DEVELOPMENT MODELS, AGRICULTURAL POLICIES, AND AGRICULTURAL GROWTH: PERU, 1950-2010

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Abstract

Throughout its history, Peru, as a small open economy, has undergone cycles of crisis and recovery, usually linked to fluctuations in the international market. The Peruvian economy has always been an exporter of primary products and an importer of manufactured goods This paper has a two-fold aim: to identify the salient characteristics of the development models and policies affecting Peruvian agriculture since the mid-twentieth century, and to identify what effect they have had on agricultural production and productivity based on an estimation of total-factor productivity (TFP) for the 1950-2010 period.Development strategy models have ranged from the diversification of primary exports, to import-substitution industrialisation, and the promotion of non-traditional exports, which is the current model. These strategies have determined the outcome for agriculture.

Key words: Peruvian economic history, Peruvian agriculture, development models, Latin American economic history, agricultural growth

Resumen:

Históricamente Perú, como una economía abierta pequeña, ha atravesado ciclos de crisis y recuperación, habitualmente vinculados a las fluctuaciones del mercado internacional. La economía peruana ha sido siempre exportadora de productos primarios e importadora de manufacturas. Este trabajo tiene dos objetivos: en primer lugar identificar lascaracterísticas más destacadas de los modelos de desarrollo y las políticas que han afectado al sector agrario peruano desde mediados del siglo XX; en segundo lugar, identificar los efectos que éstas han tenido en la producción agraria y la productividad, calculada esta última como productividad total de los factores para el periodo 1950-2010. Las estrategias de desarrollo han ido desde la diversificación de exportaciones primarias a la industrialización sustitutiva de importaciones y la promoción de exportaciones primarias no tradicionales, que es el modelo actual. Estas estrategias han sido claves para entender los resultados del sector agrario.

Palabras clave: Historia económica peruana, agricultura peruana, modelos de desarrollo, historia económica de América Latina, crecimiento agrario

JEL CODES: N56, O47, Q54, Q10

1. Introduction[1]

The economic importance of the agricultural sector in Peru has decreased noticeably in the last half-century. Changes in the distribution of gross domestic product (GDP) and employment by economic sectors, based on the national population censuses (1961, 1972, 1981, 1993, and 2007), show a downward trend in the weight of agricultural production and employment. At present, the agricultural sector contributes 9% to GDP and represents 24.7% of the economically active population (EAP), according to the 2007 census, and 65.5% of the EAP in rural areas (INEI, 2008). Peruvian agriculture shows low levels of labour productivity, partly explained by the fragmentation of land ownership, the lack of private and public assets available to farmers, rural poverty, and the limited development of agrarian markets (labour, credit, technical assistance, information, insurance, and so on). Agriculture is also the sector with the highest poverty levels, affecting 53.8% of the total agricultural occupied EAP in 2010, compared to only 16.4% among the non-agricultural occupied EAP (Velazco &Velazco, 2012).

Furthermore, agriculture in Peru is heterogeneous, both in terms of its articulation with the markets and in its levels of profitability and sustainability. Thus, we see the coexistence of modern, highly technical agriculturealongside small family farms, oriented to both local and international markets.The linkage between small-scale agriculture and the export agro-industry occurs through markets, in that agricultural goods are the raw materials for agribusiness, the renting of land, and the labour market (Figueroa, 1996).

From a geographical perspective, we must take into account the characteristics that determine Peru's three natural regions: *costa* (coast), *sierra* (highlands), and *selva* (forest). The coast is the centre of the country's industrial, commercial, and agricultural activity. Lima, the political and economic capital, is on the coast and is home to about a third of the total population. The highlands consist of the Andes mountains, high plateaus (*altiplanos*), and mountain valleys, covering 27% of the country. The forest is the largest but least populated area of Peru. Tropical rainforest covers 60% of the

national territory. Small farms are found in all three regions, but are most common in the highlands.

Peru is an interesting case for studies of the effects of development strategies and agricultural policies, having experienced a major socio-economic transformation in the twentieth century, like many other developing countries. In 1940, when the first census of the century was conducted, the country's population was mainly rural (65%) and resident in the highlands (63%). By 2007, the date of the latest census, most of the population (77%) was living in the cities, and most settlements (55%) of any size were on the coast (INEI, 2008). Over this period, the country experimented with a variety of economic policies.

In this context, this workhas a two-fold aim: to identify the salient characteristics of the development models and policies affecting Peruvian agriculture since the mid-twentieth century, and to identify what effect they have had on agricultural production and productivity, and on the sources of growth of agricultural output, based on an estimation of total-factor productivity (TFP) for the 1950-2010 period. Evidently, it is not only economic development strategies that affect results in the agricultural sector; changes in the international economy also play an important role, although they are outside the scope of this work.

The workis organised into six sections. Section 2 explains the economic development models implemented, with a particular interest in the export-led growth model (focusing on the promotion of both traditional and non-traditional export products), and the import-substitution industrialisation model. Agrarian reform policy and its effects on agrarian structure are discussed in Section 3. Section 4 analyses changes in production and labour productivity in the agriculture sector, and the results of estimating TFP are presented in Section 5. We outline our conclusions in Section 6.

2. Economic development models in the second half of the twentieth century in Peru

Throughout its history, Peru, as a small open economy, has undergone cycles of crisis and recovery, usually linked to fluctuations in the international market. The Peruvian economy has always been an exporter of primary products and an importer of manufactured goods (Thorp & Bertram, 1978). Development strategy models have

ranged from the diversification of primary exports (until the late 1950s) to import-substitution industrialisation (1960-1975) and the promotion of non-traditional exports; this pattern has held since the early 1990s and is current today.

