# Peru's native potato revolution

*Douglas Horton and Katia Samanamud*

For the past half century, potato production has grown slowly in the Andean region of South America, where the potato originated and has long been a major staple food. The exception is Peru, where potato production has surged in recent years. Based on a review of official Peruvian statistics, this Innovation Brief documents trends in Peruvian potato production over the past half century, estimates production and marketing of native and improved potato varieties over the past decade, and identifies factors that have influenced these trends. The recent growth in Peru's potato production reflects changes in both supply and demand. On the supply side, the rapid expansion of Peru's road network, the increasing number and size of trucks, and the spread of cellphones have dramatically improved the links between highland farmers and dynamic urban markets and have reduced marketing costs. On the demand side, the image of the potato has changed from one of a "poor man's food" to one of an under-exploited national treasure and source of pride. The Project for Potato Innovation and Competitiveness in Peru (INCOPA Project) has promoted the cultivation and use of native potatoes through public-private alliances that pursue: innovations in production and marketing, policy changes, and public awareness. This initiative appears to have stimulated demand for native and improved potatoes and it has also contributed to the supply of new production technology. Many small farmers, including those who cultivate native potatoes, have benefitted from the recent increases in potato production, sales, and farm-gate prices. The main benefits of market chain innovation and increased market demand for potatoes have accrued to early innovators characterized by higher levels of education, larger land holdings, better access to credit and input supplies and to markets for their products, and superior endowments of financial and social capital and entrepreneurial capabilities.

## Introduction

**The potato was domesticated** 7,000 – 10,000 ago in the Andean highlands of South America, where it became a staple food. In recent times, potato production has grown slowly in the countries of this region and in some cases it has declined. A recent review of potato production statistics (Scott, 2011) indicates that annual growth rates for the potato crop in Latin America as a whole have lagged behind those for other developing regions, including Africa and Asia. In Peru, however, potato production has expanded dramatically in recent years. As Scott (2011: 148) notes, "the renaissance in potato output and area planted in Peru over the last 15 years has been perhaps the most remarkable development in the region over the last half century."

In this Innovation Brief, we examine recent trends in potato production in Peru and explore the role of native potatoes in the renaissance of Peruvian potato production. Specific objectives are to: document trends in Peruvian potato production over the past half century; estimate trends in production and marketing of native and improved potato varieties for the past decade; and identify key factors that have influenced these trends, and the policy implications.

We use the terms "native potatoes" and "native varieties" to denote landraces or local potato varieties that have developed largely by natural processes, by adaptation to the natural and cultural environment in which they grow. Native varieties differ from "improved varieties", which are the products of formal potato breeding programs, which have been deliberately bred to conform to a particular official standard of traits, such as high yield and resistance to pests or diseases.

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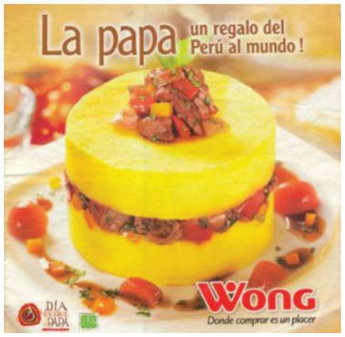
Hundreds of native potato varieties are still cultivated in the highlands of Peru and other parts of the Andes. In poor and remote mountainous areas, "the potato remains a key component in the livelihood systems of small-scale farmers, contributing to food security as a direct food source and as a cash crop" (Meinzen Dick *et al.*, 2009:235). In Andean highland areas above 3,500 m.a.s.l. the potato crop generates more added value and employment per hectare than any other food crop.

Potatoes are grown throughout the Peruvian highlands and also in irrigated valleys on the central coast. Native potato varieties are typically grown by farm families on small plots of land above 3,500 m.a.s.l. The vast majority of Peru's potato producers are smallholder farmers, who cultivate less than a half hectare of potatoes. In contrast, improved potato varieties are typically grown on larger plots of land in better-endowed areas at lower elevations. Large-scale commercial farms are few in number and generally cultivate potatoes in fertile inter-Andean valleys and in irrigated valleys along Peru's coast.

## Methods

**This Innovation Brief** is based primarily on an analysis of statistics from Peru's Ministry of Agriculture. Beginning in 1950, Peru's Ministry of Agriculture has estimated national and department-level[1] potato production, the harvested area, the number of farmers who produce potatoes, the volume of potatoes sold by farmers, and the prices received by farmers. More recently, the Ministry has estimated the same variables for each of Peru's districts[2].






