

## The impact of organic native crops on the socioeconomic development and environmental sustainability of small-scale farmers in Jujuy, Argentina

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**Abstract:** Increased demand in Europe, North America, and Japan has created a market for exotic native South American food crops such as Açai, Yacon, and Camu Camu. Consumers increasingly seek out these products to promote fair trade and sustainable development. However, to date, no research has critically examined whether these native crops achieve their purported objectives for sustainable development and human health. Jujuy, a remote northern region of Argentina, has been a focal point of this development, with organic, exotic, and native crops marketed as healthier for consumers, beneficial for farmers, and protective of the region's culture and environment. Drawing on key informant interviews with producers and distributors, this paper examines the extent to which cultivating native organic crops benefits the socioeconomic development and environmental sustainability of small-scale farmers. Findings suggest potential synergies under limited conditions. We conclude by discussing potential implications of native crop promotion for the integrity of the local environment.

**Key Words:** *native crops, organic food, small-scale farmers, Yacon, Jujuy- Argentina.*

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### Introduction

In regions like Jujuy, Argentina, organic native crops may provide economic alternatives to conventional agriculture, capture premium prices, improve the management of natural resources, and help restore cultural identity for the region's farmers. Conversely, conventional agriculture has been specifically designed to increase commodity productivity, maximise financial benefits, and concentrate power and land. Beyond these narrow objectives, conventional agriculture has negative impacts, including displacing small-scale farmers and polluting the environment through the use of

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agrochemicals (Pimentel et al. 2005). If sustainable agriculture is understood as a multifunctional activity that integrates food production and farmers' livelihoods with ecological services and cultural development, there may be an opportunity to adopt a sustainable agricultural practice that restores small-scale farmers' livelihoods and nourishes a healthy environment.

This paper explores the extent to which organic native crop cultivation has had a positive (or negative) impact on the socioeconomic development and environmental sustainability of Jujuy's small-scale farmers, the role of organic food markets in creating spaces for small-scale farmers, and the capabilities of the rural poor to diversify native crops as a resilience technique not only to environmental conditions locally but to broader, global, human-environment systems and conditions.

The Quebrada de Humahuaca, the focus of our study, exemplifies the contrast between sustainable agriculture and conventional farming. This narrow mountain valley is located in the northeast part of Jujuy, Argentina. It borders Bolivia in the north and Chile in the east. It forms a natural corridor from the north to the south, spanning 155 km. An estimated 28,000 people reside mainly in the towns of Tilcara, Humahuaca and Tumbaya. The area is rich in archaeological sites and was declared a World Heritage Site in 2003. This designation has since increased tourism in the area. The history of the "Quebrada de Humahuaca" goes back 11,000 years. Archaeological evidence from the hunter-gatherer period has been found at sites in this region. This evidence demonstrates the domestication of vegetables since around 2000 B.C., as well as the existence of exchange and trade networks with neighbouring communities. This historical context is crucial for understanding that the Quebrada region maintained many traditional practices that were later marginalised during the colonial period and the introduction of conventional agriculture.

The yacón cooperative is located in an isolated region in the town of Barcena, in the Quebrada de Humahuaca, 50 kilometres from Jujuy city at 2,000 meters above sea level. Approximately 200 families live in this small town. The cooperative is composed of residents of the town of Barcena and currently includes 15 yacón producers. Because the men of Barcena refuse to participate in the cooperative, all its members are women. The main objective of the cooperative is to rescue, revive, and continue planting yacón. Currently, local people are benefiting from the commercialisation of yacón. For this reason, the cooperative is constantly looking for new ways to utilise the crop by developing products such as syrup, tea leaves and candies.

Small-scale farmers are far more susceptible to the capricious nature of agriculture, making their livelihood highly competitive and unstable. Moreover, popular cash crops, unlike native crops, are water-intensive and require expensive fertiliser and pesticides. On the other hand, native crops are naturally adapted to local climate conditions, are not dependent on agrochemicals, and can be sold at a premium because of current demand (Pimentel et al., 2005). Cultivation of native products may also limit agricultural expansion in ecologically fragile areas and yield higher returns on investment for farmers (Carr, 2003).

Balancing development and sustainability while combating poverty, achieving food security, and preserving biodiversity remains a major challenge for the global community, particularly in remote, mountainous regions like the Quebrada de Humahuaca. In light of the increasing demand for organic food, agriculturally sustainable development may be poised to achieve this balance. However, to explore the potential of native organic crop production through agriculturally sustainable development, it is important to understand its impact on the socioeconomic development and environmental sustainability of small-scale farmers.



