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A ROADMAP UNTIL 2030 AND FIRST ACTION PLAN FOR THE PERUVIAN AGRI-FOOD SECTOR, FOCUSING ON ANDEAN NATIVE CROPS

Results from the 3rd and 4th Futures Workshops of the Pecolo Project

FINLAND FUTURES RESEARCH CENTRE
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FOREWORDS

A globally connected and changing world facing wicked problems including growing population, changing climate, scarce resources, and other sustainability questions forces us to assess our future more carefully than ever before. The future of food is a shared global question that has to be answered at local, regional and national levels as these concerns impact food value chains around the world.

In order to find possible solutions for complicated questions such as the future of food, we need data, information, knowledge and commitment from all stakeholders. Cooperation between governmental organisations, businesses, consumers, civil society, farmers and researchers is essential if we want to develop solutions that are ecologically, socially, economically and culturally sustainable and acceptable to all those involved in making them a reality.

Futures studies and foresight processes and methods aim to support thinking about possible futures and help to find ways to reach those that are most desirable. We have to accept that the future is uncertain, but is it better just to wait and see what happens, or to be proactive and try to shape our futures despite the risks? In the PECELO project the answer is clear: working together with stakeholders, we want to figure out the way to a sustainable agri-food sector in Peru and Colombia. This publication focuses on the Peruvian case and is the second of two publications concerning Peru that have been produced based on the results of the PECOLO project's four-stage futures process. We hope that it can help all stakeholders in their future work towards sustainable and innovative food futures.

Dr. Juha Kaskinen
Director of Finland Futures Research Centre

INTRODUCTION

PECOLO, or *Native crops for sustainable and innovative food futures in Peru and Colombia*, is a collaborative project involving the University of Turku, Finland (UTU), Universidad Nacional Agraria La Molina, Peru (UNALM) and Universidad el Bosque, Colombia (UEB). From UTU, Finland Futures Research Centre (FFRC) coordinates the project. In addition, the Functional Foods Forum and Department of Biochemistry of the University of Turku are also participating in the project.

One of the key focus areas of the PECOLO project is the development of innovation environments around native Andean crops. Futures research and foresight methodologies are used as novel tools for developing innovation environments in cooperation with academic, public and private sector organizations and NGOs.

This is the second of two publications concerning Peru that have been produced based on the results of the PECOLO project's four-stage futures process. The first, *A Scenario for the Desirable Future of the Peruvian Agri-Food Sector 2030, Focusing on Andean Native Crops: Results from the 1st and 2nd Futures Workshops of the PECOLO Project*¹, describes the methods and results of the first two steps of the futures process. The outcome was a futures table describing a set of three alternative futures for the Peruvian agri-food sector that reconsider the potential of Andean crops, as well as a scenario narrative for the most desirable future.

This second publication covers the work that took place during the project's third and fourth futures workshops. The third workshop established a vision for 2030 based on the desirable scenario of the second workshop, and a roadmap for the Peruvian agri-food sector with a special focus on Andean native crops. The fourth and final workshop elaborated concrete actions that can and should be taken by stakeholders in the first implementation period, from 2020–2022, in order to begin to move toward these common goals.

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¹ Lakkala, Hanna – Birmoser Ferreira-Aulu, Marianna – Del Carpio Rodríguez, Ahmed Omar – Kaskinen, Juha – Morales-Soriano, Eduardo – Repo-Carrasco-Valencia, Ritva – Vargas Delgado, Luis Fernando – Vidaurre-Ruiz, Julio & Vähäkari, Noora (2019) *A Scenario for the Desirable Future of the Peruvian Agrifood Sector 2030, Focusing on Andean Native Crops. Results from the 1st and 2nd Futures Workshops of the PECOLO Project*. FFRC eBooks 8/2019, Finland Futures Research Centre, University of Turku, 33 p. <http://urn.fi/URN:ISBN:978-952-249-524-2>.

METHODS

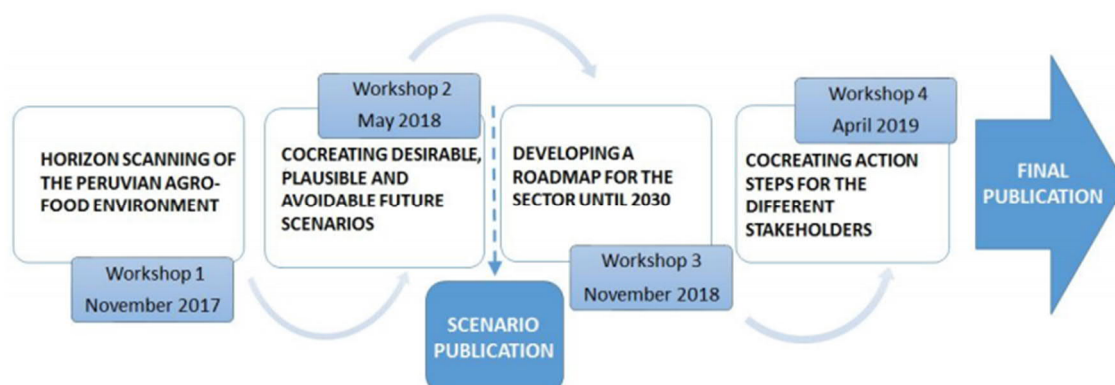


Figure 1. The PECOLO futures process.

Workshop 3: Roadmapping Workshop

The third PECOLO workshop focused on developing a roadmap for the future with sector stakeholders. A desirable scenario for the Peruvian agri-food sector in 2030, the product of the scenario workshop (workshop 2 of 4), was used as a basis for the third workshop's exercise. In groups, the stakeholders discussed the question: *What are the steps that need to be taken into consideration in order to reach the desirable future state for 2030?*

The workshop started by giving an overview of what had been done up until that point. Although most participants were present in the previous steps of the futures process, there were also a number of new participants representing the partner organizations. The scenario co-created by the stakeholders in the previous step was presented with the help of images to create poetic immersion into the desirable 2030 state.

Having those images in mind, and a printed document of the desired future state of 2030, the participants were divided into groups of 4–5 persons representing different sectors and organizations. A simple roadmap building technique of four steps was introduced using the road map table (table 1 below):

1. Based on the desirable future scenario, discuss the vision of the desirable future to be achieved together within a sector. Based on that discussion, formulate a short vision statement and write it in the top row.
2. Identify drivers (e.g. megatrends, trends, societal needs etc.) that may affect or support your actions. Some drivers, such as megatrends, have an impact throughout all of the time frames, whereas others are more short-lived and may have an impact only during one time frame. List drivers in the rows below the vision statement.
3. Define the five most important factors to be taken into consideration (eg. politics, technology, RDI...) in the road map. List them in the left-hand column.
4. For each of your chosen factors, define the strategic steps/elements to be considered in each given time frame to make these changes possible and take their relation to each other into account. List them in the appropriate rows and time frames.

