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**The Andean Initiative
Elevating a collaborative
agenda on agrobiodiversity,
climate action and healthy diets**

STRATEGY
2020•2030

The Andean Initiative: Elevating a collaborative agenda on agrobiodiversity, climate action and healthy diets

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Foreword

The International Potato Center (CIP) has been at the forefront of innovation in mountain agriculture for five decades. The crags and fields and valleys of the Andes are where 4,354 varieties of potato originated, the start of a journey to feed populations from Dublin to Delhi. Since 1971, CIP has made its home in Peru, developing tools, methods, and best practices to conserve and improve potato, sweetpotato, and Andean roots and tubers, while also strengthening food systems and fighting malnutrition around the world.

Much has changed in the 50 years since CIP was established, but one fact remains foremost: the role of agriculture and food chains around the world to drive innovation, support economic growth, and feed the ever-growing global population. Agriculture remains central to global solutions for addressing poverty, malnutrition, climate change, and biodiversity loss. But agriculture can do much more. Within its practices, food provisioning from “farm to fork” can be a tool for improving social inclusion, human health, and environmental sustainability. As the fundamental link between people, plants and the planet, Andean agriculture – of which the potato is only one crop – has the great potential to support transformation processes that turn beneficiaries into agents of change, empowered to play a key role in achieving the Sustainable Development Goals at local, national, regional and global scales.

The 2020-2030 Andean Initiative strategy presented here introduces new directions for CIP’s collaborative science for a co-innovation agenda for the Andes. In these pages, we identify challenges and opportunities to improve food systems to provide more nutritious food and more stable yields in the face climate change and urbanization but within planetary boundaries, and while sinking carbon and conserving freshwater.

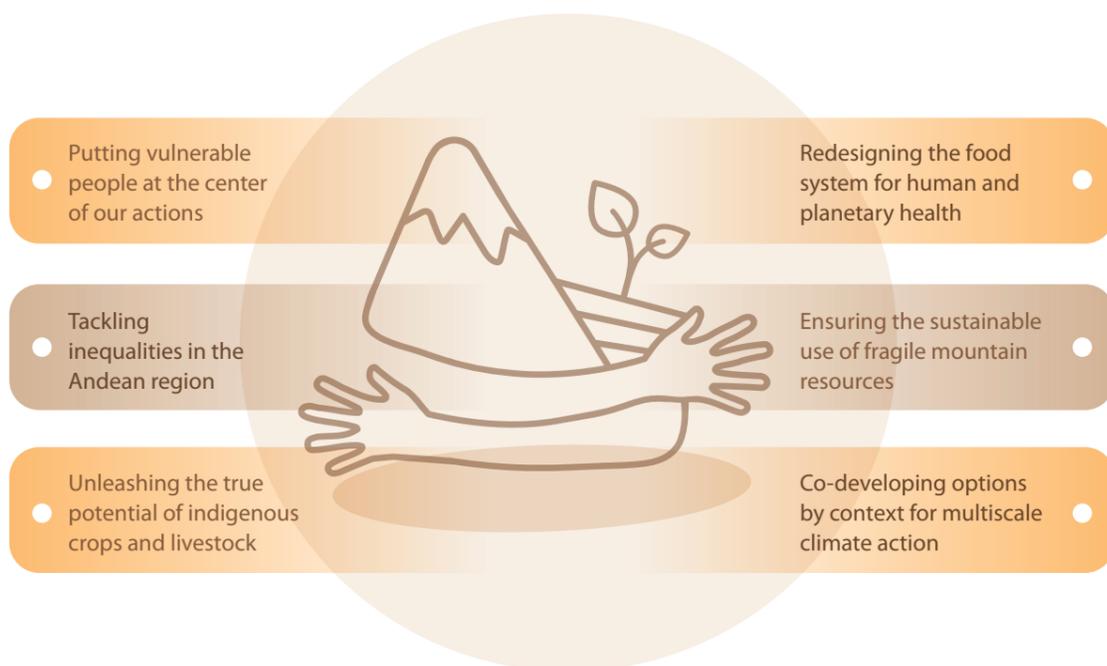
Using systems innovation to achieve impact at scale, we at CIP are determined this next decade will become the decade of Andean food systems transformation: a decade of opportunity centered around a shared vision of a food secure future where global ecology, planetary health, and human relationships are in balance. The decade where vulnerable people in fragile environments are part of the solution. We welcome you to become a part of this initiative, this co-creation of what Andean food systems can and will become.

Ginya Truitt Nakata
Regional Director for Latin America and the Caribbean
International Potato Center (CIP)

Executive summary

The Andes Mountains, like many parts of the world, are facing unprecedented challenges to its sustainable development in the form of the climate crisis, COVID-19 pandemic, biodiversity loss and major inefficiencies in the food system. To address these challenges, and capitalize on opportunities therein, the **Andean Initiative** will pursue an integrated agenda on agrobiodiversity, climate action and food for health. The Andean Initiative is a regional innovation platform aiming to facilitate collaborative science for co-innovation with emphasis on gender, indigenous people, youth, big data and digital solutions. The Initiative will contribute solutions and lessons toward sustainable mountain food systems with potential for scaling in mountain regions around the world.

We envision mountains where people enjoy prosperity and well-being while conserving its rich natural resources. The Andean Initiative's mission is to preserve the Andes's unique agrobiodiversity and build a climate-resilient future in which all humans enjoy healthy diets by:



This Andean Initiative strategy is the result of an extensive multi-stakeholder consultation conducted with more than 50 organizations working in the Andean region during 2019 and 2020. The resulting agenda aims to address contemporary challenges through collaborative science-based solutions and innovations on agrobiodiversity, climate change and food for health and their interactions with interconnected flows of goods and services toward the Amazon and coastal areas of western South America. To achieve these goals, people, plants and the planet will be central:



people

As food systems transition and Andean people are increasingly affected by the double burden of malnutrition - stunting and overweight - there is an urgent need to reshape system outcomes toward healthy diets. Achieving human and planetary health can be achieved by making better use of the rich agrobiodiversity in the region, including Andean legumes, grains, and vegetables as key components. The Andean Initiative will conduct research on food system drivers, food supply chains, food environments, and consumer behavior and diets along major city-region foodsheds.¹



plants

As one of the original Vavilov centers of crop origin, the richness of agrobiodiversity is among the Andes's major strengths. What used to be called 'lost crops' or 'neglected and underutilized species' are, in reality, treasure troves for the development of differential and inclusive market systems based on 'future, super or smart foods.' The Andean Initiative will explore the nutritional and nutraceutical traits of agrobiodiversity and promote sustainable business models and value chain development. The Initiative will also spearhead conservation intelligence through systematic *in-situ* monitoring in key diversity hotspots.



planet

Climate change is affecting the Andes with incidences and intensities more pronounced compared to other ecologies. Climate change is occurring at the highest altitudinal frontier of agriculture globally, where responses to climate extremes are rooted in traditional practices. The Andean Initiative will focus on climate action in contrasting geographies and policy engagement based on models and regional forecasting. The Initiative will also promote the conservation, restoration and sustainable use of high-altitude peat and grasslands, incentive systems through inclusive business, and integrated climate knowledge management.

¹ A foodshed is the geographical area between where food is produced and food is consumed. The concept encompasses a network of a goods or service from its origin to its ultimate destination.

1. Elevating a collaborative mountain agenda

In 2019 the International Potato Center (CIP) embarked on an extensive stakeholder consultation and situational analysis throughout the Andean region to identify emerging challenges and opportunities. As a result, a range of emerging topics, critical issues, and diverse demands were prioritized. Based on CIP's strengths and track record, a new strategy was developed, introducing novel directions for a collaborative research agenda in the Andes and identifying opportunities for creating enabling partnerships to deliver impact for vulnerable people in fragile mountain environments. The Andean Initiative is CIP's proactive contribution to the 2030 Agenda for Sustainable Development in western South America and global mountain regions. This mission is in line with the CGIAR's overall commitment to redesign our food systems toward social inclusion, and environmental and human health.

