

HYDRAULIC POLICY AND IRRIGATION WORKS IN THE SECOND HALF OF XVIIIth CENTURY IN SPAIN

Guillermo Pérez-Sarrión
University of Saragossa

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This analysis¹ of the relationship between the financing of hydraulic policy and the building of major irrigation works taken on in XVIIIth Century in Spain ought to be justified previously by two arguments.

First I will refer to the little significance that drainage of lacustrine lands for cultivation, as it is known in the Modern Europe, had in the region I am to deal with, that is: the Ebro valley and, over all, the area of the Ribera del Ebro, in the old kingdom of Aragón.

There is no doubt that from the Middle Ages to XIXth Century, the most proper Spanish zones to receive irrigation were the coastal Mediterranean areas and the Ebro valley, as well as the Balearic and the Canary Islands. These peninsular areas are not the only ones, but are in fact the ones whose situation we know better. In both of them irrigation had a major social and economic influence, often decisive, over many centuries.

Littoral areas have a dry and sunny weather, short rivers and ravines which carry fertile waters, as well as quaternary alluvial plains and marshlands. The development of irrigation has had important social consequences in these zones: the gulf of Rosas, the river Ebro and its delta, the rivers Turia, Júcar and the great marsh or *albufera* of Valencia, near this town, as well as the river Segura, in Murcia, are outstanding cases. But the Ebro valley, flat in its central part, is an inner semiarid area, at a long distance from the sea, and has no coastal plains. Water exists only where there are rivers, and therefore the drying up of some zones to bring them under cultivation could only take place, historically, in the scarce humid zones that emerge along the river banks, among which the major ones are the ones of the river Ebro: they are named *sotos* and *mejanas*..

From a physical viewpoint they are, in general, abandoned meanders of the river, which wind about tracing bends, or small plain areas where the river flow splits into two or three streams of water and some times originates fountains and gushes. Between 1781 and 1808 there were at least 20 documented cases of irrigation zones showing these characteristics along the 80 km of the river bed of the Canal Imperial de Aragón². There were obviously other cases along the Ebro River and along some other minor rivers such as the Jalón and the Gállego. These areas only took up a small irrigated surface, but were socially important because many of them were communal property and therefore could be divided into plots and distributed to local peasants, mainly cottagers, who did not own land to

¹For more details see Pérez Sarrión, *Política hidráulica...*

²Pérez Sarrión (1984), chart n.º 42, in pp. 494-499. Here are some toponymic place-names of ploughed, brought under cultivation and irrigated lands: *Soto de la Mejana onda*, *Ebro Viejo*, *Soto Islado* (Ribaforada, 1788, 1793-1794, 1799), *Soto del Espartal*, *mejanas del conde*, *Soto de la Barca* (Buñuel, 1790, 1797), *Mejana junto al río Ebro* (Cortes de Navarra, 1805), lands and *sotos* belonging to the zone of *Las Fuentes* (Zaragoza 1788-1796), *soto del Marqués de Ayerbe* (Zaragoza 1806), *soto del Gran Prior* (Buñuel, Ribaforada or Fustiñana 1799), lands of *la Mejana*, *Ebro Viejo y las Rozas* (Luceni, 1800), *Soto de Polliguera* (Cabañas de Ebro, 1799).

cultivate. These processes were rather more difficult in the lands which belonged to members of nobility and to the Catholic church.

There are also some other humid zones spreading out in endorreic areas, like the pool of Gallocanta, in Teruel, or the one of Sariñena, in Huesca. They are generally small; we have not any available information about them.

My second argument refers to the meaning itself of the drainage of lands to be brought under cultivation. Historically, the main aim of the drying up of humid zones in Europe has been to increase agricultural yields in a given area. In fact we know, nowadays, that irrigation has been another agrarian action that had exactly the same purpose. In that sense we think that drainage and irrigation are phenomena liable to be analyzed from a similar perspective: the agrarian growth and development which took place in Europe in modern times. Drainage of marshlands or irrigation were developed according to where the need came from; they were not opposite but alternative and complementary actions, because each of them could only occur in specific geographical areas. The paper I submit to this colloquium has been written in this perspective, and with it I hope my contribution will be of some interest.

