1) Introduction
The Italian agriculture does not enjoy a good reputation among historians, who deem it backward and stagnant. Their opinion is buttressed by the available data on national accounts. Total output and productivity grew slowly from 1861, the year of the Unification of the country (and the starting year of the series), to the 1950s, with the possible exception of the twenty years before WWI, the so-called “boom giolittiano”, from the name of the Italian prime minister. This poor performance is believed to have been a major hindrance to modern economic growth in Italy. For instance, labor productivity in agriculture grew fast enough to release workforce for employment in industry and services only after World War One.

Agricultural historians attribute the alleged backwardness to the mistrust, if not outright hostility, that landowners and peasants alike nurtured for innovation. But landowners were to be blamed more than peasants. These latter were allegedly hostile to technical progress, partly out of ignorance or conservatism, partly out of the understandable fear to jeopardize their own livelihood by recklessly adopting possibly unsuitable innovations. Furthermore, it is believed, peasants were reluctant to be involved in too many market transactions, as they would have been if they had specialized and adopted modern technology. However, peasants owned only a fairly small proportion of Italian land – the worst one in the mountains and high hills of the Alps and Appennines. Peasant ownership was to increase somewhat in the early 1920s and to become predominant after World War Two. The huge estates of the church had expropriated immediately after the Unification of the country (1863-1864). Thus most of land, including all the best ones, belonged to large-scale landowners and city-dwellers. Had they wanted, these people could have fostered technical progress, by managing their estates personally, or by renting them to capitalistic entrepreneurs who would have adopted the allegedly highly profitable “modern” techniques. Unfortunately Italian landowners did not adopt this virtuous behavior. Very few of them managed directly their estates and large-scale tenancy was common only in the Po Valley, usually extolled as the most progressive area in Italian agriculture, and in some areas of extensive cultivation in the South (Apulia, Sicily), which in contrast historian deem as very backward. In the rest of the country, land was rented to peasant households. To be sure, landowners could have forced their tenant to adopt suitably modern techniques, and their tenants would have had no choice but to obey. In contrast, the contracts they imposed were allegedly aimed at maximizing rents in the short-run with the minimum outlay of landlords’ money and at preserving the social gap with their tenants. The influential Marxist historian Emilio Sereni (1947, 1966) lumped together all contracts (with the exception of large-scale tenancy in the Po Valley) as “feudal remnants”. This indictment is widely shared among historians. For instance Zaninelli (1992:28), surely not a Marxist, writes “Italian agriculture was prisoner of an irresoluble dilemma: technical innovation (and thus the demand for knowledge) required a change in social organization. If, as it was the case, it prevailed the preference for a slow and frictionless change in social relations, the price had to be a slow and contradictory technical progress”

Historians blame also the state for the sluggish technical progress. Orlando (1984) argues that it should have adopted a “politica produttivista” (a policy for productivity), by investing in R&D and extension services, in land reclamation and also in infrastructures. Some of these measures were adopted, especially during the “boom giolittiano” and especially in the North, but as a whole the agrarian policy aimed at preserving the income of great landowners. Until the 1880s, the task was not terribly hard, as agriculture was highly profitable. The conditions of great landowners changed drastically in the 1880s, under the threat of foreign grain. The government rushed to protect wheat-growing against the “great invasion” (O’Rourke 1997) with duties up to 30%. These latter prevented Italian agriculture from specializing in productions, such as tree-crops or vegetables, which suited much more than cereals to its factor endowment.

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1 See for instance Daneo 1980 and, for further references Federico 1994.
Some of the premises of the conventional wisdom have been contested in the last decades. Federico (1986) has estimated that about 80% of Italian agricultural production was exchanged on the market in the 1880s. Furthermore, there is ample evidence of the peasants' willingness to exploit market opportunities and specialize in the production for the market. Cohen and Galassi have argued in a number of articles (1990, 1992, 1994) that contracts did not affect productivity. The duty on wheat, according to a CGE estimate (Federico-O'Rourke 2000), reduced aggregate GDP only by 1.1%, while Nutzenadel (2001) suggests that Fascist agricultural policies may have contributed to the modernization of agriculture in the 1930s.