The new strategic direction for the coming decade builds on CIP's legacy to facilitate collective action, but now specifically includes attention to youth, consumer perspectives, city-region foodsheds, native Andean crops and healthy diets beyond potato, and business-led solutions. The Andean Initiative explicitly embraces the challenge to close the gender gap and the digital divide to foment access to modern information and communication technologies. The 2020-2030 strategy of the Andean Initiative - a regional collaborative platform - is guided by our core values: trust in and reliance on horizontal partnerships through participatory, empowering, and bottom-up approaches.

In 2021, CIP will celebrate its 50th anniversary looking back on decades of pioneering global achievements. The celebration comes at a critical time when the climate crisis, biodiversity loss, and significant inefficiencies in the global food system are posing a threat to sustainable development. The Andes's role as a powerhouse for ecosystems services provision – food, water, energy and biodiversity for local, global, and lowland populations – is at stake. Agriculture is, at the same time, complicit to and a victim of accelerated global change. Mountain socioecological systems are particularly vulnerable and exposed. Therefore, we propose to elevate a collaborative platform agenda to strengthen science for co-innovation on agrobiodiversity, climate action and food for health to ensure a bright and resilient future for Andean people and the natural environment on which we all depend.

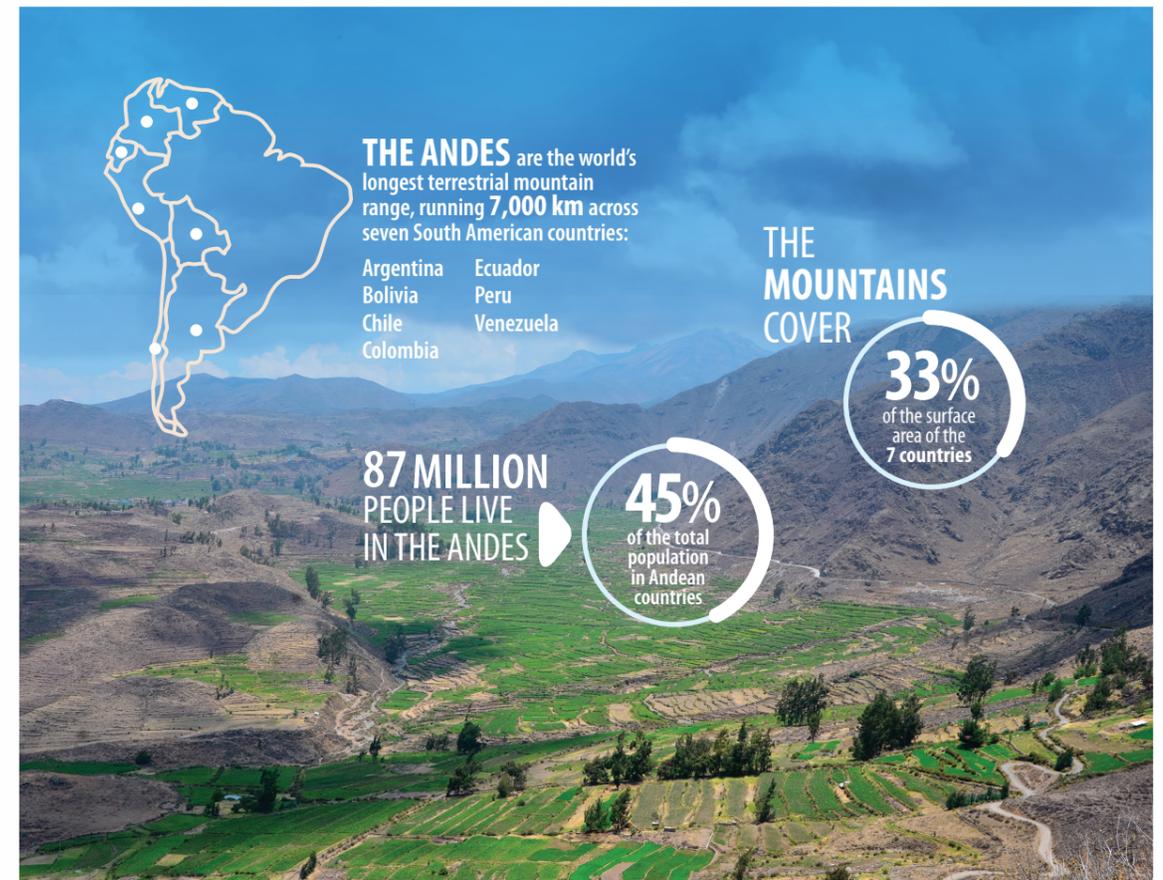
2. Why the Andes?

The Andes are the world's longest terrestrial mountain range, running 7,000 km across seven South American countries: Argentina, Bolivia, Chile, Colombia, Ecuador, Peru, and Venezuela. The mountains cover 33% of the areas in these seven countries and, as such, they are vital for their respective economies and the livelihoods of the region's population. Eighty-seven million people live in the Andes, accounting for 45% of the total population in Andean countries. Another 40 million people also depend on mountain resources and ecosystem services to the cities on the Pacific coast and along the eastern Amazonian watersheds. The northern Andes are among the most densely populated mountain regions in the world.

The Andes are rich, diverse, fragile, exposed and a key provider of ecosystem services, but also a living laboratory for advances in both climate science and understanding its environmental impact on food systems. For scientists and change agents, this offers an enormous opportunity. By better understanding the extremes experienced in the Andes and how people, the environment, and agrobiodiversity adapt, we can be better prepared for what might happen elsewhere as a result of extreme and unpredictable weather patterns. By studying the rich agrobiodiversity of the Andes we can harness its uses to meet a growing demand for sustainable diets, particularly in emerging markets, while also preserving rural incomes and livelihood resilience and thus reducing the need for Andean people to move elsewhere.

THE ANDES are rich

The Andes are exceptionally rich in biodiversity, cultural diversity and natural resources including minerals, fresh water, and soil carbon. With approximately 30,000 species of vascular plants (half of those endemic to the region), the Andes surpass the diversity of any other mountain range. For example, there are 3,000 types of orchids in Peru alone, and Colombia hosts 167 passionflower species. Likewise, the richness of fauna in the Andes is exceptional with approximately 600 mammals, 1,700 birds, 600 reptiles and 400 fish. Furthermore, rates of endemism are high: for example, the Andes hosts 1,000 species of amphibians, two-thirds of which are endemic to the region.



The Andes are also a major center of domestication of key crops like potato and quinoa and a secondary center of diversity for maize and beans. It also is the center of origin for important crop species and highly nutritious foods that underpin ecosystems, economies, and diets. More than 50 native crops, thousands of unexplored crop varieties, and many unique breeds of native livestock wait for their true potential to be unleashed. The species richness of potato and tomato wild relatives has offered resistance genes and unique traits of vital importance for crop breeding. Growing interest in novel and healthy foods can support high-value markets and inclusive businesses that prioritize sustainability and diversity.

THE ANDES are diverse

The climate in the Andes varies greatly depending on latitude, altitude, and proximity to the sea or Amazon. The Andes is home to more than 85 of the planet's 120 life zones, and the Tropical Andes, the Dry Andes and the Wet Andes represent three large climate zones with numerous microclimates. The vast variety of Andean ecosystems and landscapes contain some of the wettest, driest, warmest, and coldest habitats on earth. These extreme environments are inhabited by diverse ethnic groups, including Quechua, Aymara, Jaqaru and Chipaya, with different languages, cultures, and traditions. Such varied conditions have contributed to a vast pool of traditional knowledge and adaptation mechanisms, often undervalued, but of vital importance for climate change adaptation.

