Comparing visions for CAP reform post 2015: Farmer intentions and farm bio-economic modelling

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Abstract— This paper illustrates the impacts of two potential CAP reform scenarios on beef farmers in Scotland post 2015 using an optimising farm level model. These results are then compared with farmers' perception about the policy changes, captured during a farmer intentions survey.
The model results suggest that beef farms suffer a loss in farmer net margins under fully decoupled as well as under partially decoupled scenarios (up to -25%) compared to current historical single farm payments. The model also shows that farms respond by reducing the number of beef animals on farm by up to 5%. However, under a partially decoupled scenario, beef farms increase calf numbers by 15% to benefit from coupled calf payment. This is contrasted with a survey of 1,400 beef producers which was conducted in the Summer of 2013. A set of hypothetical payment scenarios was used to test whether farmers would expand, intensify or extensify activity.
Comparing both exercises it seem that most intentions relate to increasing activity, compared to the results of farm level models These factors highlight significant factors for future modelling of European farmers. These are i) the adoption of rationality within farming, when farmer decisions may be considered sub-optimal, ii) the consideration of social and environmental factors within decision-making, which dictates the annual choice of allocation between productive and non-productive land resource, iii) the consideration of farmer exit and how this could be modelled within future farm level models, and iv) the inclusion of capital asset items and long-term planning as a source of rational decision-making.

Index Terms—Farm Level Modelling; Farmer Intentions; CAP Reform

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1. Introduction

Under proposed CAP reform, farm subsidies provided to Scottish farms, which until now were based on their historical entitlements, have to be replaced with the Basic Payment Scheme (BPS), which would be determined under mandatory internal convergence. The Scottish Government (SG) has proposed a number of possible options to implement the Basic Payment Scheme (BPS) under Common Agriculture Policy (CAP) reforms. One of the proposed reforms for this state is a two-region payment system, which is based on land capability and land use. One regional payment comprises land under arable cropping,

temporary grass and permanent grass and would get a higher rate of BPS (region1). The second type of regional payment (region2) consists of land under rough grazing and would receive a lower rate of BPS. The rate of payment is determined by considering a number of issues such as Greening Payment, National Reserve and Young Farmer Scheme as mandatory payments and Voluntary Coupled Support, Redistributive Payments, Small Farmer Scheme and Areas of Natural Constraint Support as optional payments. The proposed two-region payment system is further coupled with and without calf payment scheme.

This paper examines the response of these new payment schemes on Scottish beef farms using an optimising farm level model. Farm net margin as optimised by the model was used as a measure to illustrate the impacts of policy change scenarios used in this paper. The results were then compared with a survey of farmer intentions towards CAP reform payment scenarios. This provides information for assessing the full response of activity change with respect to farmer decision-making and external drivers from CAP reform.

2. Methodology

2.1. Farm Level Optimisation

Farm level data used in the model was taken from the Scottish Farm Accountancy Survey (Scottish Government, 2011). The FBS collected physical and financial data from around 250 beef farms across Scotland. A cluster analysis was carried out to group the farms based on the farm types (as designated in the FAS) as well as their production level, size and financial status. A farm level optimising model, named “ScotFarm”, developed at SRUC, was used for this study. ScotFarm maximised farm profits for all farm types within a number of limiting farm resources such as land, labour, feed and stock replacement. The total land available to a farm is fixed. Farms are allowed to buy in feeds, animal replacements and hire labour if required. The farming net income is comprised of the accumulated revenues collected from the final product of the farm activities (crops, animals and milk) plus farm payments minus costs incurred for inputs under those activities. The input costs are replacement costs for livestock, variable costs including labour, feed and veterinary costs and overhead costs on farms. The model consists of beef as well as dairy, sheep and tillage activities (especially for the mixed farms) on farm. The stocking rate on each farm is also fixed to the farm level data assuming that all farms were operating under optimum stocking rates. The beef and sheep systems follow a two year replacement structure. The

animals are replaced by on-farm or off-farm replacement stocks. A feed module, based on Alderman and Cottrill (1993) is used in the model to determine feed requirements for each of the animals on a farm based on type, age and production level of the animal. Feeds available to the livestock on farm are fresh grass, grass silage, grass hay, maize silage and concentrate feeds.

2.2. Farmer Survey

A telephone based survey of Scottish agricultural holdings was conducted over the Summer of 2013. A spatially representative sample of 10,000 holdings was selected using information from the June Agricultural Census on region, activity, size and farming enterprise. The basis of the questionnaire was developed from past surveys conducted for the Scottish sector (Barnes et al., 2009; Barnes and Toma, 2012). The questionnaire had a number of sections, these were i) socio-economic and demographic factors; ii) farm related structural factors; iii) current levels of activity and payment levels; iv) proposed intentions in 2020; v) hypothetical subsidy scenarios, namely increasing payment by 25% and decreasing payment by 25%. Finally, attitudes towards the ease of application of activities was explored. The survey was administered throughout the Summer of 2013 (May – July). Overall, this yielded a response rate of 1,764 observations from livestock based holdings. These were then matched with census data to provide further information on activity levels, such as size, economic size units, main activities and regions

Given the extensive range of activities proposed a binary-choice approach was considered the most parsimonious estimation strategy. Accordingly, farms were given a value of 1 if they stated an intention to increase activity, and a 0 for remaining the same. A binary logistic regression was estimated as it has the advantage of providing an odds ratios related to the range of causes for increasing activity

2.3. Modelling Scenarios

This paper examines two CAP reform scenarios; i) where BPS is entirely decoupled (named 2Reg scenario) and ii) where BPS is partially coupled with beef calf payments (named 2Reg+CalfPay). The payments used in this study for these two scenarios are provided in Table 1. The proposed decoupled calf payment system has three rates, namely i) 10 calves getting € 172.52 per calf, ii) the next 40 calves getting a rate of € 115.01 per calf, and iii) over 50 calves will receive €57.51 per calf. Results from these two scenarios are compared with a baseline scenario where the model is run under the current CAP payment schemes.

TABLE 1: SCENARIOS USED IN MODELLING

Regions	Scenarios				
	2Reg	2Reg+CalfPay			
	BPS (€/ha)	BPS (€/ha)	Calf<10 (€/calf)	Calf(10-50) (€/calf)	Calf >50 (€/calf)
Region 1	244.38	224.62	172.52	115.01	57.51
Region 2	27.45	25.23	172.52	115.01	57.51

3. Results

3.1. Farm Level Modelling

The cluster analysis on the Farm Account Survey, produced 8 beef farm types across Scotland. These farms differ from each other on size, production level, labour use, farm net margin and subsidy payment. The farm types and the corresponding land size and single farm payment rate is provided in Table 2.

TABLE 2: BEEF FARM TYPES WITH THEIR LAND SIZE AND SINGLE FARM PAYMENT RATE

Farm types	Land (ha)			SFP (£/ha)
	Grassland	Arable land	Rough grazing	
Beef S	77	5	49	187
Beef M	139	8	105	225
Beef L	234	16	453	145
Beef/Sheep M	93	5	603	52
Beef/Sheep L	264	28	454	127
Mixed L	145	92	68	247
Lowland cattle/sheep	172	9	58	246

The results suggest that all of the Scottish beefs farms lose out under both of the policy scenarios compared to the baseline scenario (Figure 1). Large beef farms have the largest impact within the new payment scheme. The smaller beef farms, especially the beef farms with mixed activities, have lower reductions on their farming net margin. This suggests these farms would suffer less if the new payment