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Session B: Resources, Sustainability and conflict
B 3 The quinoa dilemma - how to support sustainability

Introduction to the quinoa dilemma

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1.1. Summary

Quinoa production and consumption have experienced a boom and may be called a great success. The boom affects economy, ecology and social relations, three important aspects of sustainability. These three key points will be discussed in the present introduction, which will line up dilemmas and opportunities for the sustainable management of nature resources and human and stakeholder interests. A humble suggestion for sustainable approaches will be made.

This presentation is only meant as short introduction and may be considered as only a scratch on the surface. It is based on study of literature and mass medias. More dialog and suggestions may be made in the panel taking place in Helsinki 12th of June 2015.

1.2. Background

Quinoa has been cultivated in six South American countries even before the Inca culture. Archeologic research indicates cultivation as long ago as 5000 years before Birth of Christ in Ayacucho in Peru and 3000 years BC in Chinchorro in Chile. Columbia, Ecuador, Bolivia and Argentina are also countries with pre-Columbian quinoa production. Centers in Peru and Bolivia practiced intensive monoculture cultivation, while in other countries mixed culture and backyard cultivation were more common (Flemming and Galway, 1995).

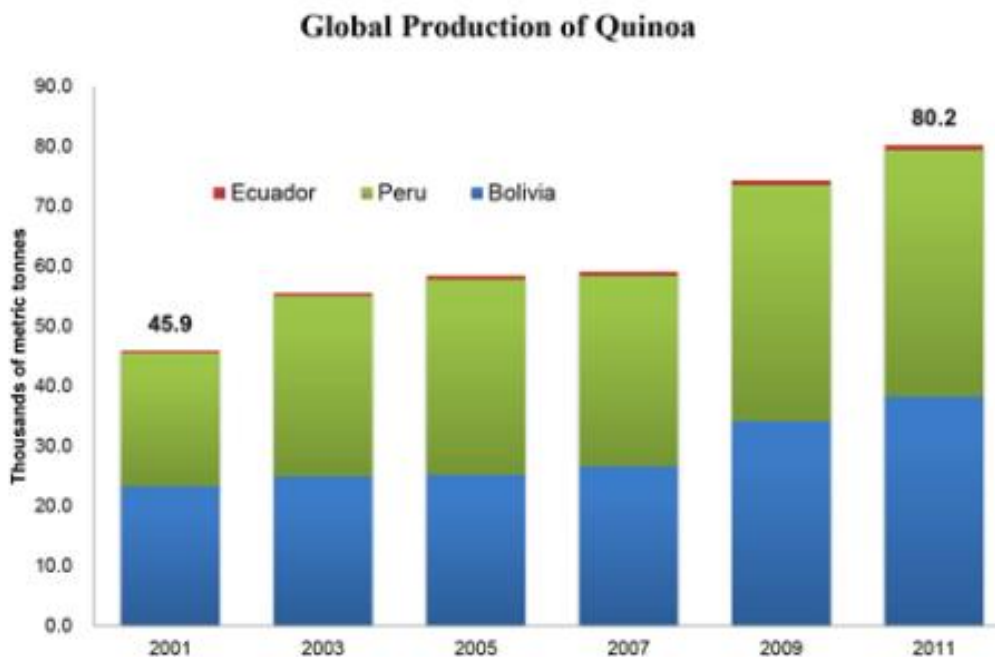
Quinoa has obtained a remarkable status as the grain from Gods or the Mother of all grains. Obviously, this is related to the Inca culture and even before this historical period. Actually, quinoa still plays a ritual role in spirituality and cultural identity.

The prevalence of quinoa was remarkably reduced during the last century. It was cultivated and consumed only by poor remote farmers in the Andes. In the case of Chile it is told that only one 85 years old farmer was found with cultivation practice. He was found during a search for quinoa in 1987. Consequently, when a

program related to support the original people of Mapuche was initiated, seeds of quinoa were distributed freely. This led to an increased quinoa production and the society experienced a better income for involved farmers, local development and even some export of quinoa (Valdivia and Hocdé, 2009).

In this century, production has raised, mostly in Bolivia, Peru and some in Ecuador. The global production counted from these three principal countries nearly doubled from 2001 45,9 to 80,2 thousand of metric tons in 2011 as shown in figure 1.

Figure 1. Global production of quinoa nearly doubled from 2001 to 2011. FAO statistic cited in Reyes, 2013.

