The difficult relationship between Agricultural Policy, Income, Labour and Sustainable Development

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Jel classification: R110, Q180, C610

Abstract

This paper analyses the impact of some policy schemes, in the current framework of CAP, on returns, labour and sustainable development of typical cropping and livestock farming systems in the south of Portugal. Three scenarios have been worked out: in the first one, the current expectations will be maintained until 2006. In the second, the payments decoupled from production will give the farmer the exact amount he is receiving now. Finally, the third scenario considers the decoupled payments on the basis of the labour expenditure of the farm. A mathematical programming model, combined with the Erosion Productivity Impact Calculator (EPIC) Cropping Systems model is used to determine the impact degrees according to the system and scheme scenarios evaluated. Economic results (net margin) and environmental results (nitrate leaching, soil erosion, and biodiversity changes) are obtained for each system and scenario. Results point out a significant adjustment of production plans in the two systems studied, that will move towards extensification and improvement of sustainable development but with subsequent reductions in the farm returns in the CAP 2006 scenario. Moreover, the decoupled payments seem to have a positive impact on the environmental parameters, although they affect negatively the total returns of farms.

Résumé

Ce travail analyse l'impact d'un certain nombre de mesures, qui relèvent du cadre actuel de la Politique Agricole Commune (PAC), sur les revenus, le travail et le développement durable des systèmes agricoles et d'élevage typiques dans le Sud du Portugal. Trois scénarios sont présentés: dans le premier, les attentes actuelles persistent jusqu'en 2006; dans le deuxième, le désaccouplement par rapport à la production permettra à l'agriculteur de recevoir les mêmes subventions qu'aujourd'hui ; et dans le troisième, on propose le désaccouplement sur la base de la dépense liée au travail. Un modèle de programmation linéaire combiné avec le modèle Erosion Productivity Impact Calculator (EPIC) est employé pour déterminer l'impact de ces scénarios. Des résultas économiques (marge nette) et environnementaux (lessivage des nitrates, érosion du sol et altération de la biodiversité) sont évalués pour chaque système et scénario. Ces résultas nous montrent un ajustement significatif des plans de production dans les deux systèmes étudiés, qui vont conduire à l'extensification et à l'accroissement de la durabilité, mais avec des réductions significatives des revenus obtenus dans le scénario CAP 2006. En plus, le désaccouplement semble pouvoir exercer un effet positif sur les paramètres environnementaux, malgré des conséquences négatives sur le revenu total de l'exploitation.

1. Introduction

As food needs in the European Union were satisfied and exceeding supplies grew up, the productivity paradigm dominating Europe after World War II was substituted. After Cork declaration, in 1996, Agenda 2000 has set the new goal of multifunctional paradigm for Europe in the next years.

One possibility for applying this idea in practice, thereby contributing to the proper functioning of agricultural markets, is represented by payments unlinked to production. Since 1960, agricultural economists have suggested this kind of payments to make agricultural policy reform easier (Swinbank, 2002). The agreement reached in Brussels in October 2002 allows to have a clear idea of the agricultural budget available for the future, which means we have the opportunity of trying to guarantee long-term safety to our agriculture (Fischler, 2002).

The agricultural policy need is not at issue. Markets can not be responsible for food safety, environment protection and rural landscape maintenance, and the reinforcement of agriculture competitiveness in the weaker rural areas will contribute to the economic cohesion of the European Union.

Agricultural and rural development policy should undoubtedly promote:

- a competitive agricultural sector inside the EU;
- a sustainable market-oriented agriculture;
- an effective rural development.

The key issue is now how we shall approach possible changes in politics considering that Europe has set new objectives. How shall we incorporate the multifunctionality concept?

Given the nature and scope of current and future changes within the CAP, this paper tries to provide some answers to this question. It is necessary to evaluate the impact of different policies on typical farms and agricultural systems, referring to specific regions and areas. Considering two different farms, both typical of Alentejo region, in the South of Portugal, we simulate the effects of some policy scenarios, drawn from the current situation. In the first scenario, we maintain the present expectations, which will be true until 2006. In the second scenario, we decouple payments from production, giving the farmer the exact amount he is receiving now. Finally, in the third scenario, we decouple payments, but on the basis of the labour expenditure of the farm.