Having explained that, we will deal with three major issues related to irrigation. On the first place, we will examine which was the financing system of the policy of hydraulic works construction which was outlined by the enlightened Spanish government in the late XVIIIth Century. Then, the role that the trade and the financial bourgeoisie played in this system will be considered. Lastly, we will see how a given historical case, the construction and set up of the Canal Imperial de Aragón, can provide significantly interesting data for the general issue of the colloquium.

The financing of hydraulic policy

No doubt that a central point of this analysis will be to describe the main characteristics of the system that the Enlightened State set up to finance its hydraulic policy, as it was drawn up by the Secretary of State, count of Floridablanca.

The Enlightened Spanish politicians attached great importance to agrarian policy, which was focused to rationalise agriculture and manufactures, and to build up public works, mainly roads and channels for irrigation and navigation. These actions were taken on to improve communications, to develop the trade of goods between the centre and the periphery, and to articulate an incipient inner national market. This process speeded up in the second half of XVIIIth Century, especially after the famous riots of 1766. The Enlightened politicians attached great importance to these actions; authors such as Francisco Cabarrús³, the count of Floridablanca⁴, the count of Aranda, Pedro Rodríguez Campomanes, and others, widely referred to it.

The achievement of such agrarian objectives implied a fundamental modification in the distribution of the land revenues as well as of the land property, which obviously was impossible as it jeopardised the privileges of the aristocracy and the church, both land owners, and political support of the Enlightened monarchy.

³Cabarrús (1820), pp. 347-362.

⁴Floridablanca (no date, 1952).

The politicians raised this question on several occasions, but unsuccessfully. The large seigneurial properties, the large estates (i.e. *latifundios*) and the agrarian revenues such as seigneurial rights and tithes (*diezmos*) were truly untouchable. Therefore some other agrarian actions such as the ploughing up of communal lands for dry farming, or the hydraulic policy, involving the construction of irrigation canals and ditches, were finally of great interest and fulfilled a substitute role for the agrarian reforms.

The set up of Enlightened policy created a need for the State to increase financial resources to carry it out. According to Barbier and Klein, military costs were the most important in the budget for these years⁵, but the agrarian policy required a lot of resources as well: furthermore, its real monetary cost has not been evaluated yet.

The State could never engage in a deep reform of the taxation in order to develop the income tax (plan for the *Unica Contribución*) because it was a matter of damage for the aristocracy and church, the social supports of the tardofeudal regime. So, it attempted to start three other main ways. The first was to undertake again some public rents whose administration had been given to private tenants, in order to retrieve the profits. The second was to increase taxes on consumption and trade of goods, specially with America. Lastly, the third was to issue national and foreign public debt.

The management of taxes and incomes allowed a limited increase in revenues but had no relevance. The issue of debt was the easiest resource and at the same time the most risky; in fact this was what drove the Treasury to bankruptcy. The debt was born to finance the construction of the Canal Imperial (1768, 1773) and was extraordinary developed by its construction itself (1785, 1788) as well as by the wars and threats of war against England and France (1777-1783 and 1789-1795).

The question of the increase in taxation on consumption (excise taxes), above mentioned, must be considered too. The reform of colonial trade, held in 1778-1792, can be interpreted in this sense: according to J. M. Delgado the State did not really intend to raise an active export sector controlled by the national bourgeoisie, but rather to generate taxable wealth in order to strengthen its revenues and its role as redistributor of incomes⁶.

In the second half of the XVIIIth Century quite a lot of major navigation and irrigation channels were build up. The State came to have a share in all of them, from the very beginning or along the process of construction. Moreover, there were numerous private initiatives to build up, alter or widen channels and ditches, but the State only participated in case of need for political reasons or if they had great dimensions or a complex management. Among waterways drawn up to navigation, we could mention the Canal de Castilla (a whole of three waterways), the Canal de Guadarrama and the Canal de Manzanares, in Castile; and along the axis of the river Ebro, the whole Canal Imperial de Aragón-Canal Real de Tauste and the Canal del Bajo Ebro or Canal de Amposta.