Until the late 1950s, agriculture was a key sector of the Peruvian economy, and could be described as the sector leading growth (Escobal, 1993). Agriculture was an axis of accumulation for the economy in the context of the model of primary exports of agricultural products (cotton and sugar) and minerals.

The economic history of Peru is marked by recurring export booms. Products such as guano, rubber, sugar, cotton, silver, gold, and others, have succeeded each other in dominating the export structure since the nineteenth century, reflecting the role of many countries on the periphery of the first globalisation, as suppliers of agricultural products and raw materials for the industrialised countries of Europe.

The political independence of the Spanish colonial government in the nineteenth century did not lead to a bourgeois transformation of the colonial structure, and the *hacienda* and peasant communities continued to be the predominant forms of Peruvian agrarian structures.

Capitalist development of agriculture took place in the twentieth century, with foreign capital playing an important part in this new process. As a result, the coastal hacienda evolved into a modern enterprise, leading to the consolidation of the larger haciendas and their sugar and cotton plantations. These were typically characterised by production for export, a high level of capital investment, centralised administration, and the use of modern technology (Byerlee and Viswanathan, 2017). The wage-labour system also became the norm in sugar-producing haciendas. Thus, agricultural development was driven by a growth model based on exports, in which the sugar sector was one of the leaders, its influence spreading over the northern highlands in areas such as Cajamarca, benefiting from its mainly peasant labour resources, and livestock farming.

This development model changed in the late 1950s, as in many other Latin American countries, with a turn toward models based on import-substitution industrialisation (ISI) (Bulmer-Thomas, 1994). The growth of agriculture then became dependent on the expansion of industry; it went from generating to demanding foreign currency, with food being imported to meet the growing domestic demand. The pace of

growth of agricultural production for the internal market was not fast enough to meet the increased demand for food caused by population growth and rising incomes. This meant that Peru became a net importer of the food products that made up the urban diet. In 1960, the country imported 70% of the wheat it consumed, 35% of the food oil, and 22% of the dairy products (Rojas, 1993).

During the 1960s, there were major economic, political, and social changes in Peru.In economics, there was an attempt to reduce the vulnerability of growth driven by exports, by promoting industrialisation[2]. Although the economy's dependence on metal exports as the main source of growth remained substantial (its weight in the export structure went from 48.4% in 1970 to 40.2% in 1989), there was a transformation in the export structure.Agricultural products were overtaken by fuels and by manufactured products, and minerals continued to be the main source of foreign revenue.

In the ISI implementation scenario, from 1960 to 1975, the macro-economic policy to promote industrial growth created conditions that were hostile to agricultural development. Tax and price-control policies had a negative effect on the sector's profitability and growth. In this context of support for national industry, there were two main elementsof agricultural policy during the military government of 1969-1979: implementing agrarian reform (promoting the creation of cooperatives) and guaranteeing the low cost of the food basket (Álvarez, 1983). According to Alberts (1983), agricultural policies were extremely biased in favour of urban consumers. Price-control policies and the overvalued exchange rate discriminated against agricultural exports and incentivised food imports.

The 1980s were marked by an agrarian counter-reform, reflected in the disappearance of associative forms of production and the expansion of small holdings. This was accompanied by the emergence of politically-motivated violence in rural areas, which later spread to coastal cities, a situation which was finally controlled in the early 1990s.

The macro-economic scenario was characterised by the effects of the external debt crisis and the application of orthodox policies, driving a change to a market-based strategy centred on privatisation and private investment, trade liberalisation, and the

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[2]Concern over industrialisation is part of an old debate in the economic history of Peru.The subject arose in the political arena every time there was a crisis in the export sector.These periods can be identified in the 1880s, after the War of the Pacific; in the Great Depression; and in the Second World War.

rerouting of state investments into economic infrastructure to support private enterprise. The orthodox programme failed due to difficulties and inconsistencies in its application, and to external factors (deterioration in the terms of trade, external credit being cut off, and adverse weather conditions caused by El Niño) (Wise & Pastor, 1992). Given this scenario, 1985 saw the rise to power of APRA, a political party that implemented a heterodox policy rooted in the Latin American structuralism tradition.

The APRA government diagnosed the agricultural problem as one of low profitability and implemented a set of measures to raise agricultural prices, lower costs, and increase productivity. Substantial injections of cash were used to subsidise loans and basic inputs, such as fertilisers and pesticides (Escobal, 1989). The results were positive until 1987, reflected in increased production. The main beneficiaries of this policy were the modern farms in the coastal and forest regions.

The populist policies of the ARPA government under García, from 1985 to 1990, increased aggregate demand and imports, leading to a fiscal deficit in 1988/89 and a balance of payments crisis, which led in turn to hyperinflation and recession. In mid-1990s, Fujimori launched a stabilisation programme in order to control inflation, with basic elements including restricting monetary variables, price adjustments, and public tariffs. Other measures included the elimination of subsidies, increased tax pressure, lower public expenditure, and free-floating exchange and interest rates. These measures were complemented by a set of structural reforms intended to manage resources efficiently through deregulation and market liberalisation, along with the reduction of the business role of the government through privatisations and the closure of state companies (León, 1994).[3]

The sectoral measures affecting the performance of agriculture were the elimination of subsidies and price controlson agricultural products and inputs, and free trade with the external market. In the case of imports, these measures took the form of variable import tariffsthat, to some extent, provided protection from the subsidies of the main exporter countries and the overvaluing of the local currency against the dollar.[4]

On the financial market side, the interest rate was liberalised, and credit for the sector was reduced drastically when the *Banco Agrario* (Agricultural Bank, BAP) was

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[3]For a detailed analysis of the stabilisation policy and macroeconomic performance of agriculture, see León (1994) and Dancourt & Mendoza (1994).

