# THE IMPACT OF THE RURAL ENVIRONMENTAL PROTECTION SCHEME ON IRISH DAIRY FARM PERFORMANCE AND THE CONSEQUENCES IN A DECOUPLED WORLD[1]

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## Abstract

*As a result of the 2003 reform of the Common Agricultural Policy Irish dairy farmers will be confronted with declining milk prices and reduced profitability per hectare. One possible solution to this problem is to reduce their drystock numbers and to enter the Rural Environmental Protection Scheme (REPS). The aim of this paper is to investigate the impact of participation in REPS on the performance of dairy farms and to discuss its future role in Irish dairy farming. In order to do this a series of econometric models are used to estimate the impact of participation in REPS on four measures of farm performance. In all four models REPS was found to be statistically significant and the sign on the parameter estimate for REPS was as expected.*

***Key words****: Rural Environmental Protection, Irish dairy farmer, econometric.*

## Introduction

The Rural Environmental Protection Scheme (REPS) is a five year scheme designed to reward farmers for using more environmentally friendly practices. The aim of this paper is to use data from the Irish National Farm Survey (NFS) to investigate the impact of participation in REPS on the performance of Irish dairy farms. The role that REPS may play post decoupling is discussed in the context of these findings.

## Background

There are three main objectives of the scheme as stated by the EU commission: (1) to establish farming practices and production methods which reflect the increasing concern for conservation, landscape protection and wider environmental problems; (2) to protect wildlife habitats and endangered species of flora and fauna; and (3) to produce quality food in an extensive and environmentally friendly manner. (Department of Agriculture and Food 2004) However, REPS could also be viewed as a form of income support that does not induce supply.

In order to participate in the scheme, farmers must employ a REPS planner to draw up a REPS plan and satisfy eleven key components: (1) a nutrient management plan; (2) a grassland management plan; (3) protect and maintain watercourses, waterbodies, and wells; (4) retain wildlife habitats; (5) maintain farm and field boundaries; (6) restrict use of pesticides and fertilizers near field boundaries, ponds, streams, and wells; (7) protect features of historical and archaeological interest; (8) maintain and improve visual appearance of farm and farmyard; (9) a tillage crop production plan; (10) training in environmentally

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friendly farming practices; and (11) maintenance of farm and environmental records. (Department of Agriculture and Food 2004)

The scheme was first introduced in Ireland in 1994 and was followed by REPS 2, REPS 3, and REPS 4. Participation has grown from 336 farmers and approximately 12,000 hectares in 1994 (Department of Agriculture and Food. 2005) to 47,483 farmers and almost 1.7 million hectares in 2005 (Department of Agriculture and Food. 2006). In 2005, total REPS payments were approximately 285 million euros.

In 2004, average gross output (i.e. the sum of all sales from the farm enterprise) for farms participating in REPS was 5,000 euros lower than on farms not participating in REPS (Connolly et al. 2006). However, dairy farmers typically make up a small proportion of the total farmers in REPS; approximately 17.5 percent of REPS farmers in 2002 were dairy farmers. Analysis of 2002 NFS data shows that average gross output was almost 29,000 euros lower on REPS dairy farms compared with non-REPS dairy farms, while average farm size was almost 6.5 hectares smaller compared with non-REPS dairy farms. This raises the question, how much of the deviation in gross output is due to the restrictions imposed under REPS and how much is related to other issues such as farm size, location, and age.

Prior to the 2003 reform of the Common Agricultural Policy (CAP), EU farmers were paid a variety of premia that were linked to production; for example, the special beef premia. However, with decoupling farmers no longer have to own livestock, grow cereals, or produce milk in order to receive a payment. Instead, farmers receive a single farm payment based on their average payments over the years 2000, 2001, and 2002. Farmers continue to receive this payment irrespective of their level of agricultural activity, provided they retain their land and maintain it in good agricultural condition. Breen et al. (2005) projected a 32 percent fall in dairy farmers between 2002 and 2012 as a result of these reforms.

Previously, many Irish dairy farmers did not participate in the scheme because of its restrictive nature, especially the nutrient management component, which limits the application of chemical fertilizers, organic fertilizers, and other wastes. In a survey of farmers conducted in 2004, 47 percent of dairy farmers said that their main reason for not joining REPS was because there stocking rate was too high, whereas only 1 percent of beef farms cited this as their main obstacle (Connolly et al. 2006). In many cases, these farmers had higher stocking rates because they were trying to maximize farm payments by carrying large numbers of beef animals. With decoupling, these farmers now have the option to reduce their stocking rate to levels that comply with REPS without experiencing a reduction in their single farm payment, thus making REPS a more attractive program for farmers.

