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Mobilising common biocultural heritage for the socioeconomic inclusion of small farmers: panarchy of two case studies on quinoa in Chile and Bolivia

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Abstract

Valorising the biocultural heritage of common goods could enable peasant farmers to achieve socially and economically inclusive sustainability. Increasingly appreciated by consumers, peasant heritage products offer small farmers promising opportunities for economic, social and territorial development. Identifying the obstacles and levers of this complex, multi-scale and multi-stakeholder objective requires an integrative framework. We applied the panarchy conceptual framework to two cases of participatory research with small quinoa producers: a local fair in Chile and quinoa export production in Bolivia. In both cases, the "commoning" process was crucial both to bring stakeholders together inside their communities and to gain outside recognition for their production and thus achieve social and economic inclusion.

Despite the differences in scale, the local fair and the export market shared a similar marketing strategy based on short value chains promoting quality products with high identity value. In these dynamics of biocultural heritage valorisation, the panarchical approach revealed the central place as well as the vulnerability of the community territory. As a place of both anchoring and opening, the community territory is the privileged space where autonomous and consensual control over the governance of common biocultural resources can be exercised.

Keywords

adaptive cycle; inclusive agriculture; participatory action research; short value chain; territorial development

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Priscilla Cubillos, Camila Poblete, Natalia Zavalla, Bárbara Miño and Maria-Paz Viedma were
72 students in Social Work at Maule's Catholic University, Chile. All five of them were interested in
participative research and action with local stakeholders in the rural sector.

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86 Introduction

88 Activating the biocultural heritage of peasant¹ agriculture has been proposed to promote the
90 social and economic inclusion of the peasant sector in a perspective of sustainable and inclusive
92 agriculture (Walshe and Argumedo 2016; Swiderska et al. 2018). For millennia, peasant
94 agriculture has satisfied the food needs of most of humanity, modelled rural landscapes and
96 maintained agrobiodiversity. It thus represents a form of biocultural heritage that encompasses
98 a range of natural and cultural objects—from genes to landscapes, from knowledges to
100 practices—all rooted in the history and ecology of local societies (Gavin et al. 2015).

94 Yet, despite its recent recognition by international organisations—FAO declared 2014
96 "International Year of Family Farming"— and by consumers who express a growing demand for
98 quality products with a local identity, peasant agriculture remains marginal in public policies. In
100 a majority of countries, these policies continue to promote the fragmentation of family farms in
102 favour of the agro-industrial sector, whose environmental, social, ethical and aesthetic costs
104 are however increasingly criticised as they become more widespread (e.g. epizootic outbreaks,
106 soil degradation, biodiversity loss, farmers' indebtedness, livestock cruelty, destruction of
108 amenities) (Ioris 2016).

102 In response, a number of alternatives seek to promote the specificities of peasant agriculture
104 around the values of territorial identity and biocultural heritage. Because of their socio-cultural
106 and local roots, the objects of the peasant heritage (e.g. landraces, vernacular architecture or
108 gastronomy) are distinctive of the territory. As such, they become vectors of social and
territorial identity for those who produce them and, being increasingly valued by consumers,
they also become opportunities for the economic inclusion of peasant farmers, for example in
fair-trade or short supply chains.

¹ We define peasants as agricultural producers bound to their land, customs and culture, combining autonomy with community-oriented decisions (Van der Ploeg 2018). Peasants are not limited to premodern subsistence agriculture, and many of them are long-standing actors of the economic market (Soper 2016; Van der Ploeg 2018). We use the term "peasant agriculture" instead of the commonly used term "family agriculture" to focus on the farming model (peasant farming vs. entrepreneurial farming) implemented by these producers rather than on their social status as family units.

Territorial identity, as a form of collective symbolic capital, may be activated through
110 distinguishing signs linked to a place, know-how, or product, which reinforce social identity and
inclusion and also contribute to the protection of common natural resources (Macías Vázquez
112 and Alonso González 2015; Colloredo-Mansfeld 2011). The promotion of symbolic capital can
therefore increase the economic value of material productions from agriculture, food
114 processing or handicrafts. But this process of creation/accumulation of symbolic capital runs
the risk of being appropriated by exogenous actors mandated by private interests to capture
116 the value generated by local communities (Macías Vázquez and Alonso González 2015). When
they are emblematic of a territory, biocultural heritage objects have an obvious dimension of
118 common goods, even in the case of private properties like buildings (e.g. Andalusians windmills,
Gascony dovecotes...) or privately-owned animals of local breeds (e.g. Scottish Highland cattle,
120 Chilean Araucana chickens...). The conception of biocultural objects as—at least partially—
common goods is also supported by their transgenerational value as they are both an
122 inheritance from the past (even recent) and a legacy for the future, and not only the property
of their current owners.

124 Another way to value peasant biocultural heritage is through fair-trade and short value chains,
directly connecting producers and consumers (Contreras et al. 2014). Short value chains are not
126 necessarily local: they may be short because of the small number of intermediaries, not
because of geographical distance. In fact, in several cases, peasant producers see the export
128 market as more stable and fair than the domestic market (Soper 2016). The concept of nested
markets describes arrangements that allow small local producers to access increasingly
130 globalised markets without losing control over the production process and local/global
connections (Grivins and Tisenkopfs 2018). Consumer awareness of these local/global
132 connections and their solidarity with producers are key factors for the socio-economic inclusion
of small farmers (Castaldo et al. 2009). Successful initiatives of community-supported
134 agriculture around the world show that this alternative model is also economically viable (Blay-
Palmer et al. 2016).

136 The announced benefits of inclusive development point to greater prosperity and economic
equity for more people and territories (Chakrabarti 2014). But inclusion requires not only
138 attention to the excluded: it also needs an explicit transformational strategy to align current
economic and political trajectories with long-term ecological and social realities (Beling et al.
140 2018, De Schutter 2011). Two major obstacles arise there: the dominant discourse on the
virtues of globalised commercialisation and the apolitical tradition of many social organisations
142 (Isgren and Ness 2017). To overcome them, some suggest replacing the narrow concepts of
development and growth with those of inclusive sustainability (Essex and Read 2016) and good
144 living (Beling et al. 2018), which prioritise economic localisation and cooperation among social
actors in an integrating and ethical vision of their ecological and social responsibilities. Beyond
146 economic growth, peer cooperation creates a protective space to jointly tackle socio-economic
and environmental uncertainties. Cooperation generates common knowledge through shared
148 learning of practical skills in management, marketing or communication and, at the same time,
strengthens the autonomy of local actors vis-à-vis uncontrolled outsiders (Lucas et al. 2016).