[4]Dancourt & Mendoza (1994) discuss the implications and effectiveness of import tariffs on agricultural products.

liquidated. Alongside this, the main institutional measures were the liberalisation of the land and water markets and the end of the State monopoly on the purchase of agricultural inputs and products.

The Banco Agrario began reducing the cultivated hectares from the 1988/89 cropping season, when it helped finance 800,000 hectares, and the previous one where its coverage reached 1,200,000 hectares (Escobal, 1989). This situation was exacerbated by the disappearance of the *Banca de Fomento* (Development Bank) and increased interest rates. To identify the groups that were the most negatively affected by these measures, it is enough to remember that BAP funding tended to favour coastal products. For example, in the 1980-1988 period, funding for cotton was 22.6% of the total, and for rice, 32.2% of the allocated funds (Banco Agrario, annual reports)[5].

The 1990s were a period of far-reaching changes in the economic performance of agriculture (von Hesse, 2000; Escobal, 1999; Valcárcel, 2002). The implementation of the stabilisation programme and the State's structural reforms changed the institutional environment and the conditions of participation in market relationships for farmers. A key point, in the context of those reforms, was the explicit policy of encouraging investment in the sector by declaring the development of agro-industry to be in the national interest. The role of the State changed with this new approach; its functions were redefined and its participation in promoting and guiding economic development was limited. The State assumed a regulatory and subsidiary role, and private enterprise became a fundamental driver of development (von Hesse, 2000; Eguren, 2003).

However, the bias favouring the promotion of export agriculture meant that small-scale agriculture and the peasant economy were excluded from the development agenda, unless they were able, with non-governmental support, to successfully insert themselves into the export agriculture production chain (Eguren, 2003)

According to Kay (1994), from a Latin American perspective, the link between agriculture and the world market was strengthened after the 1980s, with the change from an import-substitution strategy to a more export-oriented approach. This trend was consolidated with the introduction of structural adjustment programmes, as the

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[5]Despite these trends, it should be borne in mind that the BAP's coverage did not reach all farms, and this was most noticeable in small-scale agriculture. Data from the National Survey of Rural Households (*Encuesta Nacional de Hogares Rurales*: Portocarrero, 1987) show that in 1984, only 7.6% of farms had access to loans from the BAP. This information is crucial when considering the importance of alternative, informal sources of agricultural credit and the impact on interest rates.

expansion of export agriculture was prioritised as an alternative solution to the permanent shortage of foreign currency. Thus, as part of the economic globalisation process, transnational agricultural corporations and local investors became the predominant players on the Latin American scene. With the use of new technology enabling improvements in storage, agro-industrial processing, preservation, transport, communications, and industrial organisation, these companies achieved advantages in the production of fruit, vegetables, and flowers. Peru is no exception to this process. The structural reforms of the 1990s, particularly the policies promoting the development of agro-industry, created favourable conditions for non-traditional export agriculture to expand and consolidate[6].

In the last decade, there have been changes in agricultural activity in Peru, due to such factors as greater openness to trade with the international markets (at present Peru has free trade agreements with several countries); the growing international demand for healthy, high-quality food; the addition of new farmland; the increasing interest in bio-fuels; higher incomes for Peruvians (who now demand greater variety and higher quality in their food); the expansion of private investment in agriculture, and so on. These changes in agricultural activity have influenced the link between farmers and the agricultural product and factor markets.

The positive impact of measures favouring agro-industry can be seen in the levels of exports and employment in the productive regions.

Over the last 20 years, there have been significant changes in the mix of crops at the national level, explained by internal factors (higher income of the population, changes in consumption patterns, new regulations favouring investment in agriculture, greater openness to trade) and by external factors (a growing world population with higher incomes, and an increasing consumer preference for healthy and organic food). Crops for the internal market represent 45% of farmland, with an average annual growth rate of 3.7%. The proportion of farmland devoted to traditional Andean crops for regional and local markets fell by 3.9 percentage points in the 1990-2009 period.

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[6]This expansion of the agricultural export sector can be related to the trends identified in Latin America, as well as the ways capitalism can expand into agriculture, as described by de Janvry (1981), when considering commercial and contract farming as the predominant modes in the region. This subject has yet to be researched in the context of Peruvian agriculture. Some initial thoughts and hypotheses on this process can be found in Eguren (2002) and Valcárcel (2002).

Industrial crops represented 16.1% of farmland and showed moderate growth in the 1990-2009 period.

Export-oriented crops represent the greatest dynamism in terms of farmland use. Coffee, cocoa, asparagus, mango, beans, plantain, grapes, artichoke, and paprika were the crops with the greatest expansion in farmland. The increase in farmland allocated to non-traditional crops for export is due to increased international demand; new laws favouring the sector such as the *Ley de Promoción del Sector Agrario* (Law of Promotion of the Agrarian Sector), which offer incentives for companies; optimal environmental conditions for cultivating these crops; the ability to supply goods while production is decreasing elsewhere in the world; the development of transport infrastructure that delivers products in better condition; and the implementation of Free Trade Agreements (FTAs) between Peru and the rest of the world, including FTAs with the United States, Thailand, Singapore, and China (PROINVERSIÓN, 2007). The output for export is not only provided by large companies - small, medium, and large farmers have all established individual arrangements for dealing with major corporations, andsome companies are vertically integrated with their suppliers through contracts establishing their supervision of farming activities, financing, and conditions of sale (the quantity and quality of the product, prices, place of delivery, and penalties).

