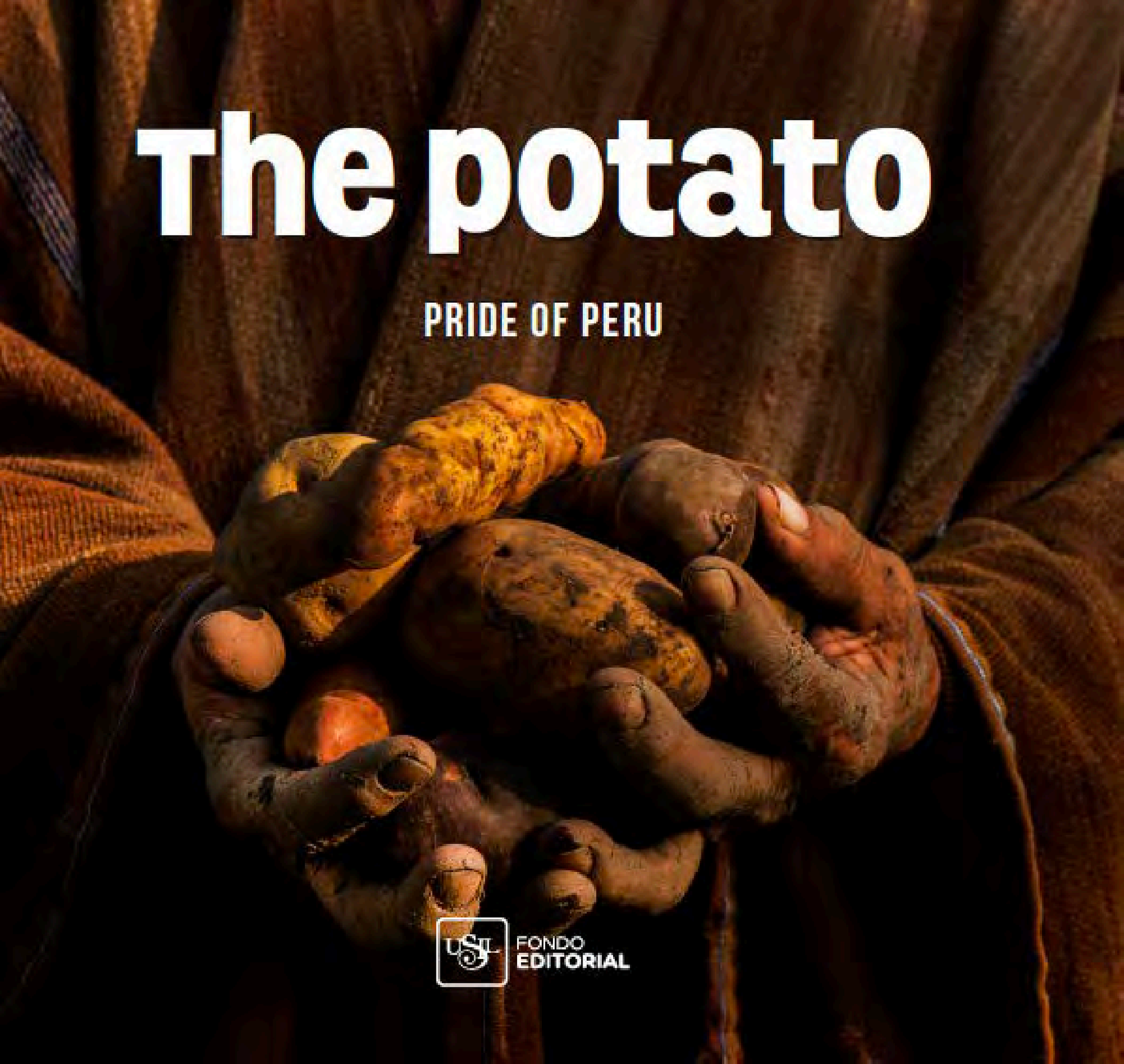
The potato

PRIDE OF PERU



FONDO EDITORIAL

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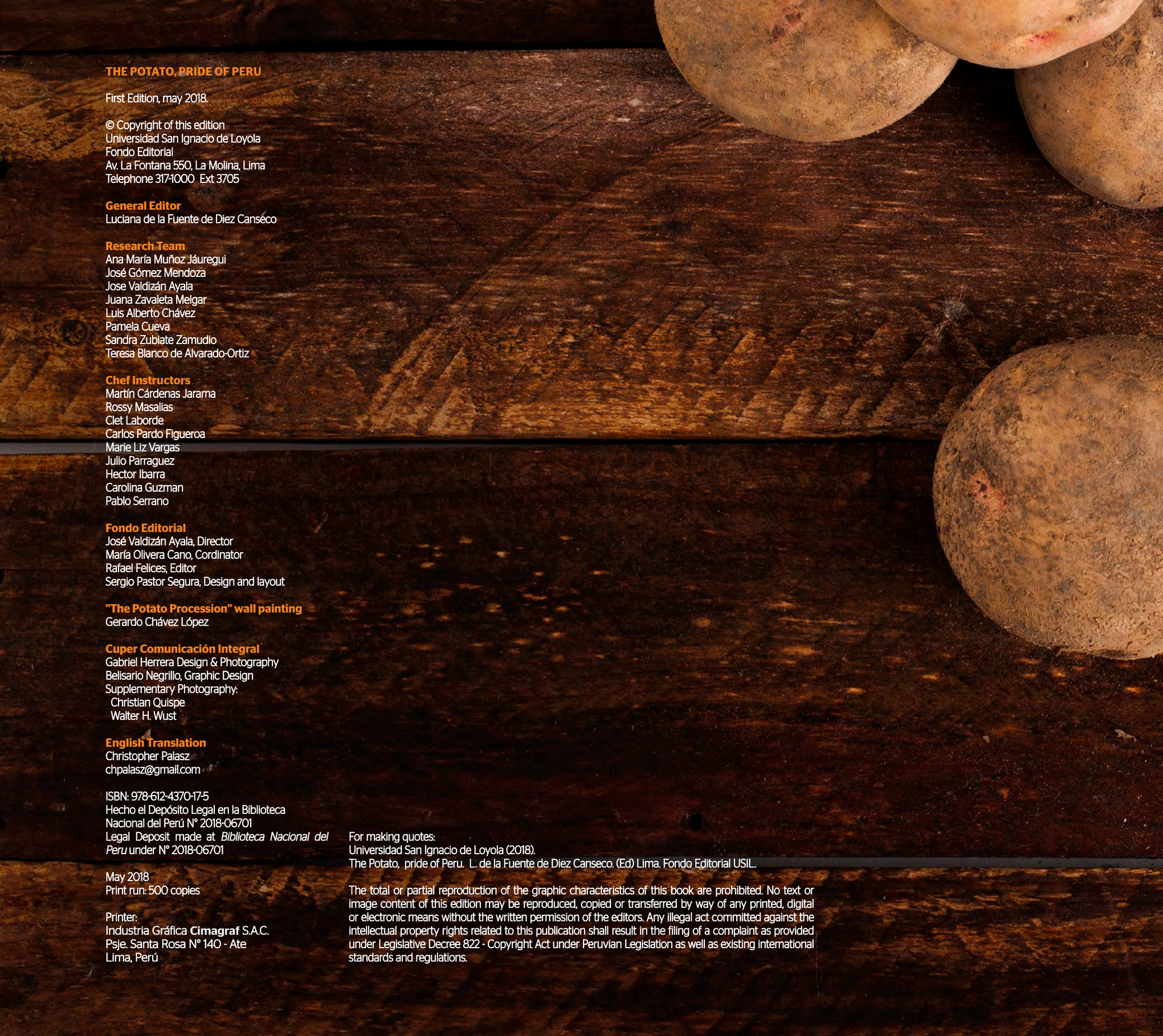

THE POTATO, PRIDE OF PERU

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Foreword

Food is a global concern involving all of humanity. Up until the discovery of America, the world population was only 500 million people. Since then demographic growth has accelerated and we are now 7.5 billion people. If we continue at this rate, global population will reach 11 billion human beings by the year 2100.

Exponential population growth and the ensuing demand for natural resources represent two of the causes of the increasing ecological imbalance that affects the survival of our species and life on Earth.

