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Abstract

This paper examines the social protection challenges faced by quinoa farmers in the southern Altiplano of Bolivia, with a focus on certified quinoa producers. Using a mixed-methods approach and insights from existing literature, the study examines the retirement planning and financial literacy of farmers affiliated with RED-QUINUA, a network of Fairtrade®-certified quinoa producer associations in the region. It highlights critical issues such as low participation in the national pension system, lack of retirement planning, and gaps in financial literacy, with particular attention to their disproportionate impact on women producers. To address these challenges, a pilot program was implemented to improve quinoa farmers' financial literacy and retirement planning. The program provided participants with critical knowledge to formulate their retirement and long-term savings plans. Results from the pilot are encouraging, demonstrating improved financial literacy, increased awareness of retirement planning, and a better understanding of savings options, particularly among women. This study shows that, with appropriate financial and retirement education, quinoa certification premiums could contribute to farmers' long-term financial security and well-being.

KEYWORDS: Quinoa Production, Retirement Savings, Financial Literacy & Education.
JEL CODES: D14, G23, Q12.

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Resumen

Este documento examina los retos de protección social a los que se enfrentan los agricultores de quinua del Altiplano Sur de Bolivia, centrándose en los productores de quinua certificada. Para ello, se utiliza un enfoque de métodos mixtos y se examina la planificación de la jubilación y los conocimientos financieros de los agricultores afiliados a RED-QUINUA, una red de asociaciones de productores de quinua con certificación Fairtrade® en la región. El estudio destaca cuestiones críticas como la baja participación en el sistema nacional de pensiones, la falta de planificación de la jubilación y las brechas en los conocimientos financieros, prestando especial atención a su impacto desproporcionado en las mujeres productoras. Para abordar estos retos, se desarrolló un programa piloto para mejorar los conocimientos financieros y la planificación de la jubilación de los productores de quinua. El programa proporcionó a los participantes los conocimientos fundamentales para elaborar sus planes de jubilación y ahorro a largo plazo. Los resultados del programa piloto son alentadores, ya que muestran una mejora de los conocimientos financieros, una mayor concienciación sobre la planificación de la jubilación y una mejor comprensión de las opciones de ahorro a largo plazo, sobre todo entre las mujeres. Este estudio muestra que, con una educación financiera y de jubilación adecuada, las primas de certificación de la quinua podrían contribuir a la seguridad financiera y al bienestar a largo plazo de los agricultores.

PALABRAS CLAVE: Producción de Quinua, Ahorro para la Jubilación, Educación Financiera.
CÓDIGOS JEL: D14, G23, Q12.

1 Introduction

In the rugged southern Altiplano of Bolivia, under a vast, high-altitude sky that reflects off the Uyuni and Coipasa salt flats, local communities have cultivated the prized *Quinoa Real* for centuries. This unique grain has thrived in extreme conditions characterized by water scarcity, sandy soils, strong winds and high altitudes, developing distinctive characteristics: large, flavorful grains rich in plant protein and a unique texture. The region also showcases a vibrant palette of quinoa colors, with black and red varieties offering higher antioxidant levels than white quinoa, enhancing both their visual appeal and health benefits. Traditionally, *Quinoa Real* has been grown on hillside plots, with farming practices closely tied to the herding of camelids, especially llamas and alpacas. By rotating crops and allowing for fallow periods, while enriching the soil with organic matter from these animals, local farmers have developed a sustainable farming system adapted to their harsh environment.

In recent decades, communities in the southern Altiplano have witnessed the transformation of quinoa from a small-scale, locally traded crop to a globally prized *superfood*. This surge in international demand, marked by a price spike in 2014, has led to increased production worldwide, even in unexpected climates. In Bolivia, for instance, quinoa cultivation has expanded into the humid eastern lowlands, in stark contrast to its native highland origins. In the southern Altiplano, the quinoa boom has led to significant changes in traditional agriculture. Driven by the quinoa boom, many farmers have adopted monocropping, expanding fields by removing natural windbreaks such as the hardy *thola* bush, reducing camelid grazing that once enriched soils, shortening fallow periods, and increasing the use of machinery that is often ill-suited to the region's fragile soils. This *intensification* has reconfigured quinoa production in the region.

The expansion of quinoa cultivation in the southern Altiplano is already having worrying consequences, particularly on soil fertility. While the area under cultivation has increased, yields have not kept pace, leaving Bolivia lagging behind neighbouring countries such as Peru and Ecuador in terms of productivity per hectare of quinoa. Recent agronomic research highlights a critical issue: the soils of the southern Altiplano are severely depleted of organic matter, a vital component of soil fertility. This degradation poses a significant challenge to quinoa growers in the region, who face the difficult task of developing strategies to increase yields from increasingly depleted soils. In addition, selling quinoa in conventional markets, where prices are lower and more volatile than in previous years, provides little incentive for farmers to prioritize sustainable practices that are critical to maintaining fertility in this challenging terrain.

In response to these pressures, some Bolivian quinoa farmers have formed associations to qualify their quinoa crops for organic and Fairtrade® certification. Organic certification provides access to higher prices in international organic markets, particularly in Europe and the United States, while adhering to strict agricultural standards that prohibit the use of synthetic pesticides and fertilizers. Fairtrade® certification goes further by incorporating broader economic, environmental, and social standards that benefit both farmers and their communities. With Fairtrade® certification, farmers are assured a *minimum price* for their quinoa, providing stability against fluctuating conventional market prices. Their associations also receive a *premium*

that can be reinvested in sustainable farming practices or used for community welfare projects.

Certified quinoa production thus offers a valuable opportunity to revitalize sustainable agricultural practices in the region. Fairtrade® certification, in particular, also provides quinoa farmers specific resources that support both their economic and social well-being. Unlike conventional producers, it benefits farmers through mechanisms such as the above-mentioned *minimum prices* and *premiums* that create pathways to improved individual and community well-being. The INESAD Foundation has partnered with RED-QUINUA, a network of Fairtrade®-certified quinoa producer associations in the region, to provide research-based guidance on reinvesting these resources in soil restoration and sustainable development. Through action-research collaborations, INESAD has facilitated the development of knowledge and tools that enable farmers to implement sustainable practices, but also build resilience to climate change and address key social dimensions, including health, financial stability, gender equality and long-term savings.

This paper examines the social protection challenges faced by quinoa farmers in the southern Altiplano of Bolivia, with a focus on certified quinoa producers. Combining qualitative and quantitative methods and insights from existing literature, the study examines the retirement planning and financial literacy of farmers affiliated with RED-QUINUA, a network of Fairtrade®-certified quinoa producer associations in the region. It highlights critical issues such as low participation in the Bolivian pension system, lack of retirement planning, and gaps in financial literacy, with particular attention to their disproportionate impact on women producers. To address these challenges, a pilot program was implemented to improve quinoa farmers' financial literacy and retirement planning. The program provided participants with critical knowledge to formulate their retirement and long-term savings plans. Results from the pilot are encouraging, demonstrating improved financial literacy, increased awareness of retirement planning, and a better understanding of savings options, particularly among women. This study shows that, with appropriate financial and retirement education, quinoa certification premiums could contribute to farmers' long-term financial security and well-being.

The document is structured as follows: Section 2 provides a contextualization of quinoa production in the southern Altiplano and background information on retirement and pensions among quinoa farmers. Section 3 provides a review of relevant literature on the factors influencing the formulation of long-term retirement plans. Section 4 outlines the qualitative exploratory research conducted among quinoa farmers in the Southern Altiplano. Section 5 presents the quantitative findings from the survey of quinoa farmers, which includes the measurement of financial literacy and retirement. Section 6 details the design and outcomes of a pilot intervention aimed at enhancing financial literacy and encouraging the formulation of long-term savings plans among quinoa farmers. Finally, section 7 concludes and provides recommendations.

2 Context and Background

2.1 Quinoa in the Southern Altiplano and the Fairtrade® Certification

The Intersalar region of southwestern Bolivia features a striking landscape characterized by an arid to semi-arid climate influenced by volcanic origins and a history of ancient seawater that left salt flats (Barrientos et al., 2017; Andressen et al., 2007). Located at elevations ranging from 3,300 to 4,200 meters above sea level (Winkel et al., 2014), this high-altitude region challenges traditional agriculture, yet has gained recognition for the production of two key products: quinoa and camelid livestock (Barrientos et al., 2017). Despite the harsh environment, the region offers unique conditions for growing *Quinoa Real*, a variety of quinoa that thrives in high-salinity soils, extreme aridity, and challenging temperatures. *Quinoa Real* grains are typically larger than other varieties and come in three colors, white, red, and black, contributing to its distinctive flavor and nutritional profile (Pellegrini et al., 2018; Laguna et al., 2006). A comparative study by Pellegrini et al. (2018) found that Bolivian red and black quinoa had the highest antioxidant activity among quinoa varieties tested from Spain, Peru, and Bolivia. Furthermore, Rojas et al. (2016) highlighted the superior protein content of Bolivian *Quinoa Real*, reinforcing its reputation as a nutrient-rich *superfood*.

Before the increase in global demand for quinoa, production in the region primarily met household needs or supplied local markets, feeding rural communities (Jacobsen, 2013; Del Barco-Gamarra et al., 2019; Romero, 2022). Farmers typically traded quinoa with valley communities through barter (Nina & Wesz, 2018). Quinoa was cultivated on relatively small plots (Nogales et al., 2015), with average yields of 20-30 quintals per season (Barrientos et al., 2017). It was typically grown on hillsides, with the plains reserved for raising camelids, creating a balanced farming system between quinoa and livestock (Del Barco-Gamarra et al., 2019). Families, usually small to medium in size, carried out most of the production through labor-intensive practices (Jimenez & Romero, 2022). The region also practiced a traditional crop rotation system, known in Aymara as *aynuqa*, which mainly alternated between quinoa and potatoes, while allowing the soil to recover through the grazing of camelids, which enriched the soil with their droppings (Nina & Wesz, 2018). To protect their crops from strong, sand-laden winds, farmers bordered their plots with native shrubs such as *thola*, which acted as natural windbreaks (Tapia, 2022).

Beginning in the late 1960s, Bolivia initiated government programs to promote the production and industrialization of nutritious Andean crops such as quinoa (Laguna et al., 2006), although these efforts had limited impact. This period also saw major changes in land tenure following the 1953 Agrarian Reform Law, which aimed to redistribute land from large landowners to local communities. Under subsequent military regimes, land redistribution increasingly favored family subdivisions, resulting in smaller communal plots (Nina & Wesz, 2018). From the 1960s to the 1980s, many people migrated to intermediate cities, departmental capitals, and tropical areas, attracted by economic opportunities such as coca leaf production, which produces more than once a year compared to the one-year yield of quinoa (Laguna et al., 2006). Migration was further driven by droughts and other adverse climatic events (Balderrama et al., 2011) and the

limited economic viability of local products such as quinoa or derivatives of camelid livestock, which were often undervalued or overlooked in urban centers (Nina & Wesz, 2018).

Since the 1980s, key events in the southern Altiplano have laid the groundwork for changes in communities in the years that followed. In 1985, agricultural machinery was first introduced to the region (Nina & Wesz, 2018), marking a shift in agricultural practices. According to Durán (2019), quinoa farmers began using disc plows, later followed by chisel plows, to increase productivity and replace labor-intensive methods. Although these machines improved yields, their overuse eventually led to a loss of soil fertility and a decline in productivity over time. That is, plowing techniques on fragile sandy soils exposed the nutrient-rich soil layer to dry and windy climates, leading to degradation (Colque et al., 2012). In parallel, organizations of peasant, indigenous and native communities (OECAs in Spanish) were created in the 1990s to support the commercialization of quinoa, especially for export, creating new economic opportunities (Laguna et al., 2006) and generating a process of return to the rural area.

Since the 2000s, the popularity of quinoa has increased significantly worldwide, as evidenced by the increase in web searches, which peaked between 2014 and 2018, as shown in Figure A.1 in the Appendix. This global surge has been fueled by numerous studies demonstrating quinoa's nutritional benefits (e.g., Graf et al., 2015; Pellegrini et al., 2018) and media coverage celebrating it as, for example, "the miracle grain of the Andes" (Harvey, 2013). In 2013, quinoa's prominence was further enhanced when the United Nations declared the year the *International Year of Quinoa* (IYQ). This initiative, proposed by the government of Bolivia in 2011 and later approved by the UN Assembly, aimed to raise awareness of the nutritional importance of quinoa, particularly its potential to improve food security and combat hunger and malnutrition. Several international events were organized, including the "First International Symposium of Farmers and Researchers for the Cultural and Nutritional Values of Quinoa" in Bolivia.

Errecat (2019) highlights the significant increase in quinoa production between 2009 and 2015, both in Bolivia and globally, with a sharp increase following the IYQ. As shown in Appendix Figure A.2, panel (a), area under cultivation and global production grew almost exponentially during this period before stabilizing. Panel (b) shows that while Bolivia's cultivated area peaked during the IYQ, production peaked two years later before leveling off and then declining, even as area continued to expand. Panel (c) shows that quinoa prices received by Bolivian farmers peaked at 3,060 USD per ton before falling below 1,000 USD; however, these prices remained well above those recorded in the 1990s. Finally, panel (d) shows that the global production value of quinoa rose steadily, with a peak closely linked to the IYQ. These trends illustrate the strong influence of international recognition on quinoa production and its market dynamics.

Today, visitors to the region can see firsthand the profound environmental, social and agricultural changes brought about by the *quinoa boom*. Once confined to hillsides, quinoa crops now line the roads leading to local communities, reflecting the shift in traditional land use. This expansion has come at a cost, however: intensive quinoa cultivation has led to a decline in soil organic matter. Deforestation of native woody plants that serve as windbreaks and the conversion of grassland to cropland have exacerbated the problem. As vegetation cover decreases, soils

are exposed to wind and water erosion, reducing their ability to retain water and essential soil nutrients (Casas et al., 2016; Tapia, 2022). Furthermore, practices such as monocropping and the introduction of chemicals have accelerated this soil degradation (Medrano & Torrico, 2015), while shortened fallow periods have further depleted soil fertility (Orsag et al., 2013; Barrientos et al., 2017). As a result, yields per hectare have decreased, driving a cycle of soil degradation and declining productivity in the region (Medrano & Torrico, 2015; Colque et al., 2024).

In recent decades, quinoa production in the southern Altiplano has evolved into two distinct approaches, as noted by Collao and Muriel (2024). One approach is *conventional* quinoa production, which relies on chemical and synthetic agricultural inputs and often forgoes sustainable soil practices such as crop rotation. This type of quinoa is typically sold directly by farmers in local and regional markets (Jiménez & Romero, 2022). In contrast, certified organic quinoa production adheres to organic farming standards, using only organic inputs and following guidelines for sustainable soil management. These guidelines include fallow periods and maintaining a certain number of camelids per hectare, among other criteria. Certified organic quinoa is produced specifically for export (ibid.; Collao & Muriel, 2024). Data from Bolivian government institutions indicate a significant shift from conventional to certified organic quinoa as the dominant production model. In 2009, the Ministry of Rural Development and Lands reported in its "National Quinoa Policy" that approximately 75% of the quinoa marketed in Challapata, the region's main quinoa hub, was conventional, while 25% was organic. However, Collao and Muriel (2024), citing Bolivia's National Food Safety and Health Service (SENASAG), point out that data from 2018 to 2020 would indicate that this trend has reversed. By that time, certified organic quinoa accounted for 85% of production, while conventional quinoa had fallen to 15%.

The commercialization of conventional and certified quinoa follows different patterns, further highlighting the differences between these production approaches. Conventional quinoa is typically collected and sold in informal markets for distribution within Bolivia or export to neighboring countries, such as Peru. This type of production is generally not organized by farmer associations (Risi et al., 2015) and is vulnerable to fluctuations in global quinoa market prices (Collao & Muriel, 2024). While conventional methods aim to reduce production costs, they result in lower selling prices compared to certified quinoa. On the other hand, certified quinoa is traded through two main frameworks that command higher prices. First, organic certification itself carries a price premium. According to Collao and Muriel (2024), prices for conventional quinoa averaged around 1,000 USD per ton, while organic quinoa exceeded 2,000 USD per ton in 2023 and reached up to 3,200 USD per ton by the end of that year. It is worth noting that despite these higher prices, organic production is associated with higher production costs (ibid).