150 In practice, the participatory valorisation of a biocultural heritage includes: context analysis,
rescue of the heritage object to be promoted, and shared design, all of which are interrelated.
152 In shared design, the promoters of the initiative—often technical institutions, NGOs or
universities—can suggest objectives and methods that local actors reinterpret and appropriate
154 in the participatory processes. To access the market, some consider it necessary to improve the
quantity and quality of the product in order to achieve a high and homogeneous standard, a
156 process that would imperatively require the support of technological institutions (FIA 2015).
However, support institutions must guard against the temptation of "command-and-control"
158 that can undermine the empowerment of local actors (Cox 2016).

Quinoa provides exemplary cases that facilitate a more complete analysis of the question of
160 peasant inclusion through the valorisation of biocultural heritage. This ancestral grain from the
Andean highlands and the Chilean coast is emblematic of the rescue and valorisation of the
162 agricultural heritage in Bolivia since the 1970s (Barrientos et al. 2017; Winkel et al. 2014, 2015)
and more recently in Chile and Peru (Bedoya-Perales et al. 2018; Delatorre-Herrera et al. 2013;

164 Lacoste et al. 2017; Núñez and Bazile 2009, 2010). Quinoa is promoted in the media as a
superfood, both healthy (high in protein, gluten-free) and authentic (under the questionable
166 slogan of "rice of the Incas"). Its production by small, largely organic farmers, has further
enhanced quinoa's popularity. While the rise of quinoa has allowed many peasant producers
168 access to the global market and to thus achieve socioeconomic inclusion, it also poses real or
potential environmental, social, and economic risks, which could lead to the exclusion of small
170 producers and benefit economic agents better prepared to face these risks. Multiple actors
with different motivations and priorities (governments, networks and transnational
172 corporations, etc.) question the relative control of quinoa production and commercialisation by
small producers and their organisations (Zandstra 2015).

174 The growing complexity of quinoa's value chain has led to reflections on inclusive models for
peasant producers that can generate social, environmental, and economic benefits for all in the
176 value chain. Recent studies focusing on Bolivia and Peru—the world's leading exporters of
quinoa—point to the association of producers and collaborations between producers,
178 processors, traders, and consumers as levers in an inclusive model (Ofstehage 2011,2012;
Böhm 2016; Zandstra 2015).

180 Unlike highland Andean countries like Bolivia, whose production has dominated the world
market for decades and remained in the hands of small farmers' organisations with only late
182 governmental support (Laguna 2011; Zandstra 2015), in Chile the recent expansion of quinoa
has been driven by state institutions for technical assistance, training, and credit, involving both
184 small producers and a dynamic agribusiness sector (PUC 2017). Despite their socioeconomic
specificities, in both countries the structure of the economy is based on the exploitation of
186 natural resources for export, and peasant family agriculture remains marginal in terms of GDP,
marked by structural poverty and social exclusion (Salcedo and Guzmán 2014).

188 **Theoretical and methodological framework**

This study on biocultural heritage, commons, and inclusive economy uses a methodology of
190 participatory action research in the field and a panarchy conceptual framework for the
integrative analysis of complex socio-ecological transformations. We consider complexity

192 intrinsic to any socio-ecological interplay that includes a multiplicity of scales (space, time),
domains (social, environmental, economic, cultural) and objectives (stability, growth or
194 reduction) (Kajikawa 2008).

Biocultural heritage, commons and inclusive economy

196 By definition, biocultural heritage is both a vector of identity—a heritage of a common local
past—and of sustainability, considered of sufficient socio-economic, cultural, or environmental
198 importance to be transmitted to future generations. Our working hypothesis is that the
activation of complex socio-environmental dynamics is necessary for peasant farmers to
200 sustainably valorise their biocultural resources and integrate socially and economically, both
locally (tourism, local fairs...) and non-locally (e.g. export markets). These complementary
202 dimensions of identity and sustainability, the local and non-local, place biocultural heritage at
the centre of territorial dynamics aimed at social inclusion and the preservation of common
204 welfare.

Commons are still often considered as simple resources, either tangible (water, land, seeds,
206 etc.) or intangible (with intellectual property interests). In this view, commons differ from
private or public goods because they are objects of rivalry but without exclusivity, at least
208 within a community. However, considering that this definition obviates the social and dynamic
dimensions of common goods, some authors emphasise that no common goods exist without
210 community (Ostrom 1990). In this view, a common good is not only a resource, but also the set
of rules and values mobilised by the community that care for that resource (Bollier 2015;
212 Gibson-Graham et al. 2013). For this reason, Bollier (2015) proposes replacing the word
"common" with the verb "commoning" to highlight all the actions of mutual aid, negotiation,
214 communication, and experimentation mobilised for the dynamic management of shared
resources. "Commoning" encompasses production, governance, culture, and personal interests
216 in an integral process. This alternative approach is enacted by responsible local communities
that define their own objectives and rules in relation to their resources (Bollier 2015).

218 Aimed at meeting basic needs and rights (food, health, education, etc.), common goods
naturally relate to the social inclusion of individuals and families marginalised by the market

220 (Bollier 2015). The second assumption of this study is that socio-cultural inclusion contributes
to economic inclusion because, by activating symbolic and social capital, small producers
222 generate volume and commercial capacity (FIA 2015). Here, cooperation among peasant
producers appears key to building a redistributive model that improves their economic income.

224 Resilience theory, adaptive loops and panarchy

In addressing the issue of mobilising biocultural heritage in peasant communities, we used the
226 theory of resilience (Walker and Salt 2006) to explore how the social, economic and
environmental components of these particular socio-ecological systems interact across time
228 and space to determine their capacity for change towards sustainable inclusion. The adaptive
loop² model summarises the possible transformational paths of a socio-ecological system or
230 subsystem into four phases of growth (r), conservation (K), release (Ω) and reorganisation (α),
the latter permitting the possible emergence of a new system (Holling 1973).

232 The position of the considered system in the four possible phases depends on the degree of
organisation (connectedness) and the amount of resources (potential) accumulated in the
234 system. Connectedness and potential are defined by the ecological, economic or socio-cultural
specificities of the system identified after an integrated assessment of its situation and
236 dynamics (for a detailed presentation of these concepts, see Gunderson and Holling 2002).