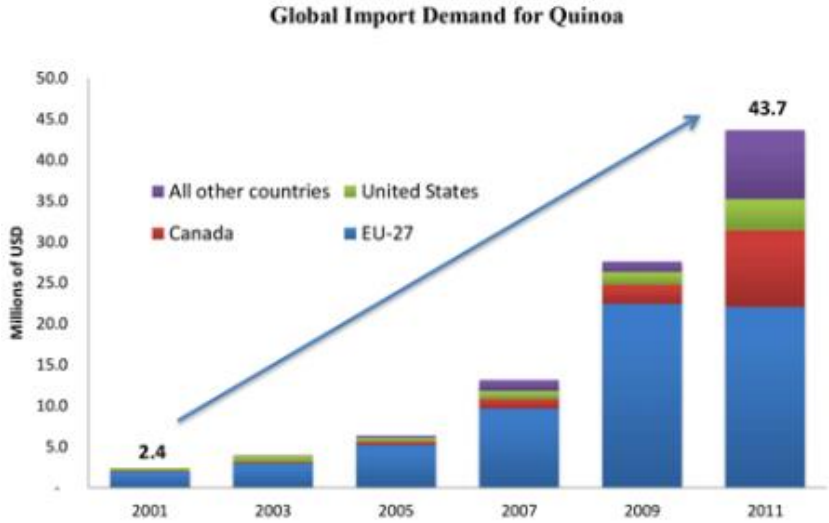


Source: FAOSTAT.

Organic standards of Royal Quinoa (in Spanish: Quinoa Real) with bigger grains and white tan emerged for sure in 1992 and represented 70 % of the Bolivian export in 2004 (Laguna,2005).

In the same decade, demands from importing countries went up. Mainly markets in EU and USA have grown, please see figure 2. Laguna *et.al.* (2006) concludes that this mainly is a buyer-driven development and Smulders *et.al.* (2015) states that the consumer group in Europe is very loyal to the product even when the prices has risen. Part of the explanation is that vegetarian consumers buy plant-protein and compare the price to the one of meat.

Figure 2. Global import demand for quinoa in millions of US dollars grouped into USA, EU- 27 old countries, Canada and other countries. Reyes, 2013.

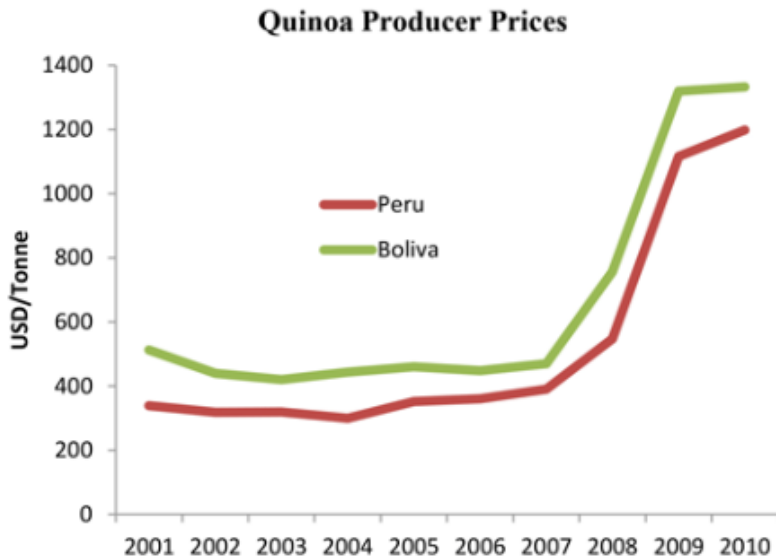


Note: We use COMTRADE data to track the world’s demand for quinoa over the last decade. Quinoa did not have a specific code in the Harmonized System (HS) until 2012, but its international transactions were included in an “other cereals” product category (100890). Quinoa and wild rice are the main products encompassed by this code. Because the world’s main producers of quinoa (Bolivia, Peru and Ecuador) do not export wild rice, quinoa’s global demand can be proxied by tallying all countries’ imports of code 100890 from Bolivia, Peru and Ecuador.

Source: Author’s computations using COMTRADE data accessed through WITS.

During these years, the prices paid to producers have doubled in Peru and Bolivia like it is shown in figure 3.

Figure 3: Quinoa producer prices in US dollars per ton in Peru and Bolivia in the period from 2001 to 2010. FAO statistics cited in Reyes, 2013.



Source: FAOSTAT.

Figure 1,2 and 3 illustrates what popular is called the “quinoa boom”. Why quinoa has experienced this boom could be explained by some reasons for applying it to the diet.