The second trading framework for certified quinoa is Fairtrade® certification. It consists of a certified trading model that goes beyond conventional trading practices by integrating social and environmental standards into its economic framework (Fairtrade, 2024). It offers farmers a "Fairtrade® Minimum Price" that protects them from price fluctuations, allowing them to plan for both productivity and financial stability. Farmers also receive a "Fairtrade® Premium," a supplementary fund used to improve business operations and support community development (ibid). Fairtrade® environmental standards emphasize sustainable agricultural practices, pro-

hibit the use of hazardous chemicals and GMOs, promote organic production, and offer higher prices for certified organic products to further incentivize organic practices (ibid). Socially, Fairtrade® upholds strict standards that require democratic organization for small farmers and ensure fair working conditions for farmers, including equal pay, safe working environments, among others. It also enforces zero tolerance for forced or child labor, reinforcing its commitment to ethical labor practices (ibid). By integrating these criteria, Fairtrade® aims to create a comprehensive trading model designed to support farmers and promote sustainability.

In Bolivia, Law No. 338 of 2013[1] formally recognizes the *concept* of *fair trade* as "commerce based on dialogue, transparency and respect, seeking greater fairness in trade to achieve changes in the rules and practices of conventional commerce, contributing to integral development for living well, offering better trading conditions and safeguarding the rights of farmers, supported by informed and responsible consumers" (Art. 8). Article 7 of the law mandates that the Bolivian government "actively promote *fair trade* and establish a fair price that takes into account family labor and the operational and administrative costs involved in producing a good or service within a pluralistic economy. This fair pricing approach is designed to take into account the real costs of production and the well-being of farmers. As Jiménez and Sotomayor (2022) note, *fair trade* in Bolivia, both in its conception and in its certification, is a strategic model for reducing poverty among agricultural producers and promoting sustainable rural development.

The Bolivian National Coordinator for Fair Trade (CNCJ-B) reports[2] that Fairtrade®-certified production in Bolivia spans five key products: coffee, castaña (globally known as "Brazil nuts"), cocoa bean, handicrafts, and quinoa. In the southern Altiplano, RED-QUINUA serves as a network of Fairtrade®-certified quinoa producer associations. By 2022, nine quinoa producer associations in the region achieved this certification, demonstrating their commitment to sustainable practices and Fairtrade® standards. CNCJ-B data show that the number of certified quinoa farmers increased from 201 members in 2022 to 262 members in 2024, reflecting greater awareness of the benefits of certification, including higher prices, funding for community projects, and compliance with environmental and social standards. Production and land use data underscore Fairtrade®'s impact on the quinoa sector in the region: in 2022, certified quinoa production reached 1,916 metric tons, cultivated on 3,456 hectares of certified farmland.

Therefore, Fairtrade® certification provides two key mechanisms to improve the well-being of certified quinoa farmers. First, at the individual level, the "Fairtrade® Minimum Price" guarantees farmers a stable income by protecting them from market fluctuations and providing higher prices for organic quinoa. This stability would cover production costs and allow farmers to plan for essentials such as health, education and retirement. Second, at the community level, the "Fairtrade® Premium" is paid to farmer associations to fund community projects that improve production or local resources. According to 2024 Fairtrade® data[3], the minimum price for saponin-free quinoa is 2,250 USD per metric ton, rising to 2,600 USD for organic

[1] Law No. 338 of 2013: "Law of Indigenous Economic Organizations for the Integration of the Sustainable Familiar Agriculture".

[2] The following information was provided by Roxana Cayo, President of the Bolivian National Coordinator for Fair Trade (CNCJ-B), based on official information on Fairtrade in Bolivia from 2022 and 2024.

[3] See: https://www.fairtrade.net/standard/minimum-price-info. Accessed October, 2024.

quinoa, with an additional premium of 260 USD per metric ton in both cases, of which at least thirty percent must be spent on environmental sustainability initiatives.

Fairtrade® certification thus provides RED-QUINUA farmers with resources to improve their livelihoods, their environment and their communities. In the following sections, we explore the unique challenges and opportunities for RED-QUINUA members in the southern Altiplano, with a focus on the well-being of aging farmers, particularly women. This focus is essential because Fairtrade® standards, particularly the social standard, prioritize the well-being of farmers (Fairtrade, 2024). Evaluating social protection for both younger and older farmers is critical to understanding how Fairtrade® benefits, such as the minimum price and premium, could improve their quality of life compared to conventional farming and trading practices.

2.2 Pension System Affiliation from Household Surveys

To understand how quinoa farmers in the southern Altiplano prepare financially for old age, we first approximate their affiliation in the Bolivian pension system. Data from the Household Survey 2022 of the Bolivian National Institute of Statistics provides general information on pension system affiliation and is the only relevant information about retirement available from this official source. Table 1 shows pension system affiliation rates at the national level and specifically for the Bolivian Altiplano, which includes the western departments of La Paz, Oruro, and Potosí, regions where quinoa-producing communities are located. The table also disaggregates the data between the rural population and those actively engaged in agriculture. Panel (a) presents affiliation rates for the economically active population, while panel (b) focuses on the employed population. Our analysis focuses on individuals between the ages of eighteen and seventy, noting that agricultural workers often remain active beyond the legal retirement age.

In order to interpret Table 1, it is useful to understand the Bolivian pension system, officially known as the "Sistema Integral de Pensiones" (Integrated Pension System), established by Pension Law No. 65. The system has three components: *contributory, semi-contributory* and *non-contributory*. The contributory component consists of workers' contributions during their years of employment, which finance old-age pensions, disability pensions, or work-related death benefits for beneficiaries (Gamboa, 2023). These funds, which had been managed by private pension funds since 1997 (Bonadona, 2004), were transferred to public administration under the *Gestora Pública* in September 2022, following the 2010 Pension Law and Supreme Decree No. 4585 (Gestora Pública, 2023). Vila and Yanes (2024), citing Calderón (2022), state that the average monthly pension in the contributory component is three hundred and eighty dollars.

The *semi-contributory* component to people who have met the minimum contribution requirements, i.e. monthly contributions for ten years (Gamboa, 2023), and have reached the age of fifty-eight. These individuals receive both their own accumulated resources and a "solidarity fraction" financed by a *Solidarity Fund* financed by contributions on incomes above a legal threshold (ibid.). The *non-contributory* component primarily provides an *unconditional cash transfer* known as "Renta Dignidad" to those over sixty who have not met the contribution

requirements. By 2021, this transfer, valued at about fifty US dollars per month, reached ninety-one percent of those over sixty-five, with public spending on this transfer increasing from 0.3 percent of GDP in 2001 to 1.5 percent in 2021 (Vila & Yanes, 2024). Although Bolivia has one of the highest pension coverage rates in Latin America (Bosch et al., 2013), much of this coverage is through low non-contributory pensions, leading to increased public spending.[4]

Table 1 provides a detailed look at pension system affiliation in Bolivia, revealing significant disparities across demographic groups. Nationally and within the Altiplano, men consistently have higher participation rates than women, a gap that is particularly pronounced in rural and agricultural areas, where traditional gender roles and limited economic opportunities often limit women's access to formal employment and pensions. The table also highlights urban-rural differences: urban populations, with greater access to formal employment and social services, generally have higher affiliation rates. Conversely, rural populations, especially those working in agriculture, face challenges such as low incomes, limited financial services and informal employment that hinder their participation in the pension system. The Altiplano region, with its distinct characteristics, follows similar trends, with men having higher participation rates than women and rural, agricultural areas continuing to lag behind the national average.

Table 1: Affiliation to the Pension System based on Household Surveys

a) Pension System Affiliation Rate (%, of the Active Population)						
	National			Altiplano		
	Total	Rural	Agricultural	Total	Rural	Agricultural
Total	20.92	8.86	2.32	19.62	9.00	1.85
Men	22.30	10.52	3.56	22.47	12.48	3.36
Women	19.18	6.53	0.50	16.19	4.65	0.21
b) Pension System Affiliation Rate (%, of the Employed Population)						
	National			Altiplano		
	Total	Rural	Agricultural	Total	Rural	Agricultural
Total	22.23	9.00	2.32	20.69	9.09	1.85
Men	23.35	10.63	3.56	23.38	12.53	3.36
Women	20.76	6.69	0.50	17.35	4.73	0.21

Note: Affiliation to the contribution and semi-contributory components of the "Sistema Integral de Pensiones", currently publicly managed by Gestora Pública. Rates are calculated for people aged between 18 and 70.
Source: Own elaboration based on the 2022 Household Survey of the National Institute of Statistics of Bolivia.

Low rates of pension system affiliation in rural and agricultural areas, particularly in the Altiplano, reveal a gap in social protection. This trend raises concerns about inadequate retirement planning among these populations, increasing their vulnerability as they age. Limited access to formal employment and social benefits limits long-term savings and access to retirement resources. Moreover, the legal retirement age may not match the demands of rural and agricultural work, where farmers continue to work despite physical strain. The following sections examine factors that contribute to low affiliation rates and inadequate retirement planning, particularly in the quinoa production sector. Key issues include cultural attitudes toward re-

[4]Hereinafter, when we refer to "affiliation to the pension system" or "contributions to the pension system", we refer specifically to workers who seek to receive pensions from the *contributory* or *semi-contributory* component of the system through their affiliation and contributions to the current fund administrator, the Gestora Pública.

tirement, reliance on informal support networks, and the range of retirement options available to agricultural workers. By examining these elements, we gain insight into the unique challenges rural populations, and quinoa farmers in particular, face in securing their financial futures.

3 Factors Explaining the Low Affiliation to the Pension System

This section provides an overview of the factors that have been identified in the literature to explain the lack of pension or retirement plans. This review helps to explain, firstly and more theoretically, the low participation in the pension system among agricultural workers in the Bolivian Altiplano, as initially identified above, and also, as will be shown in section 5, among quinoa farmers in the southern Altiplano of Bolivia, especially women. Several factors have been identified in the literature to explain the absence of pension plans. These factors can be further divided into more income-related aspects and non-income-related aspects concerning individual choice, such as educational, psychological and cultural biases. The following review focuses on aspects related to individual decisions about retirement planning, in line with the motivation of this paper to identify areas where retirement planning can be promoted, as is done in section 6. We will first distinguish between income and non-income-related factors and then examine the latter category, with a particular focus on financial literacy.

3.1 Income-Related Factors

A conventional view of saving and investing for retirement suggests that individuals should smooth their consumption during periods of relatively high income to ensure that they can maintain their standard of living when their income falls or stops in retirement. Thus, a key challenge in retirement planning is to secure a stream of current income for long-term saving. As noted by Rosenzweig (2001), standard life-cycle savings models do not adequately account for long-term and retirement savings in low-income and unstable income environments. Guven et al. (2021) note that low-income and predominantly informal households are more likely to be rural and involved in agriculture. In the context of Bolivia, data from EMINPRO (2024) consistently show that the agricultural sector has the lowest income levels. Furthermore, agricultural farmers often lack access to formal banking services to save money between harvests and the next planting season (Brune et al., 2016). Issues of self-regulation and the risks associated with informal savings mechanisms often lead to the depletion of funds.

The timing of income flows has become an area of focus when it comes to generating savings. Brune and Kerwin (2019) have emphasized that the temporal structure of income can significantly influence saving and investment decisions in developing economies. Duflo et al. (2011) have also highlighted the importance of income flow timing, especially in the context of agricultural investments. This issue holds particular relevance for quinoa farmers, as noted by Colque (2015) in the context of agriculture in the Bolivian altiplano. Colque points out that one of the challenges for savings in the agricultural sector is the timing of income from crop

sales. Agricultural farmers receive their income after the harvest, resulting in excess liquidity that needs to be managed throughout the year. This requires a higher level of financial skill to optimally allocate farm income throughout the year, compared to a steady, monthly income stream. Thaler and Shefrin (1981) have argued that receiving a salary cumulatively rather than in monthly installments could lead to higher savings, as it would counteract the typical tendency to spend as much as is earned each month. However, this assumes that individuals have the necessary financial skills and knowledge to make the best financial decisions.

3.2 Non-Income-Related Factors

3.2.1 Behavioral Biases

Gustman and Steinmeier (2001) have noted that the classic standard life-cycle hypothesis, as proposed by Modigliani and Brumberg (1954), often requires adjustments to account for imperfect information and other complexities. Savings decisions may deviate from what would be expected under strict maximization, possibly because of imperfect information channels or other aspects of human behavior that need to be taken into account. Seminal work on long-term planning by Laibson (1997) and O'Donoghue & Rabin (1999) suggests that one of the most important biases is people's tendency to overvalue present benefits over future ones. Jacobs-Lawson and Hershey (2005) note that individuals differ in their degree of future planning, with some meticulously planning for the future and others "living in the present". This behavior has been conceptualized as *present bias* (Laibson, 1997; O'Donoghue & Rabin, 2015; Goda et al., 2019). As a result, individuals tend to behave as if they are using a hyperbolic discount function[5] (Laibson, 1997), preferring to spend in the present and potentially under-saving for retirement, thus facing greater difficulties in securing the necessary resources for retirement.

The loss aversion bias, another well-known behavioral tendency in retirement savings, is rooted in the concept that losses are felt more acutely than equivalent gains. According to prospect theory (Kahneman & Tversky, 1979), investors with this bias are averse to losing their gains, and their risk tolerance changes after experiencing losses. As a result, they often hold on to declining stocks while selling rising stocks. This behavior can lead to increased risk-taking after losses, which can ultimately lead to further financial setbacks. As a result, individuals affected by this bias may choose to keep their money in low-yielding accounts, such as deposits, and struggle to invest in higher-yielding options, such as mutual funds or pension plans, despite the potential for higher returns, albeit with the associated risk. In addition, the loss aversion bias can also create a status quo bias, leading individuals to take no action and thereby neglect retirement planning (Samuelson & Zeckhauser, 1988).

Despite the importance of behavioral biases in explaining variation in savings behavior relative to the traditional approach, it remains difficult to prove that interventions that focus solely on providing nudges to reduce the impact of these biases are fully effective and scalable. In

[5]Hyperbolic discounting refers to the behavioral tendency to value immediate, albeit smaller, rewards more highly than larger, long-term rewards.

an important recent paper, DellaVigna and Linos (2022) compared the effects estimated in the literature with the effects of implementing this type of intervention on a larger scale through public policy. They found that the effect on larger groups of individuals is much smaller, although still significant. A notable effort has been made by Azuara et al. (2021) to evaluate the effectiveness of different strategies to increase voluntary savings in Latin America. Their conclusion is that interventions that focus solely on nudges, such as text message reminders for retirement savings, are easy to scale and cost effective, but do not consistently produce significant effects. It is likely, as Machicado (2022) concludes, that interventions that exclusively target behavioral biases through nudges may be more effective in the execution phase of personal retirement planning (using reminders, incentives, and commitments) than in the formulation phase. Yeh (2022) suggests that addressing behavioral biases that affect long-term planning through financial education may be a better approach, as discussed below.

3.2.2 Financial Literacy

According to Lusardi (2015), traditional savings models assume that individuals possess the necessary skills and knowledge to formulate and implement savings plans. Making long-term savings decisions, especially those related to retirement, involves dealing with an inherently uncertain future, which requires at least a basic sense of financial risk management. These skills are based on an understanding of the workings of financial markets and financial instruments, as well as practical knowledge of concepts such as purchasing power and compound interest, and the ability to perform present value calculations. In addition to recognizing the impact of psychological biases on retirement planning, it is equally important to consider whether individuals have the basic financial literacy to make financial decisions.

The literature on financial literacy suggests that without a basic understanding of finance, including basic financial calculations and knowledge of important concepts such as interest rates, individual financial decisions become more difficult. Low financial literacy can lead to increased financial risks due to uninformed decisions, higher implicit transaction costs due to suboptimal financial product choices, and a lack of risk management skills. Lusardi and Mitchell (2007) argue that in today's increasingly complex financial landscape, individuals need to be able to make well-informed financial decisions. In a world with a growing number of financial options, such as cryptocurrencies, and increasing risks, the lack of comprehensive financial literacy is of paramount importance.

When making financial decisions about retirement and long-term savings, individuals often face more complex choices than they do in their day-to-day financial decisions. In light of this, there is a growing body of literature focusing on the impact of financial literacy levels on retirement and savings decisions. According to Beverly et al. (2003), financial literacy levels are associated with individuals' ability to manage their finances effectively. Therefore, financial literacy is expected to play a critical role in shaping financial well-being through retirement savings planning. When developing a long-term retirement savings plan, individuals should consider various calculations that require a basic understanding of concepts such as present

value, simple and compound interest, and among others.

In developed countries, Bernheim and Garrett (1996) and Bayer et al. (2009) were among the first to consider financial literacy as a key factor influencing the level of retirement savings. They found that employer-provided retirement education has a significant impact on individuals' participation in and contributions to retirement savings plans. On a global scale, Lusardi and Mitchelli (2007) found that households with low financial literacy, lacking even basic economic and financial knowledge, face significant challenges in saving and retirement planning. Other studies, including those by Alessie et al. (2011), Fornero and Monticone (2011), Klapper and Panos (2011), Sekita (2011), Boisclair et al. (2017), Niu and Zhou (2018), and Dhlembeu et al. (2022), have also supported this relationship in different regions of the world, both in developed and developing countries, establishing external validity about the impact of financial literacy levels on retirement savings.