Figure 1. Regions of Jujuy Province, Argentina

Source: Own Elaboration

The challenges facing farmers in the Quebrada de Humahuaca reflect broader global patterns affecting rural communities. Eighty-two per cent of farmers live in developing nations where the majority of the rural poor (IFAD, Rural Poverty Report, International Fund for Agricultural Development, 2011) suffer from extreme conditions of vulnerability due to increasing conflict, climate change, expansion of the agricultural frontier and increasing food insecurity (Bilsborrow & Carr, 2001). In Quebrada de Humahuaca's mountainous terrain, these global pressures manifest as specific challenges: geographic isolation limits market access, climate variability disrupts traditional growing patterns, and economic marginalisation has pushed many residents to migrate to urban centres. These adverse circumstances have led to the development of various projects aimed at promoting the economic growth of small farmers in vulnerable areas while conserving the local environment and preserving cultural traditions. The Quebrada de Humahuaca region exemplifies how such initiatives can emerge through the recovery of organic native crops.

The project to recover Native Crops in Jujuy, Argentina, aims to provide a sustainable economic and environmental alternative for indigenous communities, to restore valuable native crops, and to develop a self-sustaining future for the people of the Quebrada. This region is among the poorest and most vulnerable in Argentina. Poverty levels reached 41.8% in 2022 (INDEC, Instituto Nacional de Estadísticas y Censos Buenos Aires, Argentina). The adverse economic and environmental conditions that have led to these issues require the implementation of diverse projects to promote the region's economic development.

The Quebrada de Humahuaca has always been marginalised because it is a remote, landlocked area where a few well-connected, affluent families have disproportionate

influence on local politics and the economy. The region's isolation from major urban centres and transportation networks has perpetuated economic dependency and limited local farmers' access to broader markets. Furthermore, as a remedy to local poverty, this project was initiated by local non-governmental organisations, with the support of international organisations such as UNDP (United Nations Development Programme) and international NGOs, including the Slow Food Movement, recognising the Quebrada's potential as a model for agricultural sustainability.

*The Rural Poor and Sustainable Organic Agriculture in the Quebrada de Humahuaca Context*

The present global food and environmental crisis will continue to compromise rural farmers as their livelihoods will be the most affected by climate change shocks and food production instability (Frank et al., 2011). In the Quebrada de Humahuaca, these global pressures intersect with the specific challenges outlined above—geographic isolation, economic marginalisation, and the concentration of power among affluent families—creating a particularly vulnerable situation for small-scale farmers. However, the local communities of the Quebrada possess ostensible limitations that could potentially be valuable, intangible assets in addressing both local poverty and broader sustainability challenges. Their simple lifestyles, their ability to cope with climate hazards, and their flexibility and adaptability may provide them with opportunities to employ their traditional knowledge and capabilities more efficiently, to develop agricultural market access for small farmers, and to determine the appropriate market value of environmental services.

Chamber & Conway (1991) examined the concept of sustainable livelihoods in response to concerns about population growth and persistent poverty among the rural poor, concerns that directly apply to the demographic pressures and the persistent poverty (41.8% poverty rate) observed in Jujuy province. The key objective was to explore how rural life could provide a decent and sustainable livelihood for poor, rural farmers. The authors argued that this disadvantaged population have a better chance of achieving sustainable livelihoods because of their small-scale economics and their labour-intensive, resource-productive use of land in response to risk and population growth. In the context of the Quebrada de Humahuaca, this theoretical framework helps explain why the yacón cooperative and similar initiatives focus on small-scale, labour-intensive cultivation methods that individual families can manage within the constraints of mountainous terrain. A diverse source of native crops provides farmers with potentially valuable agroecological and cultural resources (Zimmerer, 1991). It is crucial to understand the importance of sustainable living through the cultivation of native crops. Developing market access for small farmers in remote areas like Barcena and Tumbaya not only provides a space for farmers to sell their products but also creates opportunities to promote other economic and non-agricultural activities that can supplement farm income. The establishment of local markets in the Quebrada region encourages local farmers to maintain crop diversity by having spaces to sell their crops, crafts, and services such as transportation, tourism, and labour (Hellin & Higman, 2005). The creation of market spaces — exemplified by initiatives such as “La Feria de la Papa” (the Potato Fair) mentioned in the native crops project — can be promoted by government, non-governmental, and international organisations. Also, these organisations are essential to the creation of market value chains by providing rural people with infrastructure, access to market information, and financial tools (Bebbington & Thompson, 2004).