This recent work, however, does not question the core evidence for the conventional wisdom, the poor performance of the Italian agriculture. A die-hard pessimist might argue that agriculture was a failure anyway, even if for different causes. And optimists must admit that output growth was anyway insufficient, even if it cannot be attributed to specific failures. In this case, Italy would be an instance of Schultz's well-known characterization of peasants in LDCs as “rational but poor” (1964). The conventional wisdom cannot be really shelved for good without a re-appraisal of output data. This is the aim of on-going research project on agricultural production from the Unification to World War Two. It has produced so far a detailed estimate of output in four benchmark years (Statistical Appendix Table 1) and a provisional yearly series of gross output (Federico 2003 b). Section Two argues that this series can address some glaring inconsistencies in the hitherto available data, which Italian Central Statistical office (ISTAT) published as part of its seminal reconstruction of Italian historical national accounts in the 1950s. Section Three discusses the available data on the growth of inputs and uses the new series of output to re-estimate the growth in Total Factor Productivity. This latter comes out to have been very close to European average: thus Section Four re-considers the anecdotal evidence on technical progress. Section Five concludes by discussing the implications of the new series for the overall interpretation of modern economic growth in Italy.

2) The growth of agricultural production in the long run

In the mid 1950s, the Italian Central Statistical Bureau, the Istituto Centrale di Statistica, published a pioneering set of historical national accounts since 1861 (ISTAT 1957). It included series of gross agricultural output, total and by major groups of commodities, both at current and constant prices, and of value added by sector at current prices, but, curiously, not at constant prices. This gap was filled few years later by Ornello Vitali, then the main statistician of the "gruppo di Ancona", a research team on long-term development led by Giorgio Fuà (Vitali 1969a). He obtained series of Value Added by sector at 1938 prices (at 1951 boundaries) by deflating the ISTAT current-price series, without questioning their reliability. These series were published in the Statistical Appendix to the Fuà book (Ercolani 1969) and, under the somewhat unfair name of ISTAT-Fuà series, have been widely used in all the following revisions of national accounts, by Maddison (1992), Rossi-Sorgato and Toniolo (1993), Fuà-Gallegati (1993) and Bardini et al. (1993).
The series tallies well with the conventional wisdom. The long-run growth is decidedly unimpressive. From 1870 to 1939, the yearly rates did not exceed 1% - 0.89% for gross output and 0.85% for Value Added. They correspond to a cumulated growth by about 80% over the whole period: in the same years, population grew by two thirds. As graph 1 shows, production growth was quite fast in the 1860s and 1870s, but with a substantial contribution from boundary changes. Then, it stagnated from the mid 1870s to the mid 1890s. Production grew very fast, at 2.1% yearly, during the “boom giolittiano”, the real golden age of Italian agriculture. The performance of the interwar period was unremarkable, with the exception of a short interlude in the early 1920s, when production recovered from the war.

This simple analysis highlights the key role of the alleged “agrarian crisis” of the 1880s to account for the poor aggregate performance. A closer look at the production data published by ISTAT (ISTAT 1958) highlights the key role of cereal growing. From the late 1860s to the mid 1890s, the production of meat rose from 3-3.5 millions quintals to almost five and production of milk more than doubled and also the production of wine, the most important product of Italian agriculture.

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2 The rates are computed, as all others in this paper, unless otherwise specified, as linear interpolation with a time trend. The small difference between the two rates reflects the growing purchase of intermediate inputs.

3 As it is well known, Italian boundaries changed in 1866 (annexation of Veneto), 1870 (annexation of Latium), 1919 (annexation of Trentino-Alto Adige and Venezia Giulia) and 1945 (loss of some parts of Venezia Giulia). Only the two first changes were important from the point of view of agricultural output. According to the ISTAT own estimates (1957 tav 10), the ratio of Value Added at current and 1951 boundaries was 0.83 in 1861-1866, 0.94 in 1867-1870, 0.98 in 1871-1919 and 1.01 in 1919-1939. However, the ISTAT does not provide information on the sources it uses for boundary adjustments, nor does it publish any regional data on agricultural production. Thus, it seems more prudent to quote in the text the growth rates since 1870. Anyway, those for the full period are only marginally higher 0.91 for gross output and to 8.89 for Value Added).
agriculture, increased marginally, in spite of the ravages of the phylloxera. In contrast, the output of wheat declined from about 40 millions quintals in the late 1860s (without Latium) to some 35 millions in the 1890s. This decline cannot be attributed to foreign competition, as in the early 1870s wheat price was high and imports still negligible. Furthermore, also the production of corn (by then a staple food for the Italian population) declined, from 27-28 millions to 18-20 millions quintals, even without any noticeable competition from abroad. Thus, the apparent consumption of cereals in the 1880s declined in spite of the growing imports (Barberi 1961) and total caloric intake allegedly fell from about 3000 in the mid 1860s to less than 2300 in the mid 1890s. This dramatic worsening in Italian nutrition is inconsistent with trends in the average heights of Italian draftees, which in the same years increased by 1.2 centimeters (Federico 2003c). Furthermore, the decline in standards of living contrasts with other evidence (Fenoaltea 2002b). In the 1880s real wages were rising, the consumption of colonial goods was growing and traditional fibers, such as hemp, were being substituted in consumption by wool and cotton. In other words, Italians would have (almost) starved for the sake of buying “luxury” goods. Such a behavior defies credibility.