This fact is particularly relevant for Peru because of its exceptional diversity of species, variety of genetic resources and the different ecosystems located within its territory. In this context, and in light of the development of disasters caused by global climate change, the land of the Incas acquires strategic importance because it possesses an extraordinary plant that was a key source of sustenance by its former inhabitants for thousands of years: the potato.

The potato is undoubtedly Peru's greatest contribution to the global food basket. This plant, with its endemic roots in the Andes is the result of a long process of domestication that has gone on for at least 10,000 years. Hidden behind this evolution are the thousands of discoveries and countless experiences that are difficult to define in general characteristics and challenging to reconstruct given its peculiar singularity.

Researching the potato's history resembles the assembly of a puzzle with most of its pieces missing. There are more than 230 species of wild potatoes present across the American continent, extending from Chile to Colorado, in the United States. The most prominent center of genetic diversity of potatoes is in the Andean highlands of southeastern Peru, which is home to most known wild species and where one can find eight out of the nine cultivated species growing side by side.

Despite its small number of species, the diversity of the variety and shapes of domesticated potatoes is impressive. More than 3 800 varieties have adapted to a broad array of climates, soils and environmental conditions. No other crop has so many possibilities. The potato is a universal food because of its great capacity for adaptation.

In order to innovate potato cultivation, one needs to build an awareness of the importance of ancient agricultural customs preserved by the men and women of the farm fields. However, innovation and technology are needed to create something new to maintain these traditions. Within this context, the research carried out by the International Potato Center (CIP), in conjunction with NASA, is a contribution to the research developments of this ancient tuber.

The results thus far are encouraging. We would not be making forays into science fiction by pointing out that mankind is on the right track. The fact is that someday, man will be cultivating and harvesting potatoes on Mars, as shown by studies carried out recently in Peru. However, the most important thing taken away from this work is that these very experiments will serve to

expand potato crop farming to many extremely hostile and barren territories here on Earth.

In cooperation with researchers, the small farmers of Peru are the ones who have helped to identify this genetic wealth by preserving seeds in their own plots scattered throughout the upper highlands of the Andes, despite the fact that productivity growth in large part has remained stagnant. It is paradoxical that these regions, where the potato represents the primary crop for over 80% of farmers, have levels of poverty and malnutrition that are higher than the national average.

Herein lies the social and ethical commitment of San Ignacio de Loyola University to stimulate agricultural research and draw upon the potential of more than 3,000 varieties of native potatoes to reduce rural poverty. Conceiving a more inclusive agricultural development model entails providing small farmers opportunities through access to markets that pay preferential prices for their crops.

Therefore, creating and developing value chains for numerous varieties of potatoes that have traditionally only been consumed in the Andes so that they can be sold in Peru's supermarkets and restaurants, and exported as potato chips and other processed food products, is a magnificent way to help overcome the poverty and hunger of over 700 thousand Peruvian families whose livelihood depends on this crop.

The potato is deeply rooted in the sense of pride and accomplishment of the small farmers of the Peruvian Andes because native potatoes are an inherent part of their natural and cultural heritage. Moreover, this book is a tribute to those men and women who, by producing agricultural crops in such challenging environments and with scarce resources, are making a continuous contribution to the global food basket.

Raúl Diez Canseco Terry
Founder and President
Universidad San Ignacio de Loyola

Potato harvest in Pisac,
Sacred Valley of the Incas.

Prologue

Since the 16th century, when the potato began to spread from the Andes across six continents to the world, it has changed the course of history. Today it is an essential ingredient of the global food basket.

While it is true that the invention of agriculture spurred the production of cereals such as wheat, rice and corn, which caused grains to become the yardstick that measured global food production, the potato played a key role in the globalization of these grains.

Potato crop expansion was not foreign to the growth processes experienced by cities, with developing communications and mass transportation. While it initially had a lackluster reception in Europe, today it grows in over 160 countries and is a dietary staple of the global population, contributing to the reduction of hunger and attainment of food security.

It is not that roots and tubers replace grains in the global food basket. Crops such as the potato represent a significant improvement in the quality of life of humans, wherever they may be needed to ensure nutrition and reduce poverty.

The contribution of potatoes in every region of Peru is particularly important. There are native varieties being studied because of their potential value in the fight against malnutrition and childhood anemia. Potato is rich in protein, calcium, vitamin C and amino acids. Because of its high yield in places with adverse conditions, the potato was and is an excellent source of nutrition, and rural mothers know this all too well.