Clark and Mitchell (2022) found that individuals with lower levels of financial literacy and annual income tended to have limited knowledge of basic pension features. Furthermore, Van Rooij et al. (2012) found a positive correlation between financial literacy and retirement planning, highlighting the importance of developing a savings plan. They found that individuals with high levels of financial literacy were more likely to invest their retirement savings in the stock market. The authors suggested that increased financial literacy reduces planning costs by overcoming economic and psychological barriers, enabling individuals to acquire information, make calculations, and create a plan. Their findings suggest that individuals who effectively calculate their retirement savings needs are more likely to create and adhere to a successful retirement plan. Additionally, Boisclair et al. (2017) highlight the strong link between retirement planning and financial literacy, finding that individuals who correctly answer basic financial literacy questions are 10 percent more likely to have retirement savings.

In the developing world, Moure (2016) found a correlation between the lack of retirement planning in Chile and low levels of financial literacy. Only forty-seven percent of the population understood compound interest, and only eighteen percent understood the concept of inflation. The study supports the idea that there is a significant relationship between financial literacy and retirement planning. This suggests that investing in financial education could have a significant impact on people's approach to retirement and, consequently, their ability to retire with sufficient financial resources. In Ghana, Sarpong-Kumankoma (2021) found that the majority of people lack basic financial literacy. Only twenty-seven percent of respondents were able to correctly answer three simple questions about inflation, compound interest, and risk diversification. In general, younger people, the elderly, women, those with lower incomes, and the less educated score the lowest on financial literacy assessments. In addition, there is a positive correlation between financial literacy and the likelihood of saving for retirement. In Puerto Rico, Castro-González (2014) found that many respondents lacked even the most basic economic understanding needed to make informed savings and investment decisions. When asked about retirement, about sixty percent had attempted to calculate the amount needed for retirement, but less than half had attempted to develop a retirement plan.

According to Azuara et al. (2021), small-scale interventions can effectively increase financial literacy and foster greater trust in financial institutions. In Chile, their intervention among students in technical-vocational schools demonstrated the significant impact of financial literacy. Participants not only improved their financial and pension knowledge, but also showed an increase in trust in the pension system of about ten percentage points. In a study for Canada although with interesting reflections for countries with high informality and self-employment such as Bolivia, Rostamkalaei et al. (2022) found that the self-employed were not significantly different from employees in terms of financial literacy. However, the self-employed were less likely to adopt financial practices that would benefit their long-term financial well-being, despite having similar levels of confidence in future retirement prospects.

According to Lusardi (2015), many individuals struggle with basic financial calculations and lack an understanding of basic financial concepts such as compound interest, nominal and real values, and risk diversification. More advanced financial knowledge is even less understood by the general population. This lack of knowledge is closely linked to inadequate retirement planning and underutilization of financial services, which ultimately affects individual well-being. Lusardi and Mitchell (2008, 2011) suggest that three simple questions can measure financial literacy and distinguish between different levels of financial sophistication. As outlined in Lusardi (2015), the design of these questions is guided by four principles: simplicity, relevance to everyday financial decisions, brevity, and differentiability. These criteria inform the methodological approach outlined in sections 5 and 6.

The measure of financial literacy proposed by Lusardi and Mitchell (2008, 2011) and assessed across countries over a decade shows that a significant proportion of adults lack the basic knowledge necessary to make sound financial decisions, particularly in the context of long-term planning. A global assessment found that two out of three people worldwide are not fully financially literate. This suggests that approximately 3.5 billion adults worldwide, particularly in developing countries, lack a basic understanding of financial concepts. In addition, women, those with lower incomes and those with limited education have the largest gaps in financial literacy. According to Klapper and Lusardi (2020), topics such as inflation and arithmetic applied to financial decisions are more familiar to people. Conversely, risk diversification is the least understood concept globally, with only thirty-five percent of adults answering the question correctly. The authors note that this is where the most significant differences between countries are observed, with only twenty-four percent of adults in Bolivia answering three out of five questions correctly.

Given the importance of financial literacy for long-term planning, particularly in the context of retirement, and the significant challenges posed by the existing evidence, especially in developing countries like Bolivia, it is important to highlight the potential ways in which financial literacy can affect long-term planning. Yeh (2022) presents empirical evidence on the potential links between financial literacy and retirement savings. Adopting the financial decision-making framework proposed by Daxhammer and Facsar (2017), the authors examine the impact of financial literacy at various stages, including information perception, information processing, and retirement plan execution. The results strongly suggest that financial literacy has a direct

impact on each stage in the context of retirement savings. Notably, the author also shows that financial literacy indirectly affects the execution stage of retirement planning by mitigating behavioral biases such as present bias and loss aversion, which are commonly recognized as barriers to maintaining long-term savings plans.

Yeh (2022) specifically outlines the channels through which individuals with higher levels of financial literacy can effectively plan for retirement in an informed and efficient manner. Long-term planning, particularly for retirement, should ideally begin with an estimate of an individual's post-retirement needs based on their desired standard of living. Having financial knowledge about future expenses, even if only approximate, can help anticipate and prepare for future financial needs. Therefore, individuals with high levels of financial literacy are more likely to understand and accurately calculate their future financial needs for retirement. In addition, financial literacy can help mitigate behavioral biases that often impede long-term planning. For example, individuals with a better understanding of financial matters are better able to anticipate their future needs and minimize biases toward current consumption. In addition, they are less likely to succumb to the loss aversion bias, as defined above, because they have a clearer understanding of future income relative to current consumption.

After exploring the ways in which financial literacy enables individuals to consider the future and make optimal decisions, Yeh (2022) also highlights that individuals with strong financial literacy are able to evaluate their retirement options through a cost-benefit analysis. A better understanding of interest rates and risks allows them to choose the financial option that best balances their needs, expected returns, and risk tolerance. In addition, financial literacy plays a critical role in the decision and execution of a retirement plan. Behavioral biases can hinder the implementation of individual plans, but increased financial literacy leads individuals to recognize the importance of securing their future and encourages greater discipline in saving based on their informed choices. Therefore, these identified pathways strongly support the contention that financial literacy, which includes knowledge of interest rates, inflation, risk-return trade-offs, present value, and retirement options, affects financial well-being by facilitating better future planning. Carpena and Zia (2020) also note that the awareness and attitudes cultivated through financial literacy act as conduits for simple financial practices such as budgeting.

Improving financial literacy depends on delivering specialized *financial education*. Carpena et al. (2011) found that while financial education does not immediately equip individuals with the ability to evaluate costs and rewards, which requires advanced numerical skills, it significantly improves their basic understanding of financial choices and their attitudes toward financial decisions. In a notable recent study, Kaiser et al. (2022), based on seventy-six randomized experiments involving a total sample of over one hundred sixty thousand individuals, demonstrated that financial education has positive causal effects on financial knowledge and behavior. Therefore, improving financial literacy through specialized education requires an initial diagnosis to identify individuals' knowledge gaps, enabling the design of targeted and effective content to improve retirement planning. There is also growing evidence on the impact of financial education on the savings and planning habits of agricultural workers. Sayinzoga et al. (2016) found that financial literacy training changed saving and borrowing behavior and had a positive effect

on new business creation among smallholder farmers in Rwanda.

3.2.3 Culture and Trust

It's important to recognize that cultural factors have a subtle yet profound effect on human financial behavior. Fuchs-Schündeln et al. (2020) found that culture plays a crucial role in shaping household saving habits. Descendants of cultures that prioritize saving or wealth accumulation tend to save more. In addition, Costa-Font et al. (2018) have found that cultural preferences contribute significantly to differences in saving behavior across countries, with their influence persisting for up to three generations. Furthermore, Lu et al. (2021) have found that cultures with a stronger emphasis on individualism have a positive effect on households' access to financial services while reducing reliance on informal networks and distrust of financial institutions. This is particularly noteworthy because Aymara populations tend to be culturally distrustful of financial institutions, leading them to rely on more informal savings methods, as evidenced by the focus group accounts in section 4 and Tassi (2015).

Koh et al. (2021) discovered that trust in both private and public financial agents is positively correlated with retirement savings, investments, and insurance holdings. Trust can enhance people's inclination to participate in a pension system and may also influence their saving and investment behavior within the system. Fisch and Seligman (2021) propose that both confidence and financial literacy play distinct roles, and each is connected to investment behaviors. Both studies emphasize that financial education can incorporate elements related to trust in financial institutions to promote voluntary savings. For instance, Galiani et al. (2022) conducted similar efforts with banking institutions in Peru, delivering talks on the subject, and found a favorable impact on levels of trust in financial institutions. Trust is currently a crucial aspect of the Bolivian pension system. Recent changes in the management of these funds may make potential contributors wary, as discussed in the next section.

4 Qualitative Exploration

This study began with a review of the literature on factors contributing to low participation in pension systems, as described in the previous section, and then conducted two focus groups with RED-QUINUA farmers in the southern Altiplano, as reported in this section. The purpose of these focus groups, which preceded the qualitative research described in the next section, was twofold: firstly, to explore further the reasons for low participation in the pension system as suggested by the household survey data described above; and secondly, to explore how quinoa farmers in the region plan to secure resources for their old age in the absence of pension support. In addition, the qualitative research provided insights into the living conditions of older people in RED-QUINUA-related communities, contrasting their retirement strategies with those of the wider elderly population through a combination of case studies and group discussions.

A structured protocol guided our focus groups, following the qualitative exploratory approaches

of Hennink (2013) and Krueger and Casey (2014). The process began with obtaining informed consent from participants to ensure ethical compliance, followed by the use of the discussion guide and a brief sociodemographic questionnaire. The discussion guide, organized thematically, addressed four core issues. First, participants shared their strategies for securing resources for old age, including their use of the pension system or alternative options based on local traditions and practices. Second, the discussion focused on the living conditions of older people in their communities, particularly how they support themselves when they are no longer able to work. Third, it explored the possibility of RED-QUINUA farmers allocating a portion of their income to long-term savings for financial stability in old age. Finally, it assessed participants' awareness and understanding of the Bolivian pension system - its requirements, services, and the broader financial system, including institutional offerings.

4.1 Discussion Group with Leaders of RED-QUINUA Associations

The first focus group was held on September 8, 2022, in Capura, a community within the municipality of Salinas de Garci Mendoza in Oruro, approximately 390 kilometers from La Paz. Capura has regional significance as a "model" community for Fairtrade®-certified quinoa associativity in the southern Altiplano of Bolivia. The Ecological Farmers Association of Capura (AIPROCA), which has 45 members, plays a central role in the community, promoting cooperation in quinoa cultivation, camelid breeding, and handicraft production. AIPROCA specializes in the organic production and marketing of quinoa (Chaca-Mamani, 2023) and also provides nutritious quinoa-based products for school breakfast programs in local public schools. The focus group in Capura attracted 33 participants - 23 men and 10 women - who volunteered to participate. This group included not only AIPROCA members, but also leaders from RED-QUINUA associations in neighboring communities. This diverse composition enriched the discussion and provided a broad perspective on regional practices and challenges related to retirement planning, sustainable agriculture, and community resilience.

Participants in this first focus group emphasized that their personal planning is primarily focused on short- and medium-term needs, particularly those related to the immediate demands of quinoa production for the upcoming agricultural seasons. As discussed in section 2, quinoa-producing communities in Bolivia's southern Altiplano are facing significant challenges, including a sharp decline in international quinoa prices over the past decade (Collao & Muriel, 2024; Aliaga et al., 2024) and the escalating impacts of climate change (Collao & Muriel, 2024). These pressures have forced farmers to prioritize current concerns, a behavior reflected in the focus group discussions. This focus on immediate production challenges is consistent with the phenomenon of "present bias," as discussed in section 3 and explored by Goda et al. (2015), in which individuals disproportionately prioritize short-term needs at the expense of personal long-term planning. Our discussions revealed that long-term strategies, especially those related to securing resources for retirement, are often postponed or overlooked by quinoa farmers. This tendency underscores a critical gap in retirement preparedness within these communities, exacerbated by the precarious economic and environmental conditions they face.

The low participation in the pension system among the focus group participants highlights a significant gap in retirement planning. Only about one percent of the participants reported membership in the pension system, and even fewer were active contributors. In particular, their membership was based on previous employment in non-agricultural sectors rather than voluntary enrollment as self-employed or independent workers. This trend reflects a broader pattern of occupational diversification within quinoa-producing communities (Jiménez & Romero, 2022), where individuals are increasingly supplementing their agricultural income with commercial and professional activities. Interestingly, some members of these communities have pursued professional careers outside of agriculture. For example, focus group participants affiliated with the Bolivian pension system were affiliated because they were also primary and secondary school teachers. In these cases, it was their teaching rather than their agricultural work that secured their access to the pension system. This finding underscores the role of occupational diversification in shaping access to formal financial and pension systems in rural areas.

The majority of participants who were not affiliated with the Bolivian pension system cited several barriers to participation. Chief among these was a lack of awareness of the requirements for affiliation, the amount and frequency of contributions, and the benefits provided. In addition, some participants who had attempted to join in the past reported feeling "excluded," mistakenly believing that only professionals could join the system, a misconception since professional status is not a requirement for membership (Gamboa, 2023). Others expressed concern about meeting the minimum contribution requirements for receiving a pension, which require 120 contributions or ten years of monthly payments (ibid.). This requirement was seen as particularly challenging for individuals with irregular or seasonal income patterns. Furthermore, participants with some knowledge of the pension system highlighted uncertainty and mistrust regarding the transition of pension fund management from private entities to the state-run *Gestora Pública*. This lack of clarity and trust in the new system further discouraged membership, revealing both informational and systemic barriers to broader participation.

The focus group also explored the living conditions of elders in quinoa-producing communities, revealing a challenging reality. Participants emphasized that most elders in these communities live with minimal resources, relying heavily on small livestock, direct consumption of their agricultural products, and financial or in-kind support from their children, many of whom have migrated to urban centers or abroad. It has been observed that quinoa farmers who previously migrated to urban areas in search of alternative employment often return to their communities in old age. These returnees typically depend on a combination of small livestock and limited rental income, but mostly continue to live at a subsistence level, covering only basic food and essential living expenses. This situation is exacerbated by broader socio-economic challenges in the region. According to the *Municipal Atlas of Sustainable Development Goals in Bolivia* (Andersen et al., 2020), the municipalities where RED-QUINUA-producing communities are located, Salinas de Garci Mendoza and Pampa Ullagas, are characterized by high levels of unmet basic needs, affecting 82% to 85% of the population, respectively. While age-disaggregated data is not available, testimonies from focus group participants clearly indicate that the elderly are among the most vulnerable groups in these communities.

The focus group discussions also explored the potential for long-term savings to ensure financial security during retirement and the strategies available to quinoa farmers to achieve this goal. Participants acknowledged the significant challenges posed by current economic conditions, including declining quinoa prices and reduced incomes, which make saving for retirement particularly difficult. Despite these obstacles, however, there was some recognition of the importance of planning for the future, both for their own well-being and that of their families. Some farmers cited the example of miners in nearby communities who receive retirement benefits after contributing to the pension system. While the retirement income miners receive is often modest, it provides a reliable source of financial support in old age. This example resonated with participants as a potential model for promoting greater retirement security among farmers. Participants emphasized the importance of encouraging younger farmers to proactively join and contribute to the pension system, highlighting this as a key step towards ensuring a basic income in retirement. At the same time, they stressed the need to develop alternative strategies for older farmers who are approaching retirement age but may have difficulty meeting the minimum contribution requirements of the pension system. This dual approach - targeting both younger and older generations - was seen as essential to address the systemic gaps in retirement planning within quinoa farming communities.

To assess participants' financial knowledge, we administered a financial literacy assessment following the focus group, focusing on two dimensions proposed by Lusardi (2015). Two-thirds of the participants correctly answered a question about interest rates, demonstrating a basic understanding of the concept. However, only 17% answered correctly when asked a more complex question about the interplay between inflation and compound interest, suggesting gaps in more advanced financial literacy. We also explored participants' access to and perceptions of the financial system. Participants largely associated the financial system with credit rather than savings. This is consistent with Tassi's (2015) findings, which suggest that Aymara communities tend to favor bank borrowing over saving, due to a lack of trust in financial institutions. In our focus group, many participants expressed skepticism about the benefits of savings accounts, perceiving them as serving banks' interests more than their own, especially given the low interest rates offered. Despite this distrust, participants acknowledged the risks associated with informal savings methods, such as keeping money at home or informal rotating savings groups (*pasanakus*). In addition, geographic distance from banks was identified as a significant barrier, limiting their ability to engage with formal financial services on a regular basis. This combination of financial skepticism and logistical challenges underscores the need for tailored financial education and improved access to banking in rural quinoa-producing communities.