These contradictions would be immediately solved if production had risen in those years. Indeed, a look at original sources shows that the statistics of wheat production grossly overestimate the output in the early 1870s (Federico 1982). Thus, the decline of output in the 1880s is spurious. There is no such clear evidence of errors in agricultural statistics in later years, and the overall upward trend in production tallies well with the available evidence, including the data on heights. However, the data became reliable only after a thorough re-organization of the statistical service in the 1910s. Therefore, the ISTAT-Fuà series are more likely to be accurate in the interwar years. Consequently, so far the research project has focused on the pre-war period. The new index is obtained as a backward extrapolation of product series from a benchmark for 1911, which can rely on the relatively solid pre-war data. So far, the index is based ten product series (cereals, three kinds of meat, milk, wine, olive oil, wool, hemp and cocoons), which accounted for about three quarters of output in 1911. The other products are crudely estimated by interpolating their shares on total gross output in 1891 and 1911.

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4 A comparison is possible for 1938: the benchmark estimate (Federico 2000 tab 1.A) exceeds the ISTAT figure by 4.8% for gross output and 8% for Value Added.

5 The series for wool, hemp and cocoons has been estimated by Fenoaltea as part of his own reconstruction of textile consumption (Fenoaltea 2002a). The series of wine and olive oil are obtained from the consumption side and tally fairly well with the official statistics (as said, there is no evidence of major error in statistics for these products). The core series for cereals and livestock products are obtained by reconciling consumption and output-side series. The latter are estimated jointly in order to take into account the decision to allocate land to alternative uses (arable or artificial meadows), and allow for technical progress in livestock rearing. See for further details Federico 2003b
The new (Federico) series grows faster than the old (ISTAT-Fuà) – at 1.21% yearly from 1870-1913 instead of 0.92% (i.e. by 68% instead of by 48%). As easily predictable, its time profile is quite different: there is no stagnation in the 1880s and the breakthrough of the 1890s is downgraded to an acceleration within a long-run upward trend. This time pattern is consistent with the evidence about the economic conditions – most notably on heights. In fact the new series implies a 10% rise in per capita available calories from the 1860s to 1890s, which, jointly with the improvement in sanitation (e.g. in provision of running water), can account for the increase in heights (Federico 2003c). Furthermore, the implicit caloric intake is consistent with independent estimates from household budgets (Vecchi and Coppola, forthcoming).

It is possible to obtain a series of Italian agricultural production since 1800 by splicing three different sources, a consumption-based estimate (Federico-Malanima 2004) for the period to 1860, the new index for the years 1860-1913 and finally the ISTAT-Fuà series for interwar years. During the first half of the 19th century, the small increase in wages was compensated by the increase in relative prices of agricultural products – so that per capita consumption of agricultural products remained roughly constant. Population increased by about 60% (yearly 0.8%) and agricultural output increased as much. After 1860, production increased more than population: in the whole period to 1940, population almost doubled, but output increased by 130%. Thus, Italian agriculture was able to improve the nutritional standards of Italians, both in quantity and in quality (Vecchi and Coppola forthcoming).