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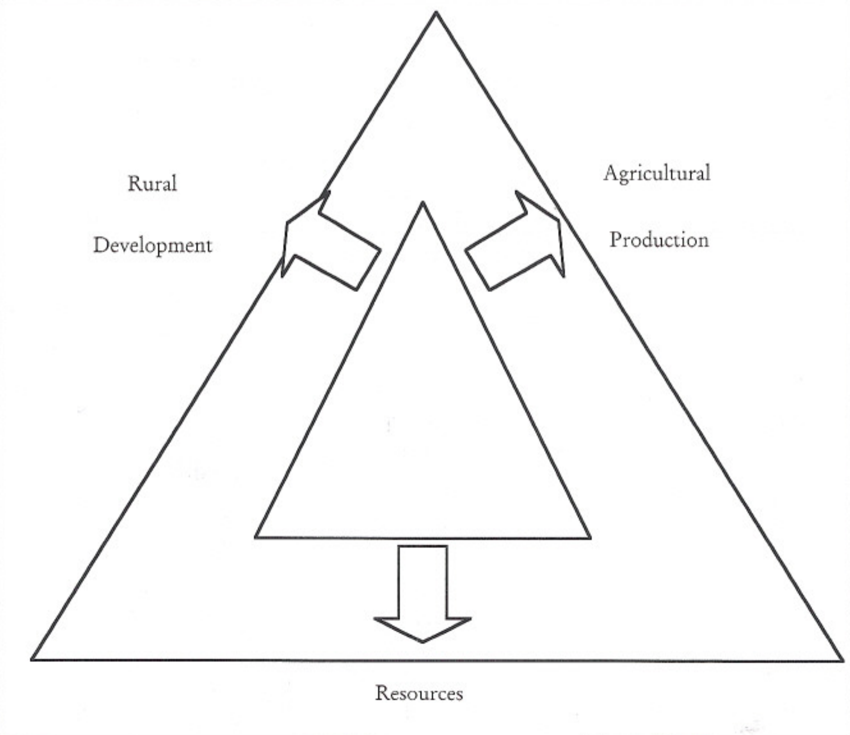
2. The analytical framework

Agricultural policies that support market prices, in which the productivist paradigm was built, have a great impact on resources use intensification, with consequences on their quality and bio-diversity.

Farms can be seen as a space where three fundamental elements interact (Van der Ploeg et al., 2002):

Figure 1. *Development process on a farm*



The farm development can take place on any side of this triangle. To increase agricultural production, the classical approach is used, based on the productivist paradigm, i.e., we reinforce the productive agricultural activities, assuring that income by production unit is higher. On the other triangle directions we can consider that enhancing the resources implies obtaining new resources or, more importantly, increasing their intrinsic value and, finally, promoting rural development implies joining new non-agricultural activities to the usual agricultural activities.

These three views of the problem can be interdependent. For example, the enhancement of the resource intrinsic value, such as soil, or water quality can imply the strengthening of rural development, thus creating the conditions for the development of non-agricultural activities with or without direct or indirect effects on agricultural activities.

More generally, we can state that the agricultural production value and the agricultural cost evolved inversely, and they tended to become closer. In the next figure, and according to Van der Ploeg et al. (2002), we show how this proximity was reached in Holland, from 1950 to 2000.

A shows the economic crisis of the present agricultural system in the European Union, which is represented by the increasingly lower difference between total agricultural production (in M.U.) and costs. B shows the ecological crisis we live in Europe today - a production intensification, linked with costs each time less untied to nature that we can perceive, for example, in the substitution of organic fertilization by chemical fertilization. Finally, C represents what we can call the structural crisis - increasing production is more and more difficult due to the quota system.