## Goals and Objectives

As farm incomes come under increasing pressure due to decreasing prices and increasing costs of production, REPS offers the chance to alleviate some of this pressure. Gorman et al. (2001) examined REPS in the context of the previous CAP reform and concluded that “there is a positive relationship between scheme participation and the enhancement of the economic and natural assets upon which farm families build their livelihoods.”

With decoupling, farmers are faced with a new set of production decisions. The goal of this paper is to examine the role of REPS in these production decisions. An understanding of the impact of REPS participation on farm performance is vital to policy makers, policy analysts, and farmers. One of the key questions that all three groups will be asking is will farmers react to decoupling and lower prices by intensifying their production or will they opt for a more extensive milk production system with lower costs and participate in REPS. In order to answer these questions, we need to know the costs of participating in REPS. Therefore, a series of econometric models were estimated to determine the impact of participation in REPS on key indicators of farm performance.

## Methods

The analysis is conducted utilizing 2002 NFS data. The dataset includes 1,040 observations that are weighted to represent 117,243 farms, approximately 95 percent of the farming population in 2002. There were 466 active dairy producers in the survey. However, during the course of the analysis some outliers were excluded and the final sample consisted of 449 observations. Data on resources, such as land, labor, animal numbers, and crops planted, are available for each farm as is financial data on prices received and quantity and cost of inputs.

Four measures of performance were used to assess the effect of REPS on dairy farms: gross output per hectare; milk produced per hectare; stocking rate per hectare; and total direct costs (TDCs) of production per hectare. Gross output per hectare is comprised of market returns to the dairy, beef, sheep, and crop enterprises; it does not include the REPS payment or other direct payments. TDCs are the sum of direct or variable costs for the same four enterprises and include the cost of feed, fertilizer, seed etc.

An econometric model was estimated for each of the four measures of farm performance using ordinary least squares. Gross output per hectare and TDCs per hectare are modeled as a function of farmer age, region, REPS, milk sold, specialist dairy, and off-farm job. Region is a dummy variable with 1 denoting farmers in the South of the country and zero denoting farmers in the North. REPS is also a dummy variable with 1 denoting farmers who participate and zero denoting farmers who do not participate in REPS. Milk sold is the total milk sales on the farm. Specialist dairy and off-farm job are two additional dummy variables. The NFS divides dairy farmers into specialist and non-specialist dairy farmers. All specialist dairy farmers are assigned the number one and non-specialist dairy farmers are assigned a zero. Farmers with off-farm jobs are assigned a one and those without off-farm jobs are assigned a zero. Milk sold per hectare and stocking rate per hectare were also modeled as a function of age, region, REPS, specialist dairy and off-farm job as well as liters of milk sold per cow, TDCs per cow and soil type. The NFS classifies soil type into one of five categories with 1 denoting the highest quality soil and 5 the lowest quality soil. Hence, dummy variables are included for soil types 1, 2, 3, and 4. These variables were included because soil type is likely to have a significant impact on stocking rate and the length of the grazing season.

## Results and Analysis

Table 1 presents the regression results with average gross output per hectare as the dependent variable. All other factors being held constant, participation in REPS reduces average gross output by 241.55 euros per hectare. In other words, average gross output per hectare is 242 euros lower on dairy farms that are in the REPS scheme. All of the other estimates have the expected sign. Farms located in the south of Ireland, specialist dairy farms, and milk sold all have positive signs, and off-farm job has a negative sign. The coefficient of age is also negative. The p-value for the coefficient of REPS is .0005, indicating that it is highly significant, as we would expect given the restrictive nature of the scheme on dairy farms. Similarly, we can see that the level of milk sales and being a specialist dairy farmer have very high levels of statistical significance.

**Table 1: Regression results with average gross output per hectare on Irish Dairy Farms as the dependent variable**

| Variable | Coefficient | p-value |
|---|---|---|
| Intercept | 1,255.72 | <0.0001 |
| Age | -3.54 | 0.1438 |
| Region | 48.37 | 0.4340 |
| REPS | -241.55 | 0.0005 |
| Milk Sold | 0.0029 | <0.0001 |
| Off-farm job | -152.73 | 0.1254 |
| Specialist Dairy | 358.20 | <0.0001 |

$R^2$ = 0.4227, Adjusted $R^2$ = 0.4148, Sample size = 449

Table 2 shows the results using liters of milk sold per hectare as the dependent variable. The coefficient for REPS is -904.89, which implies that, holding all other factors constant, REPS farms will produce 905 liters of milk less per hectare than non REPS farms. This result indicates that participation in REPS leads to lower yields per hectare on dairy farms. The REPS coefficient was highly significant with a p-value <.0001. The signs of the four soil classification coefficients are positive and highly significant; indicating that milk produced per hectare is higher on these types of soils than on category 5 soil. As expected, milk produced per hectare is higher in the south where climatic conditions are more favorable for milk production. Milk yield per hectare is higher on specialist farms and has a positive relationship with TDCs, and milk yield per cow. As expected, farmers with an off-farm job produce lower-levels of milk per hectare.