4.2 Discussion Group with Women Quinoa Farmers

The first focus group provided valuable insights for the study, but revealed a significant gender gap in participation, with far fewer women participating in the discussions despite the research team's efforts to encourage inclusivity. This pattern is consistent with Nina's (2009) findings in the Bolivian Altiplano, where women's participation in community meetings is often limited

and men typically dominate public discussions. To address this imbalance, a second focus group was organized on October 5, 2022, exclusively for women quinoa farmers from the region. This virtual meeting brought together five women, all members of farmers' associations within RED-QUINUA. Among the participants were two vice presidents of their respective associations, reflecting their leadership roles in the community. Although smaller than the first focus group, the women-only session allowed for more focused and in-depth discussions. This setting allowed participants to delve deeper into the topics outlined in the discussion guide, offering nuanced perspectives on retirement planning, financial strategies, and the challenges women face in quinoa production. The insights gained from this group not only reinforced the findings of the first focus group, but also provided a richer understanding of gendered experiences and priorities within quinoa farming communities.

In both focus groups, it became clear that participants generally lacked formal retirement or long-term savings plans. However, this does not mean that the women in the second focus group avoid planning altogether. Women in the second group discussion shared past practices that illustrate their efforts to manage risks and uncertainties in quinoa farming. For instance, the women mentioned that their families traditionally reserved a portion of their annual quinoa harvest as a safeguard against potential low yields in the following season or unexpected drops in market prices. Interestingly, this practice appears to have diminished over time, particularly during the period of rising quinoa prices a decade ago. During that boom, farmers began selling almost their entire production, retaining only a small amount for seed extraction. As Duran (2019) notes, quinoa farmers in the region now tend to store their harvest not for long-term risk management but to sell later within the same agricultural cycle when market prices improve. This shift reflects a transition from medium to long-term precautionary strategies to shorter-term market-responsive behavior, likely driven by economic pressures and changing market dynamics. These insights highlight both the adaptive strategies and the vulnerabilities of farmers as they navigate fluctuating conditions and limited financial planning resources.

In discussing retirement and living conditions for the elderly, the women in the focus group highlighted two critical cultural and economic realities in their communities. First, they emphasized that the concept of "retirement" as a distinct phase of life that begins at a certain age does not fit their context. Instead, there is a widespread expectation that individuals will continue to work well into old age to support themselves financially. Although participants acknowledged the inevitable decline in physical abilities with age, they noted that many older people supplement their income by renting out property, which serves as a partial financial buffer when active work becomes less feasible. Second, the women pointed to a deeply ingrained cultural expectation that children will care for their aging parents. This intergenerational support serves as an important sociocultural mechanism to compensate for the lack of formal retirement plans or long-term savings. Children are expected to provide the resources necessary to meet their parents' basic needs, reflecting a reliance on family networks rather than institutional systems to ensure financial security in old age. These findings underscore the importance of family and asset-based strategies in compensating for the absence of formal pension systems. They also highlight the potential vulnerability of individuals who lack these family or asset-based

supports, pointing to gaps in financial security for the elderly in these communities.

The women expressed concern about the challenges of saving, especially given the difficulties they face in generating savings from quinoa sales. They noted that their income is affected by both price and quantity, both of which have declined in recent years. Farmers reported lower quinoa yields, which they attributed to climate change and soil degradation, which continue to affect land productivity. In addition, the price of quinoa has fallen significantly and steadily in recent years. In the past, savings were often used to purchase land and livestock. During the quinoa boom, additional funds were invested in agricultural machinery, such as tractors. However, there was no evidence or testimony that savings accumulated during the boom were specifically set aside for retirement.

The group discussed their familiarity with and affiliation with the Bolivian pension system. While participants acknowledged that they had received information about the pension system in some quinoa-producing communities, they expressed that pension funds were not an attractive savings option for two main reasons. First, as farmers, they felt they lacked the financial resources to make regular monthly contributions to the pension system. Second, they were concerned about the potential loss of funds over time. For example, one participant remarked, "I will lose my savings when I die and not even my children will be able to get this money back," reflecting a lack of interest in this option. Another participant shared that she had contributed to pension funds in the past, but her membership was mandatory because she was working in a non-agricultural job. Since becoming self-employed, she has stopped contributing. Overall, and as in the first group, participants expressed mistrust of pension funds and uncertainty about the transition to the new public administration overseeing the pension system.

Finally, the discussion shifted to access to financial institutions. Contrary to common perceptions of limited financial access in rural areas, participants revealed that quinoa farmers have considerable access to banking services. According to two participants, over ninety percent of the people in their communities have a savings account, reflecting a high level of financial accessibility. This accessibility was attributed to the export of quinoa, as farmers often needed a bank account to receive payment for their crops. However, participants noted that their engagement with financial institutions was primarily related to loans rather than savings. When discussing where to keep their savings, participants expressed a preference for alternatives to banks, citing unattractive interest rates and potential fees as key deterrents. In addition, limited physical access to banks in rural areas was highlighted as a challenge, increasing the cost and inconvenience of using formal banking systems.

The focus groups provided valuable insights into the financial realities and perceptions of quinoa farmers in the southern Altiplano. While participants reported access to banking services, primarily driven by the demands of quinoa exports, financial institutions were largely viewed as sources of credit rather than savings, with unattractive interest rates, fees, and limited rural access identified as key barriers. Concerns about affordability, loss of savings upon death, and uncertainty about the transition to the new public pension administration led to doubts about the Bolivian pension system. Cultural norms and economic constraints also influenced

retirement planning, as most participants expected to work into old age and relied heavily on intergenerational support from children. Although participants acknowledged the financial challenges posed by declining quinoa prices, climate change, and soil degradation, savings during the quinoa boom were primarily invested in land, livestock, and machinery rather than long-term retirement planning. These findings highlight the need for targeted financial education, trust-building initiatives, and tailored financial products to improve farmers' long-term financial security and retirement preparedness.

5 Diagnostic Survey

5.1 Survey Design and Methodology

Following the initial stages of the research process, a specific questionnaire was developed to conduct a survey of households belonging to quinoa producer associations within RED-QUINUA in the southern Altiplano of Bolivia. The questionnaire covered nine key thematic areas: socio-economic factors, agricultural production, education, employment, gender, health, financial literacy, pensions and housing. Designed as a household survey, it focused on issues relevant to the living and production conditions of quinoa farmers in the region. This paper focuses on the financial literacy and pensions sections of the survey, while a more detailed analysis of the other sections is available in the *Development Research Working Paper Series* published by the Institute for Advanced Studies for Development (INESAD)[6] as part of the IDRC-funded project to which this paper also contributes.

The survey was conducted in eleven communities in the Intersalar region of Bolivia, located between the Uyuni and Coipasa salt flats on the border of the departments of Oruro and Potosí. These communities are home to eight RED-QUINUA quinoa farmer associations certified to Fairtrade® standards, as detailed in Figure A.3 and Table A.1 in the Appendix. Data collection was carefully designed to include households of members of the associations, with each association providing membership lists to guide the field team. Using a tracking approach, the team identified and interviewed association members first, followed by non-members within each community. This approach enabled the survey to gather data from both RED-QUINUA association members and other community residents, offering insights into registered members and non-members as of June 2023. This paper focuses exclusively on the results pertaining to members of the RED-QUINUA quinoa farmer associations.

As discussed in section 2, records from the Bolivian National Coordinator for Fair Trade (CNCJ-B) indicate that in 2022, Bolivia had nine Fairtrade®-certified quinoa associations, representing 201 farmers. By 2024, this number had increased to 262 registered farmers. In our 2023 survey, we interviewed 298 individuals aged 18 to 70 from households belonging to RED-QUINUA, i.e. Fairtrade®-certified, associations in the Oruro and Potosí regions. Thus, our survey provides a comprehensive snapshot of Fairtrade®-certified quinoa farmers in the southern Altiplano

[6] To access the publications, please visit https://www.inesad.edu.bo/category/documentos/.

of Bolivia. The slight discrepancy between the CNCJ-B 2022 records and our 2023 survey results—reflecting the absence of one association—is due to its decertification prior to our survey, as confirmed by Eusebio Encinas, president of RED-QUINUA. This change underscores the dynamic nature of quinoa production associations in the region and the rigorous standards required for quinoa certification.

Before analyzing the results on financial literacy and retirement savings among households associated with the aforementioned associations, Table 2 provides an overview of the general characteristics of the respondents. The first column describes the characteristics of individuals in communities with at least one association affiliated with RED-QUINUA, while the second column describes households with at least one member affiliated with these associations. Both columns include data for individuals between the ages of eighteen and seventy, covering production and employment, education, financial inclusion, and retirement - the latter two being the focus of this section. The data show a fairly even gender distribution, with an average age of 42 for respondents. In addition, less than five percent of respondents are not fluent in Spanish and less than seven percent report literacy problems. In terms of marital status, about three-quarters of respondents are married.

Table 2: General Descriptive Statistics

	(1) RED-QUINUA Communities			(2) RED-QUINUA Members		
Variable	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Woman	0.496	0.501	383	0.480	0.500	298
Age	41.66	13.64	383	42.27	13.45	298
Speaks Spanish	0.963	0.188	383	0.956	0.205	298
Married	0.744	0.437	383	0.742	0.438	298
Income Earner	0.911	0.285	383	0.916	0.278	298
Illiterate	0.073	0.261	383	0.060	0.239	298

Source: Own elaboration based on data from the survey of quinoa farmers conducted by INESAD.

5.2 Results on Financial Literacy and Pension-Related Knowledge

Our survey included a special section to assess financial literacy. To do so, we used two international standards: the OECD/INFE's *International Adult Financial Literacy Survey* (OECD, 2023) and the Andean Development Corporation's (CAF) *Financial Capabilities Survey*, previously conducted in Bolivia in 2013 (Mejía et al., 2015) and other Andean countries. Both surveys assess adult financial literacy across specific dimensions, including: *i)* understanding the impact of inflation on purchasing power, *ii)* recognizing when interest rates apply, *iii)* calculating simple interest and estimating compound interest, *iv)* understanding the financial relationship between risk and reward, *v)* interpreting inflation in specific scenarios, and *vi)* risk diversification. In addition, we included a more concise measure of financial literacy developed by Klapper, Lusardi, and Van Oudheusden (2015), which focuses on four dimensions: risk diversification, inflation, compound interest, and numeracy. We have adapted the numeracy

dimension to include a question about the relationship between interest rates and inflation, given its importance for long-term planning, as discussed in section 3.

The data in Figures 1 and 2 show the distribution of responses to the financial literacy questions, categorized into *non-responses, incorrect responses,* and *correct responses.* Panel (a) of Figure 1 presents the results for the first question, which assessed understanding of inflation's impact on purchasing power. This question evaluated whether respondents understood that a fixed amount of money loses purchasing power over time in a no-interest scenario due to annual inflation. Overall, only fifty-four percent of respondents answered this question correctly, as shown in panel (a) of the figure. A gender-based analysis in panel (a) of Figure 2 reveals that only forty-six percent of women responded correctly, compared to sixty-one percent of men. Given the gender-balanced nature of the survey sample, this marks the first indication of a gender gap in basic financial literacy among RED-QUINUA farmers in the southern Altiplano.

The next question assessed respondents' ability to identify whether an interest rate was involved in a given scenario. They were presented with a situation in which one person lends another a fixed amount of money and receives the same amount back the next day. Panel (b) of Figure 1 shows that eighty-five percent of respondents correctly recognized that no interest was involved in this transaction. The gender analysis in panel (b) of Figure 2 shows that eighty-eight percent of men and eighty-one percent of women answered correctly. These results indicate that most quinoa farmers can accurately identify the application of interest in everyday financial situations. However, this contrasts with the results of the next question, which asked respondents to perform simple interest rate calculations.

The ability to identify the application of interest contrasts sharply with the ability to perform a simple interest calculation. Respondents were presented with a scenario involving a principal of one hundred monetary units earning an annual interest rate of two percent. They were asked to calculate the total amount after one year, that is, one hundred and two monetary units. As shown in panel (c) of Figure 1, only fourteen percent of respondents answered this basic calculation correctly. The majority answered incorrectly (fifty-nine percent) or did not answer at all (twenty-seven percent). The gender analysis in panel (c) of Figure 2 shows similar correct response rates for men (fifteen percent) and women (thirteen percent), although a higher proportion of women did not respond. These results indicate that calculating simple interest is a significant challenge for both male and female quinoa farmers in the region.

The next question assessed financial literacy in relation to compound interest. Respondents were asked to determine the result of applying a two percent annual interest rate to a fixed sum of one hundred monetary units over five years. The options were: more than one hundred ten, exactly one hundred ten, or less than one hundred ten monetary units. Panel (d) of Figure 1 shows that fifty-seven percent of respondents correctly answered that the amount would be more than one hundred ten monetary units. The gender analysis in panel (d) of Figure 2 shows that women had a slightly higher rate of incorrect answers than men, at forty-one percent compared to thirty-eight percent. Although this question was less challenging than the previous one, the results indicate that about two-fifths of the farmers had difficulty handling compound interest.

It is likely that without the multiple choice options, the correct response rate would have been lower given the difficulties observed with the previous question requiring direct calculations.

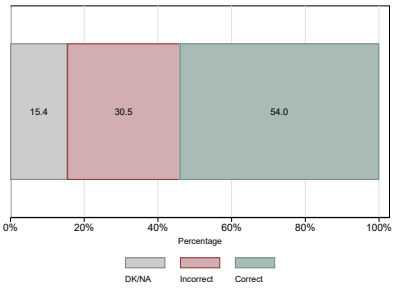
The survey then included a series of short questions to assess understanding of financial risk and return, the impact of inflation on personal finances, and risk diversification. The first question assessed respondents' understanding of the basic relationship between return and risk, specifically whether high returns imply high risk. Fifty-seven percent of respondents correctly identified this positive relationship, as shown in panel (e) of Figure 1. The gender analysis in panel (e) of Figure 2 shows that women had a lower correct response rate (fifty-three percent) than men (sixty-one percent). The second question asked whether higher inflation leads to an increase in the cost of living. Panel (f) of Figure 1 shows that seventy-three percent of respondents answered correctly, with no substantial gender differences observed. The final question assessed whether diversification reduces the likelihood of financial loss. Panel (g) of Figure 1 shows that fifty-nine percent of respondents correctly answered that diversification reduces risk. While the percentage of correct responses was similar for men and women, the gender breakdown shows that women had a higher percentage of non-responses.

The final financial literacy question addressed the relationship between interest rates and inflation, asking respondents to assess the impact of a one percent interest rate and a two percent inflation rate on the purchasing power of personal savings over one year. Panel (h) of Figure 1 shows that only forty-nine percent of respondents correctly identified that the purchasing power of their savings would decrease under this scenario. Forty-one percent answered incorrectly and ten percent did not respond. The gender analysis in panel (h) of Figure 2 shows that women had a lower correct response rate (forty-four percent) than men (fifty-three percent), and women's non-response rate was nearly double that of men. These results highlight the difficulty of understanding the interrelated nature of financial concepts, particularly when making long-term decisions, and underscore the greater challenges women face in this regard.

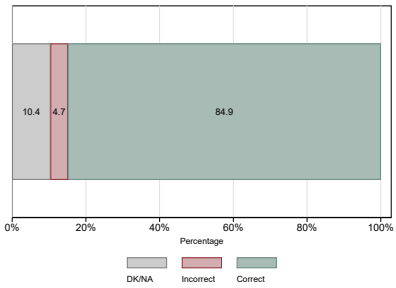
Our assessment of the financial literacy of RED-QUINUA farmers provides valuable insights for designing the pilot intervention discussed in the next section. A significant proportion of farmers struggle with basic financial tasks, such as calculating simple interest rates in everyday scenarios. In addition, many have difficulty relating and applying basic concepts such as interest rates and inflation, skills that are essential for effective long-term financial planning and safeguarding personal savings over time. While some farmers demonstrate an understanding of interest rates, their understanding wanes when confronted with more complex topics, such as compound interest. In addition, only sixty percent of respondents answered correctly on topics such as inflation, the risk-return relationship and risk diversification. These findings suggest that while a basic level of financial literacy exists, critical areas such as understanding interest rates and inflation require targeted reinforcement. The results also reveal a systematic gender knowledge gap: women face greater challenges than men in understanding and applying basic financial principles. Addressing these disparities will be key to promoting financial literacy among all RED-QUINUA farmers, as shown below.

