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Environmental and socioeconomic impact of the new cotton reform

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Abstract— Following the decoupling of the cotton subsidies in 2006 the production system has become less intensive in input usage with an average yield reduction of 40 per cent. Albeit the farm income has not been reduced, the reform has had a negative effect on the economy of some rural areas of Southern Spain, where there are few productive alternatives to cotton, with a 39% reduction of direct farm labour. Besides, the reform has been borne by the ginning industry (60% reduction), the agrochemical suppliers and the auxiliary sector. On the other hand, the environment has benefits from the extensification of the cotton production since three quarter of the production is now carried out under integrated production that implies a reduction in the amount of fertilizers and pesticides that farmers can use.

Keywords— cotton, CAP reform, decoupling, Spain.

I. INTRODUCTION

Cotton is the most important irrigated arable crop in Southern Spain with an average of some 91,000 ha before the reform, being grown by 9,200 farms and employing two-thirds of the total farm labour generated from irrigated extensive arable crops [1-2]. Furthermore, the cotton production involves a complex economic sector of input supplier companies and 27 ginning firms.

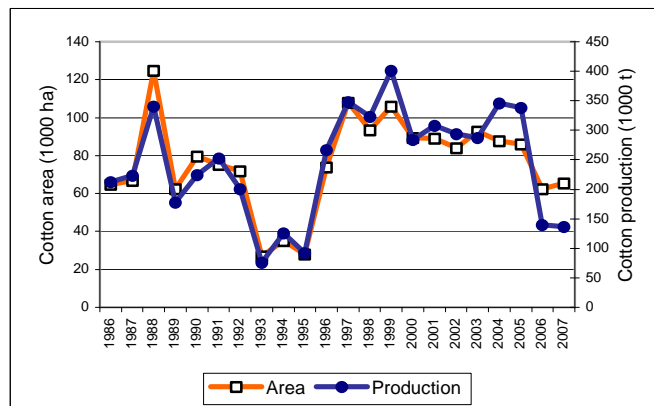
This study analyzes the impact of the New Cotton Reform (NCR) in Spain after the implementation of the Council Regulation (EC) No 864/2004 of 29 April 2004 in the season 2006/07. Following the decoupling of the subsidies of this reform, the producer receives 65% of the subsidies obtained during the reference period (2000-2002) as a fixed payment of 1,509 €/ha, for an eligible area of 70,000 ha, and 35% as area payment (up to 1,039 €/ha). In order to receive this area payment the producer does not need to harvest the raw cotton; the only requirement is to reach the open

capsule stage¹. During the 2006-2008 period, for many farmers have been more profitable to shift from conventional production to semi-abandonment cotton production, which would involve a drastic reduction in input usage (fertilizers, pesticides and irrigation water) and no harvest [3-4].

II. THE COTTON PRODUCTION IN SPAIN

The cotton area has been stable between 1996 and 2005, after the NCR the area dropped to approximately 64,000 ha (Figure 1).

Figure 1. Cotton area and production in Spain



In the last decade, Andalusian cotton production has accounted for 97% of the Spanish total production, after the NCR it represents the 100%. Cotton production and area have followed a similar pattern during the production-linked period of subsidies (1986-2005), however after the implementation of the decoupled scheme the production curve has moved downward further than the area one, which implies a reduction in yields.

¹ From 2009 the eligible area will be reduced to 48,000 ha, the area payment increased up to 1,400 €/ha and the farmer will have to harvest (but he is not obliged to deliver to the ginning industry).

