

Profit, rent, patrimony, and risk on the large landed estates in Southern Portugal toward the end of the nineteenth century**

This study focuses on the economic rationality of large landed estates in the Iberian Peninsula. It assumes these estates submit to a rational land use, that is sensitive to economic change. Its goal is to discuss the main criteria for economic management of landed estates in Southern Portugal during the last decades of the nineteenth century: namely profit, risk, rent, and patrimony. A multiple-criteria programming model, farming economic accounts, and compared analysis are used in developing a case study. The article concludes for a patrimonial logic within which a policy for compromise between income and risk was followed.

Keywords: multiple-criteria analysis; economic rationality; landed estate; Alentejo.

Lucro, renda, património e risco nos grandes domínios fundiários do Sul de Portugal nos finais do século XIX

Este estudo discute a racionalidade económica dos grandes domínios fundiários da Península Ibérica. Assume-se que a exploração agrícola destas terras se baseia em critérios de racionalidade económica, sensíveis às transformações económicas. Pretende identificar os principais critérios presentes na gestão dos grandes domínios fundiários do Sul de Portugal, nos últimos decénios do século XIX: lucro, renda, risco e património. A discussão parte do estudo da Casa de Ficalho, e apoia-se num modelo de programação multi-critério, na contabilidade dos domínios, e numa análise comparativa. Conclui-se que esta racionalidade se alicerça num compromisso entre a maximização do rendimento e a minimização do risco económico, dentro de uma lógica patrimonial.

Palavras-chave: Análise multi-critério; racionalidade económica; património fundiário; Alentejo.

INTRODUCTION

Due to their vast sizes, the large landed estates in Southern Iberia have occupied a central place in the debate about the role of agriculture in the economic development of the two Iberian countries from the middle of the nineteenth century up to the first half of the twentieth century. A justification

* DEASR, Instituto Superior de Agronomia, Universidade Técnica de Lisboa, Tapada da Ajuda — 1349-017 Lisboa, Portugal. e-mail: ananovais@isa.utl.pt

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of the economy of these estates includes the analysis of the principles guiding the choices of the economic agents that run these estates, i.e. the decision-making processes of their holders. The goal of this text is to examine the economic rationality of the large landed estates of the South, specifically, the large farms of Alentejo, in the last quarter of the nineteenth century.

Considerable difference of opinion exists in the literature. On the one hand, there are authors who attribute economic agents' behaviour to utility maximization, which is subject to the constraints of technology and resource allocation, and assess the conduct of large landed estates holders accordingly. In this essentially normative perspective of economic rationality, these authors tend to assume utility maximization to be a universal principle, and align it with profit maximization, i.e., the rationality of the capitalist economic system.¹ On the other hand, there are authors who, instead of taking a principle of rationality as a starting point, try to understand the economic rationality of economic agents by analysing their actual social contexts, their options, activities, and experience. The decision-maker is understood as a social actor, belonging to certain social groups that stand in relation to others, and whose value systems, objectives, and constraints interact with the decision-making process. In this essentially descriptive approach, the rationality of large landed estates is evaluated differently according to the social and historical context in which the landholders live.²

In a certain way, the excessive concentration of the land in the *latifúndios* (large landed estates) of Southern Portugal explains some of the country's economic backwardness. Consolidated by the liberal reforms of the nineteenth century, they determined the economic, social, and cultural inertia of the region (Reis, 1993). These large estates are associated with the continuous presence of a traditional elite that refuses modernization, emphasizes rent-seeking, often as absentee landlords, and focuses on land accumulation³ (from which they obtain a high income with minimal risk), rather than managing the estate efficiently. As a result, these estates were routinely inefficient agricultural *firms* that were not driven by the "maximization of *effective* interest of own capital". Nor did they fully exploit resources, often reducing "to a minimum the execution of land investments" such as adding farm buildings or planting trees, and not paying proper attention to carefully calculated economic factors (Barros, 1980, pp. 22-25; Pereira, 1980). According to the principle of the maximization of profit, some authors might characterize the management of these large farms as "economically irrational".

¹ This is currently questioned by adherents of neoclassical economic theory (Baptista and Santos, 2005).

² On the rationality debate, see Godelier (n/date); Munier (1994 and 1995), Polanyi (1976); Sfez (1990); and Simon (1959).

³ See a summary of these theses in Reis (1993, p. 12) and Fonseca (1996, pp. 308-368).

In History and Agricultural Economics, more recent studies have argued against the idea of irrational management of the large landed estates. In Matos *et al.* (1982a), the high return to own capital results from the capitalist spirit with which the large farm owner (the one that was studied) ruled his farm. Using an economic/accounting analysis and/or calculating the return on own capital, Naredo (1980) and Roux (1980) found that the “insufficiently exploited land” should be regarded as entrepreneurially managed farmland whose owners are seeking to maximize the benefits obtained at a minimum risk, rather than maximize production, final product, or employment. The apparent backwardness of the production systems and practices of these firms are therefore explained by the underdevelopment of the economic environment (Roux, 1980) and/or by the unfavourable ecological conditions of the South (Balabanian, 1980).⁴

Adopting a more descriptive view of economic rationality, other studies have made a larger contribution. In Sumpsi Viñas (1980), the evolution of the cropping systems and the modes of land use, together with changes in technology, provide evidence of management choices that can be explained by social, political, and economic factors (Sumpsi Viñas, 1980). Case studies on nineteenth century households owning large landed estates show very consistent management strategies that are flexible and adaptable to changes in the historical, social, and economic environments, seeking the consolidation of property rights, enlargement, value increase, and capital accumulation or safeguard (Florencio, 2002; Fonseca, 1998 and 2003; Lana, 2002; Martins, 1992; Moreno, 2002; Reis, 1993, pp. 181-226 and Serrano, 2002). These studies re-focus the analysis of the land heritage on the owner’s total wealth. Through the identification of the actors and their economic, political, cultural, and environmental constraints, they shed light on the decision-making processes involved in the constitution and management of large agrarian holdings (Casado and Robledo, 2002, p. 4).

In all of these studies, no explanations are based on economic irrationality of the household owner, need of ostentation or power, or any psychological trait. They try instead to understand the rationality of the economic actors. There is, therefore, a complexification of the debate over rationality in large landed estate management in Southern Iberia, and some authors even advance a theory of a specific economic rationality (Baptista, 1980; Petruszewicz, 1989). The study by Baptista (1980) on the economics of *latifundia* from the 1930s to the 1960s stands out. After an in-depth analysis of the land use regime of *latifundia*, he identifies it with “a clear and specific logic of economic functioning.” The economic rationality is based not on the maximization of profit alone, but on profit plus sharecropping rents. The

⁴ These authors study respectively, the large farms in Andalusia in the early twentieth and in Estremadura and Alentejo in the 1960s and 1970s. See also Santos (2003).

objective is pursued by direct cropping of the better land, based on wage labour, and by sharecropping the poorer land; since “received sharecropping rents are higher than the profit he would secure if he directly cultivated those lands with wage labour.” The viability of such a system was based mainly on the sharecropper “often accepting an implicit wage well below the average wage rate in the region.” On the other hand, on lands cultivated with wage labour, an “unequivocally capitalist” relationship of production was established in a context where workers relied exclusively on uncertain farm employment and wages, and provided an abundant labour force (Baptista, 1980, pp. 350-362).⁵

The main issues of this debate were analysed by Pedro Hespanha (1983) in his critique of the study *Senhores da Terra* (Matos *et al.*, 1982a).⁶ The author reminds us of the following: “the capitalist spirit as a mental superstructure exists only after it becomes a mass phenomenon, and overrides the traditional standards of conduct”; “the ecological factors and the technological factors, so often considered as independent variables of the system [should] be seen as elements where the tensions between the natural and the social dialectically combine”; the social categories (e.g. farmer and sharecropper) should not be studied on their own, but in their interactions, and the forms of land ownership should be analysed in their economic, juridical, political, and symbolic dimensions.

Addressing the process of change of land ownership into modern capitalist ownership in the second half of the nineteenth century, Pedro Hespanha depicts it as a “slow, arhythmic, and complex process, with back and forth moves”. In this process, he finds “particular conservative-minded ownership-related strategies rooted on a logic of minimization of land-value depreciation risk rather than income maximization.” Contrary to the more recent studies in Portuguese History cited in this paper, this author underlined the role of traditional practices. Although based on economic management principles, these derive mostly from a prudent management, which reflects a not-specifically-capitalist logic grounded on risk aversion; on the non-conversion of land and natural resources into capital forms, and the domination of farm economics by the household economics.⁷ The following structural

⁵ That is the system that Petruszewicz analyses, in the 1800s in Mezzogiorno. He claims that latifundism is not feudal, capitalist, or a transition; that it is a specific system (a rational and efficient production system) — a version of social, economic and cultural equilibrium in which innovation and technological evolution takes place; that it is placed between two historical moments: the destruction of feudal jurisdiction and land liberalization (anti-feudal laws of 1806) and the end of the century crisis (1989, p. XXIII and XXXII).

⁶ Study based on the diaries of a farmer from Alentejo of the second half of the nineteenth century.

⁷ Petruszewicz (1989) concludes that risk management was made through the diversification of activities that increase the autonomy of the farming system *vis-à-vis* the market, rather than the diversification of activities for the market.

data, endogenous to Alentejo's rural society, help to explain the viability of such practices: namely, abundant labour force that was not completely free from extra-economic entailments; the local political rule of the landed class; low mobility of land ownership; high land prices; and a tenancy regime unfavourable to the tenant farmer. "Situations, where property value increases do not correspond to the capitalization of income, derive most assuredly from land ownership systems not yet dominated by capitalist ownership forms" (Hespanha, 1983, pp. 68-74).

The present study fits into the perspective adopted by the latter authors cited. We assume that the economic decisions are characterized by multi-rationality (Sfez, 1990, p. 183), and that the actors make their decisions and guide their economic behaviour to optimize certain criteria. Therefore, the analysis of rationality includes the identification of criteria, and integrates them with a theoretical approach that shows the logic of the actors' actions. To identify the criteria and reveal this logic, the actors have to be placed in their social groups and their economic environment, which configure the options of action for the individual.⁸ These criteria thus do not need to be strictly economic (Godelier, n/date; and Polanyi, 1976). Our contribution to the debate is to shed light on which criteria are present, and their relative weight and significance to the management of large farms in Alentejo in the last quarter of the nineteenth century. Four plausible key criteria are discussed: profit, rent, patrimony, and risk.

To this end, we conducted a study of *Casa Agrícola*⁹ of Ficalho in the last two decades of the 1800s and first years of the 1900s. The discussion has its point of departure and main concern in the solution to a mathematical programming model built to check fundamental criteria that guided the choice of the agricultural production system used by this *Casa*.

The paper is organized as follows. In the next section we outline the profile of the decision-maker/land holder, the Earl of Ficalho, by reporting on his social, economic, and cultural environment, and his knowledge regarding the decisions under study. We also describe the land heritage and characterize the agricultural production system. Then we present the mathematical programming model, and the criteria guiding the management of the agricultural household. We base our argument on the findings that emerge from the programming model, especially those concerning the role of sharecroppers in the *Casa's* economics, the analysis of the economic perform-

⁸ See Baptista and Santos (2005, pp. 9-13); Boussard (1987, pp. 24-27) and Santos (1991, pp. 1-3).