1.2.1. Reasons for applying quinoa in the diet

According to UN, the world is facing a protein-crisis if we do not change our protein sources. In our diet, we consume more and more meat, at the same time as the world population is increasing. Using more land to the production animal protein is not possible neither rational. Therefore, to have a more sustainable development we need to change to a more plant protein rich diet. This will minimize the protein crisis and it will minimize nitrous oxide and mitigate climate change (Davidson, 2012).

Quinoa has remarkable high content of proteins. Mainly protein as reason is linked to sustainability. One may take into account that conditions in the place of cultivation, during growth season and the methods of processing affects the validity of minerals and vitamins.

Mineral content is another reason for quinoa apply to make healthy diets. The mineral content in the plant depends on the content and availability in the soil. Data changes significant from cultivation in USA, Peru, Bolivia, Chile or Denmark (Vega-Galvez *et.al*, 2010; Blume and Jacobsen, 2010). Methods of processing after harvest could minimize calcium, iron and potassium if damaging the seed coat too heavy (Vega-Galvez *et.al*, 2010).

Quinoa is rich in A, B, C and E vitamins even though content of vitamin C decreases during long-term storage (Castellion *et.al*, 2010). Similar decrease in content of vitamin E if the plant during flowering stage accesses plenty of water (Fischer *et.al*, 2013).

1.2.3. Reasons for cultivation

There are many reasons related to justify production in matter of ecological sustainability, indeed if it is organic certified too.

The climate conditions in the Andean Altiplano are challenging because of scarce precipitation, frost and windiness. In addition, soil quality is poor and depleted for nutrients. The amplitude of plants for these growing conditions are narrow. Harsh climate in high altitudes is just one example of the adaptability. Quinoa varieties are many and classified as five ecotypes grouped by adaption to level over sea. The identification by five ecotypes was first presented by Tapia *et.al*. 1980, but mostly cited Valencia-Chamorro, 2003.

Due to the broad adaptability to different climates, the area of quinoa cultivation has expanded. FAO counts on more than 22 countries worldwide where quinoa is cultivated currently (FAO, 2011). Varieties from Chile are recommended for European cultivation and is implemented as a multi-purpose crop with impact on the local ecosystem (Galwey, 1993). Galwey assumes that the saponins are repellent to birds but Stoate *et.al*. states that in Great Britain the cultivation have provided more feed for wild seed eating birds, which means securing and increasing biodiversity (Stoate *et.al.*, 2004).

Faced with the challenge of increasing the production of quality food to feed the world's growing population the United Nations General Assembly declared 2013 the "International Year of Quinoa". FAO promotes quinoa for its adaptability to extreme climate conditions and at the same time acknowledge the Andean people for being guaranties for the conservation of this brilliant crop. It seems to offer a solution for food sovereignty and security in vulnerable areas.

Farmers especially in Bolivia have managed to organize and find their way to a global market (Laguna *et.al.* 2006). Bolivia is among the poorest countries in the world referring to living standards. However the income from quinoa has led to improvements in housing and stopped emigration from the Altiplano to Chapare in the lowland. Chapare was earlier the center of coca-production for drugs, something that Bolivia earlier was associated with (Laguna *et.al.*, 2006). On the other hand it is doubtful if it has led to improvements in the rural diet. There is some evidence that high nutritive quinoa is retracted in preference of inferior and cheap food items like refined pasta and polished rice (Jacobsen, 2011).

2. Discussion.

Some reasons and justifications linked to sustainable cultivation and consumption was given above. Turning to other aspects of sustainable management some challenges and conflicts still appears.

Some examples are given:

2.1. Conservation of ecosystem in the Altiplano.

Bolivia is with 80 different ecosystems one of the richest countries in the world. Referring to the ecosystem on the Altiplano it is fragile because of exposure to erosion caused by wind and too heavy soil preparation. The increased economic benefit from quinoa production has caused a rush for more arable land. The rush to get access to more land that is arable for quinoa leads to displacement of camelids, misbalancing soil nutrition by animal manure. Please see other presentation in the panel for more information.

2.2. Rights to genetic diversity.

Turning to conservation of genetic resources of quinoa and rights linked to diversity it is an issue with many complicated facets as well. The demand on quinoa has retracted landraces and promoted only few varieties in Ecuador. This case is highlighted in another presentation in the panel.

In Bolivia lack of confidence to the state authorities led to an uprising where the Patamaya research station with 1900 seed samples were burned and lost in 1998 (Rojas *et.al.* 2011). Still no investigation is recovered (Lopez, 2013) neither is it recommended to get close to Patamaya research station in vehicles which can be associated with state officials (Hamilton, 2014). One may ask if genetic resources are save enough conserved *ex-situ* places like this?