Adaptive loops are not 4-phase sequences repeating themselves in a deterministic way.
238 Depending on adaptability, shortcuts can be opened between different phases that allow a new
system to emerge without going through the destructive release phase (Ω). In an adaptive
240 system, these shortcuts are the innovative paths to sustainability. Innovation also occurs at the
end of the reorganisation phase (α), when weak internal control (low connectivity) allows
242 external opportunities ("chance events") to take root and open a path for unanticipated growth
(r) for a renewed system.

² We use the term "adaptive loop" to avoid the connotation of deterministic recurrence of the term "cycle", originally coined by Holling (1973).

244 A panarchy represents a hierarchy of adaptive loops, nested in increasing levels of organisation
(or scales), that interact with each other and drive the dynamics of the entire system
246 (Gunderson and Holling 2002). Typically, a panarchy in a socio-ecological system consists of
nested loops of households—the basic units of living and decision-making—, which are
248 themselves rooted in the territory and its economic activities and, beyond that, in the entire
society that sets socio-demographic rules and conditions.

250 In a panarchy, different types of cross-scale interactions can be recognised, including the
"revolt" connection—when the collapse of a small-scale subsystem in Ω phase propagates into
252 the surrounding, higher level, system in late K phase—and the "memory" connection—through
which a collapsed subsystem reorganises itself (α) from the resources of the surrounding,
254 higher level, system (Gunderson and Holling 2002).

Adaptive loops and resilience theory have been used to frame the dynamics of change in
256 agricultural socio-ecosystems at the individual farm, territorial or industry level (e.g. Allison and
Hobbs 2004; Sinclair et al. 2014; Darnhofer et al. 2016; Slight et al. 2016), though applications
258 of a complete panarchy nesting multiple adaptive loops across scales remain rare (but see:
Soane et al. 2012; Tittonell 2014) and, to our knowledge, none have considered biocultural
260 heritage issues.

General objective of the study

262 Building on previous vulnerability assessments of two participatory research projects in Chile
(Baquiana project) and Bolivia (Equeco project), we used the integrative framework of panarchy
264 to identify the organisational levels, stakeholders and institutions involved in promoting local
biocultural heritage for the socio-economic inclusion of peasant communities. Based on this
266 systemic vision of the complex transformations underway in two socio-ecosystems with
different trajectories and purposes, we looked for the cross-scale interactions that underlie
268 them and the rationales implemented by local actors, with the aim of drawing general lessons
on the conditions for inclusive sustainability based on common goods.

270 **Case 1: Lipimávida, Chile**

Socio-ecological assessment

272 Lipimávida is a locality on the Pacific coast of the Vichuquén municipality (*municipalidad*) in the
Region of Maule, in central Chile. In 2010, according to the policy for isolated localities
274 (Gobierno Regional del Maule 2012), Vichuquén was considered the most isolated municipality
in the region in a critical condition with respect to access to services, education, and capacity
276 for consumption. The earthquake and subsequent tsunami of February 2010 devastated
Lipimávida. Subsequently, this exiguous coastal area—inhabited although not constructible
278 according to civil security norms—saw the construction of a new village on higher terrain in the
locality, while buildings and chalets continued to be built in unauthorised coastal areas.

280 The locality is a seaside resort comprised of long beaches and a settlement of residents
historically dedicated to family agriculture and the production of woven and ceramic
282 handicrafts made by traditional local techniques. Its location at the end of the J60 coastal route
gives Lipimávida a singularity and isolation, making it attractive for tourists looking for quiet
284 seascapes and a pleasant Mediterranean climate.

Among the gastronomic attractions of the locality is the papaya, whose "trees" are part of the
286 local landscape in patios and orchards. The women prepare preserves, jams and desserts that,
together with the seafood and peasant cuisine, characterise the Lipimávida table. Another crop
288 that stands out in the memory of the residents is quinoa, whose local ecotype differs from the
Bolivian ecotypes, showing less cold tolerance (Bertero 2001) and smaller grains (Bertero et al.
290 2004). Specific to the Pacific littoral, the local quinoa was domesticated by ancestral
populations of the central and southern coastal areas of Chile. In Lipimávida, older people
292 remember that quinoa's annual harvest ensured food for winter (Cubillos-Celis et al. 2018).
They can still describe the practices of sowing, harvesting, and post-harvesting, in particular the
294 sorting, cleaning and de-saponification of the grains. As in other regions (Laguna 2011; Winkel
et al. 2012), the time and effort required for these tedious post-harvest processes, usually
296 carried out by women in charge of cooking family meals, are the main reasons for the decline of
quinoa in the local diet, making it a locally underused resource. Still, with the media attention
298 recently given to quinoa as a superfood, inhabitants of these rural coasts are beginning to

recover it as part of their traditions, seeing an opportunity to improve and diversify their family
300 incomes.

At the scale of the Maule region, massive fast growing forest monocultures, pollution, and
302 depletion of water and arable land resources, degradation of rural and urban landscapes,
drought and wildfires are all associated with an economic and social model that destroys the
304 local natural and cultural heritage in the context of an unprecedented "megadrought" event
(Garreaud et al. 2017). In 2017, the region experienced the worst wildfires in the last 40 years
306 (CONAF 2017). However, several initiatives reflect a growing awareness of socio-environmental
issues, as illustrated by the architectural restoration of the heritage village of Vichuquén after
308 the 2010 earthquake and the local agreement on watershed management implemented since
2017 by the National Agency for Sustainability and Climate Change (ASCC 2017).

310 In Lipimávida, despite an institutional and political context promoting individualism through
elective democracy, generalised private land property, and a neoliberal economy, the vitality
312 and cultural identity of local associations maintain a high degree of social cohesion among
members. Also noteworthy in this isolated community, some people have significant
314 experience of exchange with foreign countries, in the marketing of papaya to Belgium or the
sale of handicrafts in several European countries. These successful experiences in marketing
316 high quality food and handicrafts proved valuable for the launch of a pilot project on local
biocultural heritage.

318 The Baquiana Project implementation

In June 2017, the Baquiana research team initiated a collaboration and exchange of knowledge
320 and experience with a focus group of a dozen residents (11 women, 1 man), all small farmers or
artisans. Then, 13 meetings with an average attendance of 10 people, and 14 individual
322 interviews were realised during the 2017-2018 period. From the beginning of this participatory
process, the researchers sought to articulate the interests, positions and wishes of the focus
324 group with regional and local state and market actors. This was possible thanks to the support
of the Vichuquén municipality, where both the Mayor and professionals of PRODESAL (Local

326 Development Program) demonstrated flexibility in their annual programs to host this initiative,
providing time, tools and socio-technical knowledge.