⁹ The term *Casa Agrícola* refers to the landed estate and the other natural goods held by a family belonging to the economic elite, and the long-term relationship this family has with its landed estate, which supports its elevated social prestige and economic power.

ance of the farm, calculated for twelve agricultural years, and the analysis of all the expenditures of the *Casa*. In the last section we compare the organization and management of *Casa de Ficalho* with those of other nineteenth century large landed estates and conclude for a specific economic rationality of the large landed estates in Southern Portugal in the last quarter of the nineteenth century: the maximization of monetary income subjected to minimizing the economic risk within a heritage appreciation framework.

THE EARL AND THE *CASA DE FICALHO*

The *Casa de Ficalho* is located in the Baixo Alentejo region. During the period covered by this study (1882 to 1903), its owners were António de Melo Breyner Teles da Silva (1806-1894), Marquis of Ficalho, and, after his death, his son, Francisco Manuel de Melo Breyner (1837-1903), Earl of Ficalho. The latter was an only son and universal heir. He managed the affairs of the *Casa* from the beginning of the period. Consequently, he is the decision-maker whose profile is relevant to our study.

This is a family with a long aristocratic tradition rooted in the village of Serpa, which is crowned by its palace and around which their estates were organized. Its owner/manager was an individual of noble background and a member of the *intelligentsia* of the last third of the nineteenth century.

The Earl was a botanist and Full Professor in that field (from 1890), Director of the General Institute of Agriculture (1864-1877), and a member of the Royal Academy of Sciences and the Geographic Society of Lisbon. He was named Peer of the Realm in 1881, and sat on different commissions of the House of Peers (Pereira, 2004). During the period that led to the promulgation of the first law for the cereal regime, in 1889, he stood up against the intense organized pressure by Alentejo farmers who wanted to obtain protective actions from the Government. He took part in two regional congresses.¹⁰ He was a member of the Royal Central Association of Portuguese Agriculture (Gomes, n/date, p. 18; Graça, 1995, pp. 472 and 479), in which he gave a conference entitled *Science and Routine*.

His intellectual and political environment and the positions he held allow us to assume that the Earl of Ficalho would be a farmer well informed on the novelties of Agronomy and on political issues pertaining to agriculture. He understood the complexities of agriculture in the South, in which any transformation, modernization, or innovation had to be undertaken very carefully and in small steps. In his own words: “[...] the agriculture can only react against the evils of routine by one of two extreme processes — very

slowly, by means of partial and inexpensive modifications, or very rapidly, by the rigorous application of a very expensive plan that changes all. Either with great moderation and thoughtfulness or, alternatively, boldly, with much study and willpower. It is not possible, at this point, to take the middle path, which would imply the ruin of all those who did not adopt one of those systems of remodelling”.

“If routine has lots of evil in it, it has lots of good too; it sums up the wisdom of centuries, the practices of our ancestors based in facts observed with proper delay. So, it is admissible, in most farms, with the modification and improvement that science has already gradually introduced with benefit to many regions of our country”. On the other hand, he thought routine should be banished, giving rise to modern practices, in the case of certain agricultural activities: cheese production, olive presses, oil cellars, grape presses, and wine cellars (*Boletim da Real Associação Central da Agricultura Portuguesa*, 1899, p. 226).

He lived in Lisbon, and was 45 years old when he assumed the administration of his *Casa*, which he oversaw through a manager residing in Serpa. He went to the village regularly, staying in his palace (Conde de Arnos, 1998, p. 34).

At the time of the Marquis and Earl of Ficalho, *Casa de Ficalho* was an extensive landed estate comprising several large land-holdings (*herdades*), hunting enclosures, farms, vegetable plots, vineyards, olive orchards, scrublands, and watermills. The estate included two manors and several houses and yards. Integrating part of a sixteenth century’s entailed estate, land bought in public auctions,¹¹ and redeemed *foros*.¹² The estate took advantage of the influence of socio-politic and economic changes underway throughout the second and third quarters of the nineteenth century. By the beginning of the 1880s it was stabilized, as described. At this time, *Casa de Ficalho* had property titles in an area exceeding 5,314 ha, divided into nearly 50 properties of different sized land. It collected *foros* over one fifth of this area (1,066 ha), paid *foros* or other tributes over land covering less than one third (1,659 ha), and had full property rights (in the modern sense) over one-half of it (2,589 ha, Table 1).

The estate of *Casa de Ficalho* changed little over the two decades of this study, until the succession of the Earl of Ficalho by his daughter. Its strategy was more one of consolidation of the patrimony in Serpa, through the unification of property titles, than one of expansion. It chose to purchase ownership rights over a continuous agricultural area around the farming centre. Whenever possible, *foros* were redeemed.

¹¹ Private Archive: C. C. F., portfolio number 8, letter of sale of 1836, 20 April.

¹² *Foros* were payments over land which was under *enfiteuse* (a sort of lease for life or even hereditary, in which the owner of a tract of land ceded its direct cultivation in exchange for regular payment) (Amaral, 2009, p. 112).

Casa de Ficalho in 1882 — property rights

[TABLE 1]

Property	Titles that include	Property		Collected land charges				Paid land charges		
		Number	Area (ha)	Monetary (10 ³ réis)	Wheat (dal)	Olive oil (dal)	Total* (10 ³ réis)	Monetary (10 ³ réis)	Wheat (dal)	Total* (10 ³ réis)
Land	The ability to collect foros	28	1,066	71.4	356.3	11.0	175.1			
	The direct cultivation									
	Without full property rights	11	1,659	—	—	—	—	171.6	1,344.1	636.4
	With full property rights	15	2,589	—	—	—	—	—	—	—
Urban		34		6.9	—	—	6.9	0.4	—	0.4
Total		88	5,314	78.3	356.3	11.0	182.0	172.0	1,344.1	636.8

* Values for wheat and olive oil are determined from average selling prices on *Casa de Ficalho* from 1882 to 1887.

Sources: Private archive, C. C. F., portfolio numbers 2, 8 and 9, and *Foro* books.

Excluding the area it rented out during the study period, the farming area of *Casa Agrícola de Ficalho* was 3,890 ha (Table 2). In the 1,240 ha of clean arable land, two strategies were used: part was exploited by the owner’s own farming efforts and part by sharecropping, i.e., land was handed over to sharecroppers to cultivate in return for a quarter of the production. Olive stands and mixed stands of olive and holm oaks occupied around 900 ha and the *montados*,¹³ mainly of holm oaks, about 1,300 ha. Vineyard area was very small.

Farm (1880/1890). Land use (in ha)

[TABLE 2]

Land area	Clean arable land			Land with permanent crops									Total	
	Field Crops	Fallow and natural permanent pasture	Vegetable gardens and orchard	Fig grove	Vineyard	Vineyard and olive grove	Olive grove	Mixed stand of olive and holm oaks	Montado holm oaks	Montado holm oaks and cork oaks	Montado cork oaks	Wood of young holm oaks cork oaks		Moor and underbrush
Owner farmed	253	575	10	0	0	13	549	375	1,100	47	6	134	419	3,479
Share-farmed	412	—	—	—	—	—	—	—	—	—	—	—	—	412
Total (ha)	664	575	10	0	0	13	549	375	1,100	47	6	134	419	3,891
Total (%)	17	15	0	0	0	0	14	10	28	1	0	3	11	100

Source: Agricultural maps at the end of nineteenth century, fls. 191, 192, and 193.

¹³ *Montados* are agro-forestry-pastoral systems comprising cork stripping or free-range swine production, cork oaks and holm oaks logging, and cutting firewood.

The agricultural production system was centred around field crops, mainly wheat for the consumption of the work force and for external sale. Wheat, other cereals, and other annual crops depended on sheep to fertilize the land. The other goals of raising sheep were wool and cheese production. Despite having a great area of good cereal-producing land, wheat production was not the principal final product, but stood in third place, behind olive oil (in first place — Table 3), produced in the *Casa* (along with cheese), and swine production, in second place. *Montados* were essential for free-roaming swine production. Animal traction was used for cultivation and other operations, and most of these traction animals were raised on the farm. Almost all of the livestock grazed in a free-range manner. Production was organized hierarchically and work was provided by a large number of workers, of various categories, with different responsibilities, salaries, and types of contracts.

**Final product composition from owner-farmed area of *Casa de Ficalho*
(1888/1889 — 1894/1895 and 1898/1899 — 1902/1903)**

[TABLE 3]

Activities	Final product	
	Value (10 ³ réis)	Percentage
Olive grove and olive press	6,556	32.0
Pigs	5,634	27.5
Wheat	3,904	19.0
Sheep and cheese	3,000	14.6
Montado cork	363	1.8
Breeding cattle	283	1.4
Work cattle	224	1.1
Grain legumes (broad beans, chickpeas and bitter vetch)	193	0.9
Horses, mules, and donkeys	126	0.6
Other cereals (barley, oat, and rye)	80	0.4
Montado holm oaks	71	0.3
Vegetable gardens and ducks	32	0.2
Vineyards	28	0.1
Linen	2	0.0
<i>Total</i>	20,496	100.0

Source: Private archive, C. C. F., account books, n^{er} 4 to 6 and 8 to 10.

The *Casa de Ficalho*'s agricultural production system — a traditional Southern extensive dry land system — was complex, with multiple internal exchanges and a high degree of autonomy from the input markets. Although purchasing some goods and services, the main interaction of the production system with the markets was through the sale of products: livestock, wool, cheese, olive oil, subproducts of these two, cereals and grain legumes, grapes, and firewood. These sales represented a wildly variable part of the

production and occurred in local, regional, or wider markets, where there were intermediaries with commercial relations in Lisbon.

A COMPROMISE BETWEEN REVENUE AND RISK

The mathematical programming model here presented was designed to elucidate the management criteria of *Casa Agrícola de Ficalho*, and was initially formulated as a multi-objective programming problem (MOP) solved by compromise programming in a second phase.¹⁴

MOP techniques handle the problem of simultaneous optimization of several objectives subject to a set of constraints. These techniques seek to identify the set of efficient solutions amongst those that are feasible. The elements of this set are the feasible solutions such that no other feasible solution might achieve the same or better performance for all of the objectives, and strictly better for at least one objective (i.e. those that satisfy the conditions of Pareto's optimal, see Romero and Rehman, 1989, p. 63; Zeleny, 1982, pp. 68-72).

Based only on the assumption that all economic actors seek the maximization of economic return, we assume that the main guiding criteria of the management of *Casa Agrícola de Ficalho* are the maximization of the average net farm revenue, and minimization of economic risk. According to Zeleny (1982, p. 398), risks and benefits "are inseparable, jointly perceived and evaluated". Therefore, these two criteria are modelled as objective functions of the MOP model and the conditions of the farm of the *Casa* as its constraints. These should represent the decision-making constraints of the production system, the historical environment of *Casa de Ficalho* – economic, social, agricultural, and cultural – and the specific characteristics of this *Casa* and its owner (see Appendix).

The discussion is based on the following argument: once an adequate model description of the production conditions of *Casa de Ficalho* is guaranteed, as a hypothesis, one can argue that the choices with respect to the agricultural production system of the *Casa* were guided mainly by the criteria formulated as objectives of the MOP model if one or more optimal solutions have a high degree of similarity with the production plan implemented by the *Casa*.