Agricultural production systems in the Andes are among the most diverse globally. The landscapes managed by Andean communities typically cover different altitudes, multiple production zones and complex management regimes involving both private and communal assets. By protecting the agricultural landscape and agrobiodiversity found in the Andes, and harnessing its resilience to the climate extremes, we can learn vital lessons to help the rest of the world survive the climate emergency.

THE ANDES are fragile

Andean mountain environments are fragile and can quickly be damaged by deforestation, overgrazing, cultivation on marginal soils, and progression of urbanization. These factors can result in rapid degradation of biodiversity, soil carbon stocks and water resources, and trigger an increase in natural hazards. The slow growth rate of high-altitude soils and forests severely limits recovery after degradation.

With an average altitude of 4,000 m and 103 peaks above 6,000 m, the Andes have the largest global coverage of tropical glaciers. Yet, these glaciers - essential for agriculture and freshwater provision - are disappearing at an alarming rate. Global warming is considered the primary cause of their rapid retreat. Soil erosion and biodiversity loss driven by land use change are especially troublesome. Unsustainable intensification and inadequate soil tillage practices are threatening topsoils in delicate agroecologies. Deforestation, forest fragmentation and climate change are driving endemic plants and animal species to the brink of extinction. According to the IUCN Red List, 18% of the freshwater biodiversity endemic to the Tropical Andes is threatened with extinction.

Fragility is closely linked to the livelihood risks faced by people living in the Andean region. Some of the region's poorest communities in terms of income and human development are in the Andes. The rainfed nature of Andean agriculture in extreme environments above 3,500 m and the dependence on a single harvest season make farming significantly prone to risk. Although nutrition programs have made progress in most Andean countries, children in the high Andes continue to be susceptible to undernutrition due to iron and zinc deficiencies. In terms of the digital divide, the COVID-19 pandemic has revealed it to be particularly strong in the Andes with millions of highland children having no access to digital information nor formal education.

THE ANDES are exposed

Effects of global warming are more marked as altitude increases and this is particularly noticeable in the Andes where many people live above 3,000 m and agriculture is practiced up to 4,300 m above sea level. As glaciers are melting, water regulation and storage capacity will shift to Andean wet and peatlands: the *páramo*, *puna* and *bofedales* ecosystems. These unique landscapes with their moors and lakes are very sensitive to human perturbation. Yet, global warming is pushing the altitudinal frontier of agriculture upward into ecosystems containing the region's largest stocks of soil carbon. The Andes's flora and agrobiodiversity will face risk when the changing climate makes their current environments unsuitable.

In this context, Andean agriculture finds itself more intensively exposed to extreme weather events and out-of-season shocks. The frequency and intensity of abiotic stress – particularly hail, frost, and drought – has increased. High-altitude agriculture is characterized by long cropping cycles, rain dependence, an absence of protected cultivation and a digital divide when it comes to actionable climate information. Consequently, smallholder farmers are especially exposed. High altitude environments form a natural barrier for pests and diseases. However, in recent decades they have expanded their distribution range to higher altitudes, triggering increased losses in crop and livestock production.

THE ANDES are a powerhouse of ecosystem services

The Andes provide essential ecosystem services throughout western South America and to the world, and yet, receives little reinvestment in return. The energy-water-food nexus is the main tie connecting the highlands to the lowlands. The Andean 'water towers' play a vital role for downstream areas and adjacent lowlands by storing and delivering energy through hydropower, freshwater for cities, and irrigation water to export-oriented agriculture on the Pacific coast. The Andes are also a dual carbon sink with vast carbon stocks in it 6.5 million ha of upland peat soils and 31 million ha of Andean forests.

The Andes are the region's breadbasket. Family farming represents 95% of the total agricultural units in the Andes with more than 4.9 million households involved. It is a stark paradox that the same families who provide food to the cities often live in marginal conditions deprived of basic health, education, and sanitary services. The Andes also continue to provide unique species, foods and traits to the world based on its biological richness. Furthermore, its cultural ecosystem services are essential for regional tourism.



3. Key challenges and opportunities

Structural inequality

Andean countries have persistently suffered from pronounced social, economic and ethnic inequality. According to the United Nations Economic Commission for Latin America and the Caribbean (CEPAL, 2019), Colombia is the second most unequal country in Latin America (Brazil is first) with a GINI co-efficient of 0.52.² Latin America overall remains the most unequal region in the world. In the Andes, Bolivia, Ecuador and Peru show deep ethnic and subnational disparities, which have negatively shaped societies since colonial times (Larrea and Freire, 2002).

Inequality leads to low investments and economic growth. Unequal access to productive means, capacities, opportunities and recognition, compromises innovation and productivity (ECLAC, 2018). Inequality also affects inter-generational mobility, which implies that it tends to persist across generations. Inequality within and between generations affects prospects for true development and negatively impacts the environment and productivity (ECLAC, 2018).

Selected key facts:

In 2002, Bolivia was the most unequal country in Latin America. Between 2004 and 2018, inequality in Bolivia was reduced significantly based on the GINI index, from 0.612 to 0.438 (CEPAL, 2019).

In Peru, Ecuador and Venezuela only 2.1, 1.7 and 1.5% of the total population has high incomes while 45.9, 53.7 and 58.7% of the population has low incomes (CEPAL, 2019).

The proportion of workers classified as low productivity who are excluded from social security systems is 99, 93.8 and 89.7% respectively in Peru, Venezuela and Colombia.

Youth in mountain agriculture

Due to dwindling opportunities in rural areas, youth outmigration is a constant for Andean communities as women are often left behind to shoulder the onerous burden and the region lacks significant prospects for succession in agriculture. Although, in 2020, COVID-19 has reversed this trend for the time being, presenting potential opportunities for re-investment.

Selected key facts:

Well over half the national population lives in urban areas in Bolivia (69%), Colombia (81%), Ecuador (64%), and Peru (78%) (World Bank, 2019).

The average age of a head of a rural household in Ecuador is 53 years (Salcedo and Guzman, 2014).

The number of female-managed farms has doubled in Peru, increasing from 353,957 to 668,675 between 1994 and 2012 (Remy, 2014).

² With GINI co-efficients, less than 0.2 is considered perfect income equality while greater than 0.5 represents severe income gaps.

Extreme climate impacts

The Andes are currently experiencing climatic change extremes at a much greater rate than other regions. With Andean agriculture taking place at the highest altitude anywhere in the world, upward expansion to even higher altitudes has triggered the release of untouched soil carbon from peatlands. The volume of carbon being released from unsustainable land use in the high Andes is equivalent to those derived from deforestation in the Amazon.

Selected key facts:

Andean peatlands contain the most voluminous soil organic carbon (SOC) stocks globally. Peru alone has about 1.5% of the global soil carbon stocks, representing 1000-times more carbon than annual national emissions (FAO, 2018).

The Andes host 95% of the world's tropical glaciers (Vuille et al., 2008). Between the years 2000 and 2016 the surface area in Peru covered by glaciers decreased by 29% (Seehaus et al., 2019).

Glacial meltwater is a critical water source for irrigation and drinking water for millions of people living in the Andean highlands (Johansen et al., 2018).

Threats to agrobiodiversity

The Andes are a major Vavilov center of crop origin and unique in many ways, including the fact that smallholder farmers continue to manage high levels of crop, livestock, and on-farm diversity. The native crops and livestock of the Andes are unparalleled and have huge potential in the bioeconomy. But this potential has not been realized as booms and busts in markets have led to unsustainable intensification and social exclusion. And without climate change mitigation, the diversity could be lost.

Selected key facts:

The Andes region is home to four of the world's 17 megadiverse countries: Bolivia, Colombia, Ecuador and Peru (Mittermeier et al., 1999).

The diversity of Andean crops and their wild relatives is increasingly at risk (Castañeda-Álvarez et al., 2015; MMA&A, 2009).

The loss of local varieties and breeds of domesticated animals is a key threat to food security (Brondizio et al., 2019; Pilling et al., 2020).