⁵Barbier y Klein (1981), pp. 486-489. The authors state that the amount and distribution of the expenses were directly ordered by the King; this seems to be a debatable matter. They argue, as well, that as the expenses for defense were prior than any others the security of the State was a more important political objective than enlightened reforms (p. 489). I especially disagree with this point: the scale of political priorities of a government does not use to be always in direct proportion to the amount of each objective within the budget.

⁶Delgado (1989), p. 659.

The most important work among them, from an economic point of view, was the Canal de Castilla, which was exclusively financed by State revenues coming from this very region, Castile. Concerning the irrigation works, some of the most relevant projects were the reservoir of Tibi⁷, in Alicante, and Lorca, in Murcia; and the Acequia Real del Júcar, in Valencia, which was rebuilt and widened in those times. Another relevant project, the Canal Imperial de Aragón, was a waterway for navigation and irrigation which was drawn up to enable the navigation in the middle part of the river Ebro and to settle an extensive irrigated area all around Saragossa.

The Canal Imperial flows along the right margin of the Ebro. It comes from an irrigation ditch created in XVIth Century by the Emperor Charles V (Acequia Imperial de Aragón), which was rebuilt from 1766 to 1793. In 1781 the company of the Canal Imperial purchased the old Acequia Real de Tauste, much smaller, which bends along the same section of the river but upon its left margin. The ensemble of both was named historically Proyecto del Canal Imperial de Aragón y el Canal Real de Tauste.

The Canal Imperial was initially conceived as a ditch for irrigation only; its financing was achieved by a regulated private company through the emission of bonds, that is, by means of private debt. The regulated company, called "Badin y Compañía de Madrid y Zaragoza", was composed of several French and Spanish partners. Its first issues of bonds were dated in 1768 and 1773, being placed in Amsterdam financial market among many small investors. The company failed because of mismanagement, the high technical complexity of the work itself, and the severe financial problems. Then, the count of Floridablanca, who was appointed as Secretary of State (1777-1792) in February 1777, retrieved the project for the State, considering there were some important political reasons to do so. He sorted out the company, settled its debts and supported the construction, which was mostly achieved between 1778 and 1791. In its practical aspects the plan was carried out by an enlightened Aragonese canon, Ramón Pignatelli. Besides that, during these years, Floridablanca led the hydraulic policy of the State and ran its financing.

The main works consisted of a great dam on the river Ebro, the digging up of about 80 km of water bed from the 120 km projected, and the building of many bridges and buildings. According to an estimate of Llauradó⁸ the work amounted to 98,1 million *reales de vellón*. This was almost totally financed by the issue of national and foreign debt: bonds in Holland in 1778 and 1779 worth 52,45 million *reales de vellón*, and *vales reales del Canal Imperial* (a sort of IOU) in 1785 and 1788, worth 99 million *reales de vellón*.. The difference between total incomes (159,5 millions) and expenses (98,5 millions) ran out to pay interests of loans, bills of exchange and bank drafts, as well as financial commissions.. Moreover, this debt was paid off only in part, and bore interests throughout XIXth Century.

In summary, then, the State had to issue about 150 million *reales de vellón* between 1770 and 1790 to build the Canal Imperial. To this important need many others were added, especially the expenses resulting from the wars against Great Britain (first as a threat, 1777-1779, after as a fact, 1779-february 1783), and by the French Revolution and the war against the Convention (1789-1795).

⁷It was rebuilt up upon river Montnegre to secure water to some cultivated areas near Alicante. It dates from a while before, the decade of 1730.

⁸Llauradó (1878), pp. 654-655. This estimate can be seen too in Pérez Sarrión (1984), p. 456.

On account of all this the financial needs of the Royal Treasury went up a lot. Excise taxes such as American colonial custom duties were increased as a response, and new public debt was issued. As a result, the State faced a great need to increase and improve the management of financial resources. In order to do this, Floridablanca outlined at least two responses. He tried to encourage private business men and traders to take part in financial operations run by the State, and worked out the creation of a public bank (Banco Nacional de San Carlos, 1783) so that the Treasury could have its own financial management and proper means to get cash and loans in national and foreign markets.