As stated above, there has been an increase in the international demand for organic food products during the last couple of decades. Developed countries, especially the United States, Europe, and Japan, are the main markets for organic food crops cultivated in the developing world. Global organic foods market sales reached 125 billion euros in 2021 (FiBL-AMI, 2021). Organic fruits and vegetables are high-ranking categories, meaning they are in greater demand by markets and therefore more labour-intensive. Small-scale farmers cultivate these crops in remote areas; some of these areas are increasingly at risk of deforestation to make way for cattle ranching and large-scale crop production (Cenamo et al., 2006). Sustainable organic agriculture provides an economic alternative for small-scale farmers that is both sustainable and environmentally friendly. Examples of sustainable agriculture include extractive industries based on rainforest fruit collection, crafts, and non-timber forest products (Freitas et al., 2004). Due to the organic nature of exotic crops and products, buyers are willing to pay a premium.

## **Methods**

The ethnographic study of yacón crop development and distribution aimed to understand cultivation practices, socioeconomic benefits, and environmental impacts by interviewing local producers. The study includes 10 in-depth interviews to investigate the social, economic, and environmental impacts of developing sustainable projects and trading native crops on the lives of local inhabitants. The 10 interviewees represent 62.5% of the 16 yacón producers in Barcena and reflect the community's socio-economic composition. The sample comprised 8 women and 2 men (representing the all-female cooperative membership), with ages ranging from 25 to 45 years. All interviewees farmed between 0.5 to 1 hectare and had been involved in yacón cultivation since 2002. The sample included 2 cooperative leaders (coordinator and manager) and 8 regular producer members. Importantly, the sample captured economic diversity: some interviewees depended primarily on yacón income while others relied on it as supplementary income, reflecting the varied livelihood strategies within the broader farming community. All interviewees were Barcena residents actively engaged in yacón production and sales, ensuring they could speak authoritatively to 20 years of cooperative development. Following Zimmerer (2004), we argue that household-level analysis provides a clearer framework for studying human-environment interactions at the local community, regional, or country scale.

This study was conducted in two towns in the Quebrada de Humahuaca region, the towns of Barcena and Tumbaya in Jujuy, Argentina. The informants in this study were the president of the Barcena's yacón cooperative, founding members and primary project leaders of Fundandes, and local NGO representatives, all of whom are working to develop the recovery of Andean Native crops, of which yacón is one.

In addition to interviews, local bulletins, and documents, these contributed to understanding how the Andean Natives Crops Project works. These bulletins provided detailed descriptions of the different indigenous communities living in the Andes. The bulletins included surveys completed by designated community coordinators.

Consumers increasingly seek out exotic fruits to promote fair trade and sustainable development. However, no research to date has critically examined whether these native crops achieve their purported objectives for sustainable development and human health. This paper examines the question: To what extent does the cultivation of native organic crops benefit the socioeconomic development and environmental sustainability of small-scale farmers?

## Results

The key findings indicate that the rescue of native crops, specifically the yacón crop, has contributed to: first, generating economic opportunities. Second, promote sustainable practices, encourage cultural identity and increase tourism. Finally, the results also show cooperative challenges and limits. Yacón production in Barcena was reestablished in 2000; however, cultivation and commercialisation of yacón date back to before the 1990's. Yacón was sold to train passengers who stopped at the Barcena station. Due to a 1990s national policy that dismantled many long-distance trains, as well as the introduction of buses and an increase in other forms of alternative transport, the trains stopped running (Teruel, 2007). Participants noted this as a turning point in cutting off yacón's sole customer base, and the cooperative sought to recreate Barcena's town identity after the loss of livelihood. The reinvigoration of native crops is one way to restore the local economy.

The initial effort of five families has expanded to thirty-eight, reflecting growing confidence in the crop's potential and popularity. A high-ranking cooperative participant stated that many, who initially left Barcena due to a lack of employment, returned once new efforts were made to reestablish the yacón crop. Yacón became more sought after as tourism increased and native crops became more popular. The cooperative leader further explains that this led to more demand for the crop, resulting in even more economic opportunities for local people, suggesting the importance of return migration patterns in reestablishing native crops.

The recovery of native crops was consistently described as a process of cultural reaffirmation. The leader of one indigenous community claims that increased demand for traditional native crops enabled the Alfarcito indigenous community to recover native potato varieties, seeds, and vegetables, as well as to develop infrastructure. The launch of the potato fair, "La Feria de la Papa," motivated local communities to exchange native crops, according to the leader. Cultivating native species was viewed not only as an economic strategy but as a symbolic act of continuity with pre-Hispanic agricultural practices.