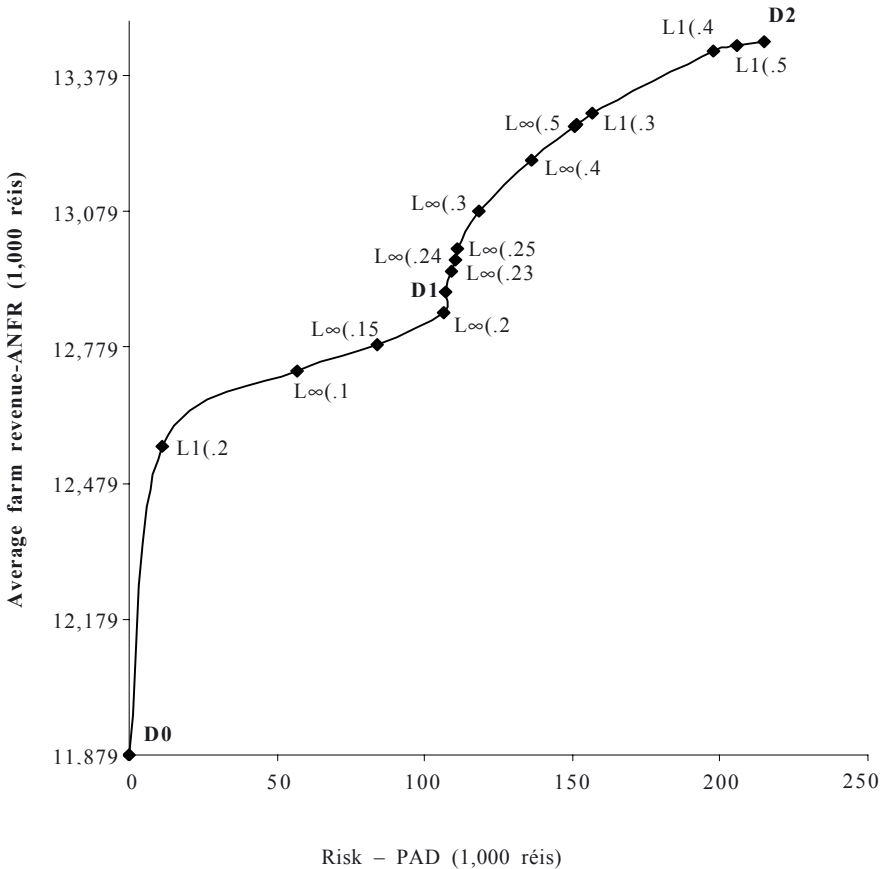
Thus, the objective weighting that provides the solution that is closest to the values observed in the *Casa de Ficalho* is the best reflection of its

¹⁴ On the use of a multiple-criteria decision-making paradigm in whole-farm planning (explained by the multidimensional consequences of the decision made, the several criteria used – biological, technical, economic, private, social, political, and environmental – and the inherent conflicts between them), see Rehman and Romero (1993).

management criteria. This solution is the consistent solution, and is represented by the point $L^\infty(0.24; 0.76)$, where 0.24 is the weight of the objective “to maximize average net farm revenue”, and 0.76, the weight of the objective “to minimize economic risk”. Curiously, the solution lies on one of the inflection points of the efficient frontier, see Graph 1.

Efficient frontier ANFR-PAD

[GRAPH 1]



To find the consistent solution we used a statistical measure of similarity — the Gower coefficient — between each of the solutions found and the data from *Casa de Ficalho*. Two coefficients are calculated: 1) one over 93 variables concerning model agricultural activities and 2) another over four structural variables — levels of wheat crop, olive production area, livestock breeding of sows, and breeding of ewes. The consistent solution has the

highest value for the first Gower coefficient – 0.716 — and a very high value for the second Gower coefficient – 0.981. The existence of consistent optimal solutions (Table 4) allows us to claim support for the hypothesis of a management guided by an economic rationality perceived as a compromise between the maximization of average net farm revenue of the farm and the minimization of economic risk, weighted in favour of the minimization of risk.

Seeking such a compromise, the *Casa de Ficalho* intended to secure revenue composed of two items: a net receipt of owner-farmed area and a land rent, which includes mainly sharecroppers’ shares, but also the rents of vegetable gardens, barley fields, and plots of cultivated land.

Main values of consistent optimal solution and corresponding observed values

[TABLE 4]

	Average net farm revenue (10 ³ réis)	Risk (10 ³ réis)	Field crops area (ha)			Number of parcels rented		
			Total	Owner-farmed	Share-cropped	Vegetable gardens and barley fields	Plots	Land under cover of montados/olive grove
Observed values . . .	12,004	–	557	263	294	3 to 8	0 to 1	1
Percentage	–	–	100	47	53	–	–	–
Consistent solution .	12,973	110	594	248	346	7	1	1
Percentage	–	–	100	42	58	–	–	–

Source: Novais (2005).

Having once established the main management criteria, two paths are important. The first uses the consistent optimal solution to discuss the place of certain options in the economic rationality of *Casa de Ficalho* and the responses this *Casa* would have made to the historical changes in the decision-making environment. If the answers obtained from the model go in the same way as the behaviour of the large Southern landed estates, as observed in the historical record, we have a second validation of the model. These discussions are made by introducing significant variations to certain parameters and/or constraints of the model and interpreting the relative drift of the new solutions from the values observed for the *Casa de Ficalho*, together with a reflection on compiled documental information pertaining to it (Novais, 2005, pp. 214-232). To save space, we do not present these trials.

In a second path, it matters to clarify which economic result(s) is/are on average net farm revenue. As mentioned above, finding a conduct leading to the maximization of economic outcome is insufficient to conclude that we are facing capitalist management logic. To clarify the meaning of this

maximization objective, it is important to know whether this economic outcome includes a positive profit or not, what the value is (as well as the value of other economic categories), and the values of the main expenditure items of the *Casa*.

THE MANAGEMENT LOGIC OF THE *CASA DE FICALHO*

OWNER AND ENTREPRENEUR REVENUES

Tables 5 and 6 are the farm accounts, at current prices, of *Casa de Ficalho* during the 12 agricultural years for which we had information from receipts and expenditures for the main products: 1888/1889 to 1894/1895 and 1898/1899 to 1902/1903.¹⁵ We used the annual rates of 4%, 3%, and 2% for the normal interest of landed capital, 5% for fixed capital and 7% for working capital (Andrade, 1901; Basto, 1941, pp. 64-66; Castro, 1900; Matos *et al.*, 1982a; Ripamonti, 1888; and Ulrich, 1908).

Analysing the farming accounts of *Casa de Ficalho*, one can see that the operations gave the farm-owner a very positive net income, during five out of every six years (Table 5, line 18). This is an income above 3 million *réis* — i.e. an amount of money that was sufficient to purchase a 20 ha farm of the best soils of the region in every year.

The owner often earned a high net annual income, which in over half of the years, represented a higher return than alternative ventures of different nature and identical risk, where he applied his capital, i.e. he had a profit. The entrepreneur (the Earl of Ficalho) sometimes had considerable losses and sometimes had even greater profits. Certainly, when appreciating these profits and losses, the Earl would have found them greater or smaller depending on the return he expected from his landed capital. Using the interest rates of 4%, 3%, and 2%, the relationship between number of years with loss and years with profit is respectively 5:7, 4:8, and 4:8 (Table 5, lines 24, 24', and 24''). Parreira Cortez mentions the alternation of gains and losses with a positive balance in its journals: “[...] the system of lending capital to the land [...] I am convinced, is pay infallible in spite of alternating between faulty and abundant, but it always pays with good interest the capital that lent to it” (Matos *et al.*, 1982a, p. 287).

¹⁵ The option for current prices is justified by the problems with the use of the price index calculated by Justino (1988 and 1990). The pros and cons of this option are discussed in Novais (2005, pp.236-237).

Farming accounts and economic results of *Casa de Ficalho* (at current prices)

Unit: 1,000 réis

[TABLE 5]

	Farm year											
	1888/89	1889/90	1890/9	1891/9	1892/9	1893/9	1894/9	1898/9	1899/0	1900/0	1901/0	1902/0
1 Gross value of production	22,547	11,143	15,376	19,629	23,846	17,422	12,451	27,471	29,468	25,567	27,905	35,691
2 Intermediate consumption	553	762	1,017	519	697	596	638	1,086	1,270	1,698	2,035	1,286
3 Self supply (seeds, feeds)	1,730	771	1,426	1,702	2,154	2,271	1,638	1,122	1,902	2,307	2,376	1,715
4 Gross value added [1-2-3]	20,264	9,610	12,933	17,408	20,995	14,555	10,175	25,250	26,297	21,562	23,494	32,690
5 Taxes	58	58	58	56	56	85	61	62	66	66	65	68
6 Sales of pasturages and outputs of extractive activity	9	24	10	11	0	5	27	8	31	72	8	2
7 Gross farm income [4-5+6]	20,215	9,576	12,885	17,364	20,940	14,475	10,141	25,197	26,262	21,569	23,436	32,623
8 Maintenance and repairs expenses + purchase of work livestock	109	487	242	204	323	275	353	432	580	519	510	515
9 Depreciation (equipment and buildings)	14	13	13	13	12	12	12	11	68	202	249	256
10 Net farm income [7-8-9]	20,092	9,076	12,630	17,147	20,604	14,188	9,777	24,753	25,614	20,847	22,678	31,853
11 Wages in kind	2,808	2,899	2,900	3,220	3,110	3,370	2,970	3,783	3,985	4,018	3,853	4,285
12 Cash wages + retirement pension and other benefits	5,232	4,402	4,595	5,243	6,010	5,045	4,644	6,547	5,765	7,747	7,962	8,212
13 Offers in kind and deteriorated products	1	1	0	0	0	0	0	0	0	0	0	52
14 Land rent or foro in kind	369	471	429	474	488	474	428	520	543	527	483	618
15 Cash land rent or foro	84	50	43	39	90	39	456	203	60	88	167	56
16 Land taxes	1,785	1,161	558	184	1,271	2,079	1,463	1,432	92	1,545	1,551	1,595
17 Interest on borrowed-capital/ accommodation bill cost	1	1	1	2	3	1	1	2	2	4	4	4
18 Net farmer income [10-11-12-13-14-15-16-17]	9,812	90	4,104	7,983	9,632	3,179	-186	12,320	15,167	6,919	8,658	17,031
19 Interest on land (at 4 %)	5,317	5,317	5,317	5,317	5,317	5,317	5,336	5,348	5,402	5,456	5,537	5,565
20 Interest on self-owned working capital	445	386	394	407	497	498	442	529	498	645	665	644
21 Interest on fixed capital	1,089	1,089	1,089	1,089	1,089	1,089	1,089	1,089	1,089	1,089	1,089	1,089
22 Management income [18-19-20-21]	2,961	-6,703	-2,697	1,170	2,729	-3,726	-7,053	5,353	8,178	-272	1,367	9,733
23 Contingency fund (2 % of EE)	209	187	204	218	246	231	205	259	271	330	340	325
24 Profit [22-23]	2,752	-6,889	-2,901	952	2,483	-3,957	-7,258	5,095	7,907	-601	1,027	9,407
25 Land income [10-11-12-13-17-20-21]	10,516	297	3,650	7,185	9,894	4,184	630	12,856	14,274	7,344	9,105	17,566