We begin with an analysis of trends in national potato production, area, and yields over the last half-century (1961-2011). Beginning in 2000, we broaden the analysis to include potato marketing at farm level. We use district-level data to estimate production, sales, and prices of native and improved varieties in the following way: we use the altitude of each district capital to establish two sets of districts, (a) those with capitals at 3,500 m.a.s.l. or higher, and (b) those below this altitude. We assume that farmers residing in the first set of districts produce only native varieties and those residing in the second set produce only improved varieties. Based on these assumptions, we use the Ministry of Agriculture statistics for the two sets of potato-producing districts to estimate the following variables:

- Production, harvested area, and yields for improved and native potato varieties (2000-2011)
- Number of producers of improved and native potato varieties (2000-2011)
- Volume of farm-gate sales of native and improved potato varieties (2000-2011)
- Farm-gate prices for improved and native potato varieties, in New Peruvian Soles of 2011 (1991-2011)[3]

We use results of the annual National Survey of Households to estimate the number of farmers who sell potatoes and the portion of their harvest that they sell.

Summary statistics are presented in Table 1 and Figures 1-4. Time series of 3-year moving averages for all the variables analyzed appear in the Annex to the web version of this Brief, which is available from www.cipotato.org/resources/publications. In all the tables and figures, we present average results for the variables in question. Since the distributions of land holdings and market surpluses are highly skewed – more like "power-law" distributions than normal distributions – the averages may not represent the "normal" situation of most potato producers. The situation of the majority of producers – ones with very small land holdings – may be quite different from that of the few large producers, and arithmetic averages for all producers may differ from typical values for these two extreme types of farmer. For this reason, an important area for future research would be to analyze production and marketing data disaggregated by size of land holding.

1 Peru has 24 departments, 19 of which produce potatoes.

2 Peru has 1,834 districts, of which 1,373 produce potatoes.

3 Prices have been deflated based on Peru's consumer price index (Index 2011=100). Yearly prices are volume-weighted averages calculated with monthly data.

**Table 1.** Percentage change in selected variables for improved and native potato varieties, Peru

| Variable | Period 2000/2002 | 2009/2011 | % Change |
|---|---|---|---|
| **Volume of production** (000 t) | | | |
| Improved varieties | 2,250 | 2,769 | 23 |
| Native varieties | 841 | 1,117 | 33 |
| **Harvested area** (000 ha) | | | |
| Improved varieties | 181 | 190 | 5 |
| Native varieties | 82 | 99 | 21 |
| **Yields** (t/ha) | | | |
| Improved varieties | 12.43 | 14.57 | 17 |
| Native varieties | 10.26 | 11.28 | 10 |
| **Farm-gate price** (New Peruvian Soles/kg) [1] | | | |
| Improved varieties | 0.48 | 0.63 | 31 |
| Native varieties | 0.51 | 0.79 | 55 |
| | **2000/2002** | **2008/2010** | |
| **Number potato producers** (000) | | | |
| Improved varieties | 650 | 799 | 23 |
| Native varieties | 344 | 425 | 24 |
| **Harvested area per producer** (ha) | | | |
| Improved varieties | 0.28 | 0.24 | -14 |
| Native varieties | 0.24 | 0.23 | -4 |
| **Number of producers who sell potatoes** (000) | | | |
| Improved varieties | 431 | 262 | -39 |
| Native varieties | 144 | 70 | -51 |
| **Percent of producers who sell potatoes** | | | |
| Improved varieties | 66 | 33 | -50 |
| Native varieties | 42 | 16 | -62 |
| **Portion of harvest sold** (%) | | | |
| Improved varieties | 57 | 60 | 5 |
| Native varieties | 20 | 28 | 40 |
| **Volume of sales** (000 t) | | | |
| Improved varieties | 1,275 | 1,604 | 26 |
| Native varieties | 167 | 289 | 73 |
| **Value of sales** (million New Peruvian Soles) [1] | | | |
| Improved varieties | 606 | 1,011 | 67 |
| Native varieties | 82 | 212 | 159 |
| **Volume of sales/seller** (kg) | | | |
| Improved varieties | 2,951 | 6,141 | 108 |
| Native varieties | 1,145 | 4,138 | 261 |
| **Value of sales/seller** (New Peruvian Soles) [1] | | | |
| Improved varieties | 1,407 | 3,860 | 174 |
| Native varieties | 569 | 3,035 | 433 |

1. New Peruvian Soles of 2011.

# Results

### Trends in potato production, harvested area, and yields

Table 1 summarizes the main changes in potato production, marketing, and prices since 2000. Figures 1-3 show trends in potato production, harvested area, and yields since 1960. Figure 4 shows price trends since 1990.