Vision statement:				
Drivers of change:	Affects all the time frames			
	Affects one time frame			
Factor 1				
Factor 2				
Factor 3				
Factor 4				
Factor 5				
Time frame	2020-2022	2023-2025	2026-2029	

Figure 2. Road map table used as a tool in the development of the road map.

Each group of stakeholders from different organisations completed one road map table together (Figure 3 below).



Figure 3. One of the groups working on their roadmaps in Lima, Peru.

Workshop 4: Action Plan Workshop

In the final workshop of the PECOLO futures process the road map developed in the third workshop was transformed into a concrete action plan. The action plan lays out specific steps the stakeholders could follow in the coming years to reach a future as close as possible to the desirable one. While the roadmap covers the entire period of time between the present and 2030, the action plans focus on the earliest part of this timeframe, from 2020–2022. By the end of 2022, the stakeholders should continue their work by developing new action plans for the next timeframe.

The participants were again divided into groups consisting of stakeholders from different sectors and organisations. In the course of the workshop, based on the road map, participants were asked to deepen the thinking around the proposed actions by considering a number of specific dimensions. The participants discussed which parties should be responsible for the implementation of the action, whom it would benefit, what resources would be needed to put it into practice, what obstacles might hinder its progress, and over what time frame it might take place (figure 4 below).

TOPIC:	
ACTION:	
RESPONSIBLES	
BENEFICIARIES	
RESOURCES	
OBSTACLES	
TIMETABLE	
OTHER	
ASSESSMENT	

Figure 4. Action plan table used in the workshop 4.

RESULTS

Workshop 3: Road map

The third workshop was organized in November 2018 at UNALM. 29 experts attended the workshop, forming 4 groups. The experts represented the following sectors:

- Academia: 16 participants
- Public sector: 5 participants
- Private sector: 8 participants
- Non-Governmental Organizations: 0 participants

Each group developed their own roadmap. Each of the groups had a slightly different focus. Group 1 had a special focus on institutional articulations and sustainability. Group 2 focused on the production of Andean crops. Group 3 focused on digitalisation, technological development and how new technologies can advance the agri-food industry as a whole. Group 3 also introduced “Andean” as a brand. Group 4 presented different ways to promote Andean goods as healthy products.

Declaración de la visión:		En el 2030 los cultivos de los granos andinos son reconocidos a nivel mundial, alcanzan la categoría de granos altamente nutritivos debido a la aplicación de la tecnología de vanguardia y las políticas promovidas en la I+D+i promoviendo el empleo y las mejoras de las condiciones de vida.		
Impulsores del cambio:	Afectan todos los marcos del tiempo	Cambio climático, alimentación saludable, urbanización y desplazamiento, especialización de mercados, sociedad de la información		
	Afectan un marco del tiempo	Ley de alimentación saludable y etiquetado de productos	Mercados digitales	Aplicación de la biotecnología y la I+D+i para diversificar el mercado
Factor 1	POL	Promoción de políticas relacionadas con cultivos andinos y promover su aplicación. Generación de evidencia, reformulación de políticas públicas.	Incidir en políticas públicas reconocimiento de cultivos andinos por su importancia.	
Factor 2	TECNOLOGIA	Promover tecnologías adaptadas para aumentar brechas de productividad.		
Factor 3	MERCADO	Posicionamiento del mercado de los granos andinos por sus ventajas nutricionales.		
Factor 4	MERCA CALIDA I+D+i	Incidir en políticas e iniciativas de investigación para que se incluyan cultivos andinos en los agendas de investigación.		
Factor 5	PRESERVAR SU CONDICIÓN DE ANDINO	Creación de un grano/cultivo orgánico		
Marco del tiempo / "Time frame"		2020-2022	2023-2025	2026-2029
Grupo #:	Nombres y organizaciones:			
3			Alvaro Cabrera - Soluciones Prácticas Waldemar Mercado - UNALM Hermelinda Alvarez - UNALM Silvia Barnechea - ITP	

Figure 5. The final roadmap table of the 3rd workshop of one of the groups.

In the roadmap table in figure 5 (above) the groups vision states: “In 2030 Andean grains are recognized worldwide, reaching the category of highly nutritious grains due to the application of cutting-edge technologies and policies that promote Research and Development”.

Below the vision statement, drivers of change are listed. In the example of the group above, the drivers seen as affecting all timeframes were Climate Change, healthy eating, urbanization and population displacement, market specialization and an information society. Other drivers were thought to affect only one timeframe. In the above example, for instance, the experts felt that a new law on food labeling would affect mainly the first time frame (2020–2022), having become institutionalized already by the beginning of the second timeframe.

All four vision statements included international recognition of Andean crops and their health aspects. While some groups understand “healthy” products mainly as nutritive, other groups also included healthy production in this concept, referring to the upholding of human rights and the health and safety of workers. The most common factors discussed were Research and Development (all four groups), and the development of public policies that promote agriculture and Andean crops in particular (3 groups). The four separate roadmap tables were synthesized into table 1 below.

Because some key stakeholders of the Andean crops’ value chains were not able to participate in the workshop, 10 additional expert interviews were carried out in order to include their perspectives as well as to verify the results. The results of these interviews were also included in the synthesis table.

The focus of the interviews was the vision of the future, the identification of trends and key factors relevant to the roadmap and the steps to be taken in each timeframe. The resulting integrated roadmap positions Peru as a Global Superfood Hub capable of providing Peruvian products based on Andean grains to both international and national markets.

The proposals clearly emphasize strengthening the framework of multisectoral policies with an emphasis on issues including:

1. Information management and the use of ICT,
2. Defining distinct roles and cooperation mechanisms for the triple helix of academia, industry, and government,
3. Capacity building on the ground, in the territories,
4. Financing,
5. Environmental management,
6. Promotion of RDI, especially in the areas of generating management instruments, technology, new products, new varieties and new packaging and adapting to Climate Change.

With respect to the world market, the proposal focuses on differentiated niches and guaranteeing quality, safety and sustainability through certifications, as well as developing strong Peruvian brands that are well positioned in the world market. This could be accomplished solely as a Peruvian project, or in alliance with other Andean countries working together to position Andean crops in world markets.