3) The proximate causes of growth: inputs and technical progress

As Table II of the Statistical Appendix show, the agricultural workforce increased from 8.2 millions in 1861 to a maximum of over 11 millions in 1921 –i.e. by a third. The number of workers declined somewhat in the 1920s but, as in many other European countries, the massive migration from the country-side started only after World War Two. To be sure, the number of workers is not
necessarily an accurate measure of the labor input, which depends on the quality of the manpower, on number of hours they worked and on the intensity of their work. There are no data on any of these parameters, but it is possible to quote some indirect evidence. The amount of skill can be measured, very crudely, by the literacy rate. It must have risen, as the overall Italian rate almost tripled, while the percentage of female workers (on average less literate) remained constant. The number of hours worked, ceteris paribus, depended on the composition of the output, which remained roughly constant over the whole period (Statistical Appendix table 1). This evidence is clearly incomplete, but, as a very first approximation, one could conclude that the skill-adjusted input of labor increased as much as or possibly faster than the number of workers.

Employing this growing mass of workers has not been easy, as agricultural land was far from abundant. Italy has always been quite a densely populated country for European standards, and a sizeable proportion of its territory is hardly suited to an agricultural use. About four fifths of it consists of hills and mountains, and as late as 1860, about 15-18% of the plains were marshy. According to Correnti and Maestri (1864 p. 362) guesstimate, by then the cropland and tree-crops extended for some 13-14 millions hectares. This core agricultural acreage rose grew to 14.8 millions hectares on the eve of World War One (NPSA 1911-1914) and to 15.5 in 1951 (ISTAT 1952, tav 158). In the same years, the acreage of permanent meadows and forests seem to have not changed that much – about 5-6 millions and 5 millions hectares in the early 1860s and 5.1 millions and 5.7 millions hectares in 1951 (ISTAT 1951). Thus, the additional core agricultural acreage must have been obtained via land reclamation. Indeed, the celebrative volume for the ten-years of the Fascist “bonifica integrale” (comprehensive land reclamation policy) quotes a total of 2.5 millions hectares for the period since 1860 (Rossini-Vanzetti 1986, pp. 694-95), inclusive of improvements of land already in agricultural use – most notably irrigation.

Land reclamation entailed massive investments. In fact, according to Vitali (1969 b) the stock of fixed capital in Italian agriculture doubled from 12 billions (1938) lire in 1881 to 23 billions in 1938 lire. These series are somewhat dubious. In fact, all this increase concentrate in the last decade of the period, from the 1920s to the war, when “miglioramenti fondiari” (“land improvements” –i.e. trees, ditches and so on, but not land reclamation) allegedly shot up from 8.5 to 17.8 billions lire. Such a boom is not supported by any evidence and such massive investments seem a priori implausible during a period of crisis such as the 1930s. Furthermore, the Vitali series omits livestock and inventories, which account for a sizeable proportion of total capital. Federico (2003 d) provides a provisional series of capital stock, which includes these items and Vitali’s estimates of land reclamation, but omits his suspicious figures on land improvements. From the Unification to World War Two, the capital stock more than doubled and fixed capital only almost tripled. Thus, capital per worker increased by two thirds and fixed capital per worker increased by 130%. To sum up, the available data, albeit imperfect, suggest an increase in the labor/land ratio and an even greater increase in the capital/land ratio. Without technical progress, these trends would have caused returns to capital and labor to decrease. In fact, according to the already quoted estimates by Federico and Malanima (2004), labor productivity declined by one third from its post-Black Death peak to a minimum in 1850-1860. Since then, labor productivity has been growing, but on the eve of World War One it exceeded the 15th century maximum only by a quarter. Italian agrarian historians usually measure land productivity with wheat yields. The most systematic work (Porisini 1971) reports data from the (flawed) official statistics and from a number of large estates. The author’s assessment is quite negative: he points out that, in spite of some notable exceptions (especially in the Po Valley since the 1890s), yields were low and slow-growing relative to North-European countries. But cereals were not representative of Italian agriculture, as they accounted for 30% of output of arable and for 20% of total output in 1911(Federico 2000 tab 1 A). Prados-O’Brien (1991) estimate that, in the same year, land productivity in Italy was as high as in Germany, 15% higher than in France, 65% higher than in England and three times higher.

\footnote{Unfortunately, there are no data on literacy among the rural population, which was anyway higher than among the Italian population at large. The overall literacy rate increased from 25% in the 1860s to about 70% on the eve of World War Two (Zamagni 1993)

\footnote{The increase in “miglioramenti fondiari” explains 75% of the growth in total capital stock from 1923 to 1939. Another 20% is accounted for by the “bonifiche” (land reclamation) and the balance by the increase in machinery.}
than in Spain. Labor productivity was very low, as easily predictable given Italy’s factor endowment.