**Table 2: Regression results with liters of milk sold per hectare on Irish Dairy Farms as the dependent variable**

| Variable | Coefficient | p-value |
|---|---|---|
| Intercept | -3,288.85 | <0.0001 |
| Age | -3.06 | 0.6233 |
| Region | 264.96 | 0.1090 |
| REPS | -904.89 | <0.0001 |
| Liters of milk per cow | 1.09 | <0.0001 |
| Off-farm job | -245.59 | 0.3335 |
| Specialist dairy | 2,193.56 | <0.0001 |
| TDCs per cow | 1.08 | 0.0516 |
| Soil type 1 | 960.04 | 0.0010 |
| Soil type 2 | 1,151.17 | 0.0009 |
| Soil type 3 | 725.75 | 0.0218 |
| Soil type 4 | 718.04 | 0.0186 |

$R^2$ = 0.56, Adjusted $R^2$ = 0.55, Sample size = 449

Table 3 shows the regression results with stocking rate per hectare as the dependent variable. Stocking rate per hectare is total livestock units divided by total area (i.e., livestock units per hectare). The coefficient for REPS is -0.33, indicating that stocking rate is lower on REPS farms; again p <.0001. As expected, the coefficients for farm location, being a specialist dairy farmer, milk production per cow, costs per cow, and soil type are all positive. The coefficient of off-farm job is negative, indicating that farmers with off-farm jobs have a lower stocking rate. It is also of interest that the magnitude of the REPS coefficient is almost double the off-farm job coefficient and much larger than the coefficients for region and specialist dairy farmer.

**Table 3: Regression results with stocking rate per hectare on Irish Dairy Farms as the dependent variable**

| Variable | Coefficient | p-value |
|---|---|---|
| Intercept | 1.3795 | <0.0001 |
| Age | -0.0022 | 0.2498 |
| Region | 0.0718 | 0.1538 |
| REPS | -0.3293 | <0.0001 |
| Liters of milk per cow | 0.000007 | 0.8131 |
| Off-farm job | -0.1684 | 0.0298 |
| Specialist dairy | 0.1104 | 0.0177 |
| TDCs per cow | 0.0003 | 0.1369 |
| Soil type 1 | 0.3962 | <0.0001 |
| Soil type 2 | 0.4777 | <0.0001 |
| Soil type 3 | 0.2426 | 0.0119 |
| Soil type 4 | 0.2623 | 0.0048 |

$R^2 = 0.19$, Adjusted $R^2 = 0.17$, Sample size = 449

Table 4 shows the regression results with TDCs per hectare as the dependent variable. Given the nature of the REPS program and the fact that it often requires farmers to reduce their stocking rate and to use lower levels of fertilizer, we would expect to see a reduction in TDCs per hectare on farms that are in REPS. As expected, the coefficient of REPS is negative, indicating that after controlling for all other factors, the TDCs per hectare for dairy farms in REPS are 123 euros lower. Once again, the REPS coefficient is statistically significant with a p-value of 0.0003. Farmers in the south and farmers with an off-farm job have lower costs per hectare, whereas specialist farmers have higher costs per hectare. As expected there is a positive relationship between milk sales and costs per hectare.

**Table 4: Regression results with total direct costs per hectare on Irish Dairy Farms as the dependent variable**

| Variable | Coefficient | p-value |
|---|---|---|
| Intercept | 575.66 | <0.0001 |
| Age | -1.45 | 0.2199 |
| Region | -20.97 | 0.4872 |
| REPS | -122.88 | 0.0003 |
| Milk sold | 0.0011 | <0.0001 |
| Off-farm job | -61.73 | 0.2044 |
| Specialist dairy | 135.27 | <0.0001 |

$R^2$ = 0.31, Adjusted $R^2$ = 0.30, Sample size = 449

**Discussion**

The results in tables 1 through 4 indicate that participation in REPS leads to lower milk production per hectare, a lower stocking rate, and a lower gross output per hectare. These results suggest that dairy farms in REPS produce approximately 905 liters of milk per hectare less. Furthermore, the stocking rate is approximately .33 livestock units lower due to the restrictions of the REPS program. Therefore, as a result of participation in REPS and the binding constraints that it places on fertilizer use, stocking rate, and milk production per hectare are lower. Gross output per hectare is 242 euros lower for dairy farms participating in REPS than for farmers not participating in REPS. This loss in gross output per hectare would be in part offset by a reduction in TDCs per hectare for REPS of approximately 123 euros.