Andean farmers domesticated more than 50 highly nutritious food crops, including numerous species with exceptionally high levels of intraspecific diversity (NRC, 1989).

Food systems transitions

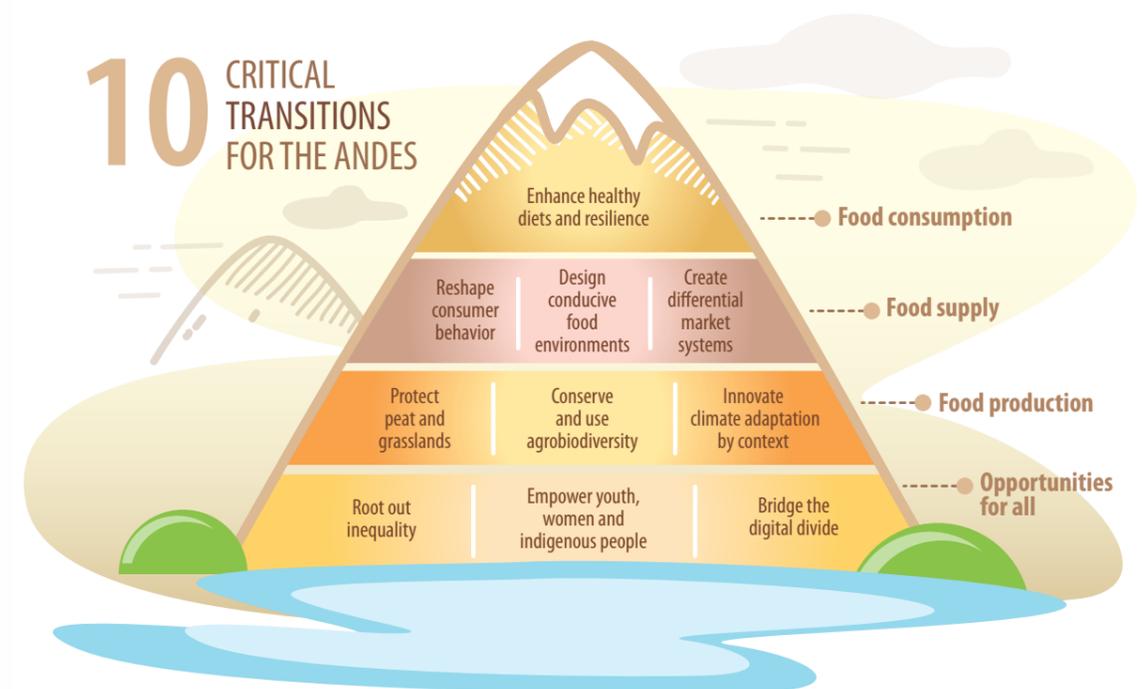
People migrating to urban areas change their food preferences and eat more food away from home – nutrition levels suffer. Thus, retail and service sectors have expanded at a fast pace with public investments in popular markets lagging behind. The expansion of supermarkets, fast and comfort food outlets have changed urban food environments. Meanwhile, rising preference in the Global North for Andean “superfoods” has spurred unsustainable intensification of those crops.

Selected key facts:

Ecuador has the highest level of the double burden among the Andean countries with a 25.2% and 60.7% rate of stunting prevalence among children and overweight/obesity among adult women. Bolivia, Colombia and Peru have moderate levels: 18.1, 12.7, 14.4% child stunting and 61.3, 63.0, 61.6% overweight/obesity among adult women (Shekar and Popkin, 2020).

Longer lengths of urban residence are related to increased obesity in Andean rural-to-urban migrant populations: a 12% higher prevalence for each 10-year unit increase in urban residence (Antiporta et al., 2016).

Increased international demand for Andean superfoods has led to unsustainable intensification and increased environmental imprints: GHG emissions of organic quinoa are in the upper range (Cacino-Esponiza et al., 2018) and accelerated land conversion driven by demand for maca (Turin et al., 2017).



4. Vision and mission

Our **vision** is one of mountains in which people enjoy prosperity and well-being while conserving its rich natural resources.

The Andean Initiative's **mission** is to preserve the Andes's unique agrobiodiversity and to build a climate-resilient future in which all humans enjoy healthy diets by:

- Putting vulnerable people central in all our actions
- Tackling inequalities in the Andean region
- Unleashing the true potential of indigenous crops and livestock
- Co-developing options by context for multiscale climate action
- Ensuring the sustainable use of fragile mountain resources
- Redesigning the food system for human and planetary health

5. Thematic areas

Synergies between people, plants and planet are central to our strategy. The Andean Initiative will spearhead science for co-innovation on the links between three thematic areas: agrobiodiversity, climate action and food for health. These themes are central to our strategy as we aim to strengthen resilience, prosperity, and well-being within mountain socioecological systems. The integration of agricultural biodiversity, climate adaptation and mitigation, and food systems offers multiple entry points for disruptive and holistic co-innovation. To enhance our effectiveness, we will focus on crosscutting issues (e.g., youth, women, indigenous people, and big data) within each of these themes to ensure equitable and efficient outcomes.

5.1 Agrobiodiversity

The Andes' unique species and varietal diversity offers a solid basis for sustainable development. Therefore, the Andean Initiative will actively promote and engage in science for co-innovation on the management and use of agrobiodiversity for sustainable conservation, healthy diets, income generation and as a nature-based solution for climate adaptation. There is an urgent need to conserve the Andes' unique crop and livestock diversity through integrated farmer-centered approaches. Smallholders are the main guardians of agrobiodiversity, yet not all farmers are the same. Intergenerational and gender differences require close attention as the personal drivers and motives to conserve may differ. The same is true for diversity as different cultivar groups, animal breeds or wild relatives will require tailored approaches. The Andean Initiative will focus on biodiscovery, bioeconomy and *in-situ* conservation.



Table 1. Intervention: Biodiscovery and prospecting based on Andean crops

Objective	Rationale	Contribution to the 2030 outcomes (Theory of Change)*		Contribution to 2030 strategy impact targets**
To systematically document intrinsic qualities, traits, and functions of species and varietal diversity toward differential market system development	Biodiscovery toward unraveling the nutritional, nutraceutical and functional traits of species and intraspecific diversity is needed to build an evidence-base for their true potential for nutrition, novel markets and/or environmental functions	2, 6, 9		4
Action (WHAT)	Justification (WHY)	Description (HOW)	Key stakeholders (WHO)	Indicators of success
<ul style="list-style-type: none"> Discover and document unique traits, properties, and functions Discover and document unique processes, preparations and uses Assure mountain people are direct benefactors of biodiscovery 	<ul style="list-style-type: none"> Robust scientific data is essential to trigger value addition Direct benefit sharing schemes need to assure that guardians of diversity are adequately compensated 	<ul style="list-style-type: none"> Through co-investment in varietal screening for traits and properties Through co-innovations in partnership with providers and users Through clear terms of engagement with mountain people 	<ul style="list-style-type: none"> Farmers and producer organizations Universities Key laboratories Private sector NGO's and civil society Governmental organizations 	<ul style="list-style-type: none"> No. unique traits, properties processes and preparations documented Level of private sector co-investment No. of viable business cases Level and type of return for mountain people