Anyway, these partial productivity measures are bound to give a biased impression of trends and levels in productivity. A much better metric is the total factor productivity (TFP). In a seminal work, Orlando (1969) estimated that the rate of growth of TFP was high only from 1897 to 1913, and in the first years of the 1920s, when agriculture was recovering from the from the war-time slump (Statistical Appendix table 2). From 1925 to 1939 the TFP grew quite slowly (although more than output) and from 1881 to 1897 it decreased, dragging down the aggregate growth in output. Furthermore, even during the “boom gioiitiano”, the North outperformed by far the Centre-South (2.04% vs. 1.02%). These results tally well with the author’s emphasis on the positive role of the “politica produttivistica” (Orlando 1984). In his comparative work on the First green Revolution, Van Zanden (1991) estimates decidedly lower figure – only 0.37% from 1870-1913. These estimates have to be reconsidered. Both use a simple Solow residual, and the implicit assumption of fixed factor shares might contrast with the evidence of changes in factor use. Orlando omits land altogether and uses preliminary versions of Vitali’s estimates of workforce, output and capital. Van Zanden uses his own estimates of production and factor inputs, which differ from all “Italian” ones. The Federico estimate (Statistical Appendix, Table 3) is computed with a Tornquist-Theil index, takes into account three factors (land, labor and capital), uses the new series of output and capital and a new estimate of factor shares in 1911 (Federico-O’Rourke 2001). Unfortunately, it cannot take into account changing factor share, as so far there are no estimates for years other than 1911. In spite of all these differences, the long-run rates of change do not differ that much from Orlando’s ones. If any, the new estimate yields a lower rate of growth in TFP, but with a different, much smoother, time path. Productivity grew also in the 1880s and 1890s, and the “boom gioiitiano” features an acceleration in the trend, not a huge discontinuity. The difference reflects mainly the steadier path of output series, while the data on factors are not so different. Productivity collapsed during the war, grew quite fast in the 1920 and more slowly in the 1930s. In the long run, from the Unification to World War One, TFP grew by about 75-85%, accounting for about three quarters of production growth.

How did Italy fare in comparative perspective? According to Van Zanden (1991), not well: the unweighted average for his 15 country estimates for 1870-1913 is 0.78 and Italy had the third lowest TFP growth in Europe, after Russia and Ireland. However, both the Orlando and Federico estimates for the same period are much less disappointing. In fact, Italy’s TFP grew as much as the European average before World War One (0.71), outperforming countries with a much greater reputation for technical prowess, most notably the United Kingdom. It is difficult to draw any firm conclusion for period after 1913, as there are very few estimates and the comparison is blurred by war-time experience. However, during the interwar years Italian performance seems to have been one of the poorest in the continent.

4) Technical progress in Italian agriculture: success or failure?

The available data, although clearly imperfect, suggests that the Italian agriculture does not deserve its poor reputation. This latter seems to have been heavily influenced by a (somewhat

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8 /Why this difference? C original data/

9 Interestingly, the omission of land would cause Orlando to underestimate the TFP growth, ceteris paribus. In fact, all factor shares sum to 1 all the same, so that land is proxied by capital and labor in proportion to their shares. But land grew less than capital and labor - so that his estimate of total inputs overestimates their growth.

10 According to his computations (Van Zanden 1988 tab A.1), production between 1870 and 1910 grew by 41% (48% over the same period according to the new Federico estimate), workforce by 18% (7%), land by 9% (6%) and capital by 74% (62%). The new data-base reports total growth in the same period by 48%, 7%, 6% and 62% respectively. Although none of these differences is very large, they all point to a lower TFP growth rate.