In the national market, Peru seeks to promote consumption with the support of the media, the educational sector and government programs associated with food and health, as well as developing new products that are better fit for local consumption habits.

Table 1. Roadmap of the Peruvian agri-food sector stakeholders until 2030 focusing on Andean grains.

<p>Vision statement: By 2030 Peru is a Global Superfoods Hub. Peruvian products based on Andean grains are easy to consume and recognized worldwide for their high contribution to international exports and domestic consumption. Peruvian Andean grains are certified for their place of origin, organic production, safety and high nutritional value. The application of cutting-edge technologies and policies promotes ecology, research, technological development, innovation and sustainable local development.</p>				
Drivers of Change	Affects all time frames	<p>Growing global demand for food (overall); Growing demand for healthy products;</p> <p>Market specialization; Increased regulation of world food trade; Urbanization; Population displacement; Information society; Advancement of biotechnology; Climate change; Globalization of quinoa production; Increased demands related to sustainability and safety; Increased presence of emerging countries (China, India and others) in the world economy; Increased demand for export certifications; Development of emerging global value chains in Andean grains.</p>		
	Affects a specific time frame	<p>Corruption; Resistance to change; Law on healthy food and labeling; Growing demand for quinoa and kiwicha; Demand for disaster prevention measures; Development of suppliers with less intermediation that contributes to rapid responses to the market; Associativity in specialized productive cooperatives with collective brands; Greater added value; Strengthening of territorial clusters.</p>	<p>Digital markets;</p> <p>Policy changes in the Peruvian government towards a circular economy.</p> <p>Demand for quinoa kiwicha and tarwi is growing.</p>	<p>Circular economy;</p> <p>Application of biotechnology and R&D&I to diversify the market;</p> <p>The demand for quinoa kiwicha, cañihua and tarwi is growing.</p>
R&D Factors	<p>Research and development of technologies to improve productivity, quality and added value; Development of R&D agendas; Technological Extension; Technological Surveillance; Development of packaging for Andean grain products; Research on adaptation to climate change and adaptation of crops in other regions of Peru; Research to achieve denomination of origin.</p>		<p>Identification and improvement of technologies; well characterized and documented germplasm banks for use in breeding; new varieties, new products, new packaging;</p>	<p>Implementation of a system of continuous and sustainable improvement; Prospective Observatory and Specialized Technological Surveillance.</p>

<p>Creating favourable policies for the development of Andean grains.</p>	<p>Generation of evidence on Andean crops – information on open access policies; Integration of state, business and academia;</p> <p>Capacity building programme in cooperativism appropriate to the conditions of the territories; Strengthening of R&D&I programmes in Andean grains; Development of an appropriate financial policy for the socioeconomic reality of producers and 2nd floor organizations that group cooperatives and associations that includes financing through regional governments and orientation of current funds; Promotion of organic production, management of natural resources and association of crops; Increase of the agricultural frontier; Development of chains in Andean grains; Recognition of seeds of declared quality at local level; importance of Andean grains in the educational curriculum (presence in educational texts); Greater use of ICTs in cooperatives; Circular economy in the treatment of residues for the generation of organic fertilizers of high nutritional content.</p>	<p>Strengthening of current R&D&I programmes or establishment of the National Research Centre for Andean Grains, with a focus on supply and demand and the preservation of agricultural diversity and food security, influencing public policy for the recognition of the importance of Andean crops;</p> <p>Strengthen the management and infrastructure of agricultural cooperatives; Development of favourable and competitive conditions for attracting investment funds and global companies; Promotion of the circular economy; Greater presence of the ITP and CITES network.</p>	<p>Strengthen cooperative agrarian management, infrastructure and services; Promotion of investment funds; Strengthen information and knowledge management services; Strengthen climate change adaptation measures; Increase technical, primary and secondary education actions; Strengthen ITP and CITES network in Andean grain value chains.</p>
<p>Higher Education</p>	<p>Adaptation of the laws referring to education (since the institutions are still in the process of adapting the new university law and laws that promote research); Pre-professional practices in tests and field schools; Promotion of entrepreneurship in the agriculture and food sector aimed mainly at the children of producers; Training in commercial intelligence; Education in cooperativism;</p>	<p>National Research Plan with their respective Research, Development and Innovation agendas for Andean grain production chains.</p>	<p>Increase in intellectual property (patents) and scientific publications.</p>

<p>Andean crops of Peru in the world market for "healthy food".</p>	<p>Peruvian products continue entering the main current markets and the protocols are established for the entrance to Asia, being distributed by supermarkets and big traders; Development of strong and collective brands; Promotion of certifications mainly in quality, organic production and fair trade; Reconversion productive of the south of the country. Develop a portfolio of products (5 - 8) for different niches, special diets and lifestyles (sportsmen, mountaineers, children with diseases, etc.); Achieve marketing authorization "novel foods" in the various Andean grains; Development of quality infrastructure for the development of Andean grains; Improve conditions for the use of FTAs; Greater use of electronic commerce in cooperatives; New market studies and trade intelligence;</p>	<p>Positioning of Andean grains of Peruvian origin in the final consumer of the world market due to its nutritional benefits and high participation of Peru in exports; Development of an Andean brand (Peru and Bolivia); Producers with market knowledge and high degree of compliance with technical requirements; Making visible the role of women in the value chains of Andean grains.</p>	<p>Andean crops from Peru are an important component of the daily diet worldwide.</p>
<p>Media</p>	<p>Promotional campaigns through the State's nutritional programs; Development of short spots; Use of images of key people (for example: Silvia Vasquez Lavado for the promotion of the consumption of Andean grains in mountaineers); Replication of strategies such as "this breast as a potato" or "to eat fish" from PRODUCE together with the academy; Promotion of quinoa as Peru's flagship product.</p>	<p>Improve crop promotion; Andean grains in the media; The media could warn of global risks and opportunities.</p>	<p>Promotion of Andean grains, whose products are known by national and international consumers.</p>
<p>National Consumption of Andean Crops</p>	<p>Promote a culture of consumption of Andean crops and their by-products; promote a healthy diet for all ages; suggest a minimum consumption of Andean products in nutritional programs, for example, to reduce anemia; Inclusion of Andean grains in municipal feeding programs and programs such as Qali Warma; Develop products that associate Andean grains with other foods to increase their sensory quality and take into account local consumption habits; Development of products for malnutrition; Facilitate access and availability of Andean grains; Promotion and regulation of the Participatory Guarantee System for the consumption of organic Andean grains at the national level; Develop capacities for the development of quality processed products.</p>	<p>Educational marketing: to teach the population about the health benefits of Andean crops in order to promote their consumption; to introduce healthy eating as a course in all (university) careers, highlighting the importance of Andean grains; to position Andean grains and the Peruvian diet.</p>	<p>Doubling per capita consumption of Andean grains, decreasing consumption of imported wheat and rice; Andean grains are an important component of the daily diet in Peru.</p>
<p>Time Frame</p>	<p>2020–2022</p>	<p>2023–2025</p>	<p>2026–2029</p>