The question of whether or not farmers would be better off participating in REPS depends not only on the loss of gross output and the reduction in TDCs, but also on the REPS payment and the farm size. In 2002 under the REPS 2 scheme farmers received 151 euro per hectare and the payment was paid only on the first 40 hectares. (Department of Agriculture and Food 2000) The maximum payment a farmer could receive was 6,040 euro and so it is not surprising that REPS was unpopular amongst larger dairy farmers. However under REPS 4 farmers will receive a payment of between 219.5 and 282 euros per hectare for their first 40 hectares depending on the classification of their land. With land that is part of a Special Areas of Conservation or Special Protection Areas being designated as Natura 2000 and receiving higher payments. In the case of non target land, the payment falls to 82 euros per hectare for the next 15 hectares. For any land beyond this, the farmer receives only 10 euros per hectare. Table 5 compares the payment received for 80 hectares of non-target and target land. As we can see, the payment for the first 40 hectares would be quite large but the payment for the second 40 hectares is substantially smaller and therefore this reduces the incentive for large land owners to enter the scheme.

**Table 5: Comparison of payments per hectare under REPS 4 for an 80-hectare farm**

| | Basic REPS | Natura 2000 |
|---|---|---|
| First 40 hectares | 8780 | 11280 |
| Second 40 hectares | 1480 | 1160 |
| Total payment for 80 hectares | 10260 | 12440 |

*Source: Rice, G. 2006*

As well as the decoupling of direct payments, the Luxembourg Agreement included reductions in the intervention price for butter and skim milk powder. Binfield et al. (2003) projected that the Irish milk price would decline by 15 percent between 2002 and 2012 while TDCs are likely to continue to increase. Therefore, the loss in gross output per hectare from joining REPS is likely to decrease with time and the reduction in TDCs is likely to increase, potentially making REPS a more attractive option in the future. It remains to be seen whether the 2003 reforms will be significant enough to attract those currently not in

REPS to join. Matthews (2002) examined the impact of what were then proposals for reform of the CAP and their impact on REPS participation. He concluded that the proposals would not make REPS participation any more or less attractive for dairy farmers in the future than it already was.

Before the 2003 reforms, the decision of whether or not to join REPS depended largely on the size of a farmer's milk quota and the number of beef premia they were claiming. For many farmers, it was a trade off between keeping more beef animals to receive the beef premia and not entering the scheme or keeping fewer animals and entering the scheme. Prior to the 2003 CAP reforms the trade in milk quota within Ireland has been quite low; approximately 2 percent of total milk quota traded per annum. If this trend in the reallocation of milk quota and decoupling of direct payments continues, it is likely that more dairy farmers will reduce their drystock numbers, switch to a more extensive milk production system, and enter REPS. However, if the Luxembourg Agreement leads to a large scale exit from milk production, as projected by Breen et al. (2005), then it is likely that milk quota will be more widely available, and farmers will replace drystock with dairy cows and have less of an incentive to enter REPS. Furthermore when the milk quota system is abolished in 2015 an environmental scheme such as REPS is likely to hold little attraction for full-time dairy farmers planning to expand their production.

## Conclusions

The results of this study indicate that participation in REPS has a negative impact on production and gross output on dairy farms as well as a negative impact on TDCs. Furthermore, the estimate for REPS in all four regressions had a very high degree of statistical significance. The negative impact of REPS on gross output per hectare is partially offset by the reduction in TDCs that are associated with REPS and further offset by the REPS payment.

Given the relatively small payment in 2002 and that farmers could only receive payment on a maximum of 40 hectares it is not surprising that REPS was unpopular amongst dairy farmers. As shown in table 5, the REPS 4 payments received for the first 40 hectares are quite substantial. However, for hectares after the first 40, the REPS payment is considerably smaller, which is likely to act as a deterrent to larger farmers entering the scheme. The analysis indicates that for Irish dairy farmers with less than 40 hectares the loss in gross output per hectare from entering REPS could be offset by the savings in TDCs per hectare and the REPS payment. However, this may not be the case for larger dairy farmers.

In conclusion, for small dairy farmers and farmers who do not have access to quota, REPS is likely to become a more attractive option. However, for larger dairy farms, REPS will only become an attractive proposition if milk quota is not available and milk and beef prices decreases significantly.

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