* please see p 25
** please see p 24

Table 2. Intervention: Bioeconomy and differential market systems

Objective	Rationale	Contribution to the 2030 outcomes (Theory of Change)*		Contribution to 2030 strategy impact targets**
To trigger the full potential of agrobiodiversity for differential market systems development	Mountain agriculture is rarely able to compete in terms of scale, volume, and price. Yet, mountains are exceptionally rich sources of high-quality, natural and culturally unique products for eco-commerce. Central to the bioeconomy and differential markets is the opportunity to generate income and rural prosperity	2, 6, 9		1, 4
Action (WHAT)	Justification (WHY)	Description (HOW)	Key stakeholders (WHO)	Indicators of success
<ul style="list-style-type: none"> Build diverse and differential market systems Strengthen the capacity of producers, cooperatives, SME's, young and female entrepreneurs Promote social inclusion and environmental sustainability along food chains 	<ul style="list-style-type: none"> The demand for healthy foods is expanding Global interest in novel foods is growing Tourism and gastronomy can bring economic value back to the land 	<ul style="list-style-type: none"> Through entrepreneurship in the food supply chains, public procurement, farmer markets and the service sectors Through collective brands, traceability, labeling and certification 	<ul style="list-style-type: none"> Farmers and producer organizations Youth and women Private sector NGO's and civil society Governmental organizations 	<ul style="list-style-type: none"> No. of new businesses No. young and female entrepreneurs Level of differentiation in markets No. of species and varieties linked to markets

Table 3. Intervention: Interactive *in-situ* conservation in biocultural hotspots

Objective	Rationale	Contribution to the 2030 outcomes (Theory of Change)*		Contribution to 2030 strategy impact targets**
To systematically monitor the conservation status of Andean agrobiodiversity in the field and support custodian farmers	The only way to know the true conservation status of the Andes's unique agrobiodiversity is by measuring it. To date only a few hotspots have been thoroughly assessed and there is a gap as far as geographical coverage and time series are concerned	1, 10		8
Action (WHAT)	Justification (WHY)	Description (HOW)	Key stakeholders (WHO)	Indicators of success
<ul style="list-style-type: none"> Establish functional networks of observatories to monitor agrobiodiversity Develop citizen-science and crowdsourcing tools and platforms for conservation intelligence Optimize <i>in-situ</i> conservation methodologies and interactive links to genebanks 	<ul style="list-style-type: none"> Growing demand from place-based organizations to apply monitoring Growing national and global interest in decision support (governments, genebank) Digital and citizen science tools to revolutionize monitoring available 	<ul style="list-style-type: none"> Through multiple stakeholders in key observatories collaborating Through youth engagements via school Through incentive systems and mobile technology 	<ul style="list-style-type: none"> Farmers Rural schools Youth and women NGO's and civil society Governmental organizations ICT companies 	<ul style="list-style-type: none"> No. of functional observatories No. of users of monitoring tools No. baseline catalogues published



5.2 Climate action

Andean agriculture is predominantly rain-fed and taking place at the highest altitude anywhere in the world. Farming is prone to extreme out-of-season weather events and changes in seasonality are directly impacting agricultural cycles. Mortality rates of indigenous livestock on highly exposed grasslands at extreme altitudes have increased. Traditional and ancestral practices to forecast weather and mitigate extreme events are increasingly failing. The rate of land use change and upward agricultural expansion has advanced, consequently compromising Soil Organic Carbon (SOC) stocks and driving the release of carbon dioxide from high-altitude peat and grasslands. Land use is also directly affecting water cycles and impacting communities downstream. The bulk of the Andes's unique agrobiodiversity is concentrated in a tight altitudinal belt between 3,800 and 4,300 m of altitude where frosts, hail and drought are increasingly intense. The complexity of Andean agroecosystems requires tailored approaches, evidence-based local-to-national policies, and collective action.

Table 4. Intervention: Multiscale climate adaptation by content in extreme environments

Objective	Rationale	Contribution to the 2030 outcomes (Theory of Change)*		Contribution to 2030 strategy impact targets**
To develop and adapt a 'basket of options' for contextual and tailored climate adaptation	Andean agroecological environments are extremely variable and site specific. Households typically manage multiple production zones, rainfed and irrigated land, a combination of private and communal resources, and mixed crop - livestock portfolios. There is no 'one-size-fits-all' when it comes to climate adaptation	1, 3, 4, 6, 8, 12		2, 7, 9
Action (WHAT)	Justification (WHY)	Description (HOW)	Key stakeholders (WHO)	Indicators of success
<ul style="list-style-type: none"> Enhance access to diverse portfolios of climate adapted technologies and practices Maximize the use of agrobiodiversity to achieve yield stability, adaptation, and resilience Actively provide climate information, decision support and ag advisory through digital platforms 	<ul style="list-style-type: none"> The impact of climate change and (a)biotic stressors are dissimilar in the central, southern and northern Andes. Access to climate adapted technologies is limited by a lack of extension There is growing demand for agricultural climate information 	<ul style="list-style-type: none"> By integrating site specific action research with regional models Through the establishment of co-laboratories and climate roundtables Through digital and user-friendly climate information platforms 	<ul style="list-style-type: none"> Farmers Rural schools Youth and women NGO's and civil society Governmental organizations ICT companies Universities Indigenous and youth organizations 	<ul style="list-style-type: none"> Rate of diffusion and no. of farmers using of climate adapted technologies and practices Level of diversification of farmers compared to starting situation No. of users of information and advisory services

* please see p 25
 ** please see p 24

Table 5. Intervention: Conservation, management and sustainable use of SOC in the high Andes

Objective	Rationale	Contribution to the 2030 outcomes (Theory of Change)*		Contribution to 2030 strategy impact targets**
To promote multilevel coordination for SOC conservation, management and sustainable in high-altitude peat and grasslands within and between countries	The volume of SOC in Andean peat- and grasslands represent the largest belowground terrestrial pool in the region. The tension between the upward expansion of agriculture and peatland conservation has not been sufficiently tackled	1, 3, 5, 6, 10		6, 9
Action (WHAT)	Justification (WHY)	Description (HOW)	Key stakeholders (WHO)	Indicators of success
<p>Monitor land use change in high-altitude peat and grasslands</p> <p>Test management options and technologies for carbon preservation, in-setting and sequestration</p> <p>Develop adapted land use and business-led incentive systems for SOC credits</p>	<p>Upland carbon cycles are currently poorly documented</p> <p>There is growing demands for management options for SOC management in agriculture</p> <p>Functional models for carbon credits in highlands agriculture are nonexistent</p>	<p>Using remote sensing and digital carbon stock mapping</p> <p>Through improved rotation designs, minimal tillage and pasture management</p> <p>By promoting policies and business models for SOC credits</p>	<ul style="list-style-type: none"> • Farmers and livestock herders • NGO's and civil society • Universities • Governmental organizations • Wool and superfood companies 	<ul style="list-style-type: none"> • Area of peat and grassland sustainably managed • Volume of SOC conserved • No. of value chains internalizing SOC conservation



Table 6. Intervention: Knowledge management for climate action in Andean agriculture

Objective	Rationale	Contribution to the 2030 outcomes (Theory of Change)*		Contribution to 2030 strategy impact targets**
To support decision makers and communities of practice operating in different departments and provinces throughout the Andes	A divide persists between those who offer and those who demand options for climate adaptation and mitigation. Regional governments, civil society and farmer organizations often have limited information about proven technologies, best-practices and decision support tools	1, 3, 4, 5, 8		2, 6, 7, 9
Action (WHAT)	Justification (WHY)	Description (HOW)	Key stakeholders (WHO)	Indicators of success
<p>Translate forecasts on climate change effects into digestible and actionable formats</p> <p>Assure open access to systematized best practices for adaptation and mitigation</p> <p>Foment communities of practice, training and feedback through climate roundtables</p>	<p>Demand for trustworthy information about climate change effects and options for adaptation and mitigation</p> <p>Growing demand for information platforms can be linked to climate roundtables, action plans and advisory services</p>	<p>Through user friendly information platforms and digital advisory</p> <p>Through collaboration with a wide range of providers of technologies and practices</p> <p>Through planning and engagement with users of information</p>	<ul style="list-style-type: none"> • Policy makers • NGO's and civil society • Governmental organizations • ICT companies • Universities • Climate roundtables 	<ul style="list-style-type: none"> • No. users and contributors to the knowledge management portals • Volume and quality of information • No. climate roundtables and communities of practice replicating practices



5.3 Food for health

Food systems in the Andes are changing rapidly. The new reality is characterized by a double burden of malnutrition - with over and undernutrition - and a transition in food retail (more supermarkets, fast and comfort food outlets). Child development in the Andes is persistently affected by micronutrient deficiencies while excessive weight and obesity is resulting in rise of diabetes and cardiovascular diseases. In parallel, there is growing awareness and consumer demand for healthy and safe food produced with adequate environmental and social standards.

