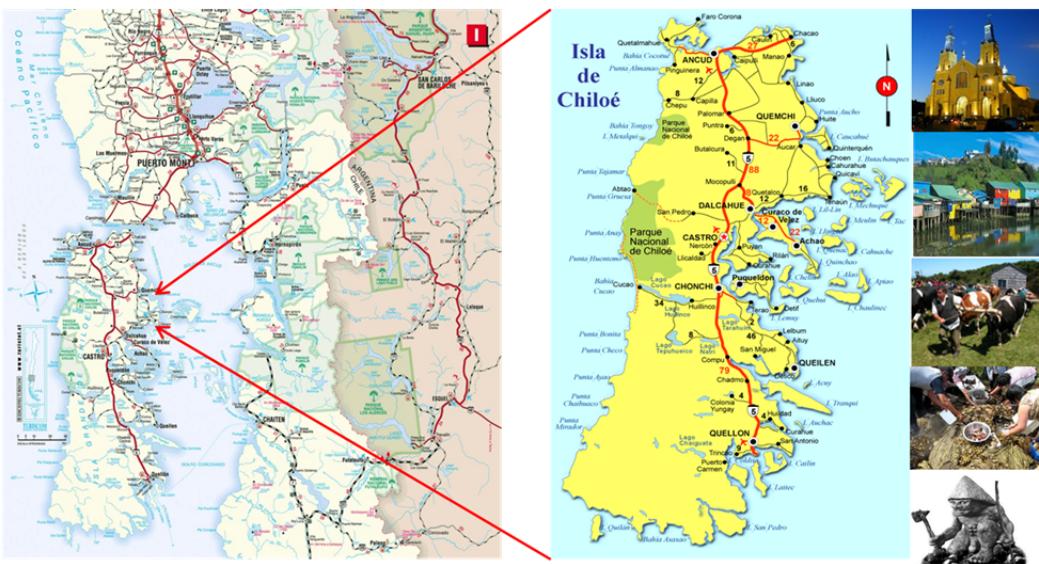
[www.papasnativasdechiloe.cl](http://www.papasnativasdechiloe.cl)



## Lamina 4

### ENCUESTA SOBRE ESTIMACIÓN DE LA IMPORTANCIA (VALOR) DE LOS RECURSOS GENÉTICOS CULTIVADOS

#### CHILOÉ



- Chiloé es un territorio valioso por su variedad vegetal
- Centro de origen de la papa a nivel mundial (Centros Vavilov)
- La papa nativa se cultiva principalmente en la isla de Chiloé
- Existe actualmente alrededor 286 variedades de papa nativa de Chiloé

## Lamina 5

### ENCUESTA SOBRE ESTIMACIÓN DE LA IMPORTANCIA (VALOR) DE LOS RECURSOS GENÉTICOS CULTIVADOS

#### Amenazas para la Conservación

Nuevas actividades económicas han producido una reorientación de las actividades de hombres y mujeres con el consecuente abandono de la agricultura familiar. Ejemplo de ello son la salmonicultura y la industria forestal. Además, variedades comerciales de papa han reemplazado el cultivo de papas nativas.



## Lamina 6

### ENCUESTA SOBRE ESTIMACIÓN DE LA IMPORTANCIA (VALOR) DE LOS RECURSOS GENÉTICOS CULTIVADOS

#### Programa de conservación de la papa nativa de Chiloé en los predios

La fundación se encargará de proveer los incentivos económicos adecuados que permitan la preservación de la papa nativa, a través de prácticas agrícolas tradicionales realizada por los pequeños agricultores locales en sus propios predios.

La fundación debe apoyar y fortalecer las iniciativas existentes y desarrollar instancias para propiciar el intercambio de conocimientos entre los agricultores. Además, debe gestionar y propiciar instancias de encuentro y colaboración con distintos servicios públicos, por ejemplo para establecer zonas protegidas que permitan neutralizar las amenazas sobre el cultivo de la papa nativa.