The expansion of agricultural frontiers based on irrigation in coastal areas creates the opportunity for greater growth of exportable production and employment,but this brings with it environmental problems and questions as to the sustainability of agricultural activity, as in the case of the exhaustion of groundwater in Ica, a situation which may threaten the availability of water for human consumption (RedGE, 2012).

Another problem to take into account, and which the recent financial crisis has made evident, is the heavy dependency of exports on the economic cycles of the importing countries. It is expected that the demand for fruit and vegetables among high-income segments of the population will not fall significantly when there are negative income shocks. Based on agricultural labour employment records and information on exports in 2009-2011, Gamero (2012) concludes that the loss of employment in Peru due to the impact of the current economic crisis is elastic in relation to exports. In other words, registered agricultural jobs fell more than exports. However, during the recovery phase, 2010-2011, employment appears to be inelastic to rising exports. This situation shows that employment is the adjustment variable when there are changes in the

international market, and reveals vulnerability and a lack of protection for wage labourers when adverse changes arise in external demand.

In the 1960s, more than half of the economically active population was engaged in agriculture, so access to land was an important factor in the performance of the Peruvian economy. Consequently, the following section will briefly discuss the main characteristics of the agrarian reform implemented in 1969, as well as its effects on the distribution of land and the agrarian structure.

3. 1969 Agrarian reform and its impact on land ownership

The military government of General Velasco (1969-1975) implemented an extensive programme of agrarian reform in 1969. The attempted reforms of earlier governments were limited in scope. An international context dominated by the Cold War and the Cuban revolution, and an internal front with a growing peasant movement in the 1950s and 1960s, put agrarian reform back on the government's agenda (de Janvry, 1994). The priority was the formation of agricultural cooperatives and associations: *Cooperativas Agrarias de Producción* (CAP), *Cooperativas Comunales*, *Sociedades Agrarias de Interés Social* (SAIS), and others (Bourque and Palmer, 1975). The main beneficiaries were wage labourers in the large estates that were in the process of being expropriated[7]. According to Alberts (Figueroa 1990:6, Alberts 1981), the bias can be explained by three factors. The first is political: by implementing this agrarian reform, the government expected to immediately dismantle the power of the Peruvian oligarchy, and the expropriation of these *haciendas*, and transferring them to the wage labourers who worked on them, was an effective way to do so. The second factor is connected to the motto "la tierra es para quien la trabaja" -"the land to the tiller"- based on the exploitative nature of the worker-owner relationship and making the point that exorbitant rents were being extracted from the peasants (Alberts, 1983). The third and last factor relates to administrative convenience: it was easier to strip power from the large landowners by handing their land directly to the wage labourers, and reorganising the rural population's access to the land later.

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[7]The agrarian reform was executed mainly on the coast and in the highlands, the two regions with greater rural population and greater areas of agricultural use. Between June 1969 and June 1979, 15,826 properties and more than 9 million hectares were expropriated. Most of this area was transferred to 370,000 beneficiaries (Eguren, 2006).

From the economic point of view, the Agrarian Reform was considered a measure for developing the internal market and supporting the industrialisation process. Thus, it was assumed that eliminating the former oligarchy would allow the peasants to integrate more fully in the national economy, and the surpluses generated in the modern agricultural sector could be funnelled into industrial investment and expansion (Valderrama, 1982).

Peru's agrarian problem in the 1950s and 1960s was defined by highly-concentrated land ownership. The agrarian reform implemented in 1969, characterised by changes in ownership structure, did not significantly alter the original agricultural structure. The haciendas were transformed into agricultural cooperatives and SAIS, with that becoming the dominant form of organisation in Peruvian agriculture until they were gradually dissolved in the 1980s. Only a small part of the expropriated land was directly allocated to private family farms (Kay, 2002). This is confirmed when we compare the agricultural censuses for 1961 and 1972. In 1961, small farms -under 5 hectares-comprised 83.2% of the total number of farms, corresponding to 5.7% of the land. In 1972, farms under 5 hectares comprised 78% of agricultural units, but were only 6.6% of the land. Mid-sized farms - 20 to 100 hectares - now had a larger share than before. This sector represented 2.9% of agricultural farm units and owned 5.3% of all farmland in 1961. After the agrarian reform, this group constituted 6.3% of all farms and held 11.7% of the land (INEI, 2009).

In the 1980s, the organisation and functions of the CAPs and SAIS collapsed, due to problems in their administration and their internal management, while their members were working less and production costs were rising, making the companies economically unviable [8] . The coastal CAPs, except for the sugar-producing cooperatives, decided to dissolve the companies and distribute the land among their members. In the highlands, most lands owned by SAIS associations were taken over by peasant communities (Burneo, 2011). As a result of this process, which was accelerated by land transfers through inheritance, farmland was fragmented and smallholdings became the most numerous group. Farmers were more interested in concentrating their

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[8]Mejía (1982) provides some examples of the problems faced by these companies. A study carried out in 1977 by a High-Level Commission of the Ministry of Agriculture clearly revealed this fact. Of 1,388 existing companies at that time, 955 (68%) had no manager and 659 (47%) lacked accounting. At the same time, the problems of lack of human resources were classified as serious in 1,088 cases (78%); lack of training in 941 cases (68%); and lack of business organization in 633 cases (48%).

efforts on their own land, and pressed for the recognition of their individual deeds of ownership (Binswanger-Mkhize et al., 2009).