The Andes' unique agrobiodiversity can offer an effective response to this tendency. Ensuring traceability and the equitable provision of healthy food to resource-poor consumers is becoming increasingly important. The COVID-19 emergency has led to an increased reliance on short supply chains and local produce, offering options for innovation in direct sourcing and e-commerce. This trend calls for better policies to harness the inclusion of smallholder and family business. Food environments and behavioral change communications are critical frontiers to nudge consumer choices. The Andean Initiative will take a food systems approach to reshape systems toward healthy, sustainable and affordable diets.



Table 7. Intervention: Taking the pulse of transitions in Andean food systems

Objective	Rationale	Contribution to the 2030 outcomes (Theory of Change)*		Contribution to 2030 strategy impact targets**
To identify key leverage points for food system innovations through characterization	To reshape the food system, it is essential to actively monitor shifts in key drivers, food supply chains, food environments, consumer behavior, diets and diverse nutritional, environmental, social outcomes	5, 11		3, 5
Action (WHAT)	Justification (WHY)	Description (HOW)	Key stakeholders (WHO)	Indicators of success
Track tendencies and trends in both rural and urban spaces to inform policy action	The is increasing demand from sub-regional governments for food systems metrics	Through multi-stakeholder collaboration at different scales	<ul style="list-style-type: none"> Statistics agencies Universities 	<ul style="list-style-type: none"> No. of information dashboards No. of fact sheets and baselines
Research differences between different age, income and ethnic groups	Food system tracking is essential to support decision support and priority setting	Through using robust minimal metrics and efficient methods	<ul style="list-style-type: none"> NGO's and civil society Governmental organizations 	<ul style="list-style-type: none"> No. of informed policy decisions
Advance methods development for citizen, public and big data science to shed light on blind spots	Integrated data analytics is essential to visualize food system shifts	Through data translation and user-oriented communication	<ul style="list-style-type: none"> ICT, retail and wholesale sectors 	<ul style="list-style-type: none"> No. of open access databases

* please see p 25
** please see p 24

Table 8. Intervention: Co-innovation along rural-urban Andean foodsheds

Objective	Rationale	Contribution to the 2030 outcomes (Theory of Change)*		Contribution to 2030 strategy impact targets**
To assure that healthy diets are an accessible, available and preferred option for vulnerable consumers in both cities and the countryside	To transform food systems toward healthy diets, environmental sustainability and social inclusion it is essential to support collective action involving different sectors and stakeholders	1, 3, 4, 6, 7, 11, 12, 13		3, 5
Action (WHAT)	Justification (WHY)	Description (HOW)	Key stakeholders (WHO)	Indicators of success
Trigger positive financial, environmental and social returns throughout food chains	National food chains need to comply with high standards	Through multi-stakeholder collaboration along food sheds	<ul style="list-style-type: none"> Retail and wholesale sector Markets 	<ul style="list-style-type: none"> No. of food supply chains with high standards No. of policies changes
Transform food environments and how they affect healthy and sustainable diets choices	The food environment contains the total scope of options within which consumers make decisions about which foods to acquire and consume	Through behavioral change communication and market system interventions	<ul style="list-style-type: none"> NGO's and civil society Governmental organizations City authorities Certification agencies 	<ul style="list-style-type: none"> No. redesigned food environments
Strengthen youth and women entrepreneurship in food business	Short supply chains and e-commerce offer novel options for youth and women entrepreneurship	Through working directly with youth and women entrepreneurs		<ul style="list-style-type: none"> No. and revenue of youth and women businesses

Table 9. Intervention: Healthy diets starting young

Objective	Rationale	Contribution to the 2030 outcomes (Theory of Change)*		Contribution to 2030 strategy impact targets**
To promote children and young people in the Andes toward informed and healthy diet choices at school and at home	The food environment is a critical space to co-design innovations to support healthy diets and to address the growing double burden of malnutrition. The group that is most vulnerable and where at the same time most gains can be made - in terms of informed choices and behavioral change - are children and youth	3, 5, 7, 11, 13		3, 5
Action (WHAT)	Justification (WHY)	Description (HOW)	Key stakeholders (WHO)	Indicators of success
<p>Assessment of the personal filters and consumer choices of children and youth</p> <p>Curriculum development and behavioral change communication for food and health in education</p> <p>Teacher, parent and youth engagement in upgrading food environments</p>	<p>Increased demand for inclusion of food and nutrition at schools</p> <p>Increased recognition that schools can act as key spaces of change</p> <p>The food environment at home is as important as at school (pairing is required)</p>	<p>Through research on the personal, economic, cognitive, aspirational and situational filters of young people</p> <p>By testing multiple options to improve food literacy at schools, outside schools and at home</p>	<ul style="list-style-type: none"> Ministries of education NGO's and civil society Parent and teacher organizations 	<ul style="list-style-type: none"> No. of schools, teachers, parents and youth reached Level of use of new food and nutrition curriculum Level of change of the food environment at schools

5.4 Closing the gap: root out inequality

Achieving the mission of the Andean Initiative, while also supporting the SDGs, requires greater equality of opportunities and rights, especially for youth, women, and indigenous peoples. All thematic areas of the Andean Initiative aim to reduce inequalities. This will materialize by providing access to capacity building, education, technology, information and knowledge, and by promoting leadership and self-representation. Farmers, youth, women and indigenous peoples will take ownership as active agents in the innovation process.

Youth, gender and indigenous peoples

The Andean Initiative will proactively address youth, gender and social barriers in order to achieve inclusive development. Specifically we will mainstream gender and social inclusion by (1) identifying, analyzing and understanding differential roles, needs, opportunities and constraints; (2) improving capacities to innovate through access to gender-sensitive technologies, enhanced leadership in organizational management, and stronger linkages, enhancing participation and coordination with different private and public actors; (3) actively promoting participation and involvement in priority setting and decision-making; and (4) including gender and age segregation in research tools and methods where appropriate.



Bridge the digital divide

The accessibility, portability and coverage of information and communication technologies for agriculture such as advisory services, information provision and data collection have the potential to transform agriculture and food production. Applications through citizen science, farmer-to-farmer videos and open data sharing increasingly make use of digital options to efficiently produce food, enhance agroclimatic information services, support smallholder decision-making, improve traceability and connection in food chains, and/or monitor shifts in biodiversity, climate and food systems. Mobile video training, real-time decision support tools for disease control and message-based extension have been used in a variety of contexts in the Andes.

Advances in remote sensing, artificial intelligence and big data will allow for big leaps forward in monitoring land use change and food system transformations. Big data analytics will be used in a variety of applications: remote sensing to monitor peat soil conservation, smartphone and sensor-based approaches to map food networks, and intelligence on plot and farm-level timeseries for enhanced management. The current COVID-19 pandemic has clearly shown the importance of connectivity and long distance education in rural settings. The Andean Initiative will link rural education and adapt content for easy use in a context of limited digital literacy. To maximize the potential of digital tools to boost equality, the Andean Initiative will investigate the influence of age, gender and ethnicity on access and use of digital technologies.