The role of financial and commercial bourgeoisie: public interests, private profits

The analysis of the agents that financed the Canal Imperial de Aragón and other hydraulic works allows us to step into a rather unknown world, ruled by vigorous banking men and traders settled in Madrid and Cádiz. These traders also had their private business and operated in national and colonial markets from privileged positions. They traded with fewer minor risks, due to the fact that the State regulated their companies or granted facilities to them. It is significant that no regulated or non-regulated companies in Barcelona are included and so we can assume that the colonial network that was developing in Catalonia at that time, was not part of this system.

The Compañía General y de Comercio de los Cinco Gremios Mayores de Madrid operated in this way. It obtained contracts to supply goods to the Army and capital city of Madrid; it took royal revenues on lease; it possessed exemptions in customs duties and monopolies for the sale of various goods in America; it discounted bills of exchange to pay for works of the State, and it placed some issues of *vales reales* in the market. This company, like many others, made a great amount of profit, and in exchange it was forced to give financial support to State plans such as the one of the Canal Imperial de Aragón, to undertake extremely risky trade operations, and to loan cash to the Treasury which was expected to be returned in extremely uncertain instalments.

A key person was the merchant and banker Francisco Cabarrús, French born, who was closely connected with traders and bankers established in Paris and Cádiz. Cabarrús carried out great commercial and financial operations for the State and obtained large profits from them as well. For instance, he managed the first three issues of *vales reales* (30-VIII-1780, 20-III-1781 and 22-V-1782) through affiliated companies, and gave some loans to the Treasury in association with the French banking houses of Lalanne and Lecoulteulx de la Noraye. He also managed half of the debt originated by the war against Great Britain, to the value of 451 million *reales de vellón*, with high profits, and carried out the creation of the Banco Nacional de San Carlos in June of 1783. Thanks to his close connections to the domestic and international financial markets he achieved that many shares of the Bank of San Carlos were bought by banking houses in France (Lalanne, Lecoulteulx de la Noraye), Dutch (Hoppe), as well as many bankers and a lot of public institutions in Spain⁹.

The bank was created by Floridablanca who aimed to supply the State with loans, to finance import and export trade to America, and to substitute the cash

⁹Tedde (1987), pp. 532 and 546; Tortella (1986).

with the issue of banknotes when shipments of metal could not arrive on time. Besides, the bank had another aim: to prevent the economical weakening of the merchants involved in American trade because this traffic generated revenues to the Treasury which were essential to finance the policy of hydraulic and public works ruled by Floridablanca. For that reason the State took an interest in traders earning cash on American trade, since it was a reward for their economic support.

The bank was founded by Cabarrús; he carried out some important tasks for Floridablanca and the State, but he also attended to his own interests. So he speculated with the purchase price of the shares of the bank in spite of the fact that he was one of the several bank managers, and made his house of commerce operate with it. To sum up, he used the bank for his own business, as he admitted clearly¹⁰. The Banco de San Carlos was in fact a public bank but it was under private control; therefore, at the same time as doing operations such as the financing of the Canal de Guadarrama he also carried out others that were, in fact, quite immoral, and moreover they were risky for the bank. Thus Lecoulteux de la Noraye, being a share holder of it, managed to get a loan worth 20 million *reales de vellón*, which amounted no less than 15% of the capital assets.

The final steps in the financial management of the Canal Imperial de Aragón occurred between the Revolution of 1789 and the destitution and trial of Floridablanca (February 1792). These facts allow us to discover the activities of many merchants and trade companies of Cádiz and Madrid which were involved in the financial network run by the Secretary of State, as well as what kind of privileges they held for their financial support to Floridablanca. They consisted of exemptions on tariffs, licenses to export shipments of goods under a regime of monopoly, and permissions to discount some of their private bills of exchange with issued *vales reales*, which became currency from that moment.