Before the NCR, traditionally cotton has been the most important arable crop in the irrigated lands of Andalusia (only surpassed by two permanent crops: citrus and olive trees)

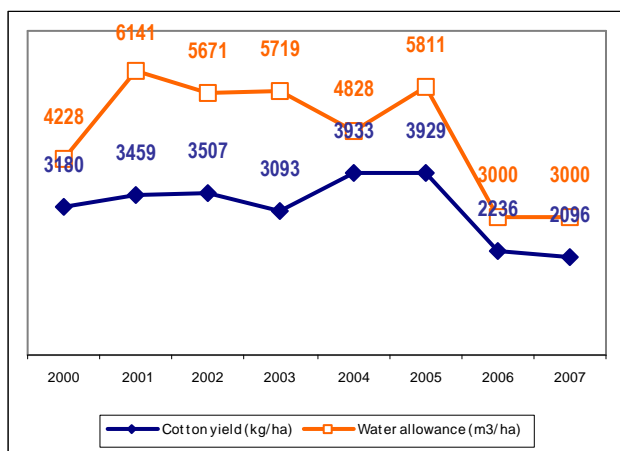
After the implementation of the NCR part of the cotton farmers have substituted this crop for soft wheat, sunflower, citrus and olive trees. As we will see in the regression analysis, the policy element is more important than the effect of drought, which coincides with it (although being the latter the main factor in some other crops, like in the case of the maize area reduction).

III. EFFECTS OF THE NCR

A. Cotton yield reduction

It is clear the NCR impact just observing the evolution of the cotton cultivated area and production: In the two years after the reform on average less than 64,000 ha were sown compared to an average above 88,000 ha in the 2000-2005 period. But the initial 28% area reduction has been surpassed by the production reduction of 55%. The consequence is a dramatic drop of the cotton yields, as it is shown in the following figure:

Figure 2. Cotton yields evolution 2001–2008



Cotton yields have dropped from 3,100-4,000 kg of raw cotton per hectare during 2000-2005 to 2,236 and 2,096 kg of raw cotton/ha in 2006 and 2007, respectively. As the water allowance line suggests, there are two factors that contribute to this yield

reduction, one is the NCR and the other is the drought. The second one however has had lesser effect on the yields, according to the analysis of the data (see Annex).

The regression analysis suggests that the cotton production level depends on the cultivated area, the water allowance and the type of support scheme:

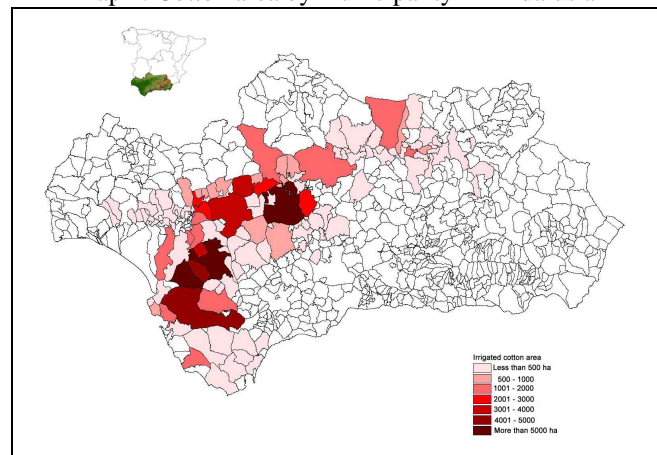
$$\text{Cotton production} = 92,339 + 1.03 \cdot \text{Area} + 21.31 \cdot \text{Water} - 83,661 \cdot \text{Decoupled}$$

Thus, the water allowance reduction, from 5,500 m³/ha which can be considered as normal year, after the implementation of the NCR is around 2,500 m³/ha would imply a production reduction of 53,275 tonnes, a quantity lower than the decoupled scheme effect (83,661 tonnes).

B. Geographic impact of NCR in Andalucía

In addition of the aggregated economic effect of the reduction of the cotton, the socioeconomic impact is even greater since most of the cotton is cultivated in a few municipalities of Southern Spain, as Map 1 shows. Thus, the NCR added a social problem in these areas where the farm and industry labour from the cotton production contributes significantly to the local economy.