Since the dawn of Andean agriculture, seeds have been associated with reproduction and femininity. Under ancient customs, men deposit seeds and women receive them, store them and nourish them. Over time, Andean women have developed the knowledge, experience and unparalleled skills in the domestication of wild potatoes and in the adaptation of new varieties. This has enabled conservation, improvements in plant diversity, plant cultivation at different ecological levels and the capacity to deal with pest infestation, diseases and the hardships brought on by climate change.

Currently, in the Andes, and in many developing countries, women play a decisive role in family food security. Rural community women contribute almost all of the labor and are fully active in every stage of potato production, from seed conservation and selection, on through to the harvest, storage and marketing.

Despite the overwhelming workloads contributed by women in rural communities, there is a noticeable need for a more equitable distribution of labor and for rural and agricultural development policies that recognize the intervention of both sexes in the generation of food security. One cannot speak of true democracy if the needs, capacities and living conditions of half the population are not considered. Furthermore, the participation of women in Democratic Governance is vital.

In this context, the book *The Potato, pride of Peru* seeks to promote the eradication of poverty in rural areas, improve the health of the most vulnerable populations, reduce inequality in all of its dimensions, and create a sustainable world based on inclusive and just societies at the service of humanity.

Luciana de la Fuente de Diez Canseco
Chief Executive Officer
Universidad San Ignacio de Loyola

A family of rural settlers walk through their fields in the outskirts of Urubamba, Cusco.

introduction

Following the discovery of America in 1492, the potato (*Solanum tuberosum L.*) has been considered one of the most widely propagated crops in the world, and ranks today among the top food crops in terms of production volumes (fourth after rice, wheat and corn) and third in terms of the most consumed food after rice and wheat. Potatoes are cultivated from altitudes as high as 5,500 m.a.s.l. in the Himalayas, down to several meters below sea level in the Netherlands (Holland). It is one of the crops with the greatest capacity to adapt, and this explains why farmers in 163 countries cultivate it. The five top potato producers: China, India, Russia, Ukraine and USA account for 57% of global potato production, and over the past 20 years, China and India increased their tuber production volumes by 109% and 145% respectively.

Potatoes are chiefly sold in domestic markets of any given country; only 3% of potato production is allocated for export to foreign markets. For the most part, potato exports are destined for neighboring countries as fresh produce or for industrial processing. The largest consumers of fresh potatoes are the populations of Europe. Western Europe has ranked highest in per capita consumption in the world for decades, followed by Eastern Europe. Countries such as Belarus and the Ukraine have consumption levels of 185 kg and 134 kg/person/year, respectively, while in the United Kingdom, consumption reaches 100 kg/person/year or more.

The factors that explain this increase in consumption include the increase of real income in some countries, the influence of Western culture, the widespread use of the microwave oven, tourism, rapid urbanization and dietary diversification. Another feature that may explain this trend is the rapid growth of the fast-food industry. In most countries, the structure of food demand has evolved, providing a powerful stimulus for the development of potato agribusiness.

In Peru, in economic and social terms, potatoes are indeed one of the most important products in the agricultural sector. Each year, farmers produce 4.7 million tons and plant 319,819 hectares, providing a livelihood for more than 700,000 families (10% of the national population). Potato farming contributes US $ 500 million to agricultural GDP (MINAG, 2016). Eighty-seven percent (87%) of producers in the Peruvian Andes grow potatoes as their main crop.

For small producers, potatoes represent both a staple food and an important source of income. This fact also involves an element that seeks to preserve ancestral customs and heritage. In addition, 80% of urban consumers state that their family consumes potatoes on a daily basis. Thousands of varieties of native potatoes are still grown in the highlands of the Peruvian Andes, where they generate more value and employment per hectare than any other food crop.