328 Focusing on the production of quinoa, the preliminary assessment study established the
patrimonial character of this product in the area and its potential for the economic inclusion of
330 peasant families (Cubillos-Celis et al. 2018). A complementary study examined the social
dynamics within the group of peasant actors involved in the co-construction of the pilot project
332 associated to the participatory research (Miño-Baes and Viedma-Araya 2019).

In the course of the participatory concertation, the initial focus on quinoa suggested by
334 researchers was challenged and reoriented towards the valorisation of a mix of traditional food
and artisanal products of biocultural resources. In addition, local actors expressed that,
336 although most did not cultivate quinoa, their problem was not the "rescue" of the crop, which
could be bought from other communities and particularly from the neighbouring region of
338 O'Higgins (Lacoste et al. 2017; Núñez and Bazile 2009). Rather, in a meeting with an expert in
quinoa threshing and de-saponification, they became convinced that cleaning the grain is a
340 complex process and that it was better to buy quinoa from other producers. Similarly, after a
participatory workshop with an expert in the co-design of agricultural development projects,
342 they felt that for them, the innovation of producing quinoa as a vegetable (Sáez-Tonacca et al.
2018) was still premature and risky. Instead, they saw a promising opportunity in this expert's
344 proposal to activate local production and human capacities through short value chains. The
pilot project "Lipimávida Heritage Fair" was then co-constructed by researchers and local
346 stakeholders with the aim of promoting the local biocultural heritage by combining agricultural
and craft products in a unique commercial offering that showcased the knowledge and skills of
348 the inhabitants of Lipimávida.

After opening in January 2018, the heritage fair has been operating regularly, not just in the
350 summer season but also on all dates when tourists are received. Members of the group are
engaged in a business that matches their interests and possibilities, offering fresh and
352 innovative products that are affordable to the diverse public visiting them.

Case 2: Salar de Uyuni, Bolivia

354 Socio-ecological assessment

356 The observations and data that follow describe the situation in the region with the highest
commercial production of quinoa in the world between 2007 and 2010, as analysed in the
framework of the Equeco project. Winkel et al. (2016) present a detailed analysis of this case,
358 and here we will only address salient points that add new insight into the issues of biocultural
heritage and collective action.

360 The study area is located in the southern highlands of Bolivia, on the banks of the Salar de
Uyuni, where plains at 3,600 meters above sea level alternate with volcanoes that reach to
362 more than 6,000 meters above sea level. This extreme environment of high desert has been
occupied for millennia by agropastoralists that raise camelids and cultivate quinoa and potatoes
364 (Cruz et al. 2017).

Despite its extreme geographic conditions, this high altitude desert was traditionally connected
366 to the Andean "archipelago" (Murra 1984). For millennia, commercial caravans allowed local
populations to manage resources of diverse ecosystems, exchanging goods such as salt,
368 minerals, quinoa, wool and meat from the Salar highlands for corn, coca, cloth, etc. from the
Andean valleys and the Pacific coast. Over time, this ancestral subsistence strategy has been
370 complemented by temporary migration for work in mining, agriculture and various activities in
more or less remote cities.

372 Land tenure, characterised by the common use for grassland and family usufruct for cropland
(Vassas-Toral 2015), confers a certain social equity in the access to land while protecting the
374 communities—through the absence of a land market—from the risk of excessive concentration
of land or outsiders' land-grabbing (Winkel et al. 2016). Common pastures are generally located
376 on plains, while family croplands were traditionally located on slopes, a disposition reflecting
ancestral ecological knowledge regarding the distribution of frost risks in mountain areas³
378 (Pouteau et al. 2011). In this desert area, each quinoa harvest results from a biennial dry fallow

³ Due to its higher density, cold air drains to the lowlands at night thus increasing the risk of frost there while slopes remain less exposed.

cycle and thus represents a doubled land area: the current cultivated field, plus the ploughed
380 fallow waiting for the next year's crop. These specificities of community land tenure and
biennial dry fallowing, which protect communities from land-grabbing and allow commercial
382 production without irrigation, are central to understanding the sustainability of rainfed
production in the region.

384 In the early 1970's, after massive job cuts in the mining and public sectors due to structural
adjustment plans, smallholder families from indigenous communities of the Salar of Uyuni
386 initiated the expansion of quinoa as a cash crop in response to increasing demand for quinoa in
neighbouring Peru, a traditional importer of *Quinoa Real*—the local quinoa ecotype of the Salar
388 region. This initial phase of commercial production was favoured by a donation of tractors from
a Belgian NGO (Laguna 2011) and by Peru's policy of supporting Andean food (Kerssen 2015); a
390 case of "chance events" as coined by Gunderson and Holling (2002). This expansion of
commercial quinoa production sparked a strong territorial dynamic that included: the partial
392 mechanisation of quinoa crops, which required converting much of the flat grasslands—the
only spaces accessible to tractors—into croplands; and the replacement of the distant and
394 prolonged emigration with various forms of seasonal mobility towards nearby urban centres
that became the principal places of residence of most quinoa producers.

396 In the observation period, the study area was populated by approximately 12,000 families of
quinoa producers, most of them of Aymara or Quechua origin with a strong cultural identity
398 (Vassas-Toral 2015; Vieira-Pak 2015). This factor of social cohesion is also observed in the
rotating system of community obligations for the management of roads, local festivals, school,
400 etc. For each producer, complying with these community obligations and paying local taxes
guarantees the right to access the usufruct of the communitary land, even if his residence in the
402 community is intermittent (Vassas-Toral 2015).

In relation to this lively tradition of self-management and participation in collective life, local
404 populations have demonstrated their organisational and negotiating capacity when they
formed, with the encouragement of European NGOs, powerful associations of family producers.
406 Organisations like CECAOT (Central de Cooperativas Agropecuarias Operación Tierra, founded

in 1974) and ANAPQUI (Asociación Nacional de Productores de Quinoa, founded in 1983)
408 encourage the production, transformation and marketing of quinoa, including export to new
niche markets with organic and fair-trade certifications (Laguna 2011; Tschopp et al. 2018).
410 As a corollary of their success in the commercial production of quinoa, local producers have
promoted a rebalancing of regional territorial development, investing their new income not so
412 much in rural communities but rather in the neighbouring cities of Salinas de Garcí Mendoza,
Llica, Uyuni, Challapata, Oruro, etc. Compared to the rural sector, the provision of health
414 services, education, electricity, water, transport, and connection in the urban sector allows for
improved training and the professionalisation of their children (Vassas-Toral 2015). Taking
416 advantage of their dual residence between rural and urban areas, most families combine two or
more activities in agriculture and livestock, handicraft, transport, commerce, mining, urban
418 employment, tourism, etc. (Vassas-Toral 2015). Among their agricultural activities, families
conserve a self-consumption production of quinoa and potatoes, while the breeding of
420 camelids and sheep—unprofitable and poorly compatible with urban residency—has
diminished. Handicraft (wool) and tourism activities (accommodation, driver-guide) remain
422 marginal. Non-agricultural income offers a guarantee against the volatility of quinoa prices,
which peaked in January 2014 (approx. 6,000 USD/ton) and then stabilised at around 1,200-
424 1,600 USD/ton.