Map 1. Cotton area by municipality in Andalusia



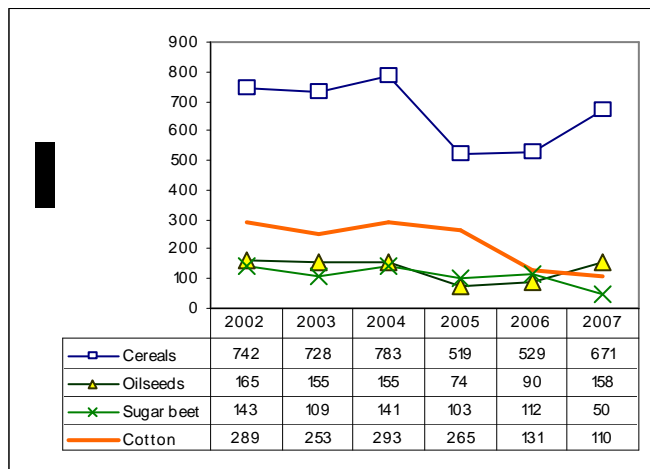
For these municipalities in Southern Andalusia, unlike the center and Northeast, there are few agronomic alternatives due to the salinity problem of

these lands. In addition to the cotton problem, the decrease of the sugar beet margin has made even more difficult to cope with both reforms.

C. Agricultural Output Value reduction

Before the NCR, the cotton production represented the 5.5% of the total Agricultural Output Value in three provinces (Córdoba, Cádiz and Jaén) and 9% in the case in Seville [5]. The implementation of the NCR has resulted in a reduction of its contribution to this macroeconomic variable, as Figure 3 shows:

Figure 3. Evolution of the Agricultural Output Value



Like in the cotton case, the reduction of the sugar beet output value is explained by the sugar price and production reduction from the last Common Market Organization reform. On the contrary, the higher cereal and oilseed prices and the substitution of cotton and sugar beet for cereals and oilseeds have increased their share in the Andalusian Agricultural Output Value.

D. Social impact of the NCR

- Farm employment:

Cotton production is a relatively high labour demanding crop. Like in the case of other inputs, the cotton agricultural production has become as well less intensive.

Before the NCR, the cotton production represented in Andalusia two thirds of the total farm labour of the

irrigated arable crops (Consejería de Agricultura y Pesca, 2005). This is equivalent to some 5,500 full-time workers. In some municipalities, it represents up to 80% of the total farm labour.

After the NCR, it has been a reduction of man-days labour of 43% [4](see Table 1).

Table 1. Farm labour by irrigation, sowing and support system in Spain

Irrigation system	Sowing system	Before NCR / After NCR	
		Cotton area (ha)	Total man-day
Rainfed	Open air	2,812 / 3,436	23,205 / 28,345
	Plastic	4,026 / 0	8,314 / 0
Sprinkle	Open air	10,187 / 14,087	189,989 / 212,016
	Plastic	10,117 / 0	188,688 / 0
Drip	Open air	16,535 / 12,474	275,311 / 191,477
	Plastic	22,239 / 0	415,872 / 0
Furrow	Open air	21,988 / 32,819	367,206 / 449,624
	Plastic	22,239 / 0	415,872 / 0
Total		87,906 / 62,816	1,543,411 / 801,462

The reductions of the cotton farm labour comes from the implementation of the integrated production system without plastic in the fields after sowing and lower use of fertilizers and pesticides. The drought since 2006 has also reduced the irrigation turns. Last, some farmers decided not to harvest in 2006 (lesser in 2007 due to higher cotton seed prices). However, the water shortage in 2006 and 2007, as the regression analysis suggest, is not the main reason behind the reduction of the cotton production.

- Ginning industry

In 2006/07, the first year of the implementation of the NCR, the Spanish ginning industry has suffered not only the impact of the reduction of the cotton production but also a reduction in the quality of the raw material [6]. In summary, these are the main effects:

- Reduction of the raw cotton to process: 60 %.
- Seasonal shutdowns: 3 out of 23.
- Final shutdown: 1 company.
- Production effects:
 - o Fiber production: -59.2%.

- Seed production: -58,8%.
- Increase of impurities: Twice as much since stripping harvesting has shifted from 13% of the cotton area to 27%.
- Increase of labour costs: 60% higher, from 93 to 148 €/tonne.
- In 2005/2006 all factories operated above the break-even point, in 2006/07 only one.
- Employment:
 - Total employment: -42%
 - Hours/day: from 20 to 12.
 - Season length: from 67 to 55 days.
 - Man-days: -1.900.
 - Part-time jobs: -376.
- Economic impact:
 - More than €23M.
 - Industrial gross margin: -27%.