A key agent, the Compañía de los Cinco Gremios Mayores de Madrid, has already been mentioned. Cinco Gremios participated in the financing of the Canal Imperial de Aragón from 1777 to July 1791, and finally took on the charge of the treasurership of the Canal. Another important but hardly known agent was Juan Bautista Condom. Being a trader established in Madrid, he was the unique initial investor partner of the very first Badín y Compañía company. The State took back the enterprise in 1777, then Condom remained in his position and became a close collaborator of Floridablanca, for whom he carried out numerous financial intermediary tasks in Madrid, Cádiz, Paris, Amsterdam, The Hague and other financial places of Europe.

Even a most superficial look to this issue raises the important role that this trader played in the financing of this irrigation work. To know his tasks has an intrinsic interest, but mostly brings us to other question: it reveals the close amalgam between public interests and private profits that could be plotted around such an hydraulic work and, further more, points out the system ruled by Floridablanca to finance his hydraulic policy. As a final result the activities of Cinco Gremios, Condom and others show the confusion that existed between public and private estates, between the public interests of State and the particular ones of the trade and financial bourgeoisie.

At the end of 1789, Condom was creditor of a large amount of money he had lent in advance to the Canal in cash and bills of exchange, to pay off the

¹⁰Tedde (1988), pp. 87-91.

interests of the State and the debts of the Canal in Holland. At this point, it must be acknowledged that the debts of Condom as a businessman were hardly distinguishable from those he had as a debtor in his position as the treasurer of the Canal and as a financial agent of Floridablanca.

Between the end of 1789 and July 1791, the long shadow of the French Revolution broke down this scenery. Condom was in trouble because he needed financial backing to maintain his commercial prestige and to be able to keep on his issues of bills of exchange; then Floridablanca supported him in several ways for he needed to achieve the canal to Saragossa at any cost. Thanks to that, Condom could pay off all the works but could finally not avoid his failure and bankruptcy. After a while, in July 1791, he was replaced in the office of treasurer by Cinco Gremios Mayores de Madrid, a company which was still solvent. In February 1792 Floridablanca was removed and taken to court (1792-1794) at the same time as Condom (1793-1801). Floridablanca was accused of having used some funds of the Treasury to support private business. These trials are, nowadays, an important source of data to get to know the financial activities of Floridablanca as well as how and why he financed his hydraulic policy¹¹.

The irrigated zone of the Canal Imperial de Aragón and its economic and social framework

The third and last part of this paper deals with several questions on drainage and irrigation which have been proposed to this colloquium, having as reference a regional well-known case, the Canal Imperial, which flows along the the Ribera del Ebro, the general data of Spain considered as a whole. I will particularly focus my analysis on wet farming.

A first question that is mainly related to this is why the ploughing up and drainage or irrigation of new lands took place. Such an action seemed to aim at increasing the land yields, so we must try to find out why it happened.

A major factor is population. The reconstruction of the Canal Imperial de Aragón, as well as the reorganisation of the old irrigated areas and the ploughing up and irrigation of idle lands occurred between 1764 and 1808. Parochial documents and census of population made in Aragón in 1711, 1768, 1787 and 1800, show a slight annual increase of 0,89% for the period 1711-1787 and of 0,54% for 1787-1800; and concerning the region of the Ribera del Ebro, where the Canal Imperial de Aragón and the Canal Real de Tauste flow, registers and census show a sharp annual increase of 1,33% for the period 1713-1768 and of 0,25% for 1768-1787. In the capital of the old kingdom or Aragón, Saragossa, which had about 42.000 inhabitants in 1787, the rise in population was more regular, being of 0.51% in 1723-1768, and of 0,63% in 1768-1787 due to a certain rural immigration. The conclusion that clearly emerges from these numbers is that the irrigation of the Canal Imperial was developed along a period of a sharp rise of population which caused a general trend to plough up pasture and idle lands. Let us remember that the first project of Badín y Compañía for the Canal Imperial was a canal exclusively dedicated to irrigation.

The rise in regional markets had its influence, as well, in the digging of irrigation channels and ditches; in fact they were made to yield crops for self-consumption and to be exported. As a matter of fact, the channels of Castile,

¹¹See Floridablanca (¿1792?) y (1795).