	Farm year												
	1888/89	1889/90	1890/9	1891/9	1892/9	1893/9	1894/9	1898/9	1899/0	1900/0	1901/0	1902/0	
26 Return on self-owned capital [18]	9,812	90	4,104	7,983	9,632	3,179	-186	12,320	15,167	6,619	8,658	17,031	
19 Interest on land (at 3 %)	3,988	3,988	3,988	3,988	3,988	3,988	4,002	4,011	4,051	4,092	4,153	4,174	
22 Management income [18-19'-20-21]	4,290	-5,373	-1,367	2,499	4,058	-2,396	-5,719	6,690	9,528	1,092	2,751	11,124	
24 Profit [22'-23]	4,081	-5,560	-1,571	2,281	3,812	-2,628	-5,924	6,432	9,257	763	2,411	10,799	
19 Interest on land (at 2 %)	2,659	2,659	2,659	2,659	2,659	2,659	2,668	2,674	2,701	2,728	2,768	2,782	
22 Management income [18-19"-20-21]	5,619	-4,044	-38	3,828	5,388	-1,067	-4,385	8,028	10,879	2,456	4,135	12,515	
24 Profit [22"-23]	5,410	-4,231	-242	3,610	5,141	-1,298	-4,590	7,668	10,608	2,126	3,796	12,190	
Net value of share of sharecropping	1,830	1,037	2,270	1,335	1,964	2,895	1,892	1,997	1,861	2,659	2,490	2,054	

Note: EE — effective expenditure [2+3+8+9+11+12]

Source and methodology, see Novais (2005)

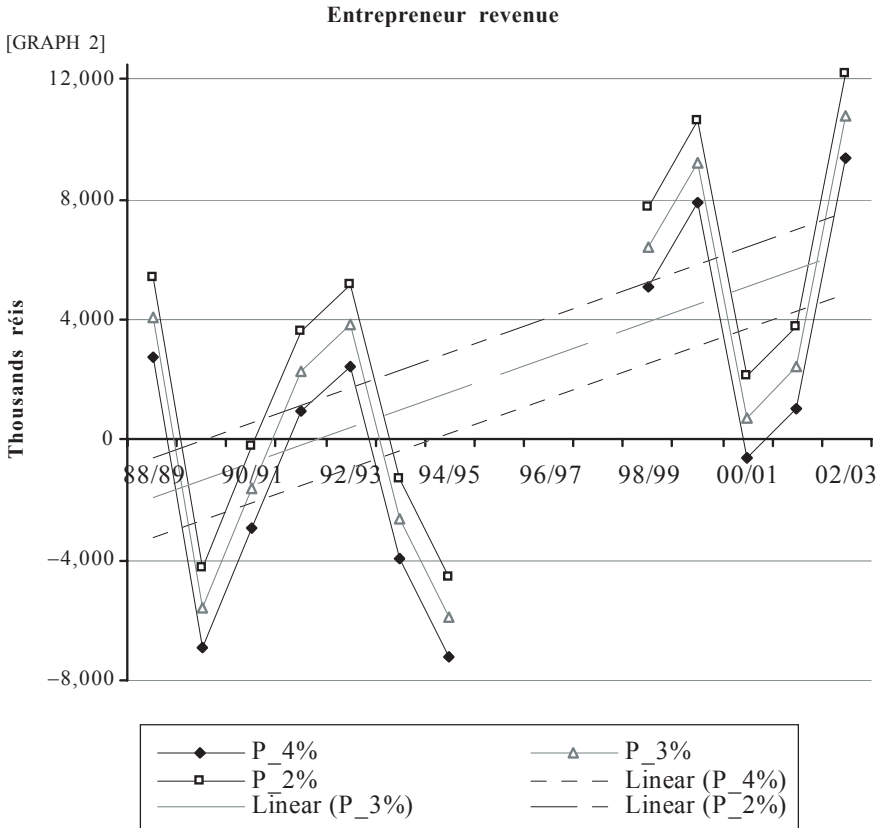
Farming economic results of Casa de Ficalho (at current prices)

[TABLE 6]

	Farm year											
	1888/89	1889/90	1890/91	1891/92	1892/93	1893/94	1894/95	1898/99	1899/00	1900/01	1901/02	1902/03
Rate of farm patrimony's profitability [(SNVS + IL + P) / FLPV]	7.45	-0.40	3.53	5.72	7.35	3.20	-0.02	9.30	11.23	5.51	6.54	12.24
The ratio of landowner to entrepreneur revenue [(SNVS + IL) / P]												
at IL rate of 4%	2.6	-0.9	-2.6	7.0	2.9	-2.1	-1.0	1.4	0.9	-13.5	7.8	0.8
at IL rate of 3%	1.4	-0.9	-4.0	2.3	1.6	-2.6	-1.0	0.9	0.6	8.9	2.8	0.6
at IL rate of 2%	0.8	-0.9	-20.4	1.1	0.9	-4.3	-1.0	0.6	0.4	2.5	1.4	0.4
Rate of self-owned capital profitability:												
[(Return on self-owned capital / self-owned capital) X 100]	8.72	0.22	5.79	7.30	8.78	4.47	-0.42	10.34	12.19	7.23	8.12	12.64
Rate of landed capital profitability												
[(Land income / landed capital) X 100]	13.48	3.40	9.63	9.46	13.42	11.91	6.20	15.64	16.14	13.24	13.83	18.58
Rate of profit [P / Total capital]												
at IL rate of 4%	2.45	-16.57	-4.09	0.87	2.26	-5.56	-16.28	4.28	6.35	-0.63	0.96	6.98
at IL rate of 3%	3.63	-13.38	-2.22	2.09	3.47	-3.69	-13.29	5.40	7.44	0.80	2.26	8.01
at IL rate of 2%	4.81	-10.18	-0.34	3.30	4.69	-1.83	-10.30	6.52	8.52	2.22	3.56	9.05

Note: SNVS — The share net value of sharecropping, at selling price, received by the Casa de Ficalho; IL — Interest on land; P — Profit; FLPV — Farm land property value. Source and methodology, see Novais (2005).

Graph 2 shows three profit curves, for interest rates on landed capital of 4%, 3%, and 2% (P_4%, P_3%, and P_2%), and their linear trends. Although these represent a small percentage of the profit variability (see low R² values), they show what the decision maker should expect, at least (if that interest rate were 4%) a result between a loss of around 3 million réis and a profit of around 5 million réis; at the best (if that interest rate were 2%) a profit of around 7.5 million réis.



Trend line	Equation	R ²	Minimum	Maximum
Linear (P_4%)	$y = 575.69x - 3,728.6$	0.2910	-3,152.910	4,906.750
Linear (P_3%)	$y = 570.27x - 2,273.3$	0.2932	-1,703.030	6,280.750
Linear (P_2%)	$y = 574.79x - 980.79$	0.2934	-406	7,641.060

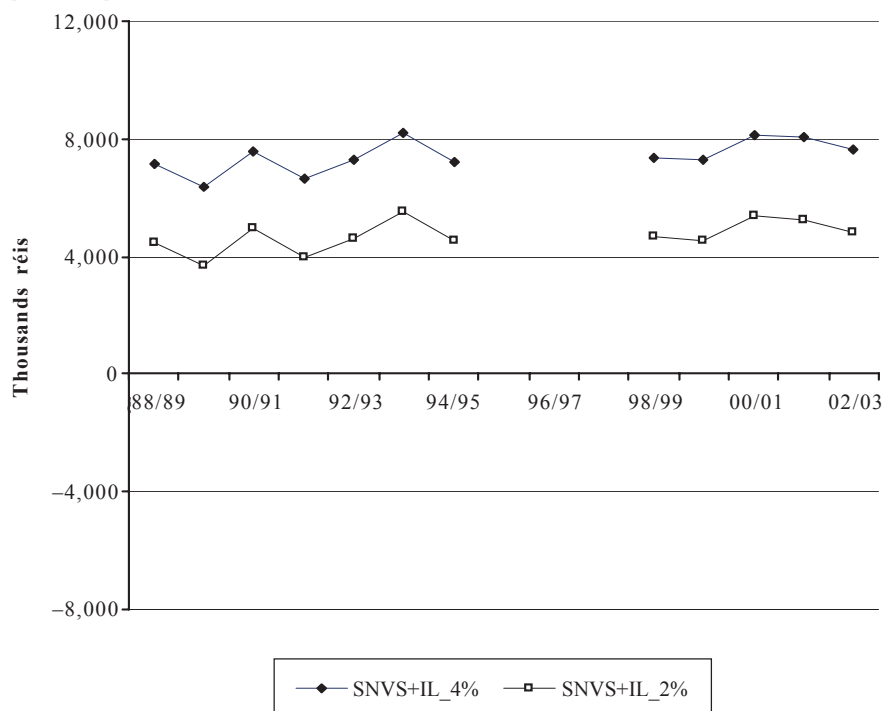
Since the value of profit is positive in most years, we cannot reject the hypothesis that an entrepreneurial logic underpins the owner-farmed management of *Casa de Ficalho*. The existence of numerous years with ex-

pected loss, however, raises the possibility of profit not being the main economic criteria in the management of the *Casa*.

The Earl of Ficalho was also the owner of the lands he exploited directly and those assigned to sharecroppers. As owner, he received revenue made up of landed capital interest (IL) and net value of sharecropping shares (SNVS). As an entrepreneur, he earned the profit of direct farming; the total corresponds to the return on the patrimony application in his agricultural household and is designated “annual revenue of patrimony” (ARP). In the 12 agricultural years for which we have accounts, the landowner revenue is one of the most stable economic results, in spite of annual fluctuations (Table 5 and Graphs 2 and 3). It compensates the entrepreneur’s losses, except in one or two years (1889/1890 and 1894/1895 — cf. Graph 4).

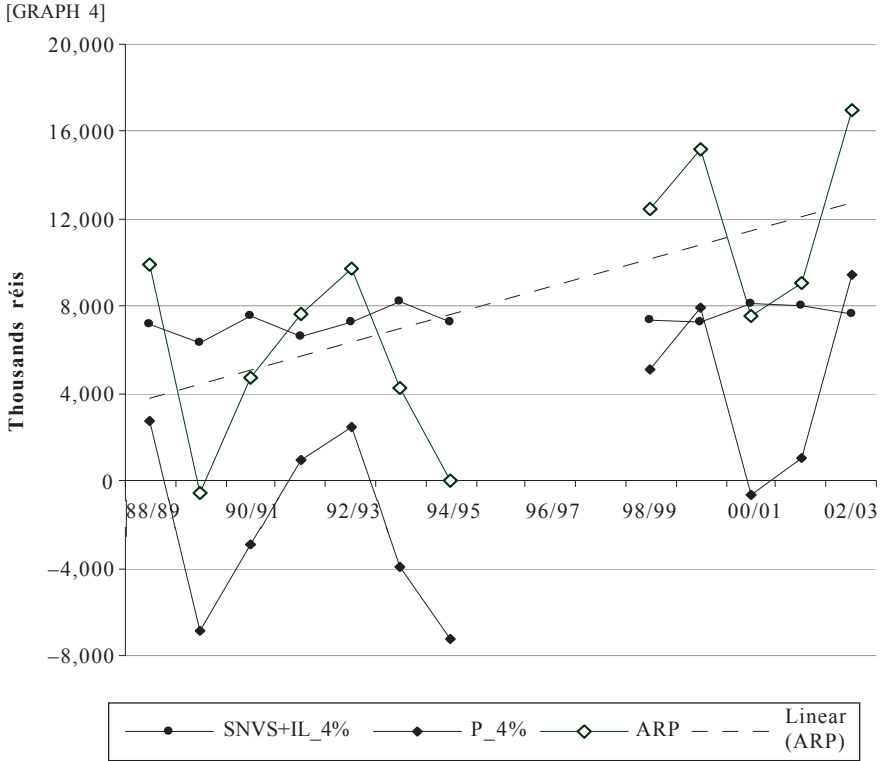
Landowner revenue

[GRAPH 3]



As a trend, the annual revenue of the patrimony of the agricultural household assumes a value between 4 and 13 million *réis* (Graph 4); again these numbers are not robust indicators since the trend lines have low R^2 values.