Partially decoupled payments and the introduction of agri-environmental measures in the CAP reform, in 1992, were the first attempt to correct the negative impact of policies strictly oriented to production, valuing the role farms have as landscape and rural space guardians. Agenda 2000 reinforces these points eliciting the rural development and multifunctionality paradigm as the bases of future agricultural policy.

The literature review shows that farm-level models can provide more details about individual impacts than large-scale models. Moreover, 1) farming systems will change in response to the new policy measures under the old and new CAP policies; and 2) the levels of sustainability and bio-diversity change as the

Figure 2. *Costs and agricultural production evolution over time, in monetary units*

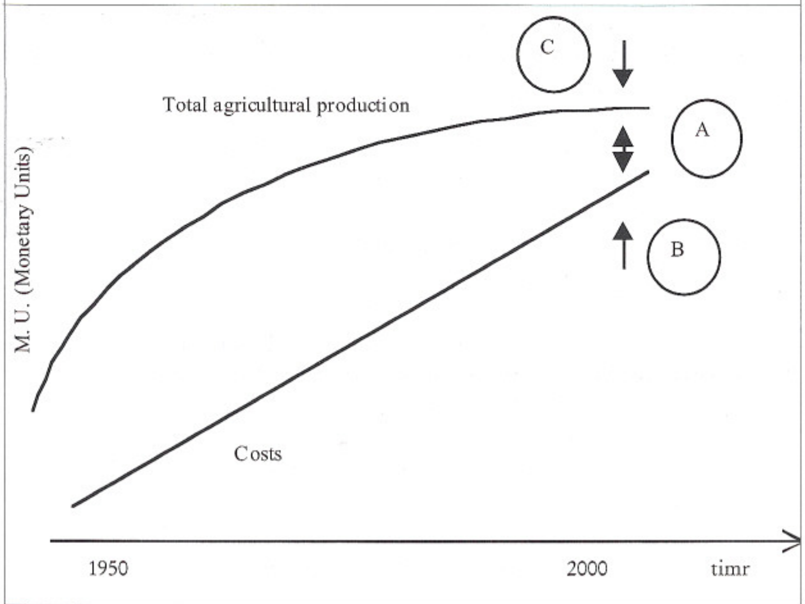


Table 1. *Results*

	Economic results				
	Liquid Margin	Production	Subsidies	Capital	Fixed costs
Farm 1	96,5	205,8	98,0	124,9	82,3
Farm 2	69,5	90,0	100,6	66,3	54,9

	Activities (% of land)							
	1	2	3	4	5	6	7	8
Farm 1	-	24,5	-	61,7	5,4	-	-	8,4
Farm 2	-	-	-	71,9	19,4	-	-	9,7

	Environmental parameters				
	N leaching (Kg/ha)	Soil erosion (ton/ha)	Biodiversity		
			% land at level 1	% land at level 3	% land at level 4
Farm 1	45,3	2,7	8,5	67,1	24,5
Farm 2	36,8	1,31	1,7	91,3	-

1 – Industrial vegetables	5 - Half-extensive dryland activities with sheep
2 – Innovative irrigated activities	6 - Extensive dryland activities with cattle
3 - Traditional irrigated activities	7 - Extensive dryland activities with sheep
4 – Intensive dryland activities	9 – Set-aside area

Source: Model results (2003).

farming systems change.

These aspects led us to the use of a micro-economic model that allows to take into account simultaneously the farming systems, the economic and institutional framework, particularly policy measures, and also the effects on the environment.

We developed a bio-economic model at farm level, which integrates a mathematical programming model and a plant growing simulation model, in order to estimate the economic and environmental impact of different policy measures on typical farming systems of Alentejo region, in southern Portugal, and, consequently, their effects on farm income, employment and bio-diversity/landscape.

The formulated programming model allows to examine the impact of some political scenarios, resulting from CAP, on the farming systems.