**Total potato production.** Over the past half century, potato production has expanded from about 1.2 million tons in the early 1960's to 3.7 million tons in 2009-2011. As Figure 1 shows, the growth in production has been anything but steady. Production increased during the 1960's and then stagnated during the 1970's. In the 1980s, production first declined and then increased. In the early 1990's, production plummeted back to the level it was at in the early 1960s. From around 1993 until 2000, potato production shot up dramatically. From 2000 to 2005, it expanded less rapidly, and since then, it has surged ahead rapidly again.

The time series for harvested area has the same peaks and valleys as that for total potato production. But while the harvested area today is about the same as it was 40 years ago, production has doubled. Potato yields, which were just over 5 t/ha in the early 1960s, increased to about 7 t/ha in 1970 and to 8 t/ha in 1980. During the 1980s, yields increased and then fell back again. In the 1990's yields recovered and then shot up to nearly 12 t/ha in 2000. Since then, yields have increased gradually to their present level of around 13.5 t/ha.

**Production of native and improved potato varieties.** Since 2000, production of native varieties has grown more rapidly than production of improved varieties (by 33% and 23%, respectively).

The faster growth of native potato production reflects more rapid expansion in the area planted to them, which has more than compensated for the faster growth of yields for improved varieties.

**Number of farmers producing and marketing potatoes**

As Table 1 shows, fewer than 1 million Peruvian farmers produced potatoes in 2000. Of these, 650,000 produced improved varieties and 344,000 produced native varieties. Since 2000, the number of producers has increased by about one-quarter, with the proportions producing improved and native varieties remaining constant.

The average farm area with potatoes is small and declining. In 2000/2002, farmers cultivated an average of 0.28 ha of improved varieties and 0.24 ha of native varieties. By 2008-2010, the average cultivated area of both types of potato had declined to about 0.23 ha. Given the skewed distribution of land holdings, most farmers cultivate much smaller plots of potatoes while a few cultivate much larger tracts.

Since 2000, the number and the proportion of potato farmers who market potatoes have both fallen. At the beginning of the decade, two-thirds of the farmers who cultivated improved varieties sold part of their harvest; by 2008/2010, this proportion had fallen to one-third. Over the same period, the proportion of farmers who marketed a portion of their harvest of native potatoes declined from 40% to under 20%. As will be seen below, the decline in the number of farmers who market potatoes was accompanied by an increase in the number of farmers who produce potatoes and an increase in the volume sold. In other words, over time, a declining number of the potato farmers is producing and marketing an increasing share of the potatoes.

**Trends in farm-gate prices**

The average farm-gate price of potatoes (in New Peruvian Soles of 2011) declined during the 1990's, with an uptick in the middle of the decade. Prices remained essentially flat from 2000 to 2005, and since then, they have climbed upward (Figure 2). The increases in potato prices have been particularly striking for native varieties. Since 2005/2007, average prices for native potatoes increased by 49%, while prices for improved varieties increased by 26%.

**Volume and value of potatoes marketed**

Peruvian farmers cultivate potatoes to provide food for their families and also to generate cash income[4]. Household survey data shows that most of the harvest of improved varieties is sold; in contrast, most native potatoes are retained for household consumption and seed. In 2000/2002, farmers growing improved varieties sold 57% of their harvest, compared to only 20% for farmers growing native varieties. By 2008/2010, farmers growing improved varieties sold 60% of their harvest and farmers growing native varieties sold 28%. From these figures it can be seen that while the share of improved varieties that is sold increased by only 5%, the share of native varieties that is sold increased by 40% over an 8-year period. During the same period, the volume of improved varieties that was marketed increased by about one-quarter while the volume of native varieties that was marketed increased by three-quarters.