Our survey included a section on retirement and the strategies farmers planned to use, if any,

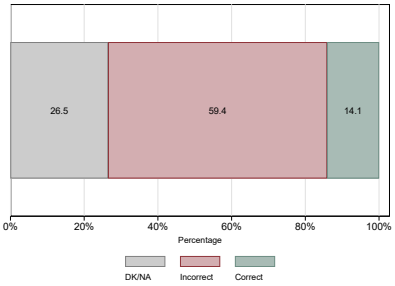
Figure 1: Financial Literacy among RED-QUINUA Farmers in the Southern Altiplano



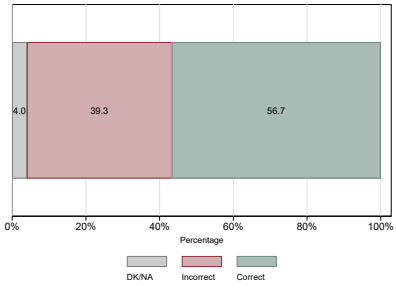
(a) Question on Annual Inflation



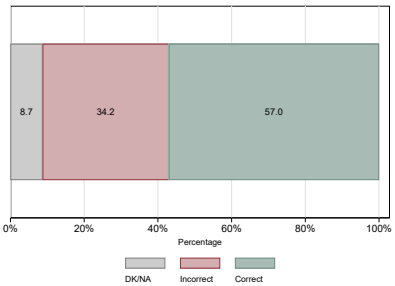
(b) Question on Interest Rate Identification



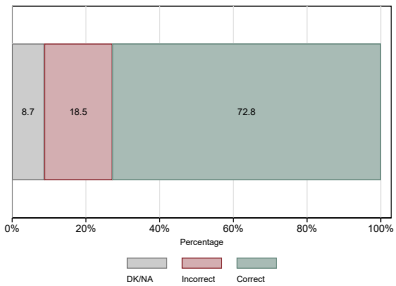
(c) Question on Interest Rate Calculation



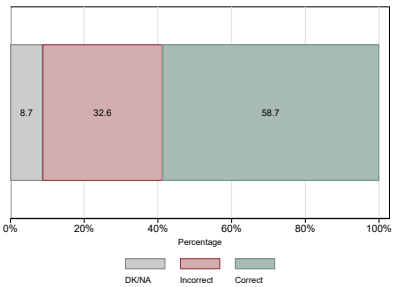
(d) Question on Compound Interest



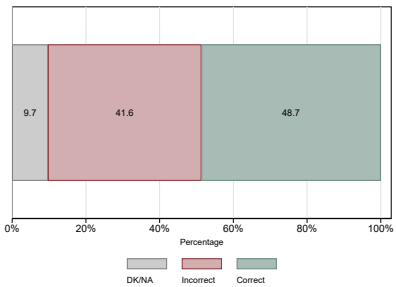
(e) Question on Relation Risk and Return



(f) Question on Inflation and Cost of Living



(g) Question on Risk Diversification

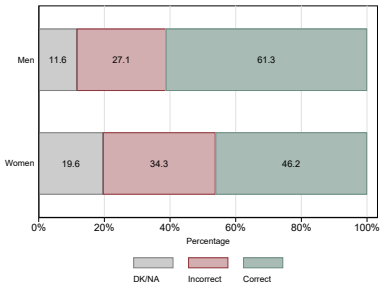


(h) Question on Inflation and Interest Rate

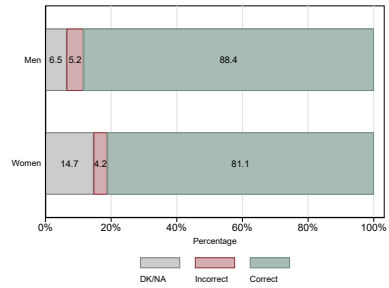
Note: Two hundred and ninety-eight observations.
Source: Own elaboration based on data from the survey of quinoa farmers conducted by INESAD.

to secure resources for retirement. One question asked farmers about the retirement plan or strategies they were considering at the time of the survey. The options included: *i)* receiving non-contributory cash transfers from the government starting at age sixty; *ii)* receiving a pension from the individual contributory component of the pension system (as discussed in section 2);

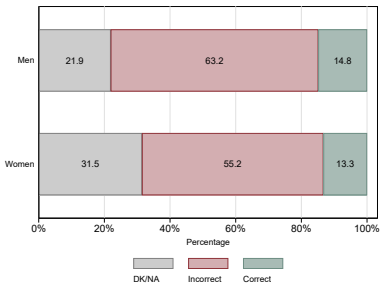
Figure 2: Financial Literacy among RED-QUINUA Farmers by Gender



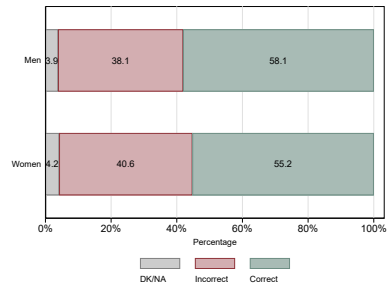
(a) Question on Annual Inflation



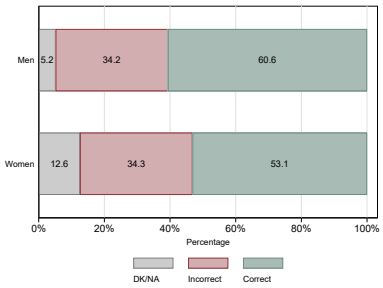
(b) Question on Interest Rate Identification



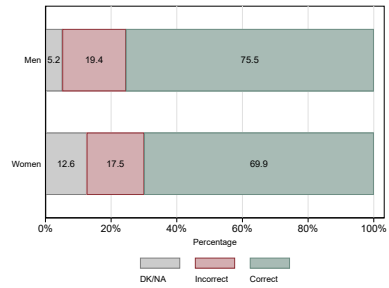
(c) Question on Interest Rate Calculation



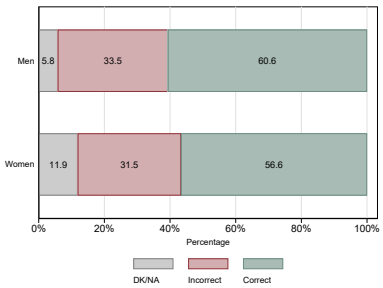
(d) Question on Compound Interest



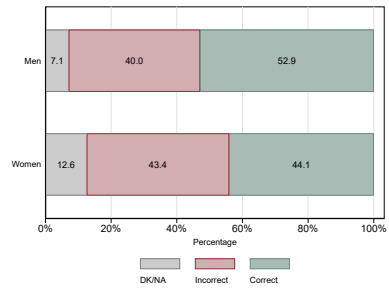
(e) Question on Relation Risk and Return



(f) Question on Inflation and Cost of Living



(g) Question on Risk Diversification



(h) Question on Inflation and Interest Rate

Note: Two hundred and ninety-eight observations. One hundred and fifty-five males and one hundred, and forty-seven females.
Source: Own elaboration based on data from the survey of quinoa farmers conducted by INESAD.

iii) selling assets such as livestock, land, or vehicles; *iv)* receiving income or interest from their own assets; *v)* relying on family support; and *vi)* using personal savings or informal mechanisms such as *pasanakus* (informal rotating savings groups). Based on the results of the qualitative

research in the previous section, two additional options were included: *a)* continuing to work indefinitely with no defined retirement age, and *b)* not having a retirement plan or not thinking about retirement. Figure 3 illustrates the strategies identified and shows the percentage of respondents who considered each to be among their top three sources of retirement resources.

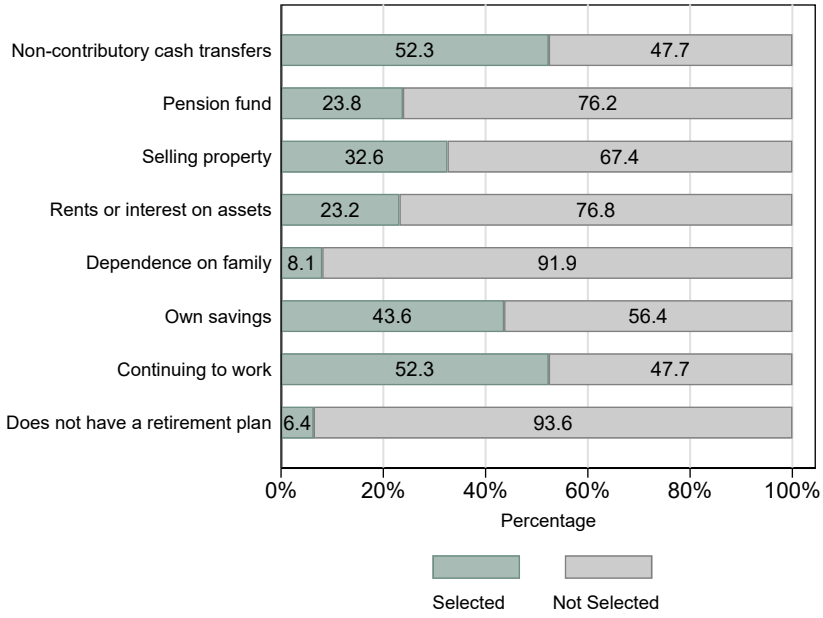
Figure 3 shows that fifty-two percent of respondents consider non-contributory cash transfers, such as the Renta Dignidad in Bolivia, as one of their sources of retirement income. Despite being a guaranteed source of income in old age, forty-eight percent do not include this option in their retirement portfolio. This may reflect a lack of awareness of the existence of this transfer or, as mentioned in the focus groups, a perception that the amount provided is insufficient to meet basic needs in old age. In contrast, twenty-four percent of respondents plan to rely on retirement income from their individual contributions to the Bolivian pension system. However, this is higher than the effective enrollment rate of thirteen percent in the pension system among the quinoa farmers surveyed. According to the focus groups discussed in section 4, this low effective participation is primarily due to secondary employment rather than self-identification as independent workers. The gender analysis in Figure A.4 in the annex shows that women are less likely than men to include the pension system in their retirement plans.

The data also show that thirty-three percent of respondents intend to sell their property to finance their retirement, while twenty-three percent plan to rely on rental income or interest from property or investments. In addition, forty-four percent of respondents plan to use personal savings as a source of retirement income. Now, building on the focus group findings presented in section 4, the survey results show that a substantial proportion of respondents, fifty-two percent, express a clear intention to continue working as a source of income well into their later years. This trend, visualized in the seventh bar of Figure 3, reflects a broader cultural and economic reality identified during the focus groups: many individuals in these communities expect to work into old age, often in physically demanding activities such as agriculture. This underscores a pervasive lack of preparedness for retirement. In addition, six percent of respondents admitted to having no retirement plan or even considering retirement, highlighting a critical gap in long-term financial planning.

6 Pilot Intervention on Financial and Retirement Education

The previous sections have highlighted two key findings: a significant lack of retirement planning among quinoa farmers in Bolivia's southern Altiplano, and the potential for financial education to support the development and implementation of retirement plans for greater financial security in later years. This section presents the results of a pilot intervention focused on financial education and retirement planning, which aimed to improve financial literacy and encourage the creation of comprehensive retirement plans among these farmers.

Figure 3: Pension Portfolio among RED-QUINUA Farmers in the Southern Altiplano



Note: Two hundred and ninety-eight observations.
Source: Own elaboration based on data from the survey of quinoa farmers conducted by INESAD.

6.1 Design and Implementation of the Pilot Intervention

As part of this study, a pilot intervention was designed and implemented to deliver an educational workshop on financial literacy and retirement planning. The content was developed on the basis of the results of the diagnostic survey reported in the last section, with financial literacy and pension knowledge measures informing the design. The workshop, designed by Aramayo, Claure, and Marconi (2024), specialists in financial education with a gender focus in Bolivia, used an *experiential* and *participatory* training method. This approach built on participants' existing knowledge, encouraged active engagement through group discussions on real-life scenarios, reinforced prior knowledge while introducing new concepts, and developed critical analysis skills through practical applications. The workshop structure followed a training sequence of *action, reflection, new information* and *application*.

It comprised four training components, each developed using a standardized methodology:

- Topic 1: Income, Consumption and Savings,
- Topic 2: Investment of Savings and Return on Investment,
- Topic 3: Inflation and Time Value of Money,
- Topic 4: Pension, Long-term Savings and Pension System.

The first topic began with a discussion and brainstorming session on personal and household budgets to identify the basic elements, income, expenses, and savings, and their classifications

based on participants' experiences. Small groups then analyzed a case study with specific amounts and developed a budget based on this scenario, which was then reviewed by the entire group. The training team reinforced the budget concepts with teaching materials that expanded on the group's findings and filled in any gaps in understanding. To solidify the knowledge gained, the session concluded with a discussion of future budget development, emphasizing the role of budgeting in achieving household and personal financial stability.

The second topic focused on investing savings and the returns on such investments. It began with a discussion of personal or family financial goals, with participants sharing planned purchases for the year. This led to a reflection on achieving these financial goals and the role of short-, medium-, and long-term savings in achieving them. The training team highlighted the reasons for saving, the importance of developing a savings habit, and introduced the key distinction between saving and investing. The session also explored different savings and investment options. Finally, participants completed hands-on exercises using different interest rates to evaluate investment options and maximize returns by applying the concepts discussed.

The third topic covered inflation and the purchasing power of money. It began with a discussion of participants' observations of price fluctuations, particularly the rising costs of basic items. The group identified products that had seen the most significant price increases in recent months and discussed the impact on their budgets and the potential consequences for the national economy. A comparison exercise illustrated what one hundred monetary units could buy on the day of the training and one year later, helping to visualize the impact of inflation. The training team then explained the concept of inflation and its impact on purchasing power. Finally, strategies for mitigating the effects of inflation on personal finances were discussed, emphasizing the erosion of the value of money over time and the importance of investing to protect against further losses.

The fourth topic focused on pensions, retirement savings, and the Bolivian pension system. The discussion began with case studies on preparing for retirement, asking participants to assess their financial readiness for retirement, potential sources of income if they were unable to work in old age, and whether they had an emergency fund for financial security. The training team introduced key concepts related to the pension system and retirement savings, building on participants' existing knowledge while providing relevant information. The session concluded with strategies for achieving financial stability in old age, emphasizing pension preparation as an essential form of savings. This topic was supplemented by the distribution of the *Guide for Farmers and Self-Employed Workers on the Bolivian Pension System*, developed by Escalante (2024) as part of this project.[7] This guide informs quinoa farmers about how to join the pension system as "independent workers," a category in which they make their own contributions.

The guide explains the structure of the Bolivian pension system in a very educational way, detailing the contributory, semi-contributory, and non-contributory systems based on total contributions, and outlining the benefits available under each system. It also describes the requirements and steps for joining the pension system as an independent worker, along with

[7]To access this Guide, please visit: https://www.inesad.edu.bo/2024/06/28/.

information on the *Gestora Pública* offices throughout the country that currently administer the pension system. Finally, the guide covers how to make contributions as a self-employed worker, including contribution amounts based on income, payment methods, and authorized financial institutions. This information is based on Gamboa (2023), which provides a deeper analysis of this type of affiliation for quinoa farmers.

The pilot intervention was delivered as a one-day workshop that was conducted four times using the same methodology. Each workshop lasted seven academic hours and involved a total of ninety-one participants. Three sessions were held in Challapata, the main quinoa hub in Bolivia's southern Altiplano (Albarracín, 2016; Collao & Muriel, 2024), and one in Oruro, the departmental capital where most RED-QUINUA communities are located. The workshops were attended by representatives of different quinoa associations, with a notable participation of young people and women. As described above, the methodology was designed to be replicable and scalable. A standardized session guide was developed to ensure consistency in content and activities, while encouraging the active participation of all participants (Aramayo et al., 2024). This approach leveraged participants' collective experience and prior knowledge to reinforce new concepts and facilitate their application in daily life.

6.2 Assessment of the Pilot Intervention

As part of the pilot intervention, pre- and post-intervention surveys were conducted to assess its potential impact on participants. These surveys focused primarily on financial literacy, following the OECD-INFE (2023) and Klapper et al. (2015) methodologies, asoutlined in Section 5 for the diagnostic survey. Additional questions addressed knowledge of pension savings and personal retirement plans. To avoid redundancy with the diagnostic survey, questions were rephrased and adjusted in the pre- and post-questionnaires. Each question and response is presented below, with answers categorized as *correct, incorrect*, or *no response*. Although ninety-one individuals participated in the pilot, not all completed both questionnaires, as participation in the survey was voluntary. The results below represent responses from seventy-five percent, that is sixty-six participants, who completed *both* questionnaires.

Results are shown in Figure 4, comparing responses before and after the pilot intervention. Each stacked bar reports the same number of observations. In addition, Figures 5 and 6 provide a breakdown of responses by gender. The first question in the assessment focused on participants' understanding of long-term savings ("ahorro previsional" in Spanish), specifically its purpose, both before and after the intervention. The question included multiple response options, one of which was "saving for old age". In panel (a) of Figure 4, the data show that before the intervention, only forty-two percent of participants answered this question correctly. After the training, this increased to sixty-seven percent. The panel also highlights a significant reduction in non-responses, which dropped from forty-one percent to eleven percent after the intervention.