The model fits the calculation of the implications of different resource endowments, different market conditions, and improved new technologies (Hazell and Norton, 1986). For each farming system, the level of sustainability is estimated using EPIC, which was previously calibrated for erosion rates, water pollution and crop yields. Then, the levels of soil erosion, water pollution and the crop yields are included in the linear programming model. For each optimal solution of the bio-economic model, the total sustainable parameters (erosion level, water pollution, the degree of bio-diversity) and the total economic parameters (farm income and labour) are calculated. The farming systems include dryland cereal farming systems (intensive and extensive), livestock (sheep and cattle) and irrigated crops using conventional and conservation farming technologies. Each farming system is supposed to have a different effect on sustainability which is assumed to vary from level 1 - high degree of bio-diversity present in natural landscape-, to level 6 - low diversity degree, present in intensive farming systems. Further characterisation of the farming systems included in the model is presented in Annex 1.

The model can be specified as follows:

$$\text{Max } E(\pi) = \Sigma_j \Sigma_a \Sigma_t \Sigma_b (p_j f(k_{(j,t)}) - C_k K_{(j,t)} + A_{(j,a,t)}) X_{(j,a,t,b)}$$

$$\text{s.a.} \quad \Sigma_j \Sigma_a \Sigma_t \Sigma_b X_{(j,a,t,b)} \leq S$$

$$\Sigma_j \Sigma_t \Sigma_b X_{(j,a,t,b)} \leq D_a$$

$$K_{(j,t)} \geq 0; \text{ e } X_{(j,a,t,b)} \geq 0;$$

where: j,a,t and b indicate the farming system, the compensatory and agri-environmental subsidies, the production technologies and the effect on bio-diversity, respectively (see appendix 1); x is the decision variable which defines the area (ha) occupied by the farming system; $f(k_{(j,t)})$ is the production function of j farming system according to the technology t; $K_{(j,t)}$ is the vector of the changing inputs used in the production process of j farming system with technology t, C_k is the unit cost of the different variable inputs used; pj is the final price of products; $A_{(j,a,t)}$ is the parameter of the agricultural payments which are function of the farming system; S is the vector set of the available production inputs (land, labour and fixed capital); and D is the parameter to modulate the different policy schemes.

The objective function, Max E(π), is the maximisation of the net margin or the long-term revenue. It represents the return of the production systems to the land, fixed capital, permanent labour and management. This model was applied to two typical farms data of Alentejo region in Portugal. One of the farms is representative of dryland farming systems and another is representative of mixed, irrigated and dryland farming systems.

3. Results

Table 1 presents the results obtained in the *CAP 1997* scenario, which reflects prices and subsidies in 1997.

The other three scenarios are the following: the CAP 2006 scenario shows the prices predictions for products and production factors in 2006 and income and production subsidies, should Agenda 2000 be maintained. The FM decoupling and FM labour aids scenarios are two alternatives of agricultural policy, which allow the multilateral liberalization of world trade and the complete decouplement of income subsidies from production. In the first scenario we consider that farmers will have a direct payment (an income subsidy) with no relation with production, but on the basis of the CAP 2006 scenario - they will receive exactly the same amount of subsidies as in the past. In the second scenario, the subsidy is directly linked with labour, and we consider that the workers' salaries will be fully paid by agricultural policy funds.

The changes of prices and subsidies in the Agenda 2000 scenario (CAP 2006), although that policy maintains the 1992 reform principles, prove to have a significant impact on income, production options and the environment.

The net margin suffers from reductions of more then 40%, for both farms. These reductions are clearly linked with the decrease in agricultural production and the subsidy reduction, which is higher than the reduction in operational costs.

The relation between the production value and the subsidies is maintained on farm 1 and is higher on farm 2. On this farm, the production value represents only 63% of the subsidies. These economic results are ascribable to the production extensification, which is mainly obtained in the system Extensive Dry Land with Cattle. In the above case study, this policy leads to lower incomes from agriculture and to the degradation of agriculture compared to the other sectors of economy, since it also reduces the operational costs and the production value. Nevertheless, the effects on the environment are very positive, and are represented by a considerable drop in nitrate losses and soil erosion (more then 50% on farm 2) and by a significant biodiversity improvement.