11 The European figures are obtained as simple averages of country estimates of TFP growth. See Federico 2005a table 5.5 for details and references. One can remind that Europe as a whole outperformed the Western Settlement countries before 1913.
selective) reading of the technical literature of the time. In particular, many experts blamed Italian farmers for not having adopted massively British new husbandry. Ghino Valenti (1911), the greatest Italian agricultural economist of the early 20th century, argued that the low level of the cattle/land ratio in the whole country (but in some areas of the Po Valley) was a damning evidence of the backwardness of Italian agriculture. This reasoning is consistent with the use of wheat yields as the measure of technical development: in fact a large stock of cattle increased the supply of manure and thus yields. On the other hand, the reasoning is not necessarily correct, as pointed out by some “revisionist” historians such as G. Biagioli (1984) or F. Galassi (1986) on Tuscany or Bevilacqua (1986) and Petruziello (1990) for Southern Italy. They stress that most grass need a lot of water, which in UK and North Western Europe is provided by Summer rains. In Italy, the supply of water was sufficient only in some areas of the Po Valley, thanks to irrigation, and indeed in those areas continuous rotation had been in use since the Middle Ages. Elsewhere in the country, the long dry Summer and the lack of irrigation made it impossible to adopt the new husbandry. However, Italian peasant had found an alternative solution to the problem of abolishing fallow – the diffusion of maize since the 18th century, especially in Northern Italy (Coppola 1979). The cultivation of maize reintegrates the nutrients lost to other cereals, and it produces about 50% more calories per unit of land than wheat. Maize needs also much more labor than wheat (twice for males and three times for females): thus its diffusion both made it possible a fast increase in rural population and it employed the additional workforce. In short, maize played the same role of potato in Ireland. As the potato, maize had negative, although much less catastrophic, consequences on public health: a purely maidic nutrition causes the pellagra, a ultimately mortal disease.

To be sure, maize apart, Italian agriculture did not shine for the adoption of major innovations in the 19th century. Traditional techniques still prevailed with little improvements. However, this pattern was common to most countries of Western Europe: all over the continent, the breakthrough was the adoption of fertilizers. Their production started in Italy in the 1880s and by 1913 its consumption totaled 13.5 kg/ha – two thirds of the French one and a quarter of the German one (Pezzati 1993). The (fairly) enthusiastic adoption of fertilizers is not really surprising, as they were a quintessential land-saving innovation, and thus quite suitable for a land-scarce country such as Italy. The factor endowment slowed down the adoption of labor-saving innovations such as machinery: in 1939, there were 40000 tractors in the whole country, versus 250000 in 1961 and 660000 in 1971. However, Italy was not particularly backward from this point of view: in the whole Europe on the eve of World War One, there were only 270000 tractors (Svennilson 1954). However, the case of the steam thresher shows that machines were not shunned per se. It was quite expensive and difficult to manage, yet which spread quite fast in the 1880s (Federico 2003b). The machines belonged to specialized entrepreneurs, who earned a “normal” commercial profit by renting their services to farmers. In fact, an econometric analysis shows that its diffusion depended on interest rates and expectations of wheat prices. Thus, the adoption of the thresher is a good example of institutional flexibility and “rational” behaviour, in stark contrast with the conventional wisdom.

As a whole, thus, Italian farmers have shown a remarkable capability of innovating provided that the new techniques were suited to the environment and factor endowment. Of course, this statement does not rule out the possibility of a higher productivity growth, if farmers were given a greater range of suitable innovations and/or an easier access to capital. However in this case, the blame has to be borne by the credit system or by the state. And, clearly, it is impossible to estimate the additional increase in productivity growth from –say- a doubling of investments in R&D.

5) Agriculture and modern economic growth in Italy

How would the new view of the long-run performance of Italian agriculture affect the overall interpretation of Italian economic development? The answer depends pretty much on the issue and the theoretical framework. One might ask to what extent did agriculture perform the three-pronged “Kuznetsian” role (Johnston and Mellor 1961) of a) providing goods to feed the population and to earn foreign currency (‘product’ role); b) purchasing manufactures, both for consumption and for investment (‘market’ role); and c) supplying manpower and capital to industry and
services (‘factor’ role). The data presented so far suggest that Italian agriculture was quite successful in the "product" role. The high natural rate of increase in the rural population guaranteed a large surplus of manpower even if agriculture workforce did not decline (Statistical Appendix table 2). It is also likely that the rural consumers absorbed a substantial part of the product of Italian industry, as they were shielded from the pernicious temptations of foreign manufactures by quite high duties. Finally some of the savings by farmers and landowners may have ended up in financing industries via the intermediation of the banking system (the anecdotal evidence seems to rule out a massive direct investments), although the total amount is difficult to estimate. Thus, one could tentatively conclude that Italian agriculture did perform fairly well its three-pronged role. This statements would be consistent with the estimated growth in Total Factor Productivity – as agriculture could perform its "role" the better the faster the TFP growth. In theory, one could try to be more precise and estimate each of these contributions. However, on a more general vein, one might question the relevance of this theoretical framework in the case at hand. In fact, it implicitly assumes the economy to be closed, with the partial exception of exports of agricultural products. This assumption was realistic in the 1960s, when it was first conceived, but not necessarily for 19th and early 20th century Italy. In fact, it was an open economy throughout most of the period. It could import as much capital as it needed, subject to the country risk, and it could export all the surplus workers that the “modern” sector was unable to absorb (hence the massive emigration of the 1890s and 1900s). Italian industry succeeded to export an increasing share of its products and a substantial share of Italian population was fed on imported wheat.