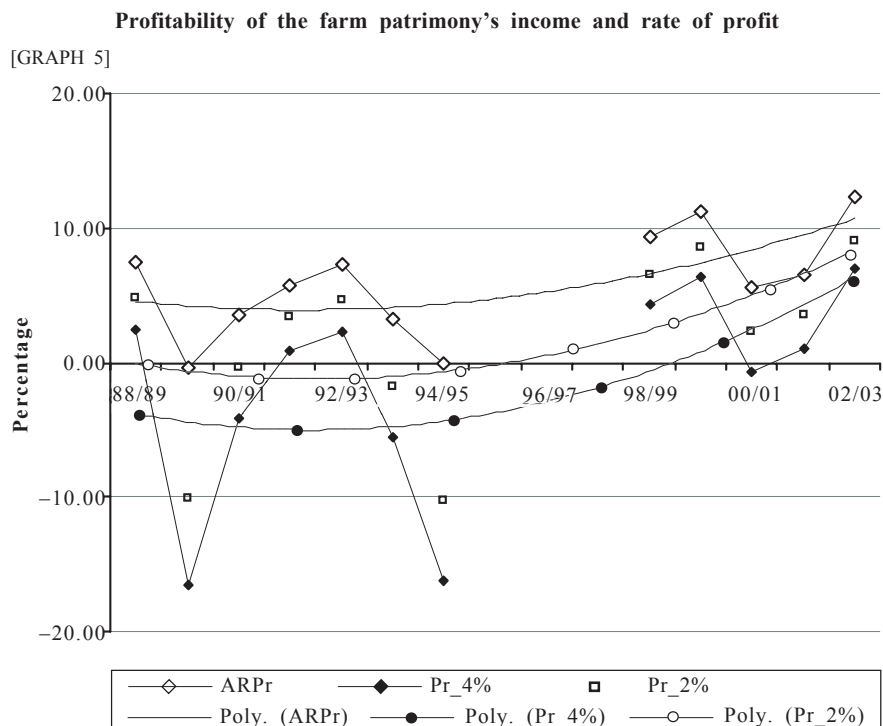
Annual revenue of the farm patrimony, landowner, and entrepreneur revenue



Trend line	Equation	R ²	Minimum	Maximum
Linear (ARP)	$y = 640.2 x + 3,108.8$	0.35	3,749.000	12,712.800

Profits were frequently a minor part of the annual revenue of patrimony, at any of the interest rates used (Table 5 and Graph 4): 10 out of 12 years, for 4% interest rate on landed capital, 7 out of 12 years, for 2% interest rate. Notice that, excluding the years of loss, the value of landowner revenue was 1.4 to 8.9 times the profit value, and that when profit is higher it never triples the landowner revenue for the same three interest rates. It is not surprising that, on a farm that made very little use of borrowed capital, profit rates (Pr = profit/total capital of the firm) were often very small when compared to rates of annual revenue of patrimony [ARPr = (value of sharecroppers' share + interest on landed capital + profit)/value of farm land property]. The last tends to assume values between 4% and 10% (Graph 5). Greater return rates are found for own capital, between 5% and 12%, and

for landed capital, between 8% and 18% (Table 6). These values agree with some mentioned in the sources of the time.¹⁶



Trend line	Equation	R ²	Minimum
Poly. (ARPr)	$y = 0.0015x^4 - 0.0548x^3 + 0.7122x^2 - 3.3118x + 8.3546$	0.41	3.38
Poly. (Pr_4%)	$y = -0.0022x^4 + 0.0618x^3 - 0.4007x^2 + 0.1500x - 2.5538$	0.29	-5.58
Poly. (Pr_2%)	$y = -0.0018x^4 + 0.0498x^3 - 0.3202x^2 + 0.0669x + 1.0808$	0.30	-3.78

Notice that these rates have lower values in the first half of the 1890s and higher values in the later period, after the publication of the cereals law of 1899. For profit, this represents the transition from a period where losses dominated to a period of growing profits.

PATRIMONIAL WORTH

The economic results of the farm show that landed patrimony was the focal point of the management strategy of *Casa de Ficalho*. This means that,

¹⁶ The value mentioned by Ripamonti (1888, p. 38), for average agricultural revenue in 1887 was 10%, which is in the second interval. Matos *et al.* (1982a, pp. 86-87) computed annual rates of return to capital of 11% and 16% for the *Casa de Parreira Cortez*.

while running his farm, the Earl would not put his interests as landowner in second place and would refuse any options that reduced the worth of his estate.

In this double role of *landowner* and agricultural *entrepreneur*, our decision-maker did not see his economic result as the mere sum of interests (land rent plus profit). In the presence of the rigidity of the traditional agricultural production system, assigning land to sharecroppers was important, because of the interactions it had with owner farming, to maximize net revenue while minimizing economic risk: sharecroppers provide the owner with stubble and fallow grazing areas at very low cost, improving the conditions for livestock activities, namely swine raising. In turn, these activities also allow for the gain from products and subproducts from *montado* and olive groves (Novais, 2005, pp. 204-211).

Some authors make an association between the lack of entrepreneurial character of the large Southern landed estates and a low level of land improvement performance. The analysis of all the expenses the Serpa manager recorded in the account books shows that the sum of current farming expenses (except brush clearing and olive, holm oak, and cork oak pruning), rents, and *foros* on land plots and houses, taxes, and general expenses of the owner represents 86% of total expenses (Table 7). The rest of the expenditure items make up a low investment level, relative to total expenditure or available net income, i.e., net farmer income plus sharecropping shares.

Expenditure of *Casa de Ficalho*

[TABLE 7]

Expenditure items	Total of 12 years		88/89- -94/95	98/99- -02/03
	Value (10 ³ réis)	%	%	%
With land				
land exchanges and associated expenses	-697	-	-	-
foro discharging and associated expenses	411	0.6	-	-
acquisition of an olive-grove and associated expenses	652	-	0.5	0.6
Land clearing	5,898	3.2	0.0	4.2
Brush clearing (cereals, olive trees, and montados)	5,014	2.7	3.1	2.6
Planting (rooting-up, planting of slips, and trees and grafting)	106	0.1	0.1	0.0
Cleaning and pruning of trees (olive trees and montados)	4,254	2.3	2.1	2.4
Constructions (build and repair) in owner-farmed area	5,485	3.0	1.0	3.6
Constructions (build and repair) in rent-out area	66	0.0	0.0	0.0
Equipment (acquisition, transport, and repair)	181	0.1	0.0	0.1
Acquisition of work animals	2,742	1.5	1.9	1.3
Current farming expenses, (except brush clearing and tree pruning)	136,503	73.8	76.6	73.0
Land rents	7,199	3.9	4.4	3.7
Taxes	15,475	8.4	10.0	7.8
Repair work in the palace, garden, coach house, terrace, castle walls, and equipment	441	0.2	0.1	0.3
Repair work in the houses of Vila Verde de Ficalho	21	0.0	0.0	0.0
General expenses of the owner (non-agricultural)	423	0.2	0.2	0.2
Total expenditure	184,871	100.0	100.0	100.0

Source and methodology, see Novais (2005).

Some attention was given to brush clearing and tree cleaning, to buildings construction and repair and, in the last years, which witnessed a configuration of cereal protectionist policy, to land clearing. All of these investments sought to maintain or increase the productive capacity of the agricultural household, but had a close relationship with the preservation or growth of landed capital, and represented 11.3% of total expenditure. The non-land related investments, acquisition of equipment and animals, were minimal – 1.6% of total expenditure. The investment in property rights and new land did not reach 1% of total expenditure (1 million *réis*), about the same as the expense with conservation and improvement of the habitation/palace, its annex and garden. With regard to increasing his landholding, the Earl of Ficalho apparently followed his father's strategy of consolidation of property rights and enlargement of the land estate that was the farm centre.

In spite of the small investment in land in the municipality of Serpa, one can say that the Earl of Ficalho, heir to a large landed patrimony, managed his agricultural household using an underlying patrimonial logic.

COMPARING *CASA DE FICALHO* WITH OTHER NINETEENTH CENTURY LARGE LANDED ESTATES

To conclude this discussion, it is important to compare *Casa de Ficalho* to other large landed estates in the Iberian Peninsula at the time, studied by different authors.

First, *Casa de Ficalho* is similar to the large landed estates of Évora's economic elite and other landowners from Évora, of the second half of the 1800s, studied by Helder da Fonseca (1996). It is significantly smaller, however, than the agricultural households of owners, Eugénio de Almeida and José Maria dos Santos, described as capitalists of the Regeneration by some authors (e.g., Fonseca, 1996; Martins, 1992; Reis, 1993, pp. 181-226) (Table 8).

In the last quarter of the nineteenth century, the spatial distribution of land property belonging to *Casa de Ficalho* shows a group of contiguous large land-holdings around the Serpa village, which included the farm centre. It was built up through successive annexations of several neighbouring properties improving on each other's value. The latest purchases and exchanges of lands were made along with the consolidation of property rights that lasted up to the 1890s. Therefore, it seems that the owners of *Casa de Ficalho* followed "the common approach used in land acquisition", realized by members of Évora's economic elite and other major Southern landowners: 1) the acquisition of adjacent properties to the large estates owned and/or farmed by the landowners; 2) the consolidation of property titles by

means of the purchase of dispersed property titles and the remission of *foros* and pensions (Fonseca, 1996, p. 345 and 2003).¹⁷

Estate value of landowner in the last quarter of the nineteenth century

[TABLE 8]

Landowners	Estate Value (millions of réis)	
	Value	Total
Earl of Ficalho (Serpa – 1888/03) (a)	133 to 139	
Parreira Cortez (Serpa – 1872/86) (b)	100 to 205	
Elite of Évora (1880/05) (c)		109.3 ± 198.8
Six holders of the economic elite of Évora (1880/05) (d)	208.1 ± 266.3	254.4 ± 308.3
Margiochi [Évora, heritage of father-in-law Eugénio de Almeida] (1872)(e)	266	
José Maria dos Santos (1878) (f)	328.7	355.7
Eugénio de Almeida (1871) (g)		1,391.3

Sources: (a) C. C. F, *portfolio* n.º 8; Venal value in certificate of property register. (b) Imputed values by Parreira Cortez (Matos *et al.*, 1982a, p. 81). (c) Fonseca (1996, pp. 480-490 [Appendix, table XI]). (d) Fonseca (1996, pp. 491-492 [Appendix, table XIII]). (e) Fonseca (1996, pp. 491-492 [Appendix, table XIII]). (f) Martins (1992, pp. 399-401 [Appendix III]); we discount 58 million réis, as a minimum value attached to agricultural implements, livestock, and so on. (g) Reis (1993, p. 202 [table 26]).