Table 1, based on the farming censuses of 1961, 1972, 1994, and 2012, shows the distribution of farms by number and size (hectares). At the national level, in 1961 farms under 5 hectares represented 83% of all farms, but had access to only 5.7% of farmland. The results of the 2012 census confirm the predominance of very small farms, which nevertheless represent a tiny proportion of farmland. The first phase of the agrarian reform produced a small reduction in the concentration of land, with the Gini coefficient passing from 0.94 in 1961 to 0.88 in 1972. In 1994, the coefficient reached 0.5because of the land distribution process (Zegarra, 1999). Estimates seem to indicate a pattern of greater equality in land distribution (Velazco, 2001). From 1961 to 1994, we can also see declining numbers of large farms and the growth of mid-sized holdings (INEI, 2013).However, when comparing the results of the 2012 farm census, processes of fragmentation and concentration of land are identified. The first process leads to the predominance of small-scale units, while the second refers to the fact that land has been acquiredby a few agents (either for productive or speculative purposes). A more dynamic land market has enhanced land transactions.

Since the 1990s, the central government, in coordination with certain sub-national governments, has promoted and financed irrigation projects on the *costa*. These new lands were auctioned off and transferred to economic groups specializing in export agriculture (Escobedo, 2015). The regional analysis of the land concentration based on the Gini coefficient for the 2012 census allows us to distinguish a more pronounced dynamic on the *costa* than in the *sierra* and *selva*. Therefore, the Gini is 0.75 for the *costa*, 0.68 for the *sierra*, and 0.53 for the *selva* (Bourliaud &Eresue, 2015).

Returning to the discussion of the agriculture output performance, the next two sections deal with the trend in agricultural production and the estimation of the total factor productivity (TFP).

Table 1. Peru: Number and Size of Farming Units according to 1961, 1972, 1994 and 2012 Farming Surveys

	1961		1972		1994		2012	
	Number of farms (%)	Size (area) (%)	Number of farms (%)	Size (area) (%)	Number of farms (%)	Size (area) (%)	Number of farms (%)	Size (area) (%)
Under 1 Ha.	34.1	0.7	34.7	0.8	24.2	0.5	37.6	0.8
1 - 5 Ha.	49.1	5.0	43.2	5.8	46.1	5.3	41.7	5.1
5 - 20 Ha.	12.6	4.7	16.7	8.7	22.2	9.6	15.2	7.6
20 - 100 Ha.	2.9	5.3	4.3	9.3	6.3	11.7	4.5	9.5
100 - 500 Ha.	0.9	8.7	0.8	9.1	1.1	10.4	0.8	8.4
500 - 1000 Ha.	0.2	5.7	0.1	4.6	0.1	5.0	0.1	4.3
1000 - 2500 Ha.	0.1	8.9	0.1	7.4	0.1	8.4	0.1	7.3
Over 2500 Ha.	0.1	61.0	0.1	54.3	0.1	49.1	0.1	57.0
Total (%)	100	100	100	100	100	100	100	100
Total (absolute value)	851.957	18,604,500	1,390,877	23,545,147	1,745,773	35,381,808	2,213,506	38,742,465

Source: 1st, 2nd, 3rd and 4th National Farming Survey, 1961, 1972, 1994 and 2012 (INEI).

4. Trends in agricultural production and productivity

When we analyse the growth in agricultural production (Table2), we can see that the periods of greatest growth are at the beginning and end of the study period: 1950-70 and 1991-2007. Fast growth coincides with the end of the export agriculture era around 1960 and the first decade of the ISI, and again when the model changed to greater liberalisation and opening up to outside trade in 1991, and the subsequent economic expansion. The most critical period coincides with the economic crisis of the 1970s and the "lost decade" of Latin America in the 1980s.
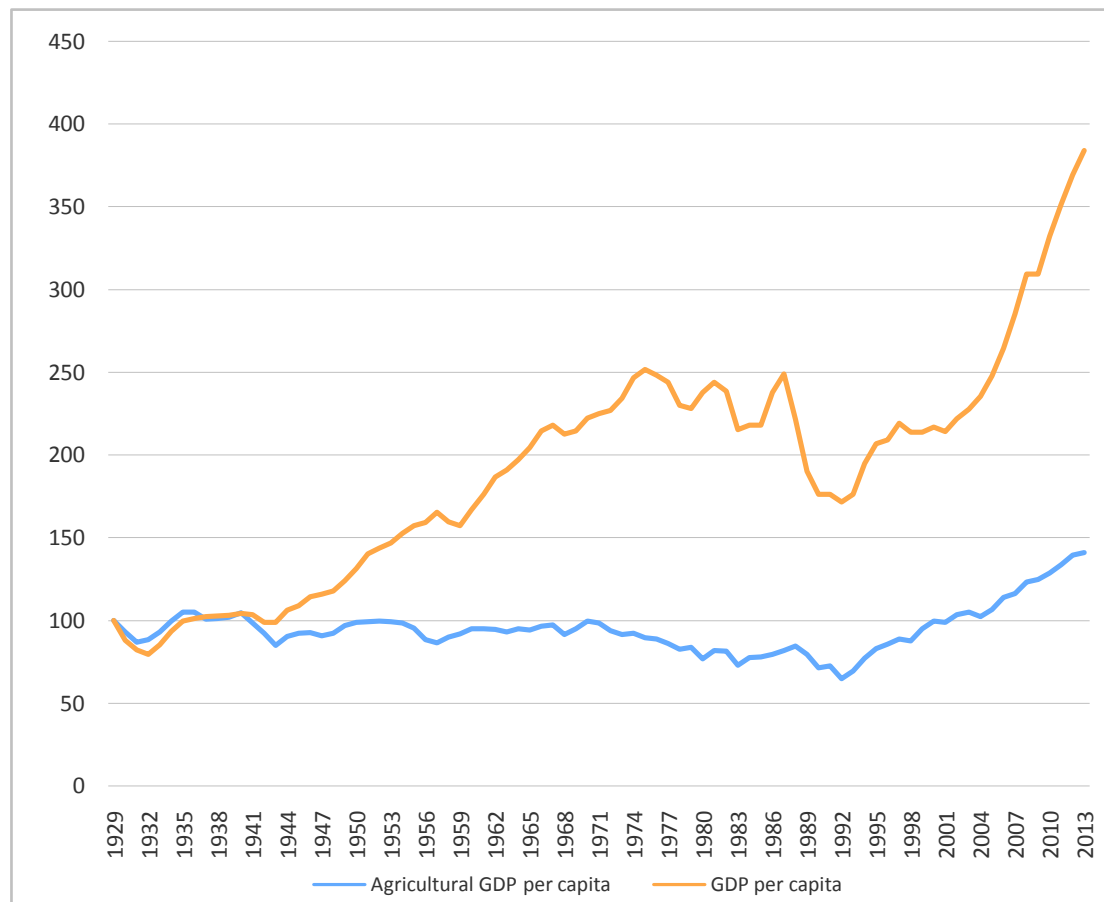
Table 2. Annual average growth rates of agricultural production by destination markets (at constant 1994 Soles)