Manzanares and Guadarrama were planned to supply Madrid and to give Castilian wheat the possibility to be exported to America. In the same way, the whole of navigation and irrigation channels made upon the river Ebro (Canal Imperial, Canal Real de Tauste, Canal de Amposta) were designed to link the Atlantic Sea to the Mediterranean Sea, not only attending to strategic military objectives, but also in order to increase the agrarian yields in the Ebro Valley and allow some of them to be exported to littoral Catalonia, Valencia and America.

Nevertheless, as far as Aragón is concerned, we must draw attention to the fact that irrigation areas of the Ebro valley are far from the sea. Coastal areas which could be irrigated had an easy access to foreign markets by sea, and we all know the great importance for trade that has been attached to maritime routes in modern centuries. Aragón had no coasts and hence the old kingdom had a relative disadvantage compared with coastal areas when the possibilities to export rose. It had to export by sea through Navarra and País Vasco, in the West, and mainly through Catalonia and País Valenciano, in the East; and for this reason it supported higher costs of transports and quite more customs and political difficulties than other countries.

Throughout the XVIIIth Century, a great process of growth and specialisation of rural farming took place in Spain. This process was attached to Catalonia and Aragón as well. In Catalonia the rise in rural settlements and an increasing possibility of shipping goods to America encouraged the growth of agriculture and the development of a regional market centered on Barcelona, which became a central point for consumption and services.

Within this process, the West zone of Catalonia, placed behind coastal mountains, in the Ebro valley, experienced a powerful agrarian growth, based on the ploughing up of new lands and some improvements in irrigation networks¹², focused to yield grains to supply the littoral areas of Catalonia. Aragón was stimulated by the development of Catalanian market, as well as by its own increase in population, mainly in Saragossa, which rose from 25.000 inhabitants in 1700 to about 50.000 in the years around 1800. Thus the old kingdom had an intense agrarian growth on lands mostly spread out over the lower and plain lands of the centre of the basin (*somontano, tierra baja*). It was based on the Mediterranean trilogy (grains, mainly wheat and barley; wine and olive oil). The lamb livestock also rose in these zones, and raised several conflicts against the migrating lamb herds which came periodically from the Pyrenees and highlands of Teruel, North and Southbound, to the central basin of the river Ebro.

The extensive irrigated surface which spread out along the Ribera del Ebro, permitted an increase in wheat and olive yields. The olive oil was cropped up preferably for the market of Saragossa. The wheat was originally produced mainly for the market of Aragón, but the sharp growth in the demand coming from Catalonia drove to export big shipments by the river Ebro, including wheat cultivated in irrigated lands. Lastly great extensions of vineyards were grown to yield wine and brandies for American markets.

As a conclusion, the spread out of irrigated lands was planned to supply the local and regional market with wheat and oil. Nevertheless, the sharp demand which came from other areas led to an economic regional structure based on the

¹²Epecially in the area of Lérida, in the irrigation ditches of Piñana and Fortanet. There were some improvements in irrigation networks in other areas, such as Termens, Torres de Segre or Verdú; according to Vicedo (1991), chapters 2 and 5.

steady exportation of wheat and a growing increase of vineyards for the same purposes¹³. This foreign demand stimulated the enlightened plans which aimed at using the Ebro as a waterway to export the agrarian yields of Aragón to the littoral of Catalonia and America.

Finally, we will briefly refer to the question of the social and economic profitability. The exact evaluation of the profitability of a work such as the Canal Imperial de Aragón is complex and difficult to be summed up in a few lines. Moreover it is a risky task because it is subject to far too simple assessments. I would not try to discuss the concept of profitability, although may be I should. Let us take for granted that an enterprise under the Old Regime was profitable as it produced obvious economical and social profits in a reasonably short period of time.

From this perspective, and using as a reference the 50 years between 1766 and 1808, the Canal Imperial de Aragón and the Canal Real de Tauste as a whole were very profitable, although not as much as their main promoters, the Aragonese count of Aranda and the Murcian count of Floridablanca thought it would be. Irrigation enabled a slight but clear rise in oil yield for local consumption, and in wheat and brandy for local consumption as well as for Catalonia and America. It also assured irrigation water and therefore crops for small land holders. This had decisive social consequences, as it provided vital security to peasants.