It is perhaps more interesting to dwell on the implication of the new series of agricultural output for the debate on the causes of modern economic growth in Italy. By definition, they change the long-run rate and the time profile of the growth in GDP per capite. Fenoaltea (2005) combines this new series, his own estimates of industrial output (Fenoaltea 2003) and some informed guesses of him on services to produce a brand new series of Italian GDP from the Unification to 1913. Table 5 reports the growth rates of this new series for different time periods and compares them with the two main existing series, by ISTAT-Fuà (Ercolani 1969) and Maddison (1992), which is reproduced in his widely used data-base of word income (Maddison 2003). As expected, the Fenoaltea series grow faster than the previous ones. The difference with the ISTAT-Fuà series is both statistically significant and quite substantial as it corresponds to a cumulated 30% difference in fifty years. About one third of this difference (36.8%) is accounted for by the revision of agricultural series. The difference between Maddison and Fenoaltea’s series is smaller and it is more than entirely accounted for by the revision. In fact, Value Added in industries and services grew more slowly according to Fenoaltea than according to Maddison. In both cases, the revision of agricultural output implies that Italian GDP was about 10% higher by 1913. The difference is not negligible, although still within the margin of error of macroeconomic estimates. All the three series show a discontinuity in the 1890s, but the gap is much larger according to ISTAT-Fuà or Maddison than according to the Fenoaltea series.

The time profile of the GDP growth is important to assess different interpretations of Italian economic growth. The ISTAT-Fuà series tallies well with the 1950s view of the process as inherently discontinuous. Scholars as Gerschenkron (1958) and Romeo (1963) assumed that modern economic growth had to start with a sudden acceleration of growth (big spurt) – although they disagreed on the timing of this acceleration in Italy. Romeo placed it in the 1880s, and attributed it to the (somewhat lagged) effect of railway building and of the Unification of Italy. Gerschenkron, in contrast, argued that the big spurt was brought about by the establishment of some universal banks with German know-how and capitals, after the collapse of Italian system in 1892-1893. In more recent times, however, Fenoaltea (1988, 2003), Cafagna (1989) and Bonelli (1979) have contested this view, arguing that the long-run growth is the net outcome of a succession of periods of growth (the 1830s-1840s, the 1880s, the “boom giolittiano”, the early

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12 It is useful to remind that financial flows between the agriculture and the rest of the economy and the world could be large only if there is a corresponding imbalance between agricultural “exports” (i.e. sales of its products) and “imports” (purchase of manufactures and services).

13 Cf for the example relative to the case of silk production, which combined agricultural production (cocoons) and industrial processing Federico 2005b
1920s) and of stagnation (all the other years). These authors, however, diverge on the interpretation of this wave-like pattern. Bonelli and Cafagna stress the role of exports, driven by world demand for Italian products, such as silk, wine and olive oil. Fenoaltea explains the cycle with the ups and downs of the worldwide supply of capital – as determined by the decisions of British investors. He also argues (2006) that his own model is the only really cyclical, while Bonelli and Cafagna were still mired in the “stages of growth” frame of mind, with each wave lifting the Italian economy up one step in the ladder to modern economic growth. The Fenoaltea series supports the wave-like view of Italian growth, although it is hardly helpful for discriminating between the two competing hypotheses for this pattern.

6) Conclusions: what next?