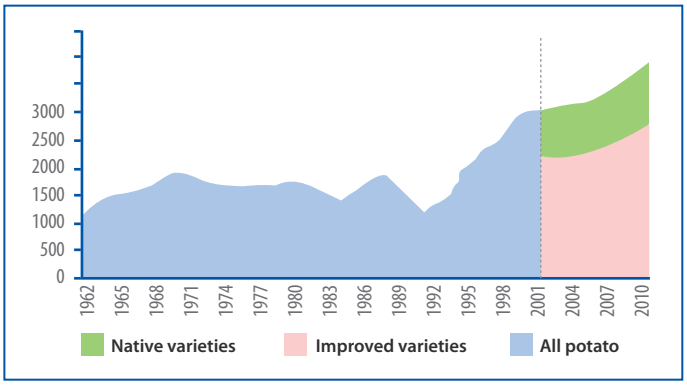
Since farm-gate prices have increased in recent years, especially for native potatoes, the value of potatoes sold has increased significantly more than the volume sold. Since 2000, the value of sales of improved and native potato varieties has increased by 67% and 159%, respectively.

As noted earlier, while the number of farmers who produce both improved and native varieties has increased, the numbers who sell potatoes has fallen. Consequently, the average value of sales for each farmer who sells potatoes has increased very sharply. Since 2000, the farmers who sold improved and native potatoes increased the value of their sales by 174% and 433%, respectively. In 2008/2010, farmers who sold improved and native potato varieties generated an average of 3,800 and 3,000 New Peruvian Soles (US$ 1,292 and $ 1,020[5]) from their sales, respectively.

4 Earlier, highland farmers didn't sell potatoes but exchanged them for other products; however, such traditional exchanges are gradually disappearing.

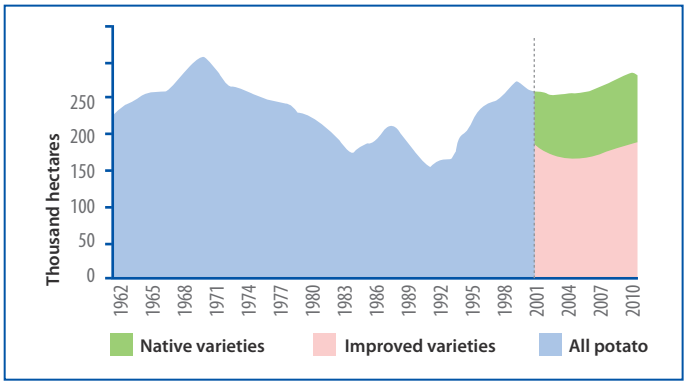
5 This estimate assumes an average exchange rate of 2.94 New Peruvian Sol / 1 US dollar.

**Figure 1.** Potato production (000t), Peru (3-year moving averages)



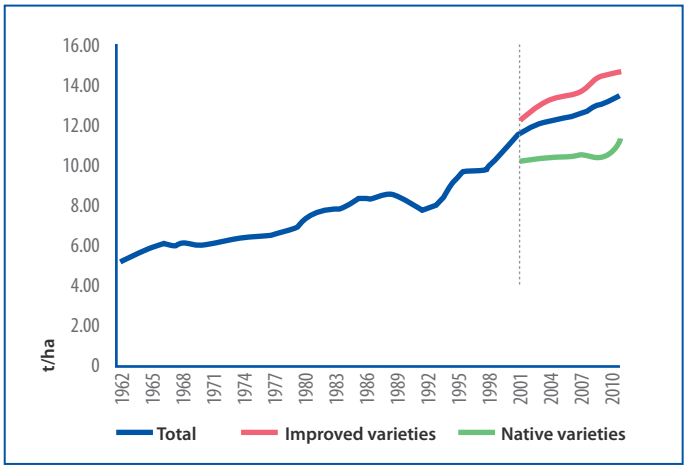

**Source:** Department of Economic and Statistical Studies. Ministry of Agriculture. Peru.
**Note:** Years shown on the horizontal axis represent the mid-points of the corresponding 3-year average. For example, 1962 represents 1961/1963.