Workshop 4: Action Plans

The fourth workshop was organized in April 2019 at UNALM. 39 participants attended the workshop, forming 6 groups. The experts represented the following sectors:

- Academia: 15 participants
- Public sector: 12 participants
- Private sector: 12 participants
- Non-Governmental Organizations: 0 participants

The objective of the workshop was to articulate a shared action plan for the agri-food sector stakeholders based on the roadmap developed in the previous step. In the first phase, each of the four groups developed their own action plans, which were then synthesised into one shared action plan (table 2 below). Each of the groups' suggested actions are reflected in the final action plan. A number of similar items suggested by the groups have been combined for clarity.

The proposed actions carry forward themes identified in the roadmapping process and can be seen as belonging to three main categories:

1. Research, Development and Innovation (RDI);
2. Building the Capacities of Value Chain Stakeholders; and
3. Strategic Communication and Marketing.

However, analysing the relationship between the action plans and key factors from the roadmap, shows that 65% of the proposed action plans are related to RDI factors and policy making. This highlights the need for a consolidated RDI system supported by a suitable package of multisectoral policies providing for effective public sector interventions along the Andean value chains.

While the actors who participated are convinced of the importance of the global market to the development of Peru's Andean value chains, they believe that more aggressive steps must be taken to position Peruvian brands there in addition to increasing national consumption.

Table 2. Action Plan 2020–2022

1. RESEARCH, DEVELOPMENT, AND INNOVATION								
Theme	Subtheme	Action	Responsible Parties	Beneficiaries	Resources Required	Obstacles	Timetable	Assessment
Developing strategies and re-search agendas	Crafting value chains strategies	Develop RDI Agendas for the value chains of Andean grains, with high-Andean quinoa as a priority	Ministry of Production ITP Technical group on value chains of Andean grains	Quinoa value chain stakeholders	Specialized databases Financing for collection of non-specialist information Specialist personnel in monitoring and foresight Technicians	No official centralized databases (not updated or articulated) Little coordination of actors to define and achieve an integrated agenda	2 years	After 2 years
		Convene an inter-institutional, multisectoral and multilevel technical roundtable focused on the Andean grain value chains to coordinate solutions addressing their main obstacles, with special focuses on technology transfer and innovation	Universities Research Institutions CONCYTEC Innovate Peru INIA ITP Ministry of Agriculture Ministry of Production	Producers Marketers Consumers Society	Universities' Infrastructures Competitive Funds Public (Ministries of Agriculture and Production) and private funding	Disinterest Corruption Distrust of residents Lack of political prioritization Individualism Division of land (parcelisation) Lack of appreciation Environmental economics?	2 years	Documentation of technical roundtable agenda Successful cases Degree of implementation Reduction of losses
	Financing the value chains	Develop and implement a financing strategy at the national	National: MEF Ministry of Production	Producers Next-generation producers	Networking Lobbying Marketing	Subject to political decision-making Changes of		

		government level to improve the competitiveness of the chains	Ministry of Agriculture Regional: Regional Government Local: Local municipalities	Young entrepreneurs		government Political instability		
	Developing new products	Promote and prioritize products with greater added value	Ministry of Agriculture Ministry of Production Ministry of Foreign Trade and Tourism ADEX Academia Companies Certification Bodies NGOs Local and Regional Governments Exporter Guilds	Producer Organizations Processing Plants Seed Producers	Public and private funding	Customs Consumption Habits Corruption High Cost of Certification	3 years	Yearly
Developing strategies and research agendas (cont.)	Innovating technologies	Generate technological innovation of Andean crops in agriculture and industry	UNALM Local Universities International Centre of the Potato INIA Private companies CONCYTEC Ministry of Production	Organised producers MSMEs Local and regional governments Associations	Financing Scientists Technological infrastructure Producing Areas Biodiversity in Andean crops (quinoa, tarwi, oluco, native potatoes)	Climate Change Limited infrastructure (agricultural, roads) Limited information system Micro-parcellisation	Planning and development of agenda, 3 months Dissemination and consolidation of work platform, 3 months Development of agricultural innovation, 2	Monitoring and evaluation system to be implemented

							years Development of agroindus- trial innovation, 1 year	
	Adapting to Climate Change	Research Cli- mate Change adaptation measures and promote related technology transfer	Ministry of En- vironment Ministry of Ag- riculture INIA Universities Farmers	Producers Consumers	Ministry of Envi- ronment	Lack of aware- ness Acceleration of Climate Change	2 years	Implemented actions Adapted tech- nologies
	Enabling e- commerce	Develop an e- commerce strat- egy	Chambers of Commerce ADEX Electronic Chamber of Commerce (private sector) Ministry of Transport and Communica- tion	Private sector Young entre- preneurs	Private sector (productive and marketing) Young people (both men and women)	Connectivity	4 years	Number of commercial agreements Number of transactions Databases
Market fore- sight		Study future sup- ply and demand for Andean prod- ucts nationally and globally	State: National Insti- tute of Innova- tion and Agri- culture (INIA) Ministry of Ag- riculture Ministry of Pro- duction National Coun- cil of Science, Technology, and Innovation Technology	Companies INIA Ministry of Health Ministry of Ag- riculture	International De- velopment Bank (IDB) Agreements of INNOVATE PERU (innova- tion financing) Specialists in technological foresight and IT tools	Costs of stud- ies Difficulty in set- ting priorities Lack of stake- holder involve- ment	Work planning and prospec- tive analysis, 10 months	Number of studies with available find- ings