While the assessment of peasant family income remains uncertain, a survey of 36 households in
426 the study area in 2007 (when quinoa was paid to the producer at about 750 USD/ton) reveals
the great disparity present within a single community, with incomes ranging from 200 to 18,000
428 USD per year (Winkel et al. 2016). This disparity in family income reflects differences in social
status (e.g. young single mothers vs. extended families) and inequalities in economic power,
430 both of which influence access to land since the inheritance of land usufruct in the region is
generally patrilineal and the extent of cultivated land depends on the ability of each producer
432 to assume the cost of hiring a tractor driver to plough and sow the land.

With regard to the regulation of access to land, customary rules controlled by communities and
434 indigenous authorities mix with national laws adopted by the central government. More

specifically, agricultural production is governed by local consensual and collective norms, which
436 compete with food certification controls and foreign trade regulations. Low acceptance rates
and the lack of practical implementation result in the inconsistent application of most of these
438 rules across the region.

The Equeco Project implementation

440 The Equeco project was launched in 2007, more than three decades after the start of quinoa
export production in the Salar de Uyuni region, a process that can be dated from the arrival of
442 the first agricultural tractors in late 1969 (Laguna 2011). Questioning the sustainability of a
process that has been going on for more than 30 years, project researchers examined the social
444 and environmental history of local quinoa production (see Winkel et al. 2014, 2015, 2016, for
more details). Focus groups were comprised of quinoa producers from various rural
446 communities around the Salar de Uyuni as well as the NGO AVSF ("Agronomists and
Veterinarians without Frontiers"), involved in a regional project for the sustainable
448 management of local agro-pastoral systems.

The participatory methodology of the project was based first on participant observation, where
450 researchers immersed themselves in the daily life of local producers for several months. Based
on this initial assessment of the local situation, role-playing workshops followed by group
452 analysis sessions were held in the communities to discuss with participating producers what
happened during the game and to analyse the similarity between game and reality (Vieira-Pak
454 2015). As regards local development, researchers issued recommendations for local
stakeholders (producers, authorities, NGOs...) particularly concerning the consensual renewal
456 of communal norms of land access and use (AVSF 2010). On an international scale, researchers
accompanied the renegotiation process between producer organisations and FairTrade
458 International on the new fair-trade certification standards for quinoa (Salliou 2011).

Adaptive loops and panarchy

460 Case 1: Lipimávida (Chile)

Returning to the case of Lipimávida, three levels of analysis of the ongoing innovation process
462 emerged from the study: the group of food and handicraft producers, the tourism activity in the
locality of Lipimávida, and the socioeconomic context of the Vichuquén municipality.

464 *First loop: quinoa and handicraft producers*

The concertation process among the local participants in the Project resulted in the decision to
466 establish a new fair of heritage products in the community, with the objective of allowing its
participants to market their handicraft, food, and local products in their own territory and
468 without intermediaries. In its organisational phase, the fair group began with 12 members,
maintaining oral agreements for its regulation, sustained by the bonds of trust that existed
470 among the participants. This group of a few people did not need a large organisation or a long
dialogue to start operating. To ensure a sufficient number of potential clients, the group
472 decided to hold the fair on Sundays during the summer season (January, February). Once the
offer of products, the type of activity, and its frequency were agreed upon, the members of the
474 fair, with the help of the Project facilitators, were able to mobilise external support from the
municipality, rural development services (PRODESAL) and from the parish. Through this, they
476 obtained the official authorisation to occupy public space, publicity for the inauguration of the
fair, and the use of a parking lot for their clients.

478 This brief analysis (see Cubillos-Celis et al. 2018, and Miño-Baes and Viedma-Araya, 2019, for a
complete description of the process) highlights that the local producer group is in an initial
480 phase, organised around a project of local fair with a well-defined orientation: promoting craft
and food products from their biocultural heritage. Yet, this producer group has chosen to
482 maintain a diversified offer and, up to now, its few members have decided to govern
themselves by simple oral agreements. There is no evidence of extreme product specialisation,
484 high investment in economic or work resources, organisational complexity or connectivity that
could hinder the adaptability of the group and compromise the viability of the heritage fair
486 project. For all these reasons, the current phase can be referred to as an initial (*r*) growth
phase.

488 *Second loop: local tourism*

Since the beginning of the 2000's, the tourism sector in Lipimávida has grown consistently. The
490 number of tourist establishments increased from 6 in 2004 to 70 in 2018, with a combined
accommodation capacity of more than 400 people. In this locality with only one hotel, this
492 development is mainly due to the decision of local residents to convert part of their agricultural
land for the building of cabins rented to tourists on weekends or for longer holidays.

494 The locality has 6 restaurants that offer a variety of menus with fish, seafood, quinoa, and
papayas. Several stores sell fresh and processed food products, where quinoa and papaya stand
496 out. The direct sale of fresh vegetables, medicinal plants, eggs and honey, as well as local
handicrafts, is also important in the residents' homes. In fact, handicrafts are an essential
498 component of the local tourism market, with exceptional production in clay (*greda blanca*) and
sheep's wool, spun locally and coloured with natural dyes then transformed into highly valued
500 fabrics, some of which are sold in European markets.

Despite the high potential for tourism in Lipimávida, the sector shows signs of vulnerability. The
502 town is located on a dead-end road, connected to other coastal cities by a single route (J-60)
that is rapidly saturated in the peak season. This causes numerous traffic jams repeatedly
504 reported by the local press. In addition, in the Maule region in general and in the town of
Lipimávida in particular, water scarcity seriously affects the supply of drinking water and
506 sewage services. The seasonal influx of tourists into the region exacerbates this problem.
Tourist constructions directly bordering the ocean coastline seem vulnerable because they
508 violate building regulations in seismic risk areas.