Another case referring to rights on genetic resources is the patent taken on `Apelawa` by two North American researchers from Colorado State University in 1994. This concerned a spontaneous mutation with male sterile flowers of

‘Apelawa’ and some other 43 varieties. Complaints to UN and intense work by the Bolivian Cooperation ANAPQUI followed. The researchers in USA renounced the patent before it expired in 2011 (RAFI, 1998).

Similarly appeared a conflict in Chile where the company Semillas Baer was given 32 varieties and participated in the programme distributing quinoa to Mapuches. The Mapuches are now claiming their entitlement to quinoa varieties and protesting against patent on the variety ‘Regalona Baer’. The patent runs from 2011 til 2016 (Sepulveda Ruiz, 2011).

The president of Bolivia, Evo Morales, declared all intellectual rights related to quinoa belonged to the Bolivian people, law number 098 from 2011 (Anon. a., 2015).

These actions and statements are maybe the most complicated conflict taken place between global and single state interests.

2.3. Competition between countries.

Economic interests are not restricted to the case mentioned on genetic resources. The contributions to the panel includes as well a presentation on the future scenarios for Andean quinoa. Scenarios with prosperity or collapse of the Andean quinoa. Please look it up for more information.

Introducing the quinoa dilemma, the conflict between the two principally producing countries of quinoa in Bolivia and Peru is severe. Peruvian quinoa “riles” the Bolivians when it is smuggled into their country and tried sold in organic standard and price. The Bolivians burned 23 tons in 2014 (Valdez and Bajak, 2014). The two countries have a “quinoa war” going on (Rivera, 2014). “The harvest of quinoa sows social conflicts in the Altiplano” (Azcuí, 2014).

It is assumed that between Europe and LAC some interests are conflicting too. The paradox is that quinoa was promoted for closing the gap for food security among poor people living in harsh conditions. Instead, wealthy consumers concerned about their own health and fitness embrace it. One may not know if this is a driver for development or a wrong derivation.

3. Conclusion.

For respective dilemmas lined up previous some suggestions to get closer to sustainability can be made:

- Encouragement to conservation of the ecosystem in the Altiplano needs technical and agronomic attempts like training in right ways of making and using compost, prevention of erosion by providing and planting perennials or bushes. This should be obligated farmers connected trusted organic and fair trade brands. Quinoa as special commodity like Royal Quinoa may in the future be a way to distinguish and maintain Andean quinoa as something attractive and pure.

- International regulation and agreements started with the Convention on Biological Diversity and recently agreement on the Nagoya Protocol on Access and Benefit-sharing may be ratified by more countries and implemented in a bigger scale to prevent conflicts. The objective is to provide a transparent legal framework for fair and equitable sharing of benefits arising out of the utilization of genetic resources. This covers traditional knowledge associated with genetic resources. The Nagoya Protocol was entered into force 12th of October 2014. Norway and Peru is among the 60 countries that has ratified the protocol. Bolivia and Chile have not ratified (Anon. b, 2015).

Beside governmental approaches, it must as well be mentioned that a strong public opinion against patents on seeds and animals exists. Their claims and aims are pronounced in the campaign “No patents on seeds” supported by a coalition of NGOs like Greenpeace, Development Fund of Norway, Swissaid, Berne declaration and 100 others (Anon. c., 2015)

- Applying the Nagoya Protocol could be a vehicle for more international collaboration and communication.

The organic brand and standard for Royal Quinoa especially from Bolivia is important to shelter, but even more diversified quinoa qualities can be developed. The potential of quinoa has not reached what it could be. Spillovers like saponins could for instance be used to control the plagues (Martin *et.al.*, 2008; Stuardo and Martin, 2008), or use the color agents for other items (Jacobsen and Mujica, 2001) or use the leaves for food (Swieca *et.al.*, 2014). Another innovative effort is presented in the panel with adding quinoa to corn-based snacks. Please turn to respective paper for more details.

Conclusively about the quinoa dilemma some ending remarks for now:

Quinoa production, especially in the Bolivian Altiplano, has meant a lot for people living there and indeed their struggles to reach actual quality, organization etc. must be acknowledged.

Asking how sustainability best can be supported is not a disqualification of the results and success obtained, but simply meant as reflections over the “quinoa boom” and where it has brought us.

That is conclusion so far. Anyhow more dialog will take place in the coming panel.

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