			(CONCYTEC) Companies UNALM					
Strengthening production factors in the Andean grains value chains	Improving agricultural inputs	Encourage improvements in and use of agricultural inputs including certified seeds, irrigation systems, and organic fertilizers	Ministry of Agriculture Global and Regional Governments Seed Companies	Producer Organizations	Seed Companies Ministry of Agriculture Global and Regional Governments Producer Organizations	Customs Distrust Reduction in the number of seed companies (the market is controlled by a few firms)	3 years	Tons per hectare produced Assessed yearly
Strengthening production factors in the Andean grains value chains (cont.)	Controlling pests	Develop pest control techniques	Ministry of Agriculture Institute of Production Technology Network of CITES	Value Chain Stakeholders	Agroideas Territorial governments Private Banking Public R&D funding	Access to producers Organization of producers Access to information External factors (e.g. climate)	2 years	
	Managing water and soil responsibly	Develop techniques of water and soil management	Ministry of Agriculture Institute of Production Technology Network of CITES	Value Chain Stakeholders	Agroideas Territorial governments Private Banking Public R&D funding	Access to producers Organization of producers Access to information External factors (e.g. climate)	2 years	
	Diagnosing the situation of producers	Conduct studies to diagnose the situation of producers relative to desired levels of production quality	National Institute of Quality Certification bodies	Value Chain Actors	Agroideas Territorial governments Private Banking R&D funding	Access to producers Organization of producers Access to information	2 years	

						External factors (e.g. climate)		
	Developing special crop varieties	Develop special crop varieties	Ministry of Agriculture Ministry of Production Ministry of Foreign Trade and Tourism ADEX Academia Companies Certification Bodies NGOs Local and Regional Governments Exporter Guilds	Producer Organizations Processing Plants Seed Producers	Public and private funding	Customs Consumption Habits Corruption High Cost of Certification	3 years	Yearly
Developing products for the Andean grains value chain	Adding value	Explore development of new products based on vegetable protein, such as egg and mayonnaise substitutes, hamburgers, etc.	Ministry of Production Ministry of Agriculture Ministry of Foreign Trade and Tourism RREE Rural savings banks Cooperatives SBS (financial entities)	Value Chain Stakeholders	Territorial governments Private banks R&D funding	Peruvian financial markets	2 years	Index of profitability of value chain actors Magnitude of diversification
	Diversifying markets	Evaluate possibilities for the diversification of products made	Ministry of Production Ministry of Agriculture	Value Chain Stakeholders	Territorial governments Private banks R&D funding	Peruvian financial markets	2 years	Index of profitability of value chain actors

		from Andean grains	Ministry of Foreign Trade and Tourism RREE Rural savings banks Cooperatives SBS (financial entities)					Magnitude of diversification
Developing products for the Andean grains value chain (cont.)	Diversifying markets (cont.)	Develop a portfolio of 5-8 commercial products for different niche markets connected with the wider brands of quinoa, tarwi, and native potatoes	Universities Research Institutions Ministry of Production NGOs Private Companies Farmer organizations Ministry of Agriculture Center for Productive Innovation and Technology Transfer (CITES) Sierra Exportadores Companies IN-ACAL/UNALM	Farmer organizations Cooperative Producers and Associations Regional and local governments Companies: Micro, small and medium sized, private	Biodiversity of crops Financing Certifications INDECOPI (?) Market (ADEX) Specialized human resources Technical Assistance (technical packages, market demand, financing, technical standards)	Lack of Infrastructure Market Demand Lack of adequate studies Climate Change Lack of funding Barriers to entering markets Variability in international prices Quinoa production in other countries Lack of preparation and little dissemination in legislation governing foreign trade Weak differentiation and organization of state agencies	Planning, 3 months Product development, 3 years Brand development (packaging) and certifications, 2 years	Monitoring and evaluation system to be implemented Levels of domestic consumption Sales

		Develop products for special diets	Ministry of Agriculture Ministry of Production Center for Productive Innovation and Technology Transfer (CITES) Sierra Exportadores Companies IN-ACAL/UNALM	Cooperative Producers and Associations Companies	Technical Assistance (technical packages, market demand, financing, technical standards)	Lack of Infrastructure Market Demand Lack of adequate studies Climate Change Lack of funding Barriers to entering markets Variability in international prices Quinoa production in other countries		Levels of domestic consumption Sales
		Convene interested parties to develop products to combat malnutrition and anaemia	Private pharmaceutical and food companies Universities Research institutes	Children 0-5 years old Expectant mothers Seniors	Public funding International funding World Bank Raw materials from the Andes	Certifications Consumer culture Labelling	Design, 10 months Testing, 10 months Validation, 10 months Release/Roll-out, 6 months	WHO and FAO indicators on anaemia and nutrition levels
Assuring quality	Creating and pursuing certifications	Promote organic production and the pursuit of related quality certifications	Ministry of Agriculture Ministry of Production Ministry of Foreign Trade and Tourism ADEX Academia Companies Certification Bodies	Producer Organizations Processing Plants Seed Producers	Public and private funding	Customs Consumption Habits Corruption High Cost of Certification	3 years	Yearly

			NGOs Local and Regional Governments Exporter Guilds					
Assuring quality (cont.)	Creating and pursuing certifications (cont.)	Achieve compliance with certifications of product quality relevant to desired export markets in the process of developing commercial products for different niches under the broader brands of Quinoa, Tarwi and native potatoes	Universities Research Institutions Ministry of Production NGOs Private Companies Farmer organizations	Farmer organizations Regional and local governments Companies: Micro, small and medium sized, private	Biodiversity of crops Financing bodies Certification bodies INDECOPI Market (ADEX) Specialized human resources	Lack of preparation and little dissemination in legislation governing foreign trade Weak articulation of state agencies	Planning, 3 months Product development, 3 years Brand development (packaging) and certifications, 2 years	Monitoring and evaluation system to be implemented
	Designing and implementing technical standards	Design and implement technical standards to meet market expectations for quality	National Institute of Quality Certification bodies	Value Chain Actors	Agroideas Territorial governments Private Banking R&D funding	Access to producers Organization of producers Access to information External factors (e.g. climate)	2 years	Compliance with standards demanded by the market
		Conduct studies to demonstrate compliance with technical standards	National Institute of Quality Certification bodies	Value Chain Actors	Agroideas Territorial governments Private Banking R&D funding	Access to producers Organization of producers Access to information	2 years	Compliance with standards demanded by the market