**Figure 2.** Harvested potato area (000 ha), Peru (3-year moving averages)



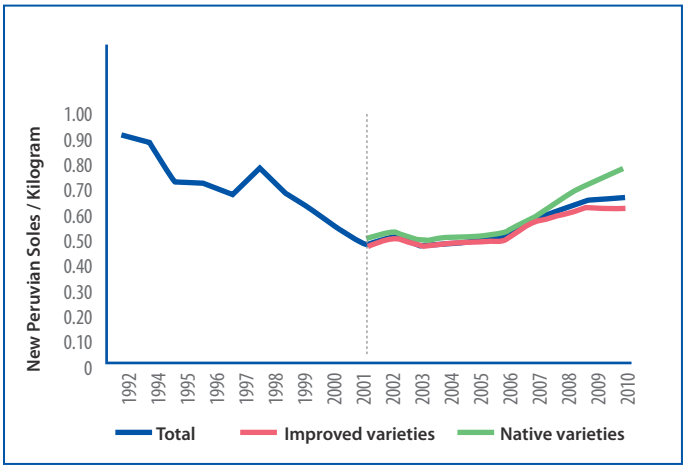

**Source:** Department of Economic and Statistical Studies. Ministry of Agriculture. Peru.

**Figure 3.** Potato yields (t/ha), Peru (3-year moving averages)




**Source:** Department of Economic and Statistical Studies. Ministry of Agriculture. Peru.

**Figure 4.** Farm-gate potato prices, Peru (3-year moving averages)




**Source:** Department of Economic and Statistical Studies. Ministry of Agriculture. Peru.

## Discussion

**During the last half century**, Peru's agricultural sector was negatively impacted by disputes over land tenure (1960s), a traumatic land reform process (1970s), and terrorism (1980s). The collapse of potato production in the early 1990s reflected the grave state of rural insecurity that prevailed in the Peruvian highlands at that time. The defeat of the terrorist Shining Path movement in 1993 marked the beginning of two decades of sustained growth in Peruvian agriculture, which is reflected in recent trends in potato production.

Other significant drivers of the recent expansion of potato production have been the pro-business policies of recent Peruvian governments, strong overall growth of the Peruvian economy, and political and budgetary decentralization. Peru's gross domestic product grew at an annual average rate of 6.3% from 2001 to 2010 (IADB, 2010: 7), and per-capita rural incomes have grown at an average annual rate of 5.1% since 1995, driven mainly by agricultural growth (Webb, 2013). The acceleration of road building and the wide diffusion of cellular phones have also contributed to economic growth and income improvements in the Peruvian highlands. Whereas Peru constructed on average only 1,000 km of new roads each year from 1950 to 2000, it has added 3,000 km of new roads each year since 2000. Rapid expansion of the road network coupled with an even larger increase in the number and size of trucks plying these roads has dramatically reduced the costs of marketing agricultural commodities produced in the highlands, such as potatoes (Webb, 2013). All of these factors have stimulated the growth of small towns and the small-farm sector in highland areas.

Strong growth of the Peruvian economy has driven increases in per capita incomes and expansion of demand for foods, such as potatoes, which are consumed in diverse forms in homes and in restaurants. The rapid growth of food processing and consumption of convenience and snack foods has stimulated the demand for potatoes, which are a basic ingredient in the fast-food and snack-food industries. In a parallel process, growing concerns for nutrition and food safety have stimulated interest in native potato varieties, which are usually grown with less use of chemical pesticides and fertilizers than in the case of improved varieties.

Recent recognition of Peruvian cuisine as one of the world's most sophisticated and high-quality, has also stimulated the demand for foods of Andean origin, such as native potatoes, the virtues of which have been featured in high-profile events such as the "Mistura", a very important and massive food festival (http://www.mistura.pe). Native potatoes are now viewed as a uniquely "Peruvian" food that is healthy, nutritious, good tasting, and diverse in its forms and uses.

The recent surge in potato production coincided with the first comprehensive initiative to promote the production and use of Peru's native varieties, by exploiting the emerging market opportunities for these potatoes. The Project for Potato Innovation and Competitiveness in Peru (INCOPA) was coordinated by the International Potato Center (CIP) through the Papa Andina Initiative, and was supported by the Swiss Agency for Development and Cooperation. INCOPA pursued a 4-prongued strategy that included:

- *Working via public-private alliances,* which were consolidated over time. Several alliances established during the project have achieved sustainability and continue to operate.
- *Fostering commercial, institutional, and technological innovation through use of the Participatory Market Chain Approach (PMCA).* Commercial innovations included a number of new fresh and processed potato products; institutional innovations included various alliances as well as legislation and technical norms for potatoes; technological innovations included selection of varieties, improvements in seed systems, and integrated approaches for pest management with native varieties.
- *A campaign to improve the image of native potatoes* through, for example, establishment of Peru's National Potato Day, promotion of the International Year of the Potato, and working with chefs and promoters of Peru's culinary revolution.