Local tourism in Lipimávida can be characterised as an advanced (*K*) phase of the adaptive loop
510 since many indicators reveal: the concentration of financial and social resources (*potential axis*)
in tourism-related activities (accommodation, restaurants, shops and crafts); and strong
512 pressures (*connectedness axis*) on the local road, land, and water resources, which present risks
for tourism development and the commercial potential of the territory.

514 *Third loop: communal socio-economic dynamics*

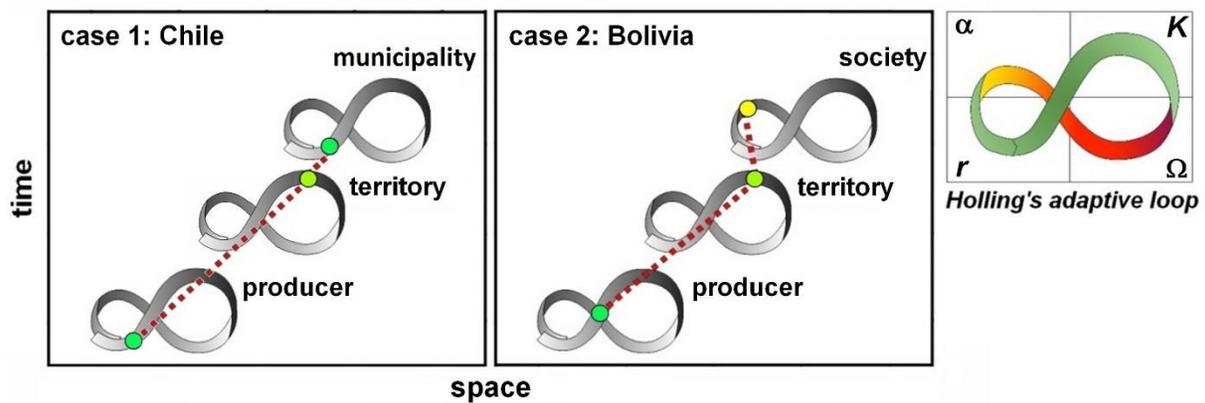
In administrative and political terms, Lipimávida depends on Vichuquén that supports different
516 types of projects aimed at contributing to the development of the territory and the well-being
of its inhabitants. Crucial for Vichuquén and the surrounding municipalities, in 2017 the
518 National Climate Change Agency initiated a "Voluntary Agreement" for the management of
water resources of the Llico, Vichuquén, Torca, Tilicura, and Agua Dulce watersheds. Through a
520 participatory process, a public-private alliance has been formed bringing together 24
organisations with the participation of public administrations, civil society organisations,
522 cultural groups, the scientific academy, the Army and private companies. The projects
promoted by the Voluntary Agreement address diverse areas such as environment, agriculture
524 and industry, education, health, tourism and culture, so as to coordinate efforts and resources
and integrate different actions that contribute to the sustainable development of the basin in
526 the face of climate change, and the foreseeable decrease in water resources. Although some
projects are already underway, others have not yet begun and all options remain open, because
528 the Voluntary Agreement is an evolutionary process in which new initiatives may be presented.

Due to the active coordination (*connectedness*) of multiple projects in different fields, and no
530 sign of exhaustion of social and financial capital (*potential*), the socio-economic sector at the
communal level can be considered in a dynamic (*r*) phase of its adaptive loop.

532 *Integrating the adaptive loops in a panarchy*

In the end, the integration of the three adaptive loops shows a tourism subsystem in advanced
534 (*K*) phase, prevailing over any other economic activity, and vulnerable not only to occasional
seismic hazards but also to the ongoing overexploitation of land, water and infrastructure
536 resources. Yet, the subsystems immediately below and above, both in a (*r*) phase, show a
responsible commitment to paths of sustainability (communal loop) and socio-economic
538 diversification and autonomy (producers' loop), all favourable to managing the vulnerability of
local tourism activities (Fig. 1, case 1).

540



542 **Fig. 1. Schematic representation of the panarchies of the two study cases.** For each case, three
 544 nested subsystems are hierarchically scaled and their respective positions in Holling's adaptive
 loops are symbolised according to the right-hand insert.

546 Case 2: Salar de Uyuni (Bolivia)

First loop: quinoa producer families

548 In the 1980's, Bolivian quinoa growers opportunistically responded to increased demand for
 gluten-free, protein-rich, organic food in North America and Europe. These new markets, often
 550 labelled fair-trade, did not replace the Peruvian market which remained open to unofficial trade
 of conventional (non-organic) quinoa (Gandarillas et al. 2015; Laguna 2011; Rojas 2011). Local
 552 quinoa producers thus occupy a diversity of niches in the growing quinoa market, but did not
 specialise in this unique production. While only a few continue to raise llama and sheep—an
 554 activity with low economic profitability, incompatible with temporary migration—, most
 maintain a seasonal rural/urban mobility that allows for off-farm activities in neighbouring
 556 cities where producer families live almost year-round (especially those with children in school).
 This strategy of on-farm/off-farm pluriactivity involving different family members results in
 558 much diversified household economies (Laguna 2011; Vassas-Toral 2015; Ofstehage 2011,
 2012; Vieira-Pak 2015).

560 Considering the income of quinoa (*potential*) and the connection to market niches
(*connectedness*), the household economy of quinoa producers shows a situation of multiple
562 trajectories between the growth (*r*) and conservation (*K*) phases. Resolutely engaged in
commercial production, local families still maintain flexibility in their activities, thus avoiding
564 complete specialisation in a profitable but risky business. This flexibility is reflected in partial
"back loops" when quinoa producers chose to alternate between multiple on- and off-farm
566 activities, and multiple market niches from conventional to certified quinoa, moving
opportunistically from one trajectory to another (Vassas-Toral 2015; Ofstehage 2011, 2012).

568 *Second loop: community territory*

The agricultural landscape of the Salar region has been profoundly modified by the change in
570 land use from pasture to crop fields, with almost all of the mechanisable lowlands now
converted to quinoa fields. More than unclear and controversial land degradation (Walsh-Dilley
572 2013; Winkel et al. 2012), it is the land area converted to quinoa crops that appears as the most
reliable indicator of the local agroecosystem having reached its maximum carrying capacity,
574 with a significant homogenisation of the landscape and virtually no more space available for
new crops.

576 The adaptive loop of the community territory thus appears to be trapped in an advanced
conservation phase (*K*) with vast quinoa monocultures resulting in minimal landscape diversity
578 (maximum field connectivity) and maximum available land capital (*potential*) already converted
into cropland.