						External factors (e.g. climate)		
Monitoring technological development and gathering business Intelligence	Monitoring technological developments	Monitor agribusiness, pharmaceuticals, and market sectors	State: National Institute of Innovation and Agriculture (INIA) Ministry of Agriculture Ministry of Production National Council of Science, Technology, and Innovation Technology (CONCYTEC) Companies UNALM	Companies INIA Ministry of Health Ministry of Agriculture	International Development Bank (IDB) Agreements of INNOVATE PERU (innovation financing) Specialists in technological foresight and IT tools	High costs of technology monitoring Non-integration of actors performing technology monitoring	Locating and integrating technology monitoring specialists, 4 months Work planning and technology monitoring, 6 months	Creation of observatories for technological developments and monitoring Bibliometrics
	Benchmarking educational initiatives abroad	Benchmark and adapt successful experiences of leading countries in providing education for forming associations and strategic alliances (e.g. techniques and strategies of horizontal and vertical integration across finance, production, pro-	Public sector actors involved in schools, cooperatives, and associations	Value Chain Actors	Public sector actors involved in schools, cooperatives, and associations	Culture in the territories	2 years	Growth in the number of partners Efficiency of vertical integration

		cessing, logistics, and consumption)						
Engaging in Technology Transfer		Transfer knowledge and technology to companies	National Institute of Innovation and Agriculture (INIA) Ministry of Agriculture Ministry of Production National Council of Science, Technology, and Innovation Technology (CONCYTEC) Companies UNALM	Companies INIA Ministry of Health Ministry of Agriculture	International Development Bank (IDB) Agreements of INNOVATE PERU (innovation financing) Specialists in technological foresight and IT tools	Access to the results of the observatories for technological development Financing for dissemination of knowledge and skills to perform technology transfer	Policy evaluation, 6 months Diffusion and uptake, 10 months	Number of companies that use the results produced by the observatories for technological development

2. Building the Capacities of Value Chain Stakeholders

Theme	Subtheme	Action	Responsible Parties	Beneficiaries	Resources Required	Obstacles	Timetable	Assessment
Gathering intelligence	Training specialists in business intelligence	Identify public objectives, trade missions, courses, and workshops	Ministry of Production Ministry of Education	Professionals Entrepreneurs Technicians	Public (Ministry of Agriculture, Canon?) and private funding	Language issues Lack of dissemination	2 years	Number of trained entrepreneurs
		Disseminate and scale up actions already in progress	Ministry of Production Ministry of Education	Professionals Entrepreneurs Technicians	Public (Ministry of Agriculture, Canon?) and private funding	Language issues Lack of dissemination	2 years	Number of trained entrepreneurs
Establishing associations, cooperatives, and strategic partnerships	Identifying and strengthening producer organizations	Promote and regulate agricultural cooperatives	Ministry of Agriculture Ministry of Production ADEX Regional and Local Governments Chambers of Commerce	Producer organizations	Public and private funding	Low level of education Lack of trust Corruption Bureaucracy Low level of associativity (pursuit of personal interests)	2 years	Semesterly
	Financing organizations of agrarian producers	Create post-harvest financing programmes and commercialize producer organizations	Ministry of Agriculture Regional and Local Governments Agro Banks Promotional Funds Companies	Producer organizations	Public and private funding	Culture of non-payment of debts Corruption Mortgage guarantees	3 years	Trimesterly
	Integrating value chain stakeholders with markets	Integrate producer organizations with markets	Ministry of Foreign Trade and Tourism	Producer organizations Companies	Public and private funding	Limited business intelligence	3 years	Trimesterly/ Quarterly

			Ministry of Production Ministry of Agriculture ADEX Chambers of Commerce			Difficulty in accessing trade fairs (due to cost or other requirements for participation)		
Establishing associations, cooperatives, and strategic partnerships (cont.)	Strengthening capacities of cooperatives to develop desirable norms and trade practices	Strengthen capacities to develop adequate norms of conduct, suitable benefits for members, and fair trade practices	Ministry of Production Universities Ministry of Agriculture Producer Organizations NGOs ADEX Chambers of Commerce	Producer organizations (small and medium sized)	Financing Personnel training (in adequate norms, benefits, and fair trade) Strategic alliances with national and international cooperatives			Producer levels of negotiation and sales Volumes Standards
	Incorporating educational initiatives into management practices	Create internships and missions for value chain actors focused on young people	Public sector actors involved in schools, cooperatives, and associations	Value Chain Actors	Public sector actors involved in schools, cooperatives, and associations	Culture in the territories	2 years	Growth in the number of partners Efficiency of vertical integration
		Incorporate educational dimensions into the management plans of institutions	Public sector actors involved in schools, cooperatives, and associations	Value Chain Actors	Public sector actors involved in schools, cooperatives, and associations	Culture in the territories	2 years	Growth in the number of partners Efficiency of vertical integration
Employing good agricultural practices	Adopting good agricultural practices	Create instruments and develop capacities to favor the adoption of good agricultural practices	Ministry of Agriculture Institute of Production Technology Network of CITES	Value Chain Stakeholders	Agroideas Territorial governments Private Banking Public R&D funding	Access to producers Organization of producers Access to information	2 years	

						External factors (e.g. climate)		
	Producing high-quality outputs	Develop capacity for production at quality levels demanded by markets	National Institute of Quality Certification bodies	Value Chain Actors	Agroideas Territorial governments Private Banking R&D funding	Access to producers Organization of producers Access to information External factors (e.g. climate)	2 years	Compliance with standards demanded by the market
	Eliminating hazardous pesticides	Eliminate all red band pesticides	General Directorate of the Environment (Ministry of Agriculture) National Service of Agricultural Health and Safety (SENASA) General Directorate of Environmental Health (DIGESA) Ministry of Production	National market	Ministry of Production Ministry of Health Ministry of Agriculture	Prices Practicality of the finished product	2 years	Product safety
	Practicing organic production, managing natural resources, and engaging in permaculture	Achieve organic certification of products and access to improved and certified seeds	INIA Organic certification bodies INDECOPI	Farmers Companies State Consumers	High technology Biotechnology	Non-availability of requirements for certification National regulations Ignorance of national and	Information collection, 8 months Development of promotion strategy, 10 months Management	10 products with organic certification placed in international markets

		without compromising the identity of the product				international legislation	of natural resources and permaculture strategy, 10 months Implementation of promotion and natural resources/permaculture strategy, 15 months	
Processing food		Develop institutional capacities needed to produce processed products of quality	NGOs Universities Research centres Producer organizations	Producers Local governments Consumers	Raw materials Natural resources Financing Technology Infrastructure Specialized human resources	Lack of political will Lack of infrastructure (technology, roads) Economic limitations	Planning, 3 months Capacity building, 2 years	Management indicators Evaluation and monitoring
Financing development and new ventures	Making supportive financial policy	Develop a financial policy aimed at small producers to support their 1st and 2nd level organizations	Ministry of Production Ministry of Agriculture Universities Research Centers Producer organizations NGOs	Producers Private companies Local governments	Financing Scientists Production areas	Limited human resources Culture of producers (e.g. not thinking of global markets, social embeddedness)	Planning, 3 months Capacity building of the organizations, 1 year Consolidation of organizations in the 2nd level, 1 year	Monitoring and evaluation system to be implemented
	Creating the conditions for private investment	Develop the linkages between producers and industrialists	Ministry of Production Ministry of Agriculture	Value Chain Stakeholders	Territorial governments Private banks R&D funding	Peruvian financial markets	2 years	