In Peru, a forgotten food product, previously looked upon as a "food for the poor" – the native potato – has become a driver of development

The potato production and distribution sector in Peru is not homogeneous and has several peculiarities, according to the varieties of potato crops. There are three large segments: white potatoes, yellow potatoes and native potatoes. For one thing, over the past 30 years the product has experienced wide price fluctuations on the markets. Another observation is that the potential of potatoes for industrialization needs a more thorough examination. Yet another is that today, the yellow potato is well positioned in Peru's domestic market and its processed products (peeled, precooked and frozen) are being exported to the USA, Spain and Japan, to target the ethnic market segment (Peruvians residing abroad). Lastly, native potatoes have been successfully introduced to local self-service markets as a gourmet concept, and some processed products (such as native potato chips, and instant mash potatoes) have been developed for export markets (including segments identified with organic certification and fair trade practices).

One of the fundamental issues addressed over the past 15 years is to promote the innovation of the industry's competitiveness and to foster articulated stakeholder efforts, particularly with small potato farms throughout the productive chain. The evidence shows the achievement of positive results at different levels. Commercial, institutional and technological innovations made will sustain the value creation of native potatoes with a view toward building demand. Similarly, the families directly participating in these efforts have benefited, and promoters have managed to influence the productive chain of the potato industry to implement changes in production, per capita consumption, and real prices. Specific studies indicate that producers increased both yields and the prices in real terms. Some indicators (based on official data) confirm this situation (period 2005-2016). Peru is now is the largest potato producer in Latin America, and 12th in the world.

In Peru, the native potato, that was previously a forgotten food product and viewed as the "food of the poor", has become a driver of development. The potato industry, particularly in the yellow and native potato segments, is evolving. New products have been created and have gained space in new high value markets (where they continue to position themselves), producing profits for a wide scope of individuals and families, including the small potato producers in the Andean highlands.

We need to build upon and strengthen the progress accomplished thus far, and use it to develop policies that consolidate the sector and reach the Bicentennial of the Republic of Peru in 2021 with clear development options. We must remind ourselves that 700,000 families or 10% of the nation's population participate in this sector.

In Peru, the potato faces the following challenges:

The development of commercial, institutional and technological innovations carried out by a series of public and private stakeholders must serve as a model to continue building and consolidating the industry. The primary elements that have driven development in Peru's potato industry include demand based work approaches, increasing the biodiversity value, and value chain promotion. These work approaches need to be broadly circulated and replicated.

Productivity (yield per hectare) is a key challenge. Peru has an average yield of 14 tm / ha, well below other LAC countries and even further behind that of world productivity leaders. The lines of action that can foster the increase in productivity include genetic

improvement, integrated crop management (which includes the topic of seed) and strengthening technical assistance (based on research results).

The issue of potato quality in Peru is an important factor for agronomic management, since it is more relevant to earmark the use of potato varieties to specific concepts in order to exploit market opportunities. For example, chicken restaurants as a market segment purchase 350,000 tons of potatoes per year and have serious quality problems. Therefore, processing options for white potato varieties (competitive varieties) would be beneficial under these market conditions.

The potato's contribution to nutrition and health represents both a challenge and an opportunity. Peru is a center of biodiversity and it has a stock of native varieties that should be categorized in terms of their profitability, and then promote their utilization. Crop bio-fortification (both genetic and agronomic improvement) also needs development with a specific focus on demand (both market demand and social policy demand).

In this context, the 2018 World Potato Congress (WPC 2018), the most prominent international scientific event in the sector, will be held for the first time in Peru (Cuzco) and in Latin America, from May 27 to 31, 2018 , with the title "A look at the future of the potato: Biodiversity, Food Security and Business". This convention is a magnificent opportunity to show case the Peruvian experience as it relates to the sustainable use of the biodiversity of the potato (emphasizing native varieties) and to promote the new criteria of commercial differentiation with variables related to nutrition and health, and its contribution to food security. This will contribute to improving the living standards of small potato producers because it consolidates the generation of alternate sources of income through access to international markets.

Under this perspective, the book, *the potato, pride of Peru,* edited by a multidisciplinary research team at the San Ignacio de Loyola University contributes a new body of knowledge about the Peruvian potato, using a holistic approach that encompasses history, biology, health, nutrition, gastronomy, economy and social development. This work will undoubtedly serve as a valuable reference for future research.

Miguel Ordinola
Director
International Potato Center

The archeological site of Qenko in the outskirts of the city of Cusco. Its terrace farm plots carved out of stone speak of the importance of agriculture for the Andean culture.

summary