Like most members of Évora’s economic elite and the other Portuguese large landholders mentioned above, who kept an interest in “direct use of the land,” the Earl of Ficalho conducted owner-farming, delivered part of the land to sharecropping, and rented out the more distant lands or small plots. He was the landlord of the large holdings that he exploited in the Serpa municipality, i.e., did not take land for rent, differing in this respect from most of those agricultural households, which were also tenants.¹⁸ Parreira Cortez also did not take land for rent, considering it “a less profitable form of agriculture” because of the costs and uncertainty on being able to collect the results of investments made. Occasionally he gave the usufruct of small lots of some land holdings with the obligation to conduct, within a timeframe, several land improvements (opening of drainage ditches or brush clearing), and rented out a large landholding for pasture or cropping, with “the obligation of maintaining and bringing up *montados*” (Matos *et al.*, 1982a, p. 49-50).

¹⁷ Also on households of Parreira Cortez, see Matos *et al.* (1982a), Eugénio de Almeida (Reis, 1993), and José Maria dos Santos (Martins, 1992). On clear strategies of land sale and purchase in house-holdings of Salamanca and Ciudad Rodrigo, see (Serrano, 2002) and in Navarra (Lana, 2002).

¹⁸ To rent out was a profitable business in the 2nd half of the 1800s (Fonseca, 1996, pp. 368-374).

We believe that the contract between *Casa de Ficalho* and one of its tenants included a similar system, but, in this case, aimed at the development of an olive grove. In another context, Lana Berasaín detects a gradual erosion over the nineteenth century of the rent option in favour of direct management of olive groves and vineyards. This erosion, relative and not absolute, was accompanied by changes in terms and conditions of the leases favouring shorter periods and rental of detached lots to a greater number of tenants (Lana, 2002, pp. 177-178).

Most of Évora's large landowners chose to reside in this city, the main regional centre of business. However, in spite of not being very distant from their farms, they do not forgo the work of a bailiff or local responsible person for the daily farm management. Administrators and managers had an indispensable role in achieving the goal of management to *increase production and land rent* in those large estates, which continued to rent out their land or to let them out in a sharecropping regime (Garrabou *et al.*, 2002; and Serrano, 2002). In the case of *Casa de Ficalho*, the presence of the manager was, moreover, necessary for the smooth running of his farm, as is confirmed in the ledgers and records of the main productions and sowings. The written accounts are an important basis for perfecting the management of farming in a landholding that was as complex as that of the *Casa de Ficalho*.

In the assessment made concerning how this *Casa* managed its farm, Hélder Fonseca's description about the behaviour of the large agricultural households of Évora in the nineteenth century seems appropriate, "they gradually stressed the mixed nature of their farming, integrating more area and new productive components into the large farm. This approach did not radically change the production system linked to the cereals, but it resulted in the enlargement and intensification of the productive area, to greater product diversification, the improvement of facilities and technical apparatus and some important progress" (Fonseca, 1996, p. 388).

Indeed, the production system practiced by the agricultural household of *Casa de Ficalho* was characterized by a complexity and diversity of productive activities, at least equivalent to those described by Fonseca (1996). During the study period, unlike Évora's agricultural households, which retained the interest in wine production, *Casa de Ficalho* seems to have turned its focus instead towards the cultivation of olive trees, which are clearly suited to the pedological and climatic conditions of Serpa. The intensification of cereal production, common to the large farms in the municipality of Beja (Péry, 1883), expressed itself in the practice of regular crop rotation, biennial or triennial in the best wheat land, the production of grain legumes in the tilled fallow sheet, and the cropping on land under cover. *Casa de Ficalho* disinfected seeds, continued to fertilize the land with manure,

avoided organic fertilizers such as guano or others of urban origin, and, at the turn of the century, experimented with the application of chemical fertilizers. Part of the soil tillage was performed with modern iron plough, present in the 1800s agricultural households studied, and he purchased a *threshing-tool*,¹⁹ possibly even a more advanced device. He postponed the introduction of the threshing-machine and the mechanical harvester, unlike a few other large farms (Radich, 1996, p. 134). The purchase price of some cattle- and mule-breeders points to some selection of work livestock, which is also reflected in more careful feeding of these animals and the production livestock. At the turn of the century, he introduced pig and sheep vaccination; improved the existing livestock facilities, and erected new buildings; compacted or extended, by grafting or purchase, the olive groves, and invested in improving the quality of the oil produced, as can be deduced from the upgrading of the oil press and the storage houses for olive husk, the replacement of some oil-press equipment, and the classification of the olive oil sold after 1900.²⁰ He carried out regular brush clearing and pruning of trees in olive groves and *montados*, and from the late 1880s, intensified brush clearing and began land clearing with hired workers from the Beira region, integrating “the land clearing movement” that “ran through [...] all the Alentejo” (Fonseca, 1996, p. 402) in the last two decades of the nineteenth century. As in other agricultural households studied (Matos *et al.*, 1982a; Fonseca, 1996; Martins, 1992; and Lana, 2002), he built and repaired farm walls, repaired and cleaned wells and ponds, opened ditches and wooded water lines, built, restored, or repaired homes in the social areas (workers’ housing) of the land holdings, journeyman houses, various types of facilities for livestock and storage of agricultural products, and accesses to them.

From this comparative summary focused on common features and the most revealing of the agricultural dynamics, we note that despite the peculiarities of this case and the context and uniqueness of the owner, *Casa de Ficalho* managed the large landed estate and organized its agricultural operations according to guidelines very similar to those of other contemporary large landed estate-owners.

A second observation is a reminder that the enumeration of various innovations and improvements may provide an image of dynamic change inconsistent with reality. We have seen the Earl of Ficalho’s preoccupation

¹⁹ Basically a wooden cylinder with iron teeth, pulled by traction animals, with which one threshes the grain on the threshing floor.

²⁰ In the last quarter of the nineteenth century, investments in olive grove or vineyard were made by other large agricultural holdings of Évora (Fonseca, 1996), Lisboa (Martins, 1992), San Adrián (Lana, 2002), and Sevilha (Florencio, 2002).

with the adoption of new techniques and agricultural practices, a view shared by Francisco Margiochi. This man, a landowner from Évora and agronomist, in submitting his plans for activities on one of his farms, elucidated that it was not his intention to “change the [regional] farming system, because as vicious as it is, it always represents more or less the conditions and circumstances that determined its adoption” (Fonseca, 1996, p. 351).

More accurate than the views are the numbers. Adding the cost of all improvements and investments made by *Casa de Ficalho* over the 12 years analysed, we reach a number that represents, as we have seen, a small proportion of total expenditure, but also of the accumulated income available for the entrepreneur-owner — “net farmer income”. We observed that this ratio calculation is in excess, due to the impossibility of distinguishing repair and maintenance of buildings from works that embodied new investments (Table 9). The Earl of Ficalho invested in his property of Serpa only about one sixth of the accumulated income of the farm patrimony, which tended to vary between 4 and 13 million *réis* annually (Graph 4). The value applied to farm improvements was equal to about one quarter to one sixth of his income as *landowner*, or two fifths to double that of the entrepreneur profit, depending on the interest rate of landed capital.

Economic results and investments in the *Casa de Ficalho*

[TABLE 9]

Economic results	Accumulated investment costs in accumulated results in 12 years (%)	
	(1)	(2)
Net farmer income (available income)	16.2	15.6
Annual income of the farm patrimony (SNVS + IL + P)	15.8	15.3
At interest rate of landed capital – 4 %		
Owner revenue (SNVS + IL)	17.2	16.6
Profit (P)	191.0	184.4
At interest rate of landed capital – 2 %		
Owner revenue (SNVS + IL)	27.1	26.1
Profit (P)	38.0	36.7

(1) Acquisition expenses of property rights, land clearing, tree plantings, grafting, buildings, repairs, new agricultural implements, equipment, and working livestock. (2) Previous expense value less the buildings and repair expenses made in large land holdings rented out and urban proprieties.

Source and methodology, see Novais (2005).

compare the proportion of investments in *Casa de Ficalho* with those of other large farms of Alentejo at that time.

However, available studies show that the owners of the large Southern landed estates in the nineteenth century were involved in a variety of business, “from the modern and traditional industry to mines, finance, banking and trade” (Fonseca, 1996 p. 429).²¹ That diversification strategy did not prevent a trend toward concentration of wealth in real estate holdings, i.e. the strengthening of “their interests in the agricultural sector through the acquisition of land and farming.” The authors of these studies interpret this bet on the lease and the direct use of the land as the most reliable and profitable business for the capital in the Portuguese economic environment of that period, considering “the association made between the accumulation of land and the diminishing rent-seeking spirit of aristocratic tradition [...]” (Fonseca, 1996, pp. 428-429).²²

The significance of the two key terms, profitability and security, in the organization and management of the large agricultural households, is precisely what was analysed. The profitability, as the pursuit of greater economic net result of the farm, was the starting point for this study. The debate revolved around the fact that this objective can be pursued without justifying the association of the farm enterprise to the capitalist enterprise model and the behaviour of the holder to the “entrepreneurial capitalist spirit.” The authors who studied the *Casa* of Parreira Cortez designated him as “farmer entrepreneur,” attributed him “some capitalist spirit” and said about him: “[he was] active and enterprising, focusing all his activity to achieve maximum profit with a minimum of production costs and an acceptable rate of return on capital.”²³

Adjusting the cropping accounts of this farm, as performed by Feio (1985, and 1988), we can determine the economic results obtained by that farmer between 1882/1883 and 1887/1888 (Table 10). They demonstrate the small plausibility of profit being an important guiding objective of the management of this farm: in those six years, three years are of loss, representing a total loss greater than the profit of the other three. This difference was even greater because, on cereal accounts, Feio included his gains from sharecroppers. However, even in years of losses in his farm, the farmer obtained from this a significant net income.

²¹ See also Reis (1993), Martins (1992), Florencio (2002); Moreno (2002), and Matos *et al.* (1982b, p. 89).

²² Another author does not emphasize land as one of the best investments, but sees it as a support giving more solvency and more affordability (Moreno, 2002, p. 248).

²³ Matos *et al.* (1982a, p. 89 and 1982b, p. 89) and Feio (1985 and 1988).

Farm results of Parreira Cortez (10³ réis) between 1882/1883 and 1887/1888

[TABLE 10]

Farm results by activity	Agricultural year						Average
	1882/83	1883/84	1884/8	1885/8	1886/8	1887/8	
Net farmer income (available net income)							
Sheep	313	877	815	1,045	-750	-114	364
Goats	-180	169	-186	-75	-373	-	-129
Pigs	1,464	1,947	1,578	976	1,078	1,470	1,419
Olive oil	575	1,655	1,745	45	690	4	786
Vineyard	-	-	-	65	45	24	46
Cereals and grain legumes	6,546	2,181	2,302	1,782	1,008	2,230	2,674
<i>Total</i>	8,718	6,829	6,254	3,838	1,698	3,614	5,160
Profit							
Sheep	-340	309	243	495	-1,365	-694	-225
Goats	-357	-7	-381	-172	-474	-	-278
Pigs	-688	-191	-1,135	-974	-912	-442	-724
Olive oil	220	1,276	1,361	-284	335	-325	431
Vineyard	-	-	-	14	-6	-27	-5
Cereals and grain legumes	4,889	261	399	-995	-1,566	-192	465
<i>Total</i>	3,724	1,648	487	-1,916	-3,988	-1,680	-336

Source: Feio (1985) and Feio (1988).