			Ministry of Foreign Trade and Tourism RREE Rural savings banks Cooperatives SBS (financial entities)					
Supporting entrepreneurship in agriculture and food by young people	Educating young people (including children of producers) for entrepreneurship	Adapt the educational curriculum and technical education to regional demands and an orientation toward entrepreneurship	MTPE (Employment fund) Ministry of Agriculture Ministry of Production Ministry of Foreign Trade and Tourism Ministry of Education (SINEACE ?) PCM ?	Value Chain Stakeholders	Central government Territorial governments Private companies	Administrative processes Availability of resources Regulation	2 years	Growth in number of companies and institutions
		Create internships and missions for value chain actors focused on young people	Public sector actors involved in schools, cooperatives, and associations	Value Chain Actors	Public sector actors involved in schools, cooperatives, and associations	Culture in the territories	2 years	Growth in the number of partners Efficiency of vertical integration
Supporting entrepreneurship in agriculture and food by young people (cont.)	Providing funding for entrepreneurship by young people	Develop specific funding for entrepreneurship in the agriculture and food sectors by young people	MTPE (Employment fund) Ministry of Agriculture Ministry of Production Ministry of Foreign Trade and Tourism	Value Chain Stakeholders	Central government Territorial governments Private companies	Administrative processes Availability of resources Regulation	2 years	Growth in number of companies and institutions

			Ministry of Education (SINEACE) PCM					
Increasing access for consumers		Increase access and ease of consumption with a focus on the user	Ministry of Production Ministry of Health Ministry of Agriculture	National (domestic) market	Ministry of Production Ministry of Health Ministry of Agriculture	Consumption culture Prices Practicality of the finished product	2 years	Per capita consumption growth

3. Strategic Communication and Marketing								
Theme	Sub-theme	Action	Responsible Parties	Beneficiaries	Resources Required	Obstacles	Timetable	Assessment
Promoting Andean grains as a part of healthy eating		Create persuasive informational campaigns to promote the consumption of Andean grains for their nutritional benefits, in the media and through government nutrition and food programs	Ministry of Foreign Trade and Tourism Prom Peru Ministry of Agriculture Ministry of Production NGOs Private companies Producers Ministry of Health Ministry of Education Ministry of Culture Ministry of Development and Social Inclusion Universities Society Families Nutritionist Association of Peru	Consumers (coast, mountain, and Amazon regions) Producers Food industry Society	Financing Communications professionals Existing institutional resources Mass media Diffusion campaigns TV program ("Eat quinoa, kiwicha, tarwi...") Fairs	Disinformation Discrimination Consumption habits Lack of acceptance/Resistance to change Price Practicality of products for consumers	Andean food consumption culture change strategy, 10 months Implementation of the culture change strategy, 15 months	10 percent increase in consumption of Andean crops and their derivatives Per capita consumption growth

Promoting Peruvian food products worldwide		Develop global marketing strategies and consumer marketing	Academia Business schools ADEX Ministry of Production Ministry of Agriculture Ministry of Tourism and Foreign Trade RREE National Industry Society Private companies	Farmers Businesspeople The state (through taxation) Consumers	International financing Business financing Personnel of foreign trade schools Technicians PROMPERU Office of Digital Government State development of road, maritime, and air infrastructure	Lobbies Power groups Disintegration of the production chain	Marketing, logistics, and marketing studies, 10 months Implementation of the marketing campaign, 10 months Implementation of marketing and marketing during the bicentennial, 10 months	10 percent increase in sales of products using Andean grains
Promoting technology imports		Create campaigns for promoting technology imports	Ministry of Agriculture Ministry of Health Ministry of Production Universities Nutritionist Association of Peru	Producers Food industry Society	Ministry of Production Universities	Disinformation Lack of acceptance New consumption habits	2 years	Development of new products that can be easily adopted
Promoting agricultural subsidies		Create campaigns to promote incentives and subsidies	Ministry of Agriculture Ministry of Education Ministry of Health Ministry of Production Ministry of Culture Universities Nutritionist Association of Peru	Producers Food industry Society	Ministry of Agriculture Ministry of Health Ministry of Production Universities		2 years	Products at more affordable prices

DISCUSSION

The primary focus of the action plan is on the many ways in which the value chains of Andean crops can be strengthened.

In examining the results of the workshop, the idea that strong value chains for Andean grains will benefit many categories of stakeholders, from producers through companies and entrepreneurs to consumers, was very apparent. Actions discussed as ways to contribute to the value chains include effectively incorporating new stakeholders, increasing their capacities to add value by producing, processing, and marketing high-quality crops and innovative food products, and expanding the reach of the value chains to connect them with global markets.

In addition, cultural changes in food consumption are desired to bring Andean grains back to a more central place in Peruvian diets, where they have been supplanted over time by less nutritious imported alternatives (especially wheat and rice). Many of the experts concluded that even if international markets are important, more focus should also be put on national consumption.

Strategic communication and marketing efforts are seen as targeting both domestic and worldwide consumers with a message that links Andean grains with healthy eating.

Within Peru, these approaches would emphasize the nutritional benefits of Andean grains, incorporating them into a transformed culture of “healthy eating” and into government nutrition programs. Internationally, marketing efforts would be needed to develop further strategies for promoting Peruvian products globally. In addition, strategic communication could assist in promoting the import of technologies and in encouraging the government to offer agricultural subsidies for the cultivation of Andean grains.

Numerous categories of actors were suggested as parties with some responsibility for whether these aims will be achieved.

Government at the local, regional, and national levels was seen as playing a crucial role, and several government agencies, including the Ministries of Agriculture and Production, receive repeated mention as important players. Universities and research institutes are also prominent. For particular actions, private sector actors and organizations are seen as a valuable partner, whether they are private companies, business organizations, or banks. For others, the particular skills and aims of non-governmental organizations would be required.