As said, the provisional results of the research on agriculture are an essential part of the ongoing process of revision of Italian long-term economic growth. The research project is still going on, albeit slowly. The agenda for future work is quite well defined. Further steps include
a) the production, if possible, of a supply-side estimate of the production of wine and oil
b) the estimate of the production of minor (omitted) goods and of expenditures, in order to compute the Value Added
c) a more thorough assessment of the reliability of ISTAT series for the interwar years and, if necessary, a revision of them
d) a more accurate computation of factor use (e.g. the number of hours instead of the number of workers) and of factor shares
e) the construction of yearly series of regional gross output, extending the data four benchmark years (1891, 1911, 1938 and 1951)

The sources are more abundant than often assumed, but surely not sufficient for fully implementing the whole project without a robust dose of imagination. Clearly, it is difficult to predict the outcome of this work, relative to the preliminary index. However, the results so far shows that the work is worthwhile.
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Statistical Appendix

Table 1
Estimates of agricultural production, benchmark years (constant 1911 prices)

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<thead>
<tr>
<th></th>
<th>1891</th>
<th>1911</th>
<th>1938</th>
<th>1951</th>
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<tbody>
<tr>
<td>Crops</td>
<td>2378.9</td>
<td>2690.5</td>
<td>3810.9</td>
<td>3469.7</td>
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<tr>
<td>Tree crops</td>
<td>2435.1</td>
<td>2846.6</td>
<td>2779.0</td>
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<tr>
<td>Livestock products</td>
<td>1728.6</td>
<td>2512.5</td>
<td>3013.8</td>
<td>3379.0</td>
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<tr>
<td>Gross output</td>
<td>6542.5</td>
<td>8049.6</td>
<td>9603.7</td>
<td>10444.9</td>
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<tr>
<td>Forests</td>
<td>267.1</td>
<td>204.1</td>
<td>240.3</td>
<td>224.5</td>
</tr>
<tr>
<td>Fishing</td>
<td>48.6</td>
<td>65.0</td>
<td>115.1</td>
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<tr>
<td>Total gross output</td>
<td>6858.3</td>
<td>8318.7</td>
<td>9959.1</td>
<td>10799.9</td>
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<tr>
<td>Expenditures</td>
<td>284.3</td>
<td>551.0</td>
<td>695.4</td>
<td>980.7</td>
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<tr>
<td>Value Added</td>
<td>6574.0</td>
<td>7767.7</td>
<td>9263.7</td>
<td>9819.2</td>
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</table>

Source: elaborations by the authors on data from Federico 2000 tab. 1 A

Table 2
Agricultural workforce in Italy

<table>
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<tr>
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<th>Total workforce (millions)</th>
<th>% agricultural workforce</th>
<th>% Females</th>
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<tr>
<td></td>
<td>Total</td>
<td>Females</td>
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</tr>
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<td></td>
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<td></td>
<td>1871</td>
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<td></td>
<td></td>
<td></td>
<td>1881</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1901</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1911</td>
</tr>
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<td></td>
<td></td>
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<td>1951</td>
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<td>19.0</td>
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Source: 1861 and 1871 elaboration of the author (Federico 2003 b); 1881-1951 Vitali 1981

Table 3
Estimates of rates of change in Total Factor Productivity in Italy

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<td>∆ Prod</td>
<td>∆ TFP</td>
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<td>1861-1881</td>
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<tr>
<td>1881-1897</td>
<td>2.00</td>
<td>1.90</td>
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<tr>
<td>1913-1920</td>
<td>-0.79</td>
<td>-1.18</td>
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<tr>
<td>1920-1925</td>
<td>3.00</td>
<td>3.26</td>
</tr>
<tr>
<td>1925-1939</td>
<td>0.19</td>
<td>0.31</td>
</tr>
<tr>
<td>1881-1939</td>
<td>0.79*</td>
<td>0.69*</td>
</tr>
<tr>
<td>1861-1939</td>
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<td></td>
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</tbody>
</table>

Source: See text and Federico 2003d Appendix A

*computation by Author

Table 5
Growth rates, per capita GDP
<table>
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<th>ISTAT-Fuà</th>
<th>Maddison</th>
<th>Fenoaltea</th>
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<tbody>
<tr>
<td>1861-1913</td>
<td>0.49</td>
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<td>1861-1895</td>
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<td>1896-1913</td>
<td>2.14</td>
<td>2.97</td>
<td>2.16</td>
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Sources: see text