580 *Third loop: socioeconomic context*

The socio-economic analysis of the Salar region highlights contradictory characteristics in local
582 population dynamics, with the national census indicating a continuous population loss whereas
recent studies suggest a "re-peasantisation" of the region (Kerssen 2015; Vassas-Toral 2015). In
584 fact, commuting between rural and urban areas remains the current livelihood strategy for the
majority of the population, which implies a continuous reorganisation of household and
586 economic activities on a monthly (sometimes weekly) time scale.

588 The strategy of double rural/urban residence has implications for the norms of access to and
use of agricultural resources, since compliance with these norms allows double residents to
claim land access rights in their community of origin. Yet, here too multiple rules enacted at
590 different levels of organisation (community, nation, international organisations, food industry)
are accumulating, and continually rearranged and reinterpreted.

592 Thus, continuous adjustments in population dynamics (social potential) and land resource
management (normative connectedness) indicate an adaptive loop of the social system located
594 in a (α) phase of prolonged reorganisation, with temporary emigrants crossing returnees, and
with multiples—sometimes unimplemented—land management rules.

596 *Integrating the adaptive loops in a panarchy*

In total, the scaling of the three adaptive loops shows a territorial subsystem in a vulnerable (K)
598 phase, but without any apparent risk of a "revolt" type connection since the underlying system
is in intermediate (r) phase, with quinoa producers' families maintaining a risk-coping strategy
600 of mobility and pluriactivity on-farm and off-farm. At a higher level, the (α) phase characterising
the socio-economic context leaves open the possibility of multiple initiatives to tackle the issue
602 of the vulnerability of the territorial system (Fig. 1, case 2).

Discussion and conclusion

604 Since localities are at the crossroads of daily actions of local stakeholders and planned
interventions of external entities, it is not surprising that their territories emerge from the
606 panarchy analysis as the places where the vulnerability of local socio-ecological systems
concentrates. A more interesting result is to identify strengths and bottlenecks at adjacent
608 scales to address issues at this crucial organisational level. We have done this by paying
particular attention to "commoning" processes valuing the biocultural heritage in the
610 perspective of an inclusive peasant agriculture.

Commoning to get included

612 The two study cases illustrate how the inclusion of peasant farming through heritage products
operates simultaneously in two directions. First, it operates "inwards", with the inclusion of
614 individual peasants and artisans in local organisations that allow them to act for common
objectives, i.e. "commoning" in Bollier's terms (2015). It also operates "outwards" with the
616 recognition of peasants and artisans and their productions by a range of external socio-
economic actors: authorities, social and territorial development agents, processors and
618 marketers, gastronomic promoters, media and, finally, consumers.

"Inwards", social inclusion resulted from collaborative processes of decision making, production
620 and valorisation of biocultural goods, with the participation of marginalised people, like women
(case 1) or smallholders (case 2). Cooperation helps social and economic inclusion through the
622 co-construction of new aspirations and identities, such as initiating and managing short value
chains⁴ for diverse heritage products (case 1) or for an ancestral ecotype of quinoa, *Quinoa*
624 *Real*, emblematic of a vast territory (case 2). To individuals and families with little economic
power, collective action thus offers new social roles that embody cultural values and imply both
626 their responsibility and their rights (Bollier 2015). In addition, the relationships that bind
communities to their trade establish a boundary around their activity, which gives it a form of
628 encloseability, considered by Colloredo-Mansfeld (2011) as necessary to govern common goods
and protect them from free riders. The two case studies belong to the category of social
630 innovations resulting from bottom-up, multi-stakeholder and inclusive collective processes that
emerge from territories to respond to aspirations for change and local social needs (Faure et al.
632 2018).

"Outwards", more than just commercial spaces, the local fair (case 1) and the international
634 niche markets (case 2) become spaces for producers to meet consumers directly and for the
rest of society to recognise their products.

636 The cooperation and self-organisation of the producers are the pillars of "commoning", which
can be satisfied with an informal but effective grouping (case 1) or form powerful national

⁴ Remember that "short value chain" does not refer to the geographical distance between producer and consumer, but rather to the reduced number of intermediaries that separate them in the value chain.

638 associations (case 2). Cooperation brings autonomy and, usually, involves a form of self-
management that goes beyond the simple need to generate commercial value (Lucas et al.
640 2016). Solidarity and social inclusion, identity and cultural recognition are also key values for
the sustainability of community groups (Lacoste et al. 2017).

642 In a broader perspective, both case studies demonstrate the importance of local action for the
governance of biocultural resources, thus corroborating the potential for efficiency and
644 resilience of local self-organisation compared to centralised governance of natural resources
(Ostrom 1990; Tiftonell 2014; Tschopp et al. 2018).

646 Local experiences of "commoning" can be difficult to replicate as they are often based on
informal networks of contacts and cooperation (Macías Vázquez and Alonso González 2015).

648 The relationship of trust gradually built between the actors can be formalised through a
contract of the rights and duties of the participants, such as the renewed norms of access and
650 use of land in case 2 (AVSF 2010). But case 1 shows that in a still incipient innovation process
the lack of a formal contract does not prevent—and perhaps facilitates—joint and effective
652 action by the group.

Another key point is the mobilisation of consumers in support of producers at the other end of
654 the value chain. In the face of attempts to capture cultural value by exogenous actors, it seems
essential to maintain local social control (on the part of producers) and non-local control (on
656 the part of consumers) over the material capital of natural resources and products, but also
over the collective symbolic capital of knowledge, norms, images, etc. (Macías Vázquez and
658 Alonso González 2015). This objective of social control over heritage products does not mean
that the community of producers withdraws into itself: at the other end of the value chain,
660 citizen organisations concerned about the quality of their food, authenticity, social justice and
the sustainability of their modes of consumption can effectively support the orientations of
662 local producers (e.g. through militant fair-trade associations or community-supported
agriculture). Sustained public participation in the heritage fair in case 1 and the engagement of
664 fair trade organisations with quinoa producers in case 2 illustrate the common interest and

objective agreement between actors at both ends of the value chain, which creates a "civic
666 space" that goes beyond mere market exchanges (Colloredo-Mansfeld 2011).

It has been claimed that without support from state technical agencies, small producers cannot
668 access high-value markets (FIA 2015). However, the two cases presented here demonstrate
that innovations based on the commons do not always require the intervention of centralised
670 entities. The greater efficiency of local entities in the management of territorial resources has
been emphasised by Ostrom (1990) to justify self-governance over these resources. The
672 possibility for marginalised farmers to integrate the market for their own empowerment and
establish alliances different from those recommended by external agents (government, NGOs,
674 etc.) is an option that can be as innovative and a form of resistance to the "command-and-
control" system (Cox 2016). However, there may also be abuses of power games or private
676 interests at the local level, which encourages reflection on how to maintain control over
individual or local actors in order to preserve the general interest. In case 2, this precaution led
678 to the consensual renewal of communal norms to control the usurpation by a few of common
pastures to convert them into crops with private usufruct (AVSF 2010).

