CAP reform and nitrate restrictions: implications for Irish grass based dairy production systems

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Introduction The benefit of a systems approach to analysing production situations has long been recognised in agricultural research. The development and application of production-oriented dairy models offer tremendous capabilities for both encompassing the realities faced by producers while also considering the adaptation possibilities available to them in light of internal and external forces of change. This farm level dairy model represents one such approach. The objectives of the study were: (1) to develop a comprehensive farm-level model of Irish milk production systems and (2) to apply the model to identify optimal adaptation strategies of dairy farmers within the context of European policy reform. This paper examines the implications of both the Luxembourg Agreement and the imposition of the Nitrates Directive on Irish dairy systems.

Materials and methods The farm model employs a linear programming framework which was constructed in Excel and solved using GAMS software. The model consisted of 388 activities and 218 resource constraints with the objective being profit maximisation. The comprehensiveness of the model is recognised by the detailed specification of alternative configurations of activities and constraints. Activities include forage production, dairy cow activities, subsidiary activities, purchase of inputs and sale of outputs, land, housing and quota, nutrition, labour and capital. The technical coefficients pertaining to production were based on a series of research experiments at Moorepark. An initial model application was specified assuming an area farmed of 50 ha and a milk quota of 468,000 kg (fixed for the purposes of this example). The farm model was initially solved to identify the optimum system of milk production under a baseline situation (2003). The model was then resolved to reflect the policy environment under a decoupled system as is forecast for 2007. The model was finally solved to reflect the imposition of both the decoupled system and the introduction of the EU Nitrates Directive. This directive details maximum organic N and total N limits of 170kg/ha and 260kg/ha respectively.

Results Table 1 presents a comparison of key results from model optimisations. There was a considerable reduction in N application on the grazing ground with the imposition of the Nitrates Directive. This resulted in a substantial increase in the level of concentrate supplementation while grass and silage intakes fell. While the inclusion of a beef enterprise was profitable under both the baseline and decoupled scenarios, it subsequently fell from the optimal plan. Farm net profit (FNP) over the period reduced substantially. From the baseline to the decoupled and nitrates scenario, FNP fell by €17,377, which represented a 26% drop in income.

Table 1 Comparison of key model results

	Baseline	Decoupled	Decoupled + Nitrates Directive
Grazing level of N	330 kg/ha	330 kg/ha	131 kg/ha
Number of cows	75	75	71
Month of calving	Feb./Mar	Feb./Mar	Feb./Mar
Avg. milk/cow (kg)	6577	6577	6587
Feed budget (kg DM/cow)			
Grass	3738	3738	3575
Silage	1465	1465	967
Concentrate	291	291	861
Beef animals	10	10	0
S.R. (lu/ha)	2.46	2.46	2.05
Farm Net Profit	€67,896	€57,064	€50,519

Conclusions The results indicate that dairy producers face considerable income pressures from both imposed and pending EU policy amendments. Minimisation of this negative income effect may be achieved through subsequent adaptation and configuration of system resources as shown. The dairy model allows such adaptation strategies to be identified and examined.