The gender breakdown in panels (a) and (d) of Figure 5 shows that women showed substantial improvement on the initial question about long-term savings knowledge. Prior to the pilot, only

thirty-five percent of women answered this question correctly, compared to fifty-two percent of men, indicating a knowledge gap prior to the intervention. After the pilot intervention, women's correct answers slightly exceeded men's, reaching sixty-eight percent compared to sixty-six percent for men. For both genders, there was an increase in correct answers and a decrease in incorrect and no answers. This improvement suggests that the intervention had a positive influence on participants' understanding of long-term savings. As discussed later, this effect is also evident in participants' reconsideration of retirement plans after the intervention.

The survey then included a question about the effect of inflation on the purchasing power of savings, asking participants whether a fixed amount subject to three percent annual inflation would increase, remain constant, or decrease in purchasing power. Panel (b) of Figure 4 shows that before the pilot intervention, forty-eight percent of respondents answered correctly that the purchasing power would decrease after one year, while fourteen percent answered incorrectly and thirty-eight percent did not respond. After the intervention, correct responses increased to fifty-three percent and non-responses decreased from thirty-eight to twenty-one percent. The gender analysis in panels (b) and (e) of Figure 5 shows that although women initially had fewer correct responses than men, their correct responses exceeded those of men after the intervention.

The survey also included a question to assess participants' understanding of the application of the interest rate. It presented a scenario in which one person lends money to another and the borrower returns the same amount the next day. Participants were asked whether an interest rate was applied in this scenario. Panel (c) of Figure 4 shows that before the intervention, fifty-eight percent answered correctly that no interest was applied, seventeen percent answered incorrectly, and twenty-six percent did not respond. After the intervention, correct responses increased to seventy percent, while incorrect responses almost remained stable and non-responses decreased to twelve percent. The gender analysis in panels (c) and (f) of Figure 5 shows that although women initially had a lower percentage of correct responses than men, both genders showed improved accuracy after the intervention, with women's correct response rate approaching that of men, indicating a narrowing of the knowledge gap.

The next question assessed participants' ability to perform a basic interest calculation. Prior to the pilot intervention, fewer than thirty percent of participants could calculate the result of applying an annual interest rate of two percent to a fixed sum of one hundred monetary units after one year, as shown in panel (d) of Figure 4. As noted in the diagnostic survey, interest rate calculations were among the more challenging financial literacy questions. However, after the intervention, the percentage of correct responses increased substantially, from twenty-nine percent to forty-five percent. Non-responses also dropped notably, from forty-one percent to twelve percent. Panels (a) and (d) of Figure 6 show the gender breakdown for this question. Both genders started with similar levels of performance, but after the intervention, women showed a much greater improvement, achieving a higher percentage of correct responses compared to their pre-intervention performance and surpassing the results of men.

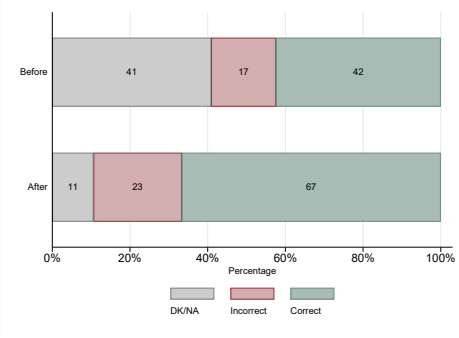
The next question assessed participants' understanding and application of compound interest. Specifically, it asked how much would accrue over five years if an annual interest rate of two

percent were applied to a principal amount of one hundred monetary units. As shown in panel (e) of Figure 4, thirty-nine percent of participants correctly answered that the total would exceed one hundred monetary units. After the intervention, there was no substantial change in overall responses. However, gender analysis in panels (b) and (e) of Figure 6 shows a slight improvement among female participants, with correct responses increasing by two percentage points. In addition, non-responses decreased in all groups after the intervention. This suggests that for broader scalability, the intervention would benefit from allocating more time or reinforcement to the topic of compound interest to achieve greater understanding and improvement, as seen in other dimensions of the pilot intervention.

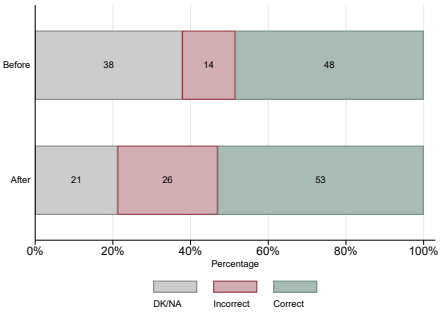
The assessment then included a more complex question that required participants to apply two interrelated financial concepts, interest rate and inflation, that are relevant to long-term planning and informed retirement decisions. Participants were asked to evaluate the change in purchasing power of personal savings given an annual interest rate of one percent and an annual inflation rate of two percent. Before the pilot intervention, only twenty-nine percent of participants correctly identified that purchasing power would decrease, as shown in panel (f) of Figure 4. After the intervention, the correct response rate increased substantially to sixty-four percent, accompanied by a significant reduction in incorrect and non-responses. The gender analysis shown in panels (c) and (f) of Figure 6 revealed improvements for both genders, with a much larger gain for women. Before the intervention, men outperformed women on this question. However, after the intervention, seventy-six percent of the women answered correctly compared to forty-eight percent of the men, effectively increasing women's financial literacy. This finding highlights the success of the pilot intervention in addressing gender differences in financial literacy, particularly in complex decision-making scenarios.

To support the hypothesis that the pilot intervention significantly improved financial literacy, particularly among women, Table 3 presents a simple regression analysis. The dependent variable is the number of correct answers each individual provided out of six questions, as described earlier. Independent variables include the pilot intervention (represented as a dummy variable for pre- and post-intervention responses), the participant's gender, and other characteristics collected through the assessment. Columns 1 and 2 of the table confirm that the pilot intervention had a positive and significant effect, increasing the number of correct responses by approximately one, from an average of 2.5 correct responses before the intervention. Introducing an interaction term between the pilot intervention and gender (specifically women) in columns 3 through 6 reveals that the significant effect is concentrated among women. This group saw an increase of 1.6 correct responses, a result robust across multiple specifications. While this analysis is subject to limitations, particularly due to sample size, the results align with the trends observed in the previous graphs, highlighting the intervention's success in reducing the gender gap in financial literacy.

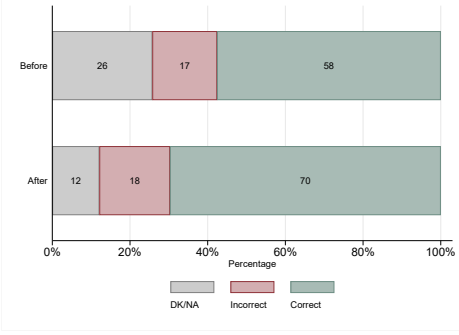
Figure 4: Results of the Pilot Intervention on Financial Knowledge



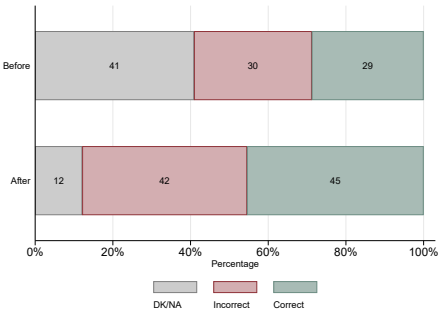
(a) Question on Pension Savings



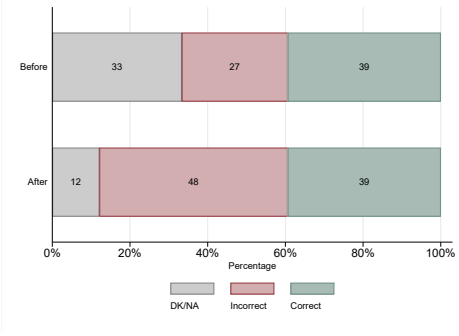
(b) Question on Annual Inflation



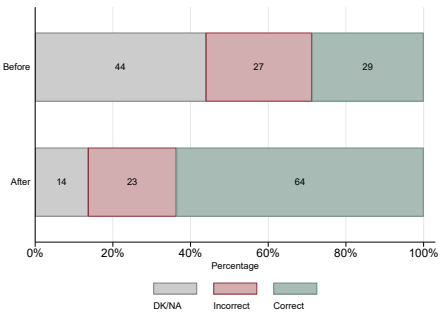
(c) Question on Interest Rate Identification



(d) Question on Interest Rate Calculation



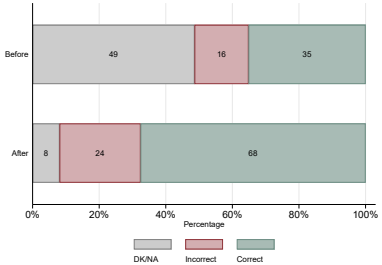
(e) Question on Compound Interest



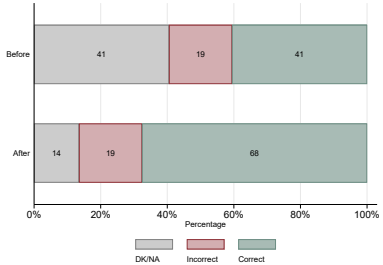
(f) Question on Inflation and Interest Rate

Note: Each panel reflects the results of sixty-six trainees who responded to both evaluation questionnaires (i.e., before and after the pilot intervention).
Source: Own elaboration based on the surveys conducted before and after the pilot intervention.

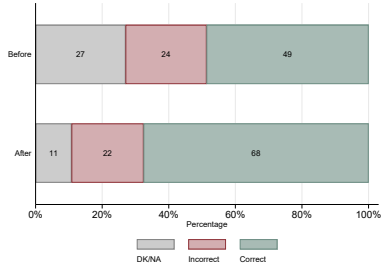
Figure 5: Results of the Pilot Intervention on Financial Knowledge by Gender



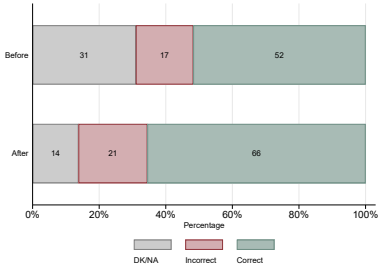
(a) Pension Savings (Women)



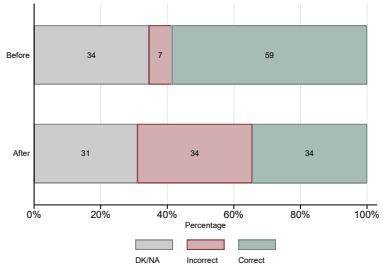
(b) Annual Inflation (Women)



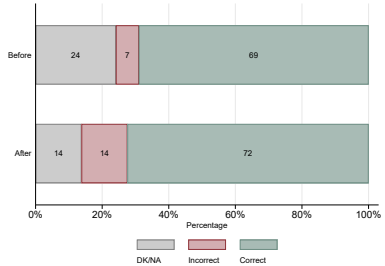
(c) Interest Rate Identif. (Women)



(d) Pension Savings (Men)



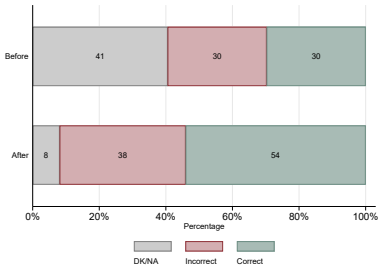
(e) Annual Inflation (Men)



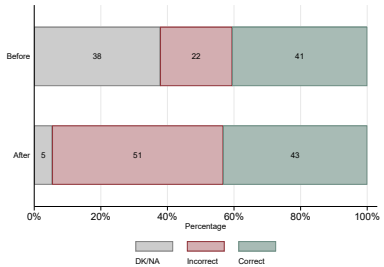
(f) Interest Rate Identification (Men)

Note: Each panel reflects the results of sixty-six trainees (thirty-seven women and twenty-nine men) who responded to both evaluation questionnaires (i.e., before and after).
Source: Own elaboration based on the surveys conducted before and after the pilot intervention.

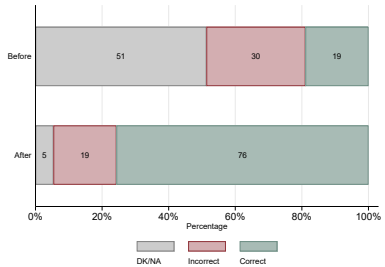
Figure 6: Results of the Pilot Intervention on Financial Knowledge by Gender



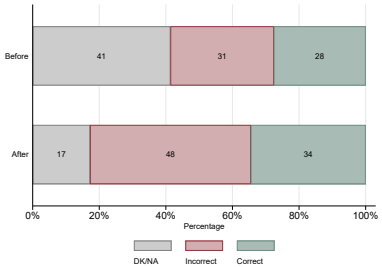
(a) Interest Rate Calculation (Women)



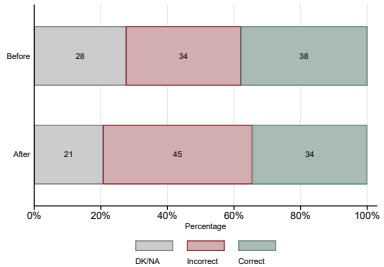
(b) Compound Interest (Women)



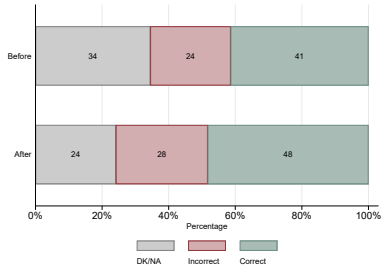
(c) Inflation and Interest Rate (Women)



(d) Interest Rate Calculation (Men)



(e) Compound Interest (Men)



(f) Inflation and Interest Rate (Men)

Note: Each panel reflects the results of sixty-six trainees (thirty-seven women and twenty-nine men) who responded to both evaluation questionnaires (i.e., before and after).
Source: Own elaboration based on the surveys conducted before and after the pilot intervention.

Table 3: Regressions on the Financial Literacy Question Score

	(1) Score	(2) Score	(3) Score	(4) Score	(5) Score	(6) Score
Pilot Intervention	0.924***	0.924***	0.0345	0.0345	0.0345	0.0345
	(0.296)	(0.297)	(0.462)	(0.457)	(0.459)	(0.459)
Woman		0.0666	-0.727	-0.586	-0.589	-0.651
		(0.303)	(0.448)	(0.416)	(0.418)	(0.417)
Pilot Intervention × Woman			1.587***	1.587***	1.587***	1.587***
			(0.592)	(0.564)	(0.566)	(0.564)
High School				0.416	0.421	0.388
				(0.300)	(0.298)	(0.296)
Previous Financial Education					-0.0250	-0.0905
					(0.379)	(0.373)
Knowledge about Pension System						0.547
						(0.394)
Observations	132	132	132	132	132	132
R2	0.070	0.070	0.121	0.233	0.233	0.245
Maximum Value Dependent Variable	6.000	6.000	6.000	6.000	6.000	6.000
Minimum Value Dependent Variable	0.000	0.000	0.000	0.000	0.000	0.000
Mean Dependent Variable before Intervention	2.455	2.455	2.455	2.455	2.455	2.455
Std. Dev. Dependent Variable	1.790	1.790	1.790	1.790	1.790	1.790

Note: Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

The pilot intervention assessment included a multiple-choice question on participants' plans for securing retirement resources. Options included: (i) public pensions, specifically the Renta Dignidad cash transfer for older adults in Bolivia (654 USD per year for those over 60 without a contributory pension or 560 USD for those with one, as detailed in section 2); (ii) retirement pensions from individual contributions to the Bolivian pension system; (iii) sale of property and assets; (iv) rental income from property or interest; (v) dependence on family; (vi) use of personal savings; (vii) continuing to work in old age; and (viii) no retirement plan. Participants were asked to select applicable options before and after the intervention. Figure 7 illustrates the responses recorded for each retirement option.

Panel (a) of Figure 7 shows that prior to the intervention, twenty-six percent of participants included the unconditional Renta Dignidad cash transfer in their retirement plans. After the intervention clarified that this transfer is automatically available to individuals upon reaching the age of sixty, the proportion increased to forty-four percent. It is important to note, however, that while the Renta Dignidad is a guaranteed source of income for older adults in Bolivia, the amount is generally perceived as insufficient to meet all needs in old age, as highlighted by the focus group results in section 4. Despite the reinforcement of information about the old-age cash transfer during the intervention, most participants did not consider the transfer as a relevant part of their retirement portfolio.