CONCLUSIONS

This study shows that the owners of large landed estates organized and ran their farms in order to obtain the greatest return on their patrimony, understanding the patrimonial income as a sum of the interest on land capital, the earnings from sharecropping arrangements, and profit. By combining the two strategies — owner farming and sharecropping — they made additional benefits in net income to their farms.

Land was considered a safe investment. In the words of Eugénio de Almeida, “[it is] safer and more risk-free” than any other business (Reis, 1993, p. 210). In an agriculture characterized by strong variability of the vegetable productions (resulting from the South’s pedological and climatic conditions and from a technology, the only one available, that left the farmer largely dependent on Nature), the safety of investment in the direct use of the land was not so evident. Moreover, “lower risk” and “higher profitability” are often two conflicting objectives.

We also showed that one way of resolving the conflict between those two goals was the compromise. Therefore, if the case of the Earl of Ficalho can be extended generally, the owners of the large Southern landed estates in the last quarter of the nineteenth century guided the management of their

farms mainly by a compromise between the maximization of the farm net income (as concluded, patrimonial income) and the minimization of economic risk. They considered these two objectives differently, as they gave greater importance to the security of income than to obtaining higher income. In the socio-economic context of the time (abundance of labour, labour contracts with supply of food or payment in kind, small market for production inputs, amongst other characteristics), that compromise led to the organization of dry land production systems that were very diverse, complex, and of high rigidity. The avoidance of techniques with a profitability threshold that involved a striking reassessment of activities can be explained largely by the rigidity.

In short, at the end of the nineteenth century, the economic rationality of the large Southern landed estates included the configuration of a management technique and goals conducted in such a way as to maximize the available net income and minimize the economic risk of the agricultural farm, in a patrimonial logic framework.

BIBLIOGRAPHY

- A REDACÇÃO DO BOLETIM DA RACAP (1899), “Sciencia e Rotina”. *Boletim da Real Associação Central da Agricultura Portuguesa*, vol. I, 5, pp. 225-227.
- ALAEJOS, A. M. and CAÑAS, J. A. (1993), “Selección de planes de cultivo en contexto de riesgo mediante el modelo Media-DAP”. *Investigacion Agraria: Economia*, vol. 8 (2), pp. 165-183.
- AMARAL, L. (2009), “Old but new questions: back to the passage from *Ancien Régime* to Liberalism in Portugal nineteenth century”. In J. Braga de Macedo *et al.* (org.), *Nove Ensaios na Tradição de Jorge Borges de Macedo*. Lisboa, Tribuna da História, pp. 101-132.
- ANDRADE, A. (1901), “Um capítulo do ‘Portugal Económico’”. *Boletim da Real Associação Central da Agricultura Portuguesa*, vol. III, 10, pp. 501-513.
- BALABANIAN, O. (1980), *Les exploitations et les problèmes de l’agriculture en Estrémadure espagnole et dans le Haut-Alentejo: contribution à l’étude de campagnes méditerranéennes* (2 vols.), n.l., n.e.
- BAPTISTA, F. O. (1980), “Economia do latifúndio – o caso português”. In A. de Barros (coord.), *A Agricultura Latifundiária na Península Ibérica*, Oeiras, Instituto Gulbenkian de Ciências/Centro de Estudos de Economia Agrária, pp. 341-372.
- BAPTISTA, F. O. and SANTOS, R. T. (2005), *Os Proprietários Florestais*, Oeiras, Celta Editora.
- BARROS, H. (1980), “O latifúndio: tentativa de caracterização económica”. In A. de Barros (coord.), *A Agricultura Latifundiária na Península Ibérica*, Oeiras, Instituto Gulbenkian de Ciências/Centro de Estudos de Economia Agrária, pp. 15-27.
- BASTO, E. A. L. (1941), “A propriedade rústica”. *Anais do Instituto Superior de Agronomia*, vol. XII (1), pp. 7-170.
- BERBEL, J. (1988), “Target returns within risk programming models: a multi-objective approach”. *Journal of Agricultural Economics*, 39 (2), pp. 263-270.
- BERBEL, J. (1989), “Analysis of protected cropping: an application of multiobjective programming technique to Spanish horticulture”. *European Review Agriculture Economics*, 16(2), pp. 203-216.
- BERBEL, J. (1993), “Risk programming in agriculture systems: a multiple criteria analysis”. *Agriculture Systems*, 41, pp. 275-288.

- BOUSSARD, J.-M. (1987), *Economie de l'agriculture*, Paris, Economica.
- CASADO ALONSO, H. and ROBLEDÓ HERNÁNDEZ, R. (eds.) (2002), *Fortuna y Negocios: Formación y Gestión de los Grandes Patrimonios (siglos XVI-XX)*, Valladolid, Universidad de Valladolid, Secretariado de Publicaciones e Intercambio Editorial, pp. 9-20.
- CASTRO, L. DE (1900), "Le Crédit Agricole et le Mouvement Associatif Rural". In B. C. C. da Costa and D. L. de Castro, *Le Portugal au Point de Vue Agricole*, Lisbonne, Imprimerie Nationale, p. 857-911.
- CONDE DE ARNOSO (1998), "Elogio do conde de Ficalho, lido na sessão especial da Sociedade de Geografia de Lisboa em 19 de Maio de 1903 pelo conde de Arnoso". In conde de Ficalho, *Dispersos*, Lisboa, Universitária Editora, pp. 33-43.
- FEIO, M. (1985), "Uma grande lavoura de Serpa na segunda metade do século XIX. A cultura dos cereais e dos legumes". *Finisterra. Revista Portuguesa de Geografia*, Lisboa, XX (40), pp. 207-266.
- FEIO, M. (1988), "Uma grande lavoura de Serpa na segunda metade do século XIX. Os gados e a rendibilidade dos principais sectores da exploração". *Finisterra. Revista Portuguesa de Geografia*, Lisboa, XXIII (45), pp. 55-100.
- FLORENCIO PUNTAS, A. (2002), "Patrimonios indianos en Sevilla en el s. XIX: entre la tradición y la innovación". In H. Casado Alonso and R. Robledo Hernández (eds.), *Fortuna y Negocios: Formación y Gestión de los Grandes Patrimonios (siglos XVI-XX)*, Valladolid, Universidad de Valladolid, Secretariado de Publicaciones e Intercambio Editorial, pp. 191-215.
- FONSECA, H. A. (1996), *O Alentejo no Século XIX. Economia e Atitudes Económicas*, Lisboa, Imprensa Nacional-Casa da Moeda.
- FONSECA, H. A. (1998), "Elites agrárias e crescimento económico na periferia portuguesa do século XIX: o exemplo do Alentejo na era liberal (1850-1910)". *Análise Social*, xxxiii (146-147), pp. 497-538.
- FONSECA, H. A. (2003), "Agrarian elites and economic growth in nineteenth-century Portugal: the example of the Alentejo in the Liberal era (1850-1910)". *Social History*, 28 (2), pp. 202-226.
- GARRABOU, R., PLANAS, J. AND SAGUER, E. (2002), "Administradores, procuradores y apoderados: una aproximación a las formas de gestión de la gran propiedad agraria en la Cataluña contemporánea". In H. Casado Alonso and R. Robledo Hernández (eds.), *Fortuna y Negocios: Formación y Gestión de los Grandes Patrimonios (siglos XVI-XX)*, Valladolid, Universidad de Valladolid, Secretariado de Publicaciones e Intercambio Editorial, pp. 301-321.
- GODELIER, M. (n/date), *Racionalidade e Irracionalidade na Economia*, Rio de Janeiro, Ed. Tempo Brasileiro.
- GOMES, M. d' A. (n/date), *Informação Histórica a Respeito da Evolução do Ensino Agrícola Superior*, Lisboa, Editorial Inquérito Limitada.
- GRAÇA, L. L. (1995), *Propriedade e Agricultura. Evolução do Modelo Dominante de Sindicalismo Agrário em Portugal*. Phd, Lisboa, Universidade Técnica de Lisboa, Instituto Superior de Agronomia.
- HESPANHA, P. (1983), "Através dos campos dos senhores da terra. Notas para o estudo da grande lavoura alentejana oitocentista". *Revista Crítica de Ciências Sociais*, 11, pp. 61-80.
- JUSTINO, D. (1988), *A Formação do Espaço Económico Nacional. Portugal 1810-1913*, vol. I, Lisboa, Vega.
- JUSTINO, D. (1990), *Preços e Salários em Portugal (1850-1912)*, Lisboa, Banco de Portugal.
- LANA BERASÁIN, J. M. (2002), "Afanes y recompensas del cuitado señor don José María Magallón y Armendáriz, o la remodelación de un patrimonio aristocrático en siglo XIX". In H. Casado Alonso and R. Robledo Hernández (eds.), *Fortuna y Negocios: Formación y Gestión de los Grandes Patrimonios (siglos XVI-XX)*, Valladolid, Universidad de Valladolid, Secretariado de Publicaciones e Intercambio Editorial, pp. 165-189.

- MARTINS, M. C. A. (1992), “Opções económicas e influência política de uma família burguesa oitocentista: o caso de São Romão e José Maria dos Santos”. *Análise Social*, xxvii (116-117), pp. 367-404.
- MATOS, A. C., MARTINS, M. C. A. and BETTENCOURT, M. L. (1982a), *Senhores da Terra. Diário de um Agricultor Alentejano (1832-1889)*, Lisboa, Imprensa Nacional-Casa da Moeda.
- MATOS, A. C., MARTINS, M. C. A. and BETTENCOURT, M. L. (1982b), “Um empresário agrícola oitocentista”. *Revista de História Económica e Social*, 10, pp. 87-93.
- MORENO LÁZARO, J. (2002), “Capitalismo agrario y empresa en Castilla la Vieja: La familia Guerra, 1814-1976”. In H. Casado Alonso and R. Robledo Hernández (eds.), *Fortuna y Negocios: Formación y Gestión de los Grandes Patrimonios (siglos XVI-XX)*, Valladolid, Universidad de Valladolid, Secretariado de Publicaciones e Intercambio Editorial, pp. 217-249.
- MUNIER, B. (1994), “Décision et cognition”. *Revue française de gestion*, Juin-Juillet-Aout, pp. 79-91.
- MUNIER, B. (1995), “Entre rationalités instrumentale et cognitive: contributions de la dernière décennie à la modelisation du risque”. *Revue d'économie politique*, 105 (1), pp. 6-70.
- NAREDO, J. M. (1980), “Algunas precisiones sobre la noción de ‘latifundio’ y el devenir de la agricultura ‘latifundiária’”. In A. de Barros (coord.), *A Agricultura Latifundiária na Península Ibérica*, Oeiras, Instituto Gulbenkian de Ciências/Centro de Estudos de Economia Agrária, pp. 303-340.
- NOVAIS, A. (2005), *Lucro, Renda, Património e Risco nas Casa Agrícolas do Alentejo no Final do Século XIX. A Casa de Ficalho*. Phd, Lisboa, Universidade Técnica de Lisboa, Instituto Superior de Agronomia.
- PEREIRA, M. (1980), “Algunas reflexões sobre a transformação económica da estrutura latifundiária”. In A. de Barros (coord.), *A Agricultura Latifundiária na Península Ibérica*, Oeiras, Instituto Gulbenkian de Ciências/Centro de Estudos de Economia Agrária, pp. 373-382.
- PEREIRA, Z. (2004), “Breyner, Francisco Manuel de Melo (1837-1903), 4.º conde de Ficalho”. In M. F. Mónica (dir.), *Dicionário Biográfico Parlamentar: 1834-1910. A – C*, Lisboa, Imprensa de Ciências Sociais and Assembleia da República.
- PÉRY, G. A. (1883), *Estatísticas Agrícolas do Distrito de Beja. Parte I, Concelho de Beja*, Lisboa, Imprensa Nacional.
- PETRUSEWICZ, M. (1989), *Latifondo. Economia morale e vita materiale in una periferia dell'Ottocent*, Venezia, Marsilio Editori.
- POLANYI, K. (1976), “La economía como actividad institucionalizada”. In K. Polanyi et al., *Comercio y Mercado en los Imperios Antiguos*, Barcelona, Labor Universitaria, pp. 289-316.
- RADICH, M. C. (1996), *Agronomia no Portugal Oitocentista. Uma Discreta Desordem*, Oeiras, Celta Editora.
- REHMAN, T. and ROMERO, C. (1993), “The application of the MCDM paradigm to the management of agricultural systems: some basic considerations”. *Agricultural Systems*, 41, pp. 239-255.
- REIS, J. (1993), *O Atraso Económico Português em Perspectiva Histórica: Estudos sobre a Economia Portuguesa na Segunda Metade do Século XIX, 1850-1930*, Lisboa, Imprensa Nacional-Casa da Moeda.
- RIPAMONTI, J. A. (1888), *Crédito Agrícola e os Bancos Ruraes*, Lisboa, Typographia Portuense.
- ROMERO, C. and REHMAN, T. (1989), *Multiple Criteria Analysis for Agricultural Decisions*, Amsterdam and New York, Elsevier Science Publishers B.V.
- ROMERO, C., REHMAN, T. and DOMINGO, J. (1988), “Compromise-risk programming for agricultural resource allocation problems: an illustration”. *Journal of Agricultural Economics*, 39 (2), pp. 271-276.