E. Environmental impact

The shift to most of the cotton production toward the integrated production system (75% of the cotton area in 2007) has resulted in a positive impact on the environment (see Table 2).

The NCR has changed the cotton production system in most farms. The traditional use of plastic after sowing to speed up the plant growth has been completely abolished, with the subsequent benefit to the environment. The sowing without plastic plus the reduction of other inputs have resulted in lower total direct costs per hectare (42%), as Figure 4 depicts.

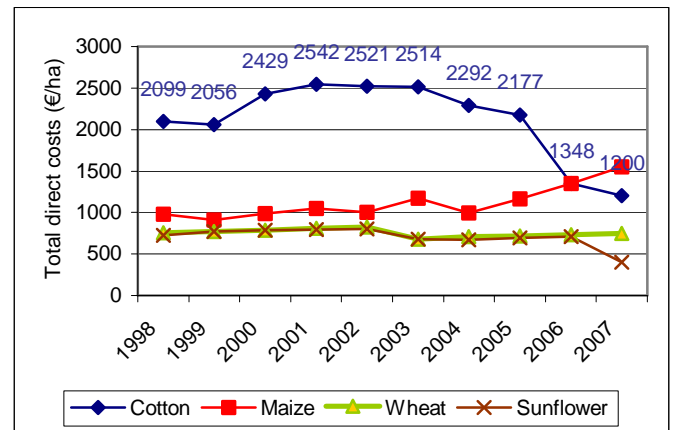
Table 2. Input requirements by production system

	Conventional cotton production (pre-NCR)	Maximum amount under integrated production (after NCR)	Fertilizers used in 2006
Nitrogen	200-250 UF/ha	118 UF/ha	90 UF/ha
Phosphorus	120 UF/ha	96 UF/ha	30 UF/ha
Potassium	75-125 UF/ha	96 UF/ha	25 UF/ha

Thus, the NCR has brought an environmental benefit derived from a lower use of fertilizers and pesticides since most cotton production in Spain (three quarter in

2007) has moved from the conventional system to integrated production.

Figure 4. Evolution of cotton direct costs



These results are in concordance with the farmers' opinion expressed in a survey carried out in 2007 about their perception of the future cotton production:

Table 3. Cotton farmers' opinion about the future of their farm (percentages)

	Great incr.	Small incr.	No change	Small decr.	Great decr.	Total
Mach. invest.	7.7	7.7	73.1	3.8	7.7	100.0
Use of fertiliz.	0.0	0.0	34.6	26.9	38.5	100.0
Use of pestic.	0.0	0.0	34.6	23.1	42.3	100.0
Use qual. seed	0.0	3.8	65.5	19.2	11.5	100.0

Source: Data from 26 farmers' interviews carried out in 2007.

IV. CONCLUSIONS

The NCR has changed the cotton production system in Spain, shifting from the traditional highly intensive on input use to the integrated production, a production system much less damaging to the environment but with a yield reduction of almost 40%. In addition, the cotton cultivated area in Spain has gone down by 30%.

Although the NCR has had a positive effect on the environment, there are some undesirable effects on the ginning industry (three shutdowns out of 23 firms, reduction of the ginned cotton of 60% and a gross margin reduction of 27% in 2006) and the agrochemical suppliers (cotton fertilizers and pesticides sales have been reduced by half and one third, respectively in 2006). It has had also a negative

effect on cotton farm employment with a reduction of 43%, this data is particularly negative for some municipalities where cotton represented 80% of the total irrigated arable crops labour.

From the EU policy point of view, if the cotton production in Spain is aimed to continue, it is necessary to take into account some modifications of the current support scheme. Since some previous studies suggests that the level of the raw cotton production in Spain does not depend on the percentage of decoupled subsidy but the link between the eligibility of the subsidy and the achievement of a minimum yield per plot with a specified quality of the raw cotton, some further reforms must be introduced to make more profitable for farmers to sow and harvest high quality cotton, like in the past, than just minimize costs and get the area payment.

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