680 In both cases, and regardless of their degree of formalisation, the new social organisations
began with the smallest possible unit: grouping of individual producers (case 1) or an
682 indigenous village community (case 2). This guaranteed the autonomy and control of local
actors over the new norms to which they would be subject (Ostrom 1990).

684 In economic terms, the two cases we analysed show that the inclusion of family agriculture
through artisanal products and heritage foods can operate by the construction of short value
686 chains both local (case 1) and international (case 2). By distributing added value more
equitably, short value chains increase the autonomy of producers while favouring agro-
688 ecological transition (Lucas et al. 2016). This is illustrated in case 2 by the intense work of
renewing the community norms for the sustainable use of territorial resources, the result of
690 raising stakeholders' awareness of the ecological and social challenges of the changes
underway in their territory.

692 As a marketing strategy, short value chains often correspond to niche markets oriented towards
the product (biocultural good of quality with identity) and the consumer (tourist in case 1, eco-
694 responsible consumer in case 2), rather than towards conventional distributors, who cling to
criteria of volume and margins rather than quality, social justice, authenticity, or mitigation of
696 environmental damage. In this short value chain strategy, agrotourism offers local producers a
particular opportunity to value their biocultural heritage within their own territory (Bazile et al.
698 2014; Núñez and Bazile 2010).

Key features of a "valuable" biocultural heritage

700 The two cases presented show that "valuable" heritage goods are products that combine local
identity and the general interest, or, in other words, that unite tradition and innovation. The
702 general interest and innovation around quinoa respond to the growing concerns in global
society about issues of nutrition and health, economy and environment, globalisation and social
704 justice. Regardless of the size of the target market, in both cases, local actors have been able to
respond to these concerns which, essentially, consist of finding quality products with an identity
706 that convinces consumers that their purchasing act benefits the common biocultural, social or
environmental heritage. The identitarian and traditional dimensions of heritage goods are
708 nourished by the affective relationship that local producers—generally inhabitants or natives of
rural areas—maintain not only with their territory (Hinds and Sparks 2009) but also with each
710 other through ties of kinship or friendship (Laguna 2011; Vassas-Toral 2015; Vieira-Pak 2015).
Whether consciously or not, this affective symbolic value is integrated into the price that the
712 consumer is willing to pay, generating a positive circle between market, social ties, and
biocultural heritage. The strategies of local actors to valorise and commercialise their
714 biocultural goods are then oriented according to these values and expectations of society in
general. This process illustrates how simultaneously managing collective and individual
716 interests at both ends of the value chains can help to resolve the ambivalence of marketing
biocultural commons (Colloredo-Mansfeld 2011).

718 Territories, between local identity and non-local connectivity

In a territorial perspective, the inclusion of peasant agriculture is established under two
720 complementary realities: the anchoring of family producers in their lands of origin even if, as in
case 2, families maintain a double rural/urban residence; and a flow of resources, people,
722 goods and information from the "outside" to the productive territory, which is then integrated
into new exchange networks, making its heritage known abroad and reinforcing its connectivity
724 to the "outside".

In case 2, the anchoring and permanence of families in communities is conditioned by the
726 tension between their access to better basic services and their active control over the access
and use of territorial productive resources. This tension is resolved by replacing emigration—
728 often long and distant—by a new form of urban/rural mobility within the region that allows
compliance with communal obligations and access to land (Vassas-Toral 2015). In centralised
730 countries, as in case 1, this communal control of territorial resources poses the challenge of
deconcentrating power and resources of state institutions.

732 For heritage resources to contribute to the inclusion of family farming, the territorial anchoring
must also value a local identity—traditional or innovative—that allows for the elaboration of a
734 story or an image to be disseminated abroad (Annes and Bessière 2018). In this story or image,
the territory is highlighted as a source of authentic (made by the inhabitants themselves, not by
736 industrial processes), natural (coming from the ocean, the mountains, the desert, all spaces a
priori without contamination...), healthy (of high nutritional value, without chemical additives),
738 aesthetic and culturally embedded products (Colloredo-Mansfeld 2011). In case 1, these
symbolic values motivated from the start the producers who were relying on their successful
740 experiences with high-quality papaya and handicrafts. For quinoa, locally an underused
resource, the heritage value of its local production and use still needs to be established with
742 more evidence. A first step would be through culinary innovation to generate socio-cultural
identity and strengthen the territorial anchorage of peasant agriculture. By betting on local
744 gastronomy and tourism, it is possible to promote biocultural heritage products without having
to look for distant markets, which is beneficial for the autonomy of emerging groups of small
746 producers (FIA 2015). In case 2, after 40 years of "generic" quinoa production and a growing

748 competition from Peru, the promotion of *Quinoa Real*'s identity is now the basis of a
denomination of origin process (Ofstehage 2011; Soraide-Lozano 2011). Yet, apart from the
difficulties for peasant farmers to get into formal certification agreements (Colloredo-Mansfeld
750 2011), a denomination of origin may be inappropriate in the current configuration of the export
market where differentiating one Bolivian ecotype from another in Peru does not motivate the
752 final consumer—European or North American— interested in the organic, healthy, or even fair
trade nature of the product, but not its geographical origin (Böhm 2016). Here, the
754 geographical distance between producers and consumers seems to be an obstacle for the latter
to appreciate the biocultural heritage of a distant and unknown territory, especially in the case
756 of a food such as quinoa, which is consumed marginally compared to tea and coffee, for
example, whose globalised consumption is accompanied by a search for a diversity of origins.
758 Solving these bottlenecks requires virtuous networks between conscious and organised citizens,
and a socially and ecologically responsible market, i.e. new terms of the social contract to take
760 into account local requirements in globalised scenarios (De Schutter 2011).

Overall, innovations based on biocultural heritage—whether creative in the case of a new
762 heritage fair or essentially adaptive in the case of sustainable export production—have made it
possible to change the local reality of small farmers without hindering existing activities, which
764 seems to guarantee their acceptability and social and economic viability in the medium and
long term. In particular, their consensual and progressive nature has made it possible to
766 promote inclusive changes that contribute to good living together.

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