6. Theory of Change and targets

The Andean Initiative's impact pathway represents our best understanding of how engagement and adaptive learning – including monitoring and evaluation and learning (M&E&L) to track progress and redirect efforts – can enable change in the lives of mountain peoples. The Andean Initiative's general impact pathway is the result of co-design with invested partners and stakeholders (figure 1) and includes clusters of outputs resulting from science for co-innovation on the conservation and use of Andean agrobiodiversity, adaptive climate action in exposed environments and food systems action along city-region foodsheds, and continuous adaptive learning. Cross-fertilization at the outcome level aims for integrated uptake and positive reinforcement between the output clusters and specific products. The Andean Initiative will engage a variety of actors at the outcome level, including governmental organizations (GO's), non-governmental organization (NGO's), the private sector (including the informal sector and Small and Medium-sized Enterprises or SMEs), and civil society groups, especially those focused on issues related to fair-trade, indigenous people and youth.

The Andean Initiative aims to be fully aligned with the Sustainable Development Goals (addressing all 17 SDGs) and the CGIAR's longer-term development goals to address the key challenges of living within planetary boundaries, sustaining food availability, promoting equality of opportunities, securing public health, and creating jobs and growth. As we move forward with the implementation of our strategy, we will use parallel exercises to ensure that our science for co-innovation maintains a focus on tangible results and societal relevance. This includes developing contextualized theories of change with research partners – as well as next and end-users – to frame research as part of a wider process of change and to test hypotheses and systematize how this change happens in different socioecological contexts.

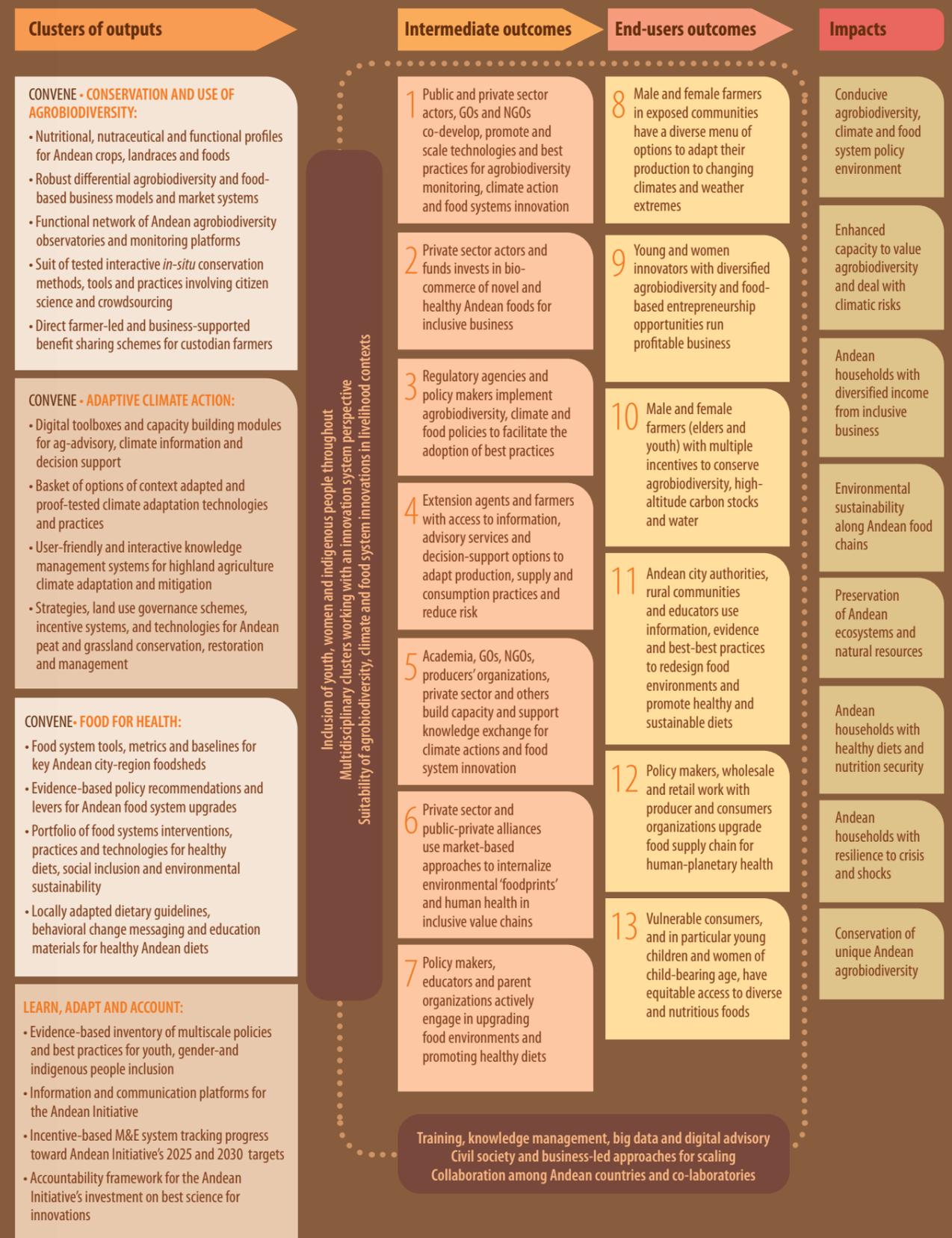


The **Andean Initiative** priority science for co-innovation **impact targets for 2030** are:

<p>1 0.5 million farm households with decent work by ILO standards, 18% income increase and 1.4 points increase in diet diversity score (> 60% involving women and youth)</p>	<p>2 2.0 million farm households use a menu of climate adaptive practices and digital decision support tools, doubling their climate resilience index (> 60% involving women and youth)</p>	<p>3 1 million youth and 5,000 decision makers with 84% increase in Knowledge, Attitude and Practice about healthy and sustainable diets.</p>
<p>4 1,500 profitable businesses run by youth and women contribute to the agrobiodiversity and food-based bioeconomy (high-value markets, public procurement, agritourism)</p>	<p>5 350,000 consumers along three major city-region foodsheds with enhanced access and availability of healthy diets in conducive food environments (> 60% involving youth)</p>	<p>6 1 million ha of Andean peat- and grasslands conserved, restored and sustainable managed (> 800 million tons of SOC)</p>
<p>7 0.8 million ha of Andean farmland sustainably managed using climate adaptive practices (>35% in buffer zones adjunct to fragile ecosystems)</p>	<p>8 95% of the agrobiodiversity in 6 representative Andean hotspots fully documented and conserved (> 10 species, >3,000 landraces)</p>	<p>9 Supply chains of 6 major Andean products [native potato, quinoa, maca, tarwi, vicuña and alpaca] with 35% increase in life-cycle environmental efficiency [carbon, water, energy, biodiversity]</p>

CIP and its partners and stakeholders involved in the Andean Initiative will conduct a baseline assessment to track progress and develop a resource mobilization strategy for implementing the science for co-innovation components to achieve outputs, outcomes and impacts.

Figure 1: Theory of Change for the Andean Initiative



7. Impact at scale

The Andean Initiative will adopt a multipronged approach to assure impact at scale in complex socioecological systems. Therefore, it will be essential to bridge landscape-level and institutional scales from the 'local' to the 'regional'. The Andean Initiative will work locally with multi-actor innovation platforms while engaging with national and international policy-making bodies, policy makers and regional organizations to down- and upscale innovations and provide evidence-based decision support.

For deep and contextualized action research the Andean Initiative will set-up a network of '**Andean Co-Laboratories**' throughout the Andes in different environments. **These sites will function as local innovation platforms where the science for co-innovation interventions are generated, validated, and adapted for different agro-ecological zones, production systems, farm types, agri-businesses, and socio-economic and political contexts.** As such, the development of the Andean Co-Laboratories will be a dynamic process involving multiple actors, sectors and dimensions. In each 'co-laboratory' a bottom-up and participatory approach to action research will assure that local preferences, intermediate and end-user demands, and socioecological barriers or opportunities are fully taken onboard.