- ROUX, B. (1980), “L’*évolution de l’agriculture latifundiaire dans le système capitaliste: Les transformations de la grande exploitation en Andalousie*”. In A. de Barros (coord.), *A Agricultura Latifundiária na Península Ibérica*, Oeiras, Instituto Gulbenkian de Ciências/Centro de Estudos de Economia Agrária, pp. 245-273.
- SANTOS, J. M. de L. (1991), *Racionalidade Económica na Exploração Agrícola Familiar. O Modelo da “unidades económica de trabalho familiar” de Alexander Chayanov*, Lisboa, Universidade Técnica de Lisboa, Instituto Superior de Agronomia.
- SANTOS, R. (2003), *Sociogénese do Latifundismo Moderno. Mercados, Crises e Mudança Social na Região de Évora, séculos XVII a XIX*, Lisboa, Banco de Portugal.
- SERRANO GARCÍA, R. (2002), “La Casa de Gor y su patrimonio en Salamanca y Ciudad Rodrigo (1849-1910)”. In H. Casado Alonso and R. Robledo Hernández (eds.), *Fortuna y Negocios: Formación y Gestión de los Grandes Patrimonios (siglos XVI-XX)*, Valladolid, Universidad de Valladolid, Secretariado de Publicaciones e Intercambio Editorial, pp. 323-349.
- SPEZ, L. (1990), *Crítica da Decisão*, Lisboa, Publicações Dom Quixote.
- SIMON, H. A. (1959), Theories of decision-making in economics and behavioral science”. *The American Economic Review*, XLIX (3), pp. 253-283.
- SUMPSI VIÑAS, J. M. (1980), “Evolucion tecnologica y racionalidad economica en las grandes explotaciones de la campiña andaluza”. In A. de Barros (coord.), *A Agricultura Latifundiária na Península Ibérica*, Oeiras, Instituto Gulbenkian de Ciências/Centro de Estudos de Economia Agrária, pp. 303-340.
- ULRICH, J. H. (1908), *O Crédito Agrícola em Portugal (sua organização)*, Lisboa, Livraria Ferin-Editora.
- ZELENY, M. (1982), *Multiple Criteria Decision Making*, Madrid, London, New York, McGraw-Hill Book Company.

SOURCES

- 1 – Private Archive: Cartório da Casa de Ficalho (C. C. F.)
 - 1.1 – Portfolio numbers 2, 8 and 9 Documents pertaining to purchases and sales of land property or propriety rights and other documents at time of *Marquis* of Ficalho and *Earl* of Ficalho.
 - 1.2 – *Foro* books (*Livros de Foros*) *Livro de Foros pertencentes à Casa do Ex.^{mo} Marquez de Ficalho: 1840-1893.*
Livro de Foros que recebe o Ex.^{mo} Marquez de Ficalho: 1879-1920.
Livro de Foros. Casa de Ficalho: 1907-1922.
 - 1.3 – Account books, n. 4 to 6 and 8 to 10
from 1882, April to 1896, February and from 1898, October to 1905, July.
- 2 – Official documents
Agricultural maps at the end of nineteenth century, fls. 191, 192, and 193.

APPENDIX. MATHEMATICAL METHOD

36 In the MOP model, the constraints and objectives are linear mathematical functions of the agricultural activity levels — the model’s variables — that

we believe have provided alternatives for the decision maker to choose among. The feasible solutions represent alternative plans of activities, defined as different combinations of alternative activity levels that do not violate any restriction. This model considers 13 states of nature²⁴, and is defined as

$$\begin{aligned} \text{Eff } Z(\mathbf{x}) &= [\text{ANFR}(\mathbf{x}), \text{PAD}(\mathbf{x})] \\ &\text{subject to } \mathbf{Ax} \leq \mathbf{b} \text{ and } \mathbf{x} \geq 0 \end{aligned}$$

Eff means the search for efficient solutions when optimizing on both objectives: (1) the average net farm revenue maximization, ANFR (\mathbf{x}), and (2) the economic risk minimization, PAD (\mathbf{x}). The \mathbf{x} vector represents feasible solutions and the x (the generic term of the \mathbf{x} vector) the alternative activity levels: productions activities, activities associated with or alternative to these, and other activities (see box). The inequality $\mathbf{Ax} \leq \mathbf{b}$ represents the constraints pertaining to resource availability, markets, and technical and biological relations amongst activities (see box), where A is the matrix of the quantity of a resource required to produce one unit of an activity and \mathbf{b} the vector of the amount of a resource available.

The average net farm revenue is calculated as the average of the gross margins of the farm²⁵, $\mathbf{mb}_t\mathbf{x}$, for each state of nature, t , weighted by the probability of occurrence of the state of nature, p_t .

$$\text{ANFR}(\mathbf{x}) = \sum_t p_t \mathbf{mb}_t\mathbf{x}$$

BOX

Model activities

1. Production activities: crops, livestock, and product transformation activities on the farm.

Crops: permanent crops, field crops, including grazing natural permanent pasture, and vegetable gardens:

Permanent crops — olive-growing, viticulture, and *montado* holm oak and cork oak use,

²⁴ The states of nature give us the variability of the conditions surrounding an economic activity. In this model, a state of nature is a standard year characterized by certain production levels of the activities and certain price levels of the products, the ones observed in the 13 years of 1888/89-1895/96 and 1898/99-1902/03. We assume the 13 states of nature to have equal probability of occurrence.

²⁵ Gross margin of the farm in a state of nature is the sum of gross margin of each activity in that state of nature. In this gross margin, we did not deduct the interest on working capital.

Field crops — cereals (wheat, barley, and oats) and grain legumes (broad beans, chickpeas, and bitter vetch) — defined by land use unit and technical path,

natural pasture — fallow ground and permanent pasture, grazed or harvested for hay — defined by land use,

Livestock: raising for sale (sheep and pigs), raising work animals (cattle and mules), work animal handling (work cattle, mules, and donkeys) and Livestock keeper's animals (sheep, pigs, cattle, mares, and donkeys) in accordance with a keeper's right (known as *pegulhal*).

Product transformation activities: wine, oil olive, or cheese productions, and respective subproducts.

2. Other activities associated with production activities: sale and purchase of crop, livestock or transformed products, or livestock purchases or sales; farm animal consumption; hiring of agricultural workers of distinct categories and with different contract modes; and making and maintenance of the carts.
3. Alternative activities to production activities: cereals and grain legumes on sharecropping and vegetable gardens and others small rent lots.
4. Loan application and final capital activities.
5. Transfer and other helping activities to modelling.

Note: The activities that the farmers adapt to the way they perceived nature's state throughout the year are defined by the states of nature.

MODEL CONSTRAINTS

Reported to

Land area and rotation requirements

Technical-biological relationships between production activities;

Animal consumption/livestock raising;

Pegulhal rights (see number 1., above);

Minimum requirements of some worker categories;

Requirements / supply of labour:

Requirements / supply of animal power in crops by operations and work periods;

Carts supply;

Requirements / supply of feeds;

Minimum and maximum proportion of some feeds intake per animal;

Product balances;

Requirements / supply of working capital by two periods and credit limit;
Some local market limits;
Non-traditional crops (including chemical fertilizer or steam-threshing)
and sharecrops were set to zero or as alternative activities.

The risk measure is the probability-weighted sum of negative deviations of gross margin of the farm, d_t^- from the reference revenue, m (an auxiliary parameter or “an endogenously established parameter which can be set by the analyst at any level”, Berbel, 1988), for each state of nature, t . This sum is the Partial Absolute Deviation or PAD.

$$\begin{aligned} \text{PAD}(\mathbf{x}) &= \sum_t p_t d_t^- \\ \mathbf{m} \mathbf{b}_t \mathbf{x} + d_t^- - dt^+ &= m \\ d_t^+ \text{ and } d_t^- &\geq 0 \end{aligned}$$

The model thus has the structure of a *mean-PAD* model that was proposed by Berbel (1988) to incorporate the risk into agricultural planning. Here, the objective of minimizing PAD is equivalent to the objective of minimizing the probability of failure or the probability of returns not achieving a predetermined safety level, g (“an exogenously determined parameter depending upon the decision-maker’s personal goals and financial constraints”)²⁶, and m is the maximin²⁷ as proposed by the author (Berbel, 1993).

In a second step, integrating the two objectives into a measure of distance from the ideal solution, we formulated the model as a compromise programming. This ideal is not a feasible solution. In our model, it represents the agricultural plan to jointly observe the values most preferred of two criteria amongst all the achievable values by the possible solutions (the maximum value of ANFR and the minimum value of PAD). The compromise solutions are the closest solutions to the ideal, accepting the basic postulate: “to be as close as possible to the perceived ideal is the rationale of human choice” (Zeleny, 1982, p. 156). These compromise solutions arise from different weights given to the objectives and different radical indices (p , which defines metrics L_p), in that distance function. We solve our model for the metrics L_1 and L_∞ . The compromise solutions are efficient solutions²⁸.

²⁶ Prob [returns $\leq g$ | $\leq \text{PAD} / [t(m-g)]$ with $m \geq g$, Berbel (1988).

²⁷ Maximin is the value equal to the highest return that is possible in the worst state of nature (comes from the solution of a game-theoretic program).

²⁸ On the compromise method and the definition of ideal point and metrics see, for instance, Rehman and Romero, 1993, Romero and Rehman, 1989, Romero *et al.*, 1988, and Zeleny, 1982. On mean-DAP approach, see Berbel, 1988, 1989, and 1993, and Alaejos and Cañas, 1993.