The most frequently mentioned resources needed for these actions are financial ones, including funding from various public and private sources. Expert knowledge, technical assistance, and the development of specialized human resources were also widely highlighted. In addition, technology, infrastructure, and biodiversity were cited as areas in need of development and conservation.

In the RDI area, much of the emphasis is on developing institutions and mechanisms for ongoing strategic planning.

Crafting an integrated value chain strategy is central to these aims and will be an ongoing concern of this process into the future. In addition, technology monitoring, business intelligence, and market foresight are three information streams needed to position Andean crops in the wider environment and take advantage of new opportunities when they arise. Emerging challenges include Climate Change, for which

local adaptation measures will be crucial, and the potential opportunity to use e-commerce to reach consumers worldwide. Efforts in both of these areas, as well as numerous others, could be accelerated through technology transfer, for which an infrastructure needs to be established and maintained.

The workshop groups suggested that the integrity and efficiency of the value chain itself can be improved in three principal ways: by improving agricultural production factors, developing new products with added value, and assuring the reliably high quality of both crops and processed foods.

Each of these areas requires their own specific actions, but all three make interrelated contributions to the ultimate outcomes. This action plan outlines the ways in which value chain stakeholders will need new and stronger capacities to make these changes possible. Efforts to establish and improve the management and trade practices of organizations of agrarian producers, including associations and cooperatives, are given special emphasis. In addition, changing some existing agricultural practices (e.g. using certified seeds), building capacity for food processing, and establishing financing mechanisms and support for entrepreneurs are all highlighted as important steps.

Obstacles currently facing these actions are numerous and varied, arising from both within and outside Peru.

At the government level, obstacles include a lack of coordination between actors toward an integrated research and implementation agenda, bureaucracy and political instability. For producers, obstacles stem from a lack of trust and/or disinterest from the public and between potential partners; self-interest, individualism, and corruption; the division of land into smaller and smaller parcels; limited physical and digital infrastructure, information, and connectivity; consolidation of seed companies; and a lack of knowledge about global markets and national and international legislation. Consumers are seen as having ingrained consumption habits and resistance to trying something new. Finally, external pressures and limitations such as Climate Change, difficulties in entering new markets, variability in international prices, and competition from other countries growing quinoa were seen as continued barriers that future efforts would need to overcome.

There are two distinct and hopefully complementary paths to the commercialization of Andean grains.

Firstly, global markets for healthy foods can bring economic benefits to the families of producers in the rural regions of the country if there are well-developed chains, a reduction or elimination of intermediaries, a portfolio of value-added products (ready to consume) with recognizable Peruvian brands in the global markets and the fulfillment of certification demands and authorizations for the entry of products derived from Andean grains (meeting standards for quality, safety, and organic status, among other requirements for novel foods).

The second approach aims at reducing nutritional problems experienced by the Peruvian population by increasing the consumption of Andean grains through government social programs, developing accessible ready-to-eat products and building capacities for food processing among local producers in rural territories.

Views about how RDI programmes could be strengthened differed on whether new institutions are required.

In the roadmapping workshop, the idea of creating a dedicated Andean grains research center was raised. However, the additional interviews carried out after the roadmap workshop suggested a contrary view, with the key actors indicating that it would not be necessary to create new institutions, but that the institutions that already carry out research, development and innovation tasks (for example: INIA and UNALM) could be strengthened. The focus of these existing institutions is mainly on agricultural research, but one option for the future could be transforming UNALM's CIINCA (Centro de Investigación e Innovación en Granos Andinos) into a center of innovation for products based on Andean grains. CIINCA is the centre for research and innovation for Andean grains developed during the previous HEI-ICI funding period 2013–2015, also with the support of University of Turku. In the PECOLO project CIINCA has played a key role and a strategic plan has been made to support its continued development. It would thus be a logical step to continue future RDI work in the context of the increasingly established innovation environment at CI-INCA.

RECOMMENDATIONS AND NEXT STEPS

The obstacles and challenges to finding a way forward are numerous and at the same time it is clear that action should be taken quickly. Because the obstacles, problems and challenges of developing the Andean grains' value chains are interconnected, we should aim to simultaneously tackle as many of them as possible. Due to the holistic nature of these problems, a reductionist piece by piece approach is not the best way to achieve effective results.

Strengthening the value chain aspects of the agri-food sector requires flows of information between its actors and other stakeholders. Increasing the transparency of the whole value chain is needed in order to create an atmosphere of trust within it. Trust between stakeholders and actors facilitates commitment and a sense of shared responsibility which is crucial to networks and innovation environments. Building such an environment is of course not easy, and takes time, money and the cooperative efforts of many people.

Multidisciplinary research is the obvious answer for investigating complex, connected and global phenomena in food and agriculture. Multidisciplinary research teams that really work together, not just gather results of different scientific disciplines in a single publication or research report, are immensely valuable. The aim could be in fact be transdisciplinary research, which in its most developed forms mean a totally new science. Before that can take place, increasing the sheer number of multidisciplinary research teams is an important first step. The same type of approach should be applied to development work.

The best arguments for supporting Andean grains are probably their health and nutritional aspects, combined with their contribution to Climate Change mitigation and adaptation. There is a huge amount of potential for new healthy and sustainably produced food products to replace unhealthy ones. Markets are of course directly dependent on consumption habits and pricing. Marketing efforts are one way to raise the level of awareness of Andean grains, but education and information programs are also essential. Healthy food products should be affordable to all consumers, not just luxury items for the wealthy.

CIINCA should play a key role in carrying forward the sustainability work done thus far. Supported and strengthened as a centre of innovation for products based on Andean grains, it will be even better equipped to lead the agenda of technological development and innovation in Andean grains into global and national markets.

It is important to consolidate a strategic alliance between the mass media, government agencies in food and health and R&D institutions such as CIINCA around products derived from Andean grains. This will make it possible to keep the public continuously informed about the benefits of consuming Andean grains, as well as promoting commercial products available in the Peruvian market.

Multi-sector coordination spaces are required to bring together the public and private sectors, academia and other actors for the development of RDI agendas and production chains that allow for the alignment of actions as well as ongoing monitoring. With the instability of the government in mind, it is important to promote governance models that do not depend exclusively on government actors.

Finally, since this publication presents an action plan only up to 2022, it is essential to remain ware that the planning process does not end here. By the end of 2022, an action plan for the following period should be in place to ensure that these efforts continue uninterrupted.

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