A robust data infrastructure will be set-up in each 'co-laboratory' with climate stations, sensors and interseason plot-level monitoring systems, including forecasting systems that use applied and integrated production, economic and climate modeling. This data will guide priority setting, policy incidence and decision support. Through a diverse range of satellite, big data and information science, the Andean Initiative will support large-scale data capture, analytics and transformation, and real-time information provision. Co-laboratories will also be essential to spearhead the process of knowledge sharing. Rural extension services, both public and private, play a key role in this process, including the use of information and communication technologies for agriculture.

In summary, Andean Co-Laboratories will:

Encourage collaboration between different stakeholders through a territorial approach;

Provide a springboard for feedback and active participation of local stakeholders to jointly determine which practices, tools and technologies can be locally adapted;

Work with farmers and other stakeholders as active agents of change throughout the science for co-innovation cycle;

Engage with local, national and international policy makers to down- and upscale innovations and provide evidence-based decision support; and

Actively engage in multilevel policy dialogues and advocacy to assure governments further enable the diffusion, uptake, and adoption of innovations.

This will require identifying, developing, and nurturing strategic partnerships (at local, national and regional levels) with key stakeholders from different sectors and communities, including but not limited to food, health, education, conservation, and extractive industries. Base organizations involving young, women and indigenous peoples will be centrally involved throughout the innovation process.



8. Governance and transformative partnerships

The Andean Initiative will function as a regional innovation platform with science for co-innovation and transformative action at its core. The Initiative will be composed of diverse partners and promote collaboration on common challenges. Governance of the innovation platform will be guided by the following bodies:

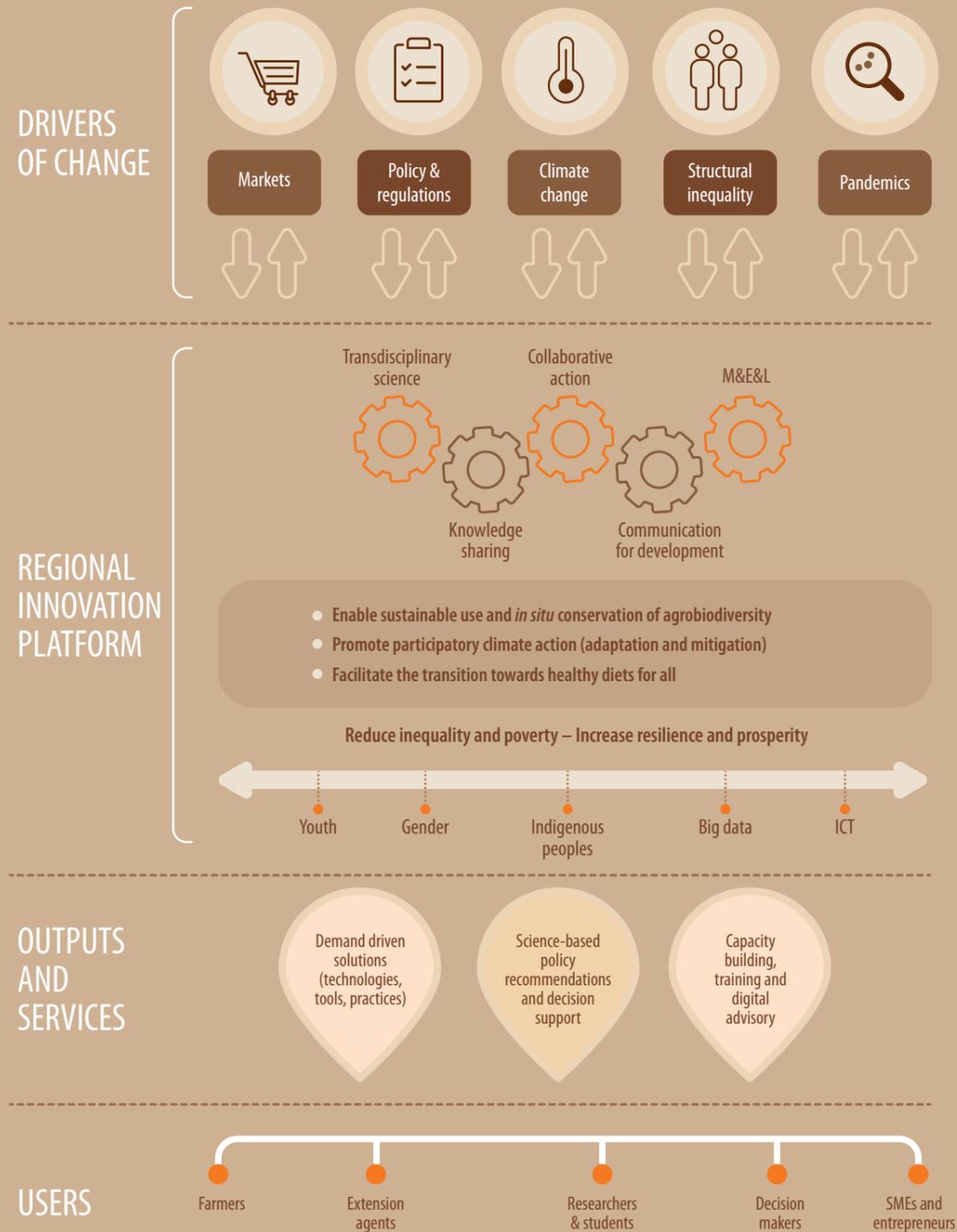
- **Strategic Coordination Committee.** This committee is composed of invested partners and stakeholders from each of the Andean countries, with a balanced composition regarding gender, ethnicity, geographic and disciplinary knowledge. The role of the committee will be to guide priority setting, resource mobilization and strategy implementation.
- **Independent Advisory Council.** An external group of global experts. Its role is to maintain strategic oversight, provide feedback on performance and advise on programmatic adjustments.
- **Strategic partners.** Key members of the innovation platform with a relevant role in science for co-innovation and a vested interest to advance the common agenda locally, nationally or regionally. Strategic partners include – but are not limited to – GOs, NGOs, farmers and their organizations, private sector cooperatives, and research and academic institutions.
- **Investors and funders.** This group consists of international cooperation agencies, philanthropists, development banks, investment funds, foundations, governments and the private sector - among others - investing in science for co-innovation to advance a common agenda, develop specific activities or products, or contract services.

Deep engagement with diverse partners to co-develop science-based solutions to complex and practical problems is central to the Andean Initiative's approach. The innovation platform wants to engage non-traditional partners with an increasingly relevant role in the Andean agriculture and food systems. Specifically, youth organizations, health and education sectors, environmental organizations and ICT startups. Our grassroots partnerships with NGO's, base organizations and cooperatives will continue to be vital for socially embedded and transformative co-innovations.

The Andean Initiative will develop alliances with (inter)national and Andean universities to enhance both upstream science on artificial intelligence or mobile applications and downstream action research on yield stability and healthy diets in 'co-laboratories' in highlands communities. To ensure effective delivery of research outputs and outcomes, the Andean Initiative will engage with diverse private-sector actors in the food system: producers associations, processors, certifiers, wholesalers, retailers, start-ups and small businesses providing digital solutions. We will also continue to work closely with different government agents from the agriculture, environment, education and health sectors at local and national scales.

We will strengthen our engagement with academia in the Andean countries as scientific capacity has increased significantly, and encourage inter-organizational knowledge sharing, capacity building, and collaborative research and cooperation between organizations throughout the Andes. Close collaboration with sister centers under the umbrella of One CGIAR and regional organizations will be essential. We will develop projects jointly, strengthen country collaborations, provide shared support services, and pursue shared staff appointments (figure 2).

Figure 2: Framework of the Andean Initiative: drivers, innovation platform, outputs and users



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CIP is a research-for-development organization with a focus on potato, sweetpotato and Andean roots and tubers. It delivers innovative science-based solutions to enhance access to affordable nutritious food, foster inclusive sustainable business and employment growth, and drive the climate resilience of root and tuber agri-food systems. Headquartered in Lima, Peru, CIP has a research presence in more than 20 countries in Africa, Asia and Latin America.

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