- *Support for policy changes* including, for example, norms for wholesale markets and inclusion of native potato varieties in the National Registry of Commercial Cultivars.

This initiative helped improve the image of native potatoes and link small producers to dynamic urban markets for potato-based products (Devaux *et al*., 2009).

Official statistics and assessments of the potato sector support the hypothesis that in recent years there has been an increase in the demand curve for potatoes – in particular for native potatoes (Proexpansión, 2012). In the past, increases in potato production and sales – even moderate ones – were associated with reductions in potato prices. However, since 2005 both potato sales and prices have risen. One possibility is that, due to reductions in transport costs, farm-gate prices for potatoes increased but wholesale and retail prices declined. But information from Lima's wholesale market over the past decade indicates that both potato sales and prices have risen here too, implying that consumer demand for potatoes has increased.

The expansion of national potato production has resulted mainly from growth in the cultivation of improved potato varieties, which feature in the fast foods consumed by a growing number of Peruvians. The small farmers who cultivate native potatoes have also benefitted from the rapid expansion of this crop. Lagging yields of native potatoes have reflected the historic focus of agricultural Research & Development (R&D) on genetic improvement and commercial farming in better-endowed regions and inattention to the needs of small and poor farmers who cultivate native varieties in remote highland areas. Triggered by the growing interest of supermarkets and large-scale processors in native potatoes and the development of new products (for example, colorful potato chips and gourmet restaurant dishes made with native potatoes), agricultural researchers and non-governmental organizations are now paying more attention to native varieties. This foretells well for future productivity increases and continued expansion of native potato cultivation and marketing.

The main benefits of market chain innovation and increased market demand for potatoes have accrued to early innovators who have higher levels of education, larger land holdings, better access to credit, input supplies and markets for their products, and superior endowments of financial and social capital and entrepreneurial capabilities. Families with the smallest landholdings, the least education, the least access to credit, and the least-developed social networks have benefitted less from the new market opportunities (Escobal and Cavero, 2012). As Peru's economy has grown in recent years, many of the rural poor have left the farm, seeking better opportunities in mines, construction sites, and commercial activities. Their family members who remain on the farm usually continue to grow potatoes for home consumption, but often reduce potato sales.

## Further reading

**Devaux, A., Horton D., Velasco C., Thiele G., López G., Bernet T., Reinoso I., Ordinola M. 2009.** Collective Action for Market Chain Innovation in the Andes. Food Policy, 34:31-38 pp.

**Escobal, J. and Cavero, D. 2012.** Transaction costs, institutional arrangement and inequality outcomes: potato marketing by small producers in rural Peru. World Development (40, 2: 329-341).

**Meinzen Dick, R., Devaux, A., Antezana, I. 2009.** Underground assets: potato biodiversity to improve the livelihoods of the poor. International Journal of Agricultural Sustainability (7,4: 235-248).

**Ordinola, M., Devaux, A., Manrique, K., Fonseca, C., Thomann, A. 2011.** Strengthening competitiveness of the potato market chain: An experience in Peru. In: Devaux, A., Ordinola, M. and Horton, D. 2011. Innovation for Development: The Papa Andina Experience. Lima, Peru: International Potato Center.

**Proexpansión. 2011.** Cambios del sector papa en el Perú en la última década: Los aportes del proyecto Innovación y Competitividad de la Papa (INCOPA). Lima, Perú: Centro Internacional de la Papa.

**Proexpansión. 2012.** Efectos de INCOPA en la Cadena de la Papa: Insumos para el informe de cierre de COSUDE. Lima, Perú.

**Scott, G. 2011.** Growth rates for potatoes in Latin America in comparative perspective: 1961-07. American Journal of Potato Research (88, 2: 143-152).

**Webb, R. 2013.** Conexión y despliegue rural. Lima, Perú: Instituto del Perú, Universidad de San Martín de Porres.

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