Before the intervention, only thirty percent of participants included a pension from the contrib-

utory component of the Bolivian pension system in their retirement plans, as shown in panel (b) of Figure 7. After the intervention, this proportion more than doubled to sixty-two percent. The gender analysis in panels (b) and (f) of Figure 8 shows that this increase was primarily driven by women. Before the intervention, thirty percent of women considered the pension system in their retirement plans, rising to sixty-five percent after the intervention, compared to fifty-nine percent of men. This finding suggests that the pilot intervention, along with the *Guide for Farmers and Self-Employed on the Bolivian Pension System* described above, successfully addressed key issues related to the administrative process of joining the pension system as a self-employed agricultural worker.

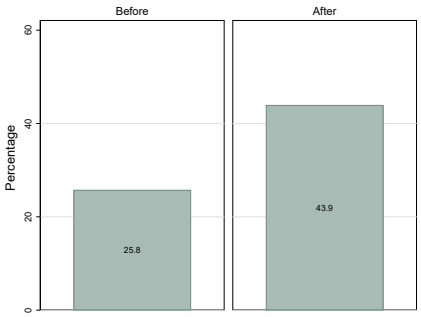
In Figure 7, panel (c) shows a modest increase of three percentage points in the number of participants who included property sales in their retirement portfolios after the pilot intervention. Panel (d), however, shows a more substantial change: the percentage of participants considering rental income or interest from personal assets increased from eighteen percent before the intervention to forty-four percent after. This shift likely reflects the impact of the second component of the pilot intervention, which emphasized the importance of investing savings to generate returns and addressed basic risk management. The increased focus on generating returns on investments is consistent with the intervention's emphasis on mitigating inflation and managing financial risks. Gender analysis showed no substantial differences for these options.

The proportion of individuals incorporating additional options, such as relying on family or personal savings, into their retirement income portfolios also increased, as shown in panels (e) and (f) of Figure 7. Personal savings are particularly important in the rural areas of the Bolivian Altiplano, where they may include not only cash or funds held in financial institutions, but also savings through informal mechanisms such as *pasanakus*. As described by Adams and Canavesi (1992), *pasanakus* are informal rotating savings associations common in the Altiplano, often organized and led by women. These groups rely on trust and familiarity among members, with personal savings circulating within the group. While these mechanisms carry risks, including the potential lack of interest earnings, they remain a viable and widely used savings option in the region, as highlighted in the focus groups detailed in section 4.

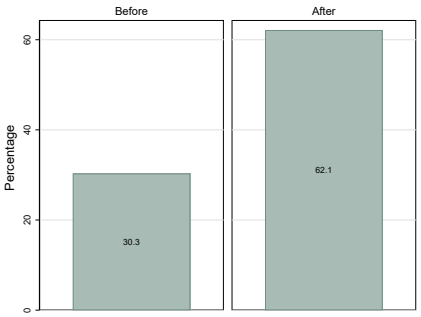
A key outcome of the pilot intervention was the formulation of retirement plans and the consideration of different options for securing financial resources in old age among individuals who had previously planned to work in old age or had no retirement plan at all. This shift is illustrated in panels (g) and (h) of Figure 7. Panel (g) shows that prior to the intervention, twenty-one percent of participants intended to continue working into old age, a common attitude in the region, but unrealistic and risky due to the physical demands of agricultural work and the natural decline in abilities, as highlighted during the focus group discussions. In addition, twenty percent of the participants reported that they had no retirement plans prior to the intervention. After the intervention, both of these proportions decreased drastically, with the percentage of participants without retirement plans dropping to just one percent. Gender analysis also revealed a notable reduction in the percentage of women without retirement plans, as shown in panel (d) of Figure 9, which decreased from twenty-seven percent to three percent.

Panel (h) of Figure 7 illustrates a marked reduction in the percentage of individuals without a retirement plan following the pilot intervention. Examining the preferences of those who previously did not have a retirement plan provides valuable insights. Figure 10 illustrates the transition from having no plan before the intervention to adopting different retirement options after the intervention. Panel (a) shows a consistent shift, with no participants remaining in the "no plan" category after the intervention. It also shows that retirement portfolio construction prioritized, in order of frequency, personal savings, rental income or interest from personal assets, public pensions, and pensions from the contributory component of the Bolivian pension system. The gender breakdown in panels (b) and (c) of the same figure shows that after the intervention, women who previously had no pension plan opted mainly for personal savings, probably through informal mechanisms, and contributory pensions from the pension system.

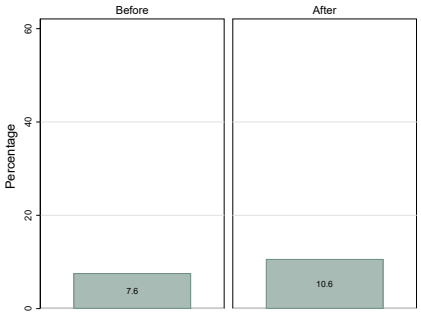
Figure 7: Results of the Pilot Intervention on Retirement Plans



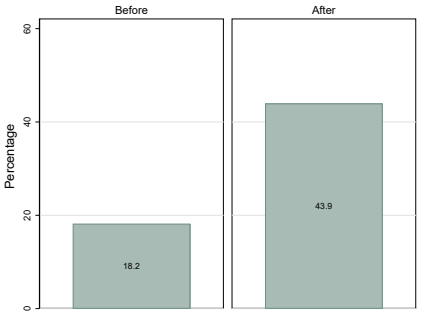
(a) Cash Transfer



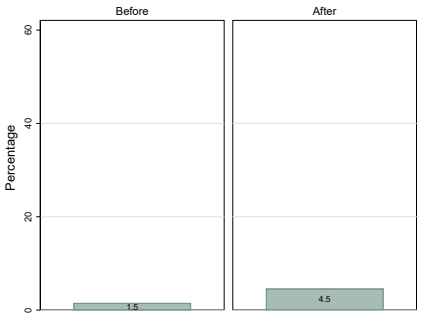
(b) Contributory Pension



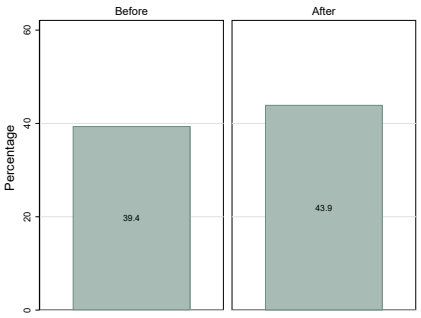
(c) Selling Property



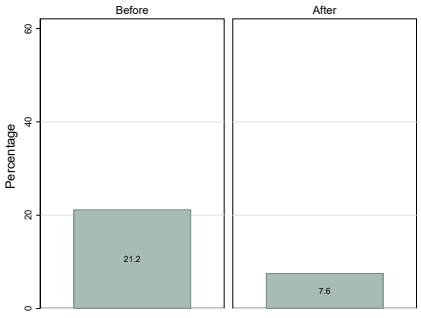
(d) Rentals, Rents or Interest



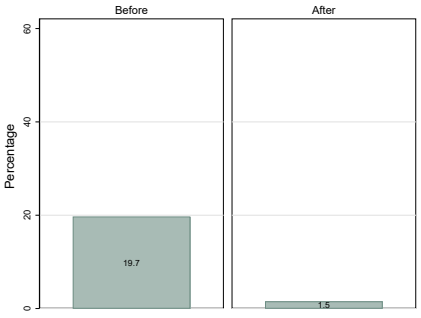
(e) Reliance on Family



(f) Own Savings



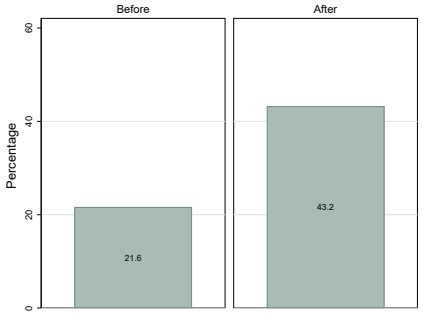
(g) Continue to Work



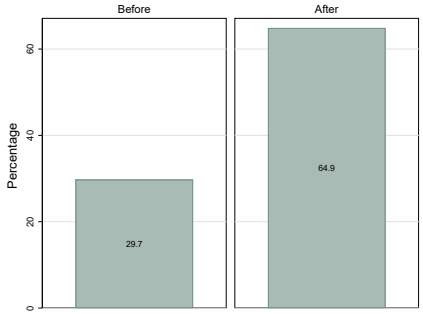
(h) No Retirement Plan

Note: Each panel reflects the results of sixty-six trainees who responded to both evaluation questionnaires (i.e., before and after the pilot intervention).
Source: Own elaboration based on the surveys conducted before and after the pilot intervention.

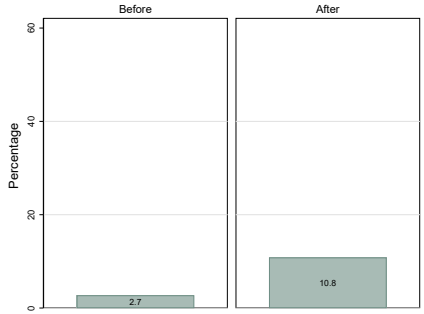
Figure 8: Results of the Pilot Intervention on Retirement Plans by Gender



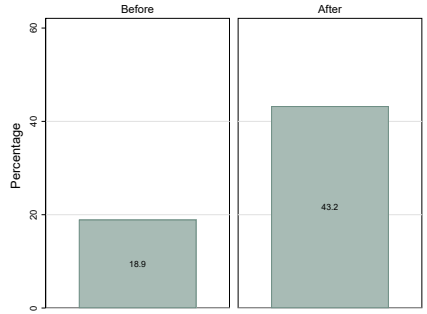
(a) Cash Transfer (Women)



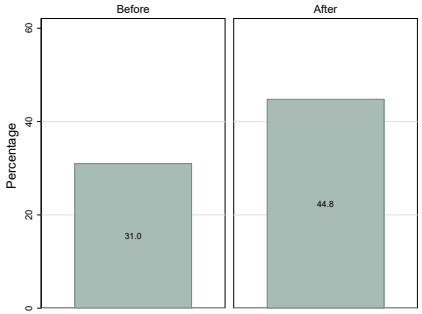
(b) Contributory Pension (Women)



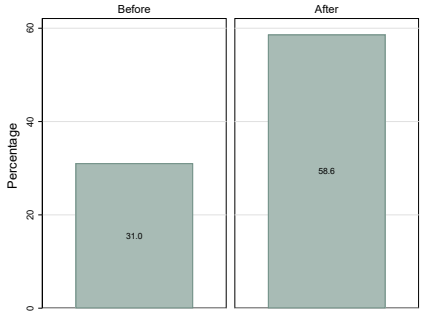
(c) Selling Property (Women)



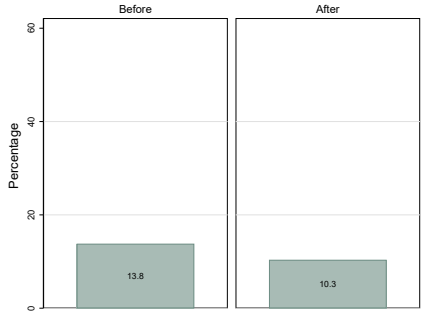
(d) Rentals, Rents or Interest (Women)



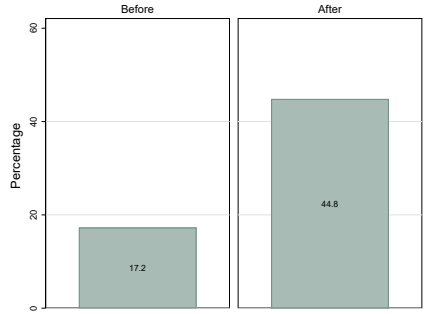
(e) Cash Transfer (Men)



(f) Contributory Pension (Men)



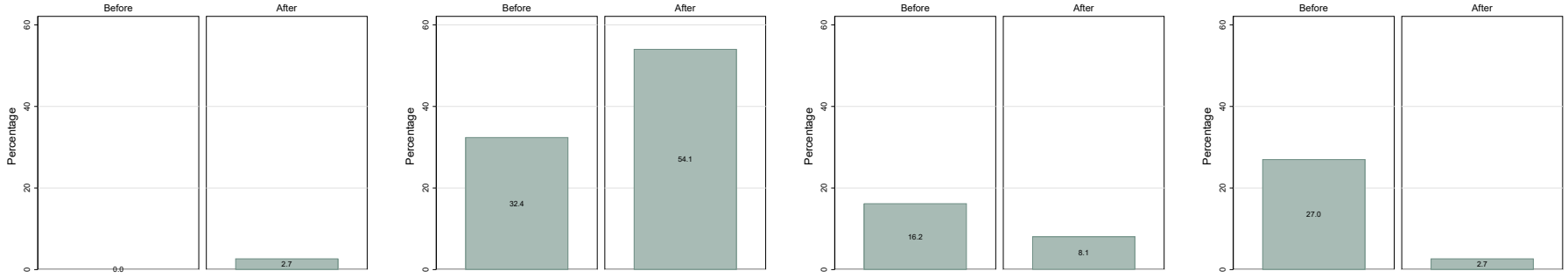
(g) Selling Property (Men)



(h) Rentals, Rents or Interest (Men)

Note: Each panel reflects the results of sixty-six trainees (thirty-seven women and twenty-nine men) who responded to both evaluation questionnaires (i.e., before and after).
Source: Own elaboration based on the surveys conducted before and after the pilot intervention.

Figure 9: Results of the Pilot Intervention on Retirement Plans by Gender

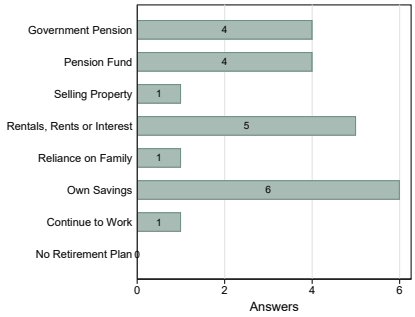


(a) Reliance on Family (Women) (b) Own Savings (Women) (c) Continue to Work (Women) (d) No Retirement Plan (Women)

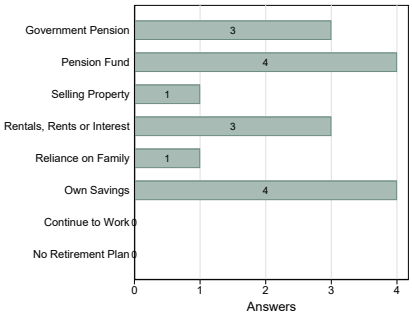
(e) Reliance on Family (Men) (f) Own Savings (Men) (g) Continue to Work (Men) (h) No Retirement Plan (Men)

Note: Each panel reflects the results of sixty-six trainees (thirty-seven women and twenty-nine men) who responded to both evaluation questionnaires (i.e., before and after).
Source: Own elaboration based on the surveys conducted before and after the pilot intervention.

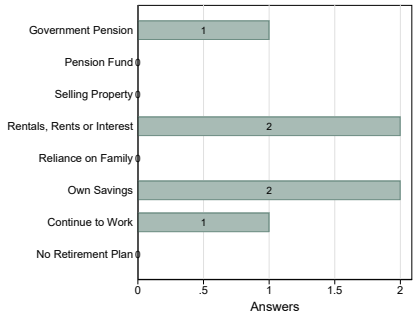
Figure 10: Reformulation of Retirement Plans for Those Who Did Not Have a Plan



(a) Post Pension Portfolio



(b) Post Pension Portfolio (Women)



(c) Post Pension Portfolio (Men)

Note: Results for thirteen individuals (three men and ten women) who indicated that they did not have a retirement plan before the pilot intervention.
Source: Own elaboration based on the surveys conducted before and after the pilot intervention.

6.3 Insights into Consumption and Saving Patterns

In addition to the pre- and post-intervention assessment surveys, quinoa farmers participated in an experimental game at the beginning of each session. The game was designed to simulate a life cycle and illustrate the consumption optimization problem, drawing on the work of Tasneem et al. (2018a, 2018b) and Ballinger et al. (2003). The game simulated a *working period* during which players earned income, consumed, and saved, followed by a shorter *retirement period* during which only consumption occurred, with savings from the working period serving as the sole source of funds. A minimum level of consumption was required throughout the life cycle, representing essential expenses such as food and basic services. Players had to ensure that they had sufficient resources to meet this minimum consumption before deciding whether to consume more or save for later rounds with reduced income. Failure to meet the minimum consumption requirement ended the game. To add some complexity, the game introduced randomness, with each round starting at a randomly assigned high or low income level.