Water, to where it arrived, also provided the access to land ownership to many poor labourers and servants, and modified in a substantial manner the sharing out of the land revenues. As a matter of fact the payments of irrigation rights caused a significant redistribution of the land revenues. When this question was raised the general manager (*protector*) Ramón Pignatelli, considered that the tithes paid in ploughed up and irrigated lands which belonged to Crown, the most extensive, had to be deemed as tithes of newly broken lands (*novales*)¹⁴, and thereby were not supposed to be paid to church but to the king together with the irrigation rights (*alfardas*)¹⁵. Consequently the peasants who cultivated the new broken lands not only became land proprietors but were due to pay a tax that in all was obviously lower than the one paid in the close seigneurial villages. So the peasants were freed, in fact, from some heavy feudal charges they were due to pay.

This process also had notable failures. The irrigated vineyards of Saragossa yielded a wine of low quality which had to be transformed into brandies. On the other hand the ploughing up and the bringing of lands under cultivation was a too long process: the Canal was started in 1768, the great sharing out of irrigable lands was carried out in 1782-1784, and in 1808 there were still plots which remained idle or were not cultivated in a proper way. Lastly, and above all, the whole canal never reached the length which had been

¹³Pérez Sarrión (1984), chapters VI y VII.

¹⁴The tithes or *diezmos* (i.e. "tenth parts") are taxes originally due to church, of medieval origins, which comprised a 10% of crops. The *novales* lands were idle or pasture lands which were ploughed up and brought under cultivations for the first time. The Pope had conferred the tithes of the *novales* lands to Spanish kings through several bills from XVIth Century and after.

¹⁵The taxes that were traditionally paid for water were called *alfardas*. The irrigation rights were taxes cashed by the Canal Imperial for the water that was supplied to land tenant farmers. The proposal of Pignatelli comprised both concepts, the *diezmo* and the *alfarda*, so that the total amount was smaller than the sum of both taxes if they were paid separately.

planned at first, and so the central part of the river Ebro never permitted an easy shipping. Furthermore, the most extensive farming lands, situated downstream, were left with no water. The main purpose of the construction of the canal was to enable navigation on the entire river, and this objective could not be fulfilled.

In spite of all these facts, the overmeasurement of the channel, as it was finally achieved, had a very positive influence on the demographic and manufacturing development of Saragossa in XIXth and XXth Centuries. The navigation along the channel came to an end because of the rise of railways in the XIXth century, and the "surplus" of water which was left over became an essential factor for the urban and demographic growth of the town. Saragossa had 50.000 inhabitants at the beginning of the 1800s; nowadays it has over 600.000, a remarkable industrial network and a very extensive irrigated agricultural area. Today Saragossa is still nearly entirely supplied with water from the historical Canal Imperial de Aragón.

In short, we can conclude that the Canal Imperial had an economical cost which was somewhat ruinous and it has never been built up according to primitive plans, but it truly was a very profitable enterprise from the social point of view. On the other side, we can conclude, also, that the economic facts pushed politicians to face the limits of human hopes and, more specifically, of the illusions raised by the reforms taken on by the Spanish Enlightenment.

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Summary

The paper focuses on some relevant aspects of recent research on the building of major irrigation and hydraulic works taken on by Enlightened Spanish government in second half of Eighteenth Century, having a well-known case as reference: the major work of the Canal Imperial de Aragón.

The most relevant question is referred to the financing of the hydraulic policy by the State, process in which the financing and colonial trade bourgeoisie played a decisive role. In the same way, the French Revolution -the fear to it, at first; its presence, after- and the foreign Spanish wars against Great Britain and France, had a major influence to break up the financial system drawn by the Spanish Secretary of State, the count of Floridablanca.

The paper ends with an outline of some of the causes that moved to build up the work of the Canal Imperial de Aragón and some of the social consequences that such an important channel for navigation and irrigation came to have, within a regional frame.