Periods	Agricultural GDP			% External Market in Agricultural GDP
	Total	Internal Market	External Market	
1950 – 1960	2.32	1.23	7.56	19.31
1961 – 1970	3.41	4.12	0.86	21.32
1971 – 1980	0.15	0.27	-0.34	17.61
1981 – 1990	1.76	1.94	1.38	14.92
1991 – 2000	5.46	5.62	4.96	13.23
2001 – 2007	3.62	3.49	4.78	14.12
Entire Period 1950 – 2007	2.74	2.74	3.12	17.23

Source: Authors' calculations based on estimations by Tello (2009) by the destination markets of agricultural products. The external agricultural GDP was calculated based on the sum of the value of achiote, unprocessed cotton, cocoa, coffee, sugar cane, onion, asparagus, mandarin oranges, mango, dried lima bean, avocado, and grapes.

Figure1 also clearly shows Peru's unfavourable economic situation in the intermediate period, when it was unable to recover the 1977 level of GDP per capita until 2005. The same graph highlights the fact that until the mid-1970s, agricultural production grew at the same rate as the population, slowing down from the mid-70s to the mid-90s, and then growing at a significantly higher rate after 1995. The intermediate stage is considered to be a period of crisis in Peruvian agriculture, defined in terms of the agricultural output growing more slowly than domestic demand (Escobal, 1993).

Figure 1. Changes in GDP per capita and agricultural GDP per capita 1929 –2011 (at constant 1994 Soles, index number 100=1929)

Source: Own calculation based on statistics from the Central Reserve Bank of Peru, available at www.bcrp.gob.pe. GDP information is at constant 1994 Soles (national currency of Peru).

The breakdown of agricultural production by destination market, whether domestic or export, and the share of exports in total production, also show which market has been the main driver of growth in agricultural GDP. The strong growth of the first two decades was based on the external market in the 50s (when the export agriculture model was still current) and on the internal market in the 60s, after the switch to ISI. This change in policy had a notable effect on agricultural exports, which were much less dynamic from 1961 and 1991, due to the reduced profitability of the sector, lower levels of investment, and a decline in the terms of trade[9]. Also, ecological limits appear on the exploitation of raw materials such as sugar and cotton (Rojas, 1993).

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[9] Regarding the terms of term (ratio of export prices to import prices), a correlation coefficient between the terms of trade and an openness trade ratio (agricultural exports to agricultural GDP) for the period 1950-2010 is 0.61, suggesting a significant and positive relationship.

The return to rapid growth of agricultural GDP from 1991 rested equally on the external and internal markets, although exports had a much lower weight in the total agricultural GDP than at the end of the export agriculture period.

Table 3 shows that labour productivity growth was very slow from the early 60s to early 90s. Productivity convergence with other economic activities was very modest. However, from the mid-90s, growth was extremely rapid, with notable convergence.

Table 3. Estimated labour productivity (at constant 1994 Soles) (index number 1961= 100 and % of agricultural labour productivity over the economy as a whole)

	1961	1972	1981	1993	2007
Agriculture	100	136	124	128	218
Agriculture/Total	23.8	21.4	19.4	29.8	37.4

Source: Authors' calculations based on statistics from the Central Reserve Bank of Peru and the National Population and Housing Census (INEI) of 1961, 1972, 1981, 1993, and 2007.

This poor growth in productivity can also be explained by the meagre growth in agricultural production from the early 70s to the early 90s, while the sector's workforce continued to grow in absolute terms until the 21st century, when inter-sectoral labour mobility began to change, and the absolute collapse of the agricultural EAP became evident (Banco Mundial, 2010).