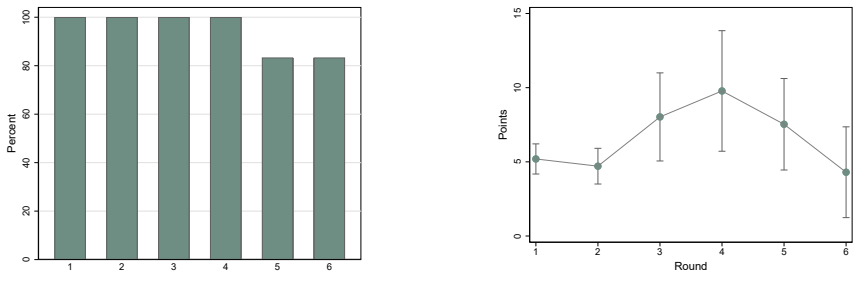
In our version of the game, participants played six experimental rounds. The first four rounds represented the *working period*, while the last two rounds simulated the *retirement period*. Players encountered two levels of simulated income: high income (nine points) and low income (three points). The game began with a high-income round, followed by a low-income round. The

next two rounds featured randomly assigned income levels. In the last two rounds, representing retirement, no income was provided. On the consumption side, the game required a minimum consumption of three points per round, which was automatically deducted from the player's saved points and income for that round. The goal was to ensure that players could meet this minimum consumption each round and continue playing. Once the minimum was met, players could choose to spend additional points or save them for future rounds. Any spending above the minimum was rewarded with small non-cash prizes (e.g., prepaid cell phone cards).

An important aspect of the game results to analyze is the pattern of saving behavior. Each round, players accumulate points equal to their savings, which they can either redeem immediately for the small prizes mentioned above or carry over to future rounds. After the fourth round, players' income drops to zero, simulating retirement and forcing them to rely solely on their in-game savings. Players continue as long as their savings meet or exceed the minimum consumption requirement for each round. The game identifies four different types of savings behavior:

- *Present Bias Game*: Some players prioritize redeeming their points for small prizes each round over saving. This strategy prevents them from advancing to the fifth round (the retirement phase) due to insufficient savings.
- *Partial Retirement Game*: Some players make it to the fifth round, but are unable to meet the minimum consumption requirement for the sixth round due to insufficient savings.
- *Perfect Game*: These players complete all six rounds by using savings from earlier rounds to cover expenses in the last two rounds, ending with a zero balance. This result, which is considered optimal, is rewarded with a larger game prize.
- *Lost Points Game*: Some players finished the game but with unused savings. While these players still receive the larger prize, their performance reflects inefficiency, as they could have used their excess savings more effectively.

Figure 11: Pension Game Activity and Savings



(a) Active Players per Round (b) Average Savings per Round

Note: 95% confidence intervals in Figure of the panel (b)
Source: Own elaboration based on the surveys conducted before and after the pilot intervention. 95% confidence intervals in panel (b)

Figure 11 provides an overview of the game played during the initial phase of the pilot intervention. Panel (a) shows the participation activity of the seventy-two players who chose to participate in the game. As explained earlier, the continuity of the game depended on the players' decisions regarding saving and consumption, especially during the rounds simulating work activity. The figure shows that seventeen percent of players were unable to proceed to the retirement simulation rounds because they did not have enough savings to meet the minimum consumption requirements in the final two rounds. In contrast, over eighty percent of players successfully smoothed their consumption during the income rounds, allowing them to complete the game. This result suggests the ability of participants to finance their retirement through long-term savings within the game framework. Panel (b) shows that, on average, participants accumulated savings during the first four rounds, which they later used to sustain their consumption during the retirement simulation phase.

The game results showed that only ten percent of the seventy-two players successfully completed the game with no excess points unused, fully exchanging their resources for the rewards offered each round. While seventy-four percent of players completed all six rounds, most did so with unused points, resulting in lost points. This suggests that while participants managed to smooth consumption during the retirement phase, their strategic planning within the game was not optimal. Many players failed to fully utilize the resources accumulated in earlier rounds to maximize their benefits in the retirement phase. These results suggest that most participants demonstrated basic planning skills as they were able to navigate the retirement phase. However, the prevalence of unused points indicates room for improvement in their planning and decision-making strategies. Targeted financial and retirement education could address these gaps, helping participants optimize resource management and improve long-term planning effectiveness.

7 Conclusions and Recommendations

This paper examines retirement planning among RED-QUINUA farmers, Fairtrade®-certified quinoa producers in Bolivia's southern Altiplano, and proposes a pilot intervention to promote retirement savings among this group. Our assessment began with the observation of low participation rates in the Bolivian pension system among these farmers, which points to a broader problem: both qualitative and quantitative analyses indicate that farmers often delay or avoid retirement planning, instead prioritizing immediate production challenges. This lack of long-term planning has significant consequences, as many older quinoa farmers in the region live in precarious conditions, relying heavily on their children for support or continuing to work beyond retirement age despite physical limitations that reduce productivity.

In reviewing strategies to promote retirement planning, we identified financial education as a key component of long-term financial preparedness. Without a basic understanding of financial concepts such as simple and compound interest, inflation, and financial risk, retirement planning becomes a daunting and often neglected task. Understanding these concepts helps farmers estimate the resources they will need for old age and supports better financial decision-making over time. Financial education, coupled with clear information about the benefits of the pension system and other financial alternatives, enables farmers to consider incorporating these options into their retirement plans and to choose solutions that meet their goals and expectations.

Our diagnostic survey of RED-QUINUA farmers revealed critical gaps in financial literacy, particularly among women, prompting the design of a targeted pilot intervention to improve financial literacy and retirement planning. Based on an experiential learning approach, the pilot intervention introduced and reinforced key financial concepts, including budgeting, saving, investment returns, inflation, the time value of money, and pensions. By contextualizing these topics through examples and case studies related to quinoa production and familiar agricultural practices, the program made financial planning both accessible and relevant to participants.

The assessment of our pilot intervention yielded promising results, demonstrating an overall improvement in participants' financial literacy. In particular, participants demonstrated a better understanding of relatively complex financial concepts, such as the relationship between interest rates and inflation, which they had initially found challenging. A significant finding was the narrowing of the gender gap in financial literacy: prior to the intervention, women generally scored lower than men on financial literacy questions. However, post-intervention assessments showed that this gap had narrowed, with women outperforming men on several topics covered. There was also a shift in retirement planning behavior. Participants who had previously planned to work indefinitely or had no retirement plan began to consider more diversified retirement strategies. Women, in particular, nearly doubled their interest in joining the pension system compared to pre-intervention levels. This shift underscores the effect of the intervention in promoting retirement planning, especially among female participants.

Therefore, RED-QUINUA farmers are encouraged to use the benefits of Fairtrade® certification to improve their long-term well-being, especially for retirement. On an individual level, the

Fairtrade® Minimum Price provides financial stability, allowing farmers to plan for both business and personal financial goals, including long-term goals. With additional financial education and retirement planning training, farmers can foster a personal culture of long-term savings by allocating a portion of their stable income to secure their future. At the community level, the Fairtrade® premium could fund financial education programs throughout the region. Building on our pilot intervention model, communities and associations can equip farmers with essential financial tools, support effective production finance management, and explore options for generating returns on long-term savings. This dual approach would strengthen both individual and collective financial resilience, promoting sustainable growth and retirement planning.

Our pilot intervention has shown promising results in improving financial literacy, particularly in promoting retirement planning among quinoa producers. As highlighted in the literature on long-term savings and retirement planning, it is important to distinguish between the *formulation* and *execution* phases of retirement planning. Given the lack of existing retirement plans in the target region, our pilot project focused on the initial *formulation* phase. Going forward, we recommend larger-scale interventions that continue to emphasize retirement plan formulation. Once a foundation is established, future initiatives could support retirement plan *execution* by assessing farmers' actual savings and exploring secure financial options beyond the pension system to strengthen their retirement strategies.

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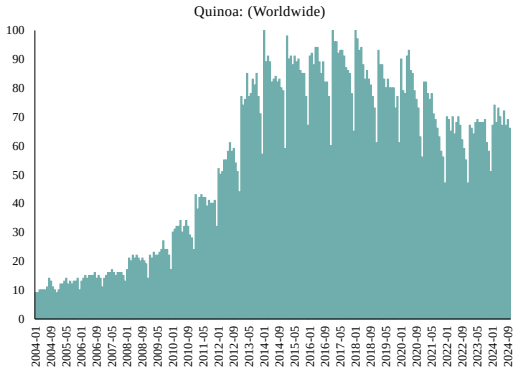
A Appendix

Figure A.1: World Searches on Quinoa



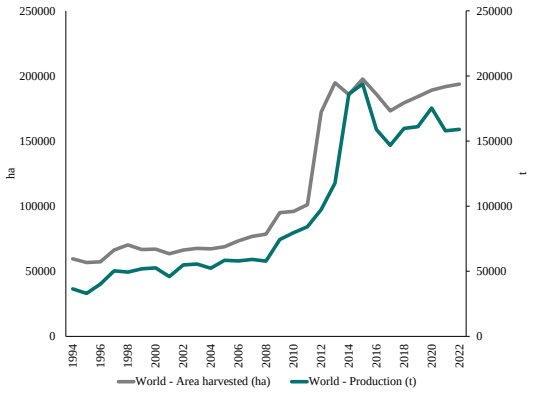
Source: Own elaboration based on Google Trends.

Table A.1: RED-QUINUA Associations and Communities in the Southern Altiplano

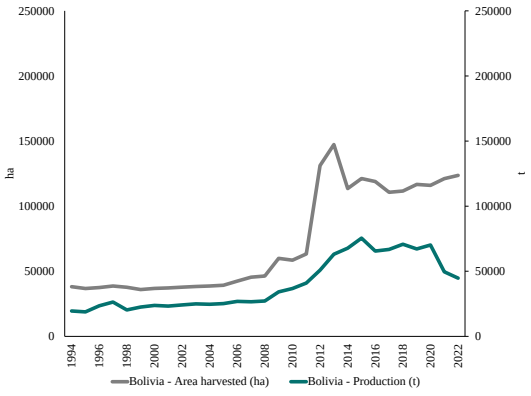
Department	Province	Municipality	Community	Fairtrade® Association
Potosí	Quijarro	Uyuni	Bella Vista	APROQUIRGAC
Oruro	Ladislao Cabrera	Pampa Aullagas	Bengal Vinto	APQC
Oruro	Ladislao Cabrera	Salinas	Capura	AIPROCA
Oruro	Ladislao Cabrera	Salinas	Chalgua	ACEINQUIR
Oruro	Ladislao Cabrera	Salinas	Florida	ACIF
Oruro	Ladislao Cabrera	Salinas	Rodeo	AMEPROQUIR
Potosí	Quijarro	Uyuni	Vintuta	APRAVI
Oruro	Ladislao Cabrera	Salinas	Sigualaca	AGROQUINUA
Oruro	Ladislao Cabrera	Salinas	Chalgua	AGROQUINUA
Oruro	Ladislao Cabrera	Salinas	Tolamayo	AGROQUINUA
Potosí	Quijarro	Uyuni	Tusqui	AGROQUINUA
Oruro	Ladislao Cabrera	Salinas	Collpuma	AGROQUINUA

Source: Own elaboration based on an interview with Eusebio Encinas (President of RED-QUINUA and Member of the Latin American and Caribbean Coordinating Committee of Small Fair Trade farmers and Workers CLAC).

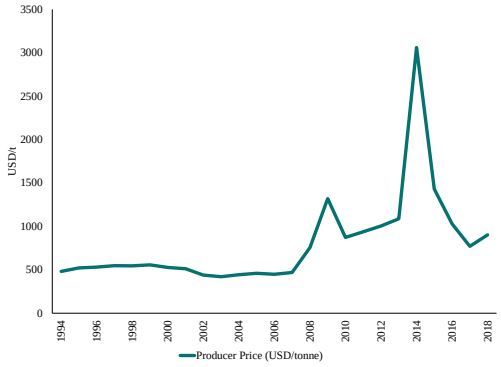
Figure A.2: Quinoa Area, Production and Prices in the World and Bolivia



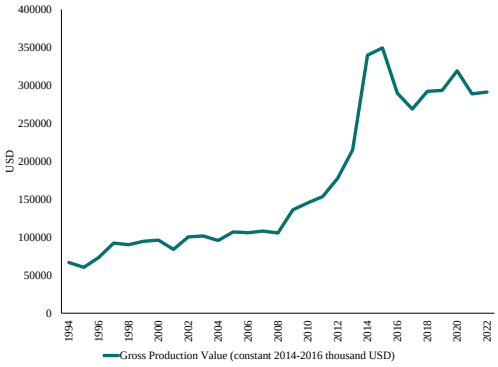
(a) World - Area Harvested and Production



(b) Bolivia - Area Harvested and Production



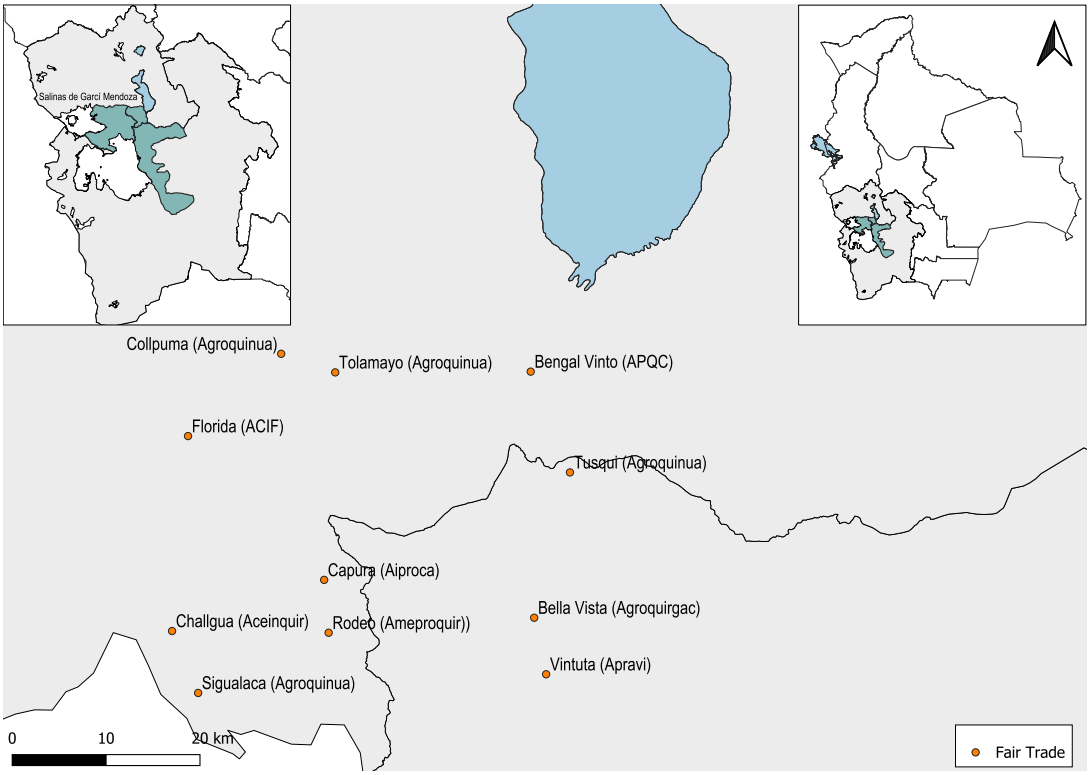
(c) Bolivia - farmer Price (USD/tonne)



(d) World - Gross Prod. Value (const. 1000 USD)

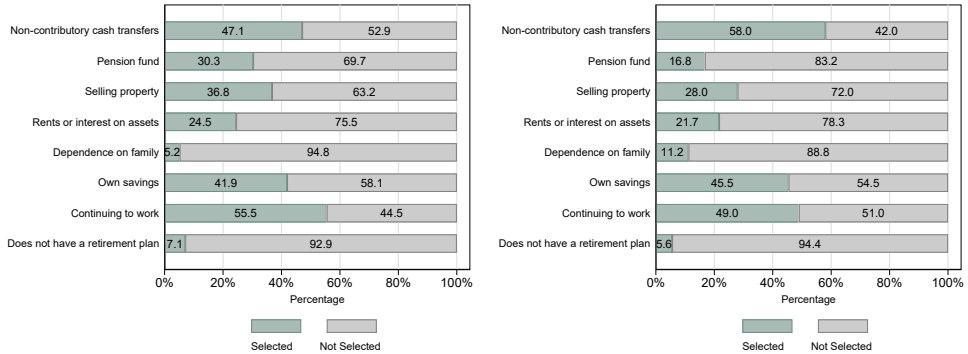
Source: Own elaboration based on FAOSTAT (2024).

Figure A.3: Geographic Location of Surveyed RED-QUINUA Associations and Communities



Source: Own elaboration based on georeferenced data from GeoBolivia (2024).

Figure A.4: Pension Portfolio among RED-QUINUA Farmers by Gender



(a) Pension Portfolio - Men

(b) Pension Portfolio - Women

Note: Own elaboration based on data from the survey of quinoa farmers conducted by INESAD.