Participants stated that the native crops restoration project encouraged the indigenous population to plant their land with traditional native crops, promoting sustainable practices. Native crops were recognised as better adapted to local climatic and soil conditions, requiring fewer external inputs such as irrigation or fertilisers. This ecological benefit connects traditional knowledge with sustainability, strengthening both environmental and cultural resilience.

A participant stated that the recognition of the "Quebrada de Humahuaca" region as a World Heritage Site significantly increased national and international tourism. Consequently, there has been a tourism boom in the area, leading to increased demand for local crafts and food crops. This has benefitted small farmers growing native crops, suggesting the importance of cultural patrimony in supporting tourism and, in turn, native crop production.

The establishment of the first culinary school dedicated to native crops, inaugurated in the small town of Tumbaya in 2008, further institutionalised these efforts, transforming traditional knowledge into structured development projects. These findings show how cultural heritage and tourism together support endogenous rural development.

Participants largely agree that the cooperative also faces many challenges. According to them, one of the biggest obstacles is the limited production, which prevents the cooperative from establishing a store in the main city. Some specified that a store in the city would help market yacón to incoming tourists and promote a stable demand for yacón products. By

adding producers, participants generally foresee opportunities to increase production at the cooperative. This finding underscores the importance of planning for economies of scale when assessing the economic viability of restoring native crops.

Lastly, participants noted that it is important for the cooperative to provide this service to the Barcena community because the ultimate goal is to generate sustainable economic opportunities for the people of Barcena and to build the town's reputation as a producer of yacón products. Again, the findings suggest the importance of native crops in fortifying and grounding local identities. The results also revealed an unexpected benefit of restoring native organic crops: the reinvigoration of a local identity tied to the land.

## **Discussion**

Our results show that cultivating native organic crops, such as yacón, can create tangible opportunities for local development in Jujuy's Quebrada de Humahuaca region. These crops not only offer economic benefits but also serve as cultural and environmental anchors that strengthen community identity. Farmers who participate in initiatives like the Yacón Cooperative have seen improvements in household income and quality of life, allowing them to remain in their communities rather than migrate for work. This demonstrates how small-scale, locally rooted agricultural projects can promote economic stability while preserving traditional ways of life.

Beyond income generation, native crop farming fosters social cohesion. The cooperative model requires collaboration and shared decision-making, encouraging local participation and trust-building. Initiatives such as the "Potato Fair" and the Slow Food Movement exemplify how these networks expand beyond economic exchange, becoming spaces of cultural reaffirmation and mutual learning. These social dynamics are essential for sustainable rural development, as they empower producers and reinforce the value of collective action.

At the same time, our findings point to the environmental dimension of native crop production. The rescue and diversification of native crops can contribute to ecological resilience and biodiversity preservation. However, success depends on maintaining a delicate balance between agricultural productivity and environmental care. In degraded areas, recovery through organic methods tends to be slower, as noted by previous research (Damiani, 2003). Nonetheless, crops such as yacón demonstrate adaptive potential even in challenging soils, highlighting their role as strategic resources for sustainable land use.

Finally, the growing international demand for native organic crops presents both opportunities and risks. While it can open new markets and promote cultural recognition, it also raises concerns about price volatility, overexploitation, and biodiversity loss if expansion is not properly managed. This underscores the need for coherent policies and local governance structures that ensure equitable participation and ecological responsibility.

In sum, the experience of the yacón producers of Barcena reveals that sustainable rural development depends not only on external demand or cultural heritage, but on the capacity of local communities to organise, innovate, and connect traditional knowledge with economic opportunities.

## **Conclusion**

Despite the growing national and international demand for Andean crops, our findings show that the lack of a clear legal and institutional framework continues to limit their

development potential in Jujuy. Local communities recognise the cultural and economic value of crops such as yacón, quinoa, and Andean potatoes, yet their efforts remain constrained by informal markets, unequal access to commercialisation spaces, and limited technical or business training.

To achieve meaningful progress, local governments and organisations must work together to create stable market opportunities—through cooperatives, ferias, and improved transport and storage systems—that strengthen local economies while respecting traditional practices. The yacón Cooperative illustrates how collective initiatives can generate income and empowerment, but also how structural gaps in business knowledge and market access restrict long-term sustainability.

While this research faced limitations in time and geographic scope, it offers valuable insight into how community-driven innovation can coexist with broader policy support. Future studies could further explore the economic chains of native crops and how tourism and globalisation shape local identities and livelihoods in the Andean region.

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