In recent years, improvements in agricultural productivity, and in the economy in general, have had a significant effect on poverty levels. Estimates based on the National Household Survey (ENAHO) show that the national poverty rate was 54.3% in 2002, and had fallen to 40.4% by 2007. For the same years, the rural poverty rate was 77.1% and 64% respectively, and urban poverty declined from 42.1% to 27.7%.

Although poverty has decreased overall, the impact on urban areas, where 70% of the country's population lives, has obviously been more favourable. The growth elasticity of poverty is higher in urban than rural areas, and higher in rural coastal areas than the rural highlands or forest (Escobal & Ponce, 2008). The decrease in rural poverty is highly concentrated in rural coastal areas. This trend is confirmed by the growth of annual household expenditure from 2004 to 2007 6.4% for the urban coast, 3.9% for the rural coast, and 1.9% for the rural highlands (Vakis et. al., 2008). The evidence suggests that not all households in rural areas have benefited from growth, and

there are different patterns and dynamics of growth on the rural coast and in the rural highlands.

5. Trends in total-factor productivity in agriculture

This section presents the results of the estimation of total-factor productivity (TFP) in Peruvian agriculture for the period 1950-2010. The aim of this approach is to identify the sources of growth of agricultural output, depending on the contribution of factors and changes in productivity.

TFP is defined as the ratio of total output (Y) to total input (X). Thus, TFP can be shown as:

TFP = Y/X   (1)

Changes in TFP over time are estimated by comparing the change in output with the change in input. Equation (1) expressed in logarithms is:

$$\frac{d\ln(TFP)}{dt} = \frac{d\ln(Y)}{dt} - \frac{d\ln(X)}{dt} \tag{2}$$

Assuming a Cobb-Douglas production function with constant returns to scale, equation (2) becomes:

$$\ln\left(\frac{TFP_t}{TFP_{t-1}}\right) = \ln\left(\frac{Y_t}{Y_{t-1}}\right) - \sum_j S_j \ln\left(\frac{X_{j,t}}{X_{j,t-1}}\right) \tag{3}$$

Where Sj is the cost structure of input j.The inputsconsidered arelabour, land, machinery,stockof cattle,and fertiliser.A description of thevariablesis found in Appendix 1.

In order to assess the robustness of the estimates, two scenarios are taken into account. The first consists of assuming constant input shares for the whole period of analysis. The weights correspond to the case of Brazil reported by Avila and Evenson (1995). The weights are 0.43 for labour; 0.22 for the land; 0.14 for the stock of cattle; 0.14 for machinery, and 0.07 for fertilisers. The second alternative corresponds to variable input shares by decades. Input shares were calculated from the Brazilian Agricultural Censuses of 1970, 1985, 1996 and 2006 and reported by Fuglie (2012). Velazco (2001) estimated the shares of land, labour, machinery and fertiliser for the

period 1970-1995, using a Cobb-Douglas function. The relative importance of those input shares is similar to the Brazilian weights, these being preferred for application to the Peruvian case[10]. Table 16.5 shows the factor shares used for the variable input share scenario.

There is a substantial empirical literature that estimates TFP using various approaches, such as the translog production function, stochastic frontier analysis, and data envelopment analysis (DEA), among others. In the context of international comparative analysis of changes in agricultural TFP, the case of Peru has been considered as part of a sample of countries for estimating TFP. The database used is from the FAO and the analysis period begins in 1960 (Fuglie, 2012; Avila et al., 2010; Ludena, 2010; Heyde et al., 2010; Nin-Pratt & Yu, 2009; Coello & Rao, 2005, Bravo-Ortega & Lederman, 2004; Pfeiffer, 2003; among others).

Tables16.4 and 16.5 show the sources of agricultural growth for the analysis periods. The contribution of the TFP index and the input index (land, livestock, labour, machinery, and fertiliser) is estimated. Outcomes with constant-input shares and variable-input shares provide similar trends, showing some discrepancy only in the 1976-1990 period. In general, results denote that the TFP shows poor performance during 1950-1959, with output being explained largely by input accumulation. The ISI period, 1960-1975, was characterised by a recovery in the TFP contribution to output growth, ranging from 18.18% to 20.08%. During the next sub-period, 1976-1990, the external debt crisis, the spread of political violence, and hyperinflation caused by the economic crisis undermined output growth. This was largely explained by input accumulation - 77% according to the constant-input share scenario and 100% for the variable-input shares scenario. The following two sub-periods witnessed remarkable output growth. From the 1990s, productivity in Peruvian agriculture recovered significantly, growing at an annual average rate of 3.09% and 3.33% during the fourth and fifth sub-periods, respectively, for the constant-input share context, and 1.81% and 3.32% for the variable-input share scenario.

Regarding the input trends, the higher growth rates were associated with arable land and permanent crops (2.09% for the entire period), fertiliser use (4.3%), and use of agricultural tractors (2.97%). On the other hand, the lowest rate of growth corresponds

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[10] The Brazilian weights were preferred due to the fact that the same five inputs used in our empirical analysis were considered.

to the number of the economically-active population in agriculture (1.01%) and livestock units (0.86%).