In the FM decoupling scenario, the income of farm 1 is still getting lower - one third of the basic scenario - and the degradation of agriculture position with respect to the other sectors of economy continues. The production value and the operational costs are almost half of the basic scenario and 30% of the CAP 2006 scenario. These economic results undoubtedly show the adjustments through production extensification, which are clear when we analyse the changes of the production plan and verify the increase in the Extensive Dry Land with Cattle (from 74 to 83%) area and observe that the area of Innovative Irrigation Crops (25.4%) has been partially substituted by Traditional Irrigated Crops (16%). On farm 2, there are no changes resulting from CAP 2006. Concerning sustainability, this scenario, as the previous one, is clearly better than the CAP 1997.

In the FM labour aids scenario, the net margin is 23. 5 thousand euros on farm 1 and -6.3 thousand euros on farm 2, which means an income drop of 76% in the first case and a situation of progressive abandonment of agriculture in the second case. Nevertheless, despite a very low income in this scenario, the change terms are better for farm 1, which has now production values and operational costs better than the basic scenario (11% and 61% more, respectively). The production plan is based on Horticultural Industrial Crops (18.9%), which represent a market-oriented choice, and Extensive Dry Land with Sheep (81%). The latter is now the principal production option for farm 2.

4. Conclusions

If we want a competitive agricultural sector in the European Union, which should be at the same time sustainable and market-oriented, while promoting sustainable rural development, we will probably have to face seriously the problem of decoupled subsidies to attain this objective. Obviously, the way these subsidies will be calculated, within the budget established in Berlin, will have a non-neglectable impact on the strength and sustainability of the CAP for the future. Nevertheless, this option affects farmers' choices. As underlined in the Agenda 2000 document, new functions will be asked to farmers, within the multifunctional agriculture framework, in Europe for the future. Therefore, it seems that the agricultural policy option should consist in the transfer of funds from the 1st to the 2nd pillar to pay farmers for the environmental objectives they reach, thus allowing a fair standard of living and assuring agriculture sustainability in the future.

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Annex 1. *Characterization of Agricultural Production Systems*

<table>
<tr><th>Production system</th><th>Activities</th><th>Production technique</th><th>Effect on biodiversity</th></tr>
<tr><td>Irrigated Horticulture and Industrial horticulture</td><td>cabbage×potato-melon– cabbage × pimento – onion</td><td rowspan="3">Traditional intensive</td><td rowspan="3">LEVEL 4</td></tr>
<tr><td>Innovative irrigation</td><td>Industrial tomato.- durum wheat- sugar beet - sunflower</td></tr>
<tr><td>Traditional irrigation</td><td>maize – sunflower</td></tr>
<tr><td rowspan="3">Intensive dryland</td><td rowspan="3">sunflower – durum wheat – wheat</td><td>Traditional mobilization</td><td>LEVEL 3</td></tr>
<tr><td>Direct seeding</td><td rowspan="2">LEVEL 4</td></tr>
<tr><td>Reduced mobilization</td></tr>
<tr><td rowspan="3">Half-extensive dryland with sheep or cattle</td><td>ploughing – durum wheat/wheat – forage – fallow</td><td>Traditional mobilization</td><td>LEVEL 2</td></tr>
<tr><td rowspan="2">durum wheat/wheat – forage – fallow</td><td>Direct seeding</td><td rowspan="2">LEVEL 3</td></tr>
<tr><td>Reduced mobilization</td></tr>
<tr><td>Extensive dryland with sheep</td><td rowspan="3">forage – 6 years fallow</td><td>traditional</td><td rowspan="3">LEVEL 1</td></tr>
<tr><td rowspan="2">Extensive dryland with cattle</td><td>Traditional with cattle from cross-breeding</td></tr>
<tr><td>Traditional with cattle from regional breeding</td></tr>
<tr><td>Fallow</td><td>Fallow</td><td></td><td>LEVEL 1</td></tr>
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