Table 4. Factor Accumulation and Productivity Contributions to Output Growth, 1950-2010 (annual average growth rate in percent)
(With constant input shares)

Periods	National context	Output growth (%)	Input growth (%)	TFP growth (%)	TPF relative to output
1950-1959	Export oriented policies	1.67	3.03	-1.36	-81.44
1960-1975	ISI policies	2.64	2.16	0.48	18.18
1976-1990	Internal/debt crisis	1.17	0.90	0.27	23.08
1991-2001	Export oriented policies Stabilisation programmes and structural reforms	5.10	2.01	3.09	60.59
2002-2010	Economic expansion	4.26	0.93	3.33	78.17
Total period 1950-2010		2.60	1.66	0.94	36.15

Source: Authors' calculations

Table 5. Factor Accumulation and Productivity Contributions to Output Growth, 1950-2010 (annual average growth rate in percent)
(with variable input shares)

Periods	National context	Output growth (%)	Input growth (%)	TFP growth (%)	TPF relative to output
1950-1959	Export oriented policies	1.67	2.08	-0.41	-24.55
1960-1975	ISI policies	2.64	2.11	0.53	20.08
1976-1990	Internal/debt crisis	1.17	1.19	-0.02	-1.71
1991-2001	Export oriented policies Stabilisation programme and structural reforms	5.10	3.29	1.81	35.49
2002-2010	Economic expansion	4.26	0.94	3.32	77.93
Total period 1950-2010		2.60	1.79	0.81	31.15

Source: Authors' calculations

The estimation of TFP suggests that significant changes have taken place in Peruvian agriculture in the last two decades. These were due to the increasing openness to international markets (Peru currently has free trade agreements with a range of countries), as well as other factors related to the growing international demand for healthy, high-quality food; the incorporation of new land for farming; the growing interest in bio-fuels; the increased income of Peruvians who demand a more varied, higher-quality food supply; and the expansion of private investment in agriculture, among other factors (Velazco &Velazco, 2012).

Finally, from a Latin American perspective, the outstanding performance of the Peruvian case since the 1990s is not an isolated case. Further, as discussed in Martín-Retortillo, et.al., 2017, Peru follows the patterns identified in the whole region.

6. Conclusions

This work, based on gathering and analysing secondary sources, examines the consequences of diverse growth models and agrarian policies for Peruvian agricultural production and productivity from 1950 to 2010.

A long-term view, 1929-2011, of total GDP per capita and agricultural GDP per capita allows us to compare the growth dynamics of total and sectoral output in relation to the demand component of population growth. Taking into account Peru's history of growth over the long term, it becomes obvious that the current accelerated growth of GDP is, in fact, a return to the growth trends of past decades. A long period has been identified in which agricultural production was stagnant, lagging behind population growth. However, this trend changed in the early 1990s, andsince then, agriculture has grown steadily.

Throughout its history, Peru, as a small open economy, has undergone cycles of crisis and recovery, usually linked to fluctuations in the international market. The Peruvian economy has always been an exporter of primary products and an importer of manufactured goods (Thorp & Bertram, 1978). Development strategy models have ranged from the diversification of primary exports, to import-substitution industrialisation, and the promotion of non-traditional exports, which is the current model. These strategies have determined the outcome for agriculture. The sector was an axis of accumulation for the economy in the context of the model of primary exports of

agricultural products (cotton and sugar) and minerals. This situation changed radically in the late 1950s, when an import-substitution industrialisation process (ISI) was encouraged. This marked a turning point, when the growth of agriculture became dependent on the expansion of industry. The evidence discussed, particularly the growth in agricultural labour productivity and the performance of TFP, seems to suggest another change in the 1990s, in how agriculture related to and connected with other economic sectors. The structural reforms of the 1990s, particularly the policies promoting the development of agro-industry, created favourable conditions for non-traditional export agriculture to expand and consolidate. This growth was led by the coastal region, thanks to its climate, access to the best land, proximity to the markets, and infrastructure. And its expansion has revitalised the wage-labour market.

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Appendix 1

Sourcesof Data forestimatingTFP(1950-2010)

Labour:
This is the number of people employed in the agricultural sector. The source is the database of the Groningen Growth and Development Center (10-industry) for the period 1960-2010. Database available on the web:www.ggdc.net.

Livestock:
The data for the number of head of cattle on farms is available in the FAO online database, FAOSTAT (www.fao.org), and FAO yearbooks for the 1950s. Different kinds of animal have been aggregated in livestock units following conversions suggested by Hayamiand Ruttan (1985:450). The aggregation weights used are: camels, 1.1; buffalo, horses and mules,1.0; cattle and donkeys, 0.8; pigs, 0.2; sheep and goats, 0.1; poultry,0.01.

Tractors:
This is the number of tractors in use in farming. The source is the FAOSTAT database. The information is available for Peru until 2003. To project values up to 2010, the average annual growth rate was estimated using the following equation: Ln (tractors) = a +b (Time). The estimated value of the coefficient is 0.012.

Fertilisers:
Information on fertiliser consumption for 1961-2010 was obtained from The International Fertilizer Industry Association (IFA). All IFADATA statistics are available in metrictonnes of three nutrients, nitrogen (N), phosphate (P2O5), and potassium (K2O). The IFA database contains historical statistics of consumption, production, and sales at regional and country level. Data for 1950-1960 is from Hopkins (1981).

Land:
Information on hectares of agricultural land comes from FAOSTAT and FAO yearbooks for the 1950s, considering the following types of land: rain-fed cropland, irrigated land, and permanent pasture. In order to account for differences in land quality, the approach proposed by Fuglie (2008) was followed. Hence, a land quality index adjusted by "rain-fed cropland equivalents" was computed by aggregating the three land types. The quality weights were based on type of land productivity. Estimates for the Latin American regions were used.

Agricultural output.
This is the net value of agricultural production in 1994 Peruvian *Nuevos Soles*, in millions, obtained from the INEI on-line database (www.inei.gob.pe). In order to eliminate from the output series the effects of short-term fluctuations due to weather or other events, the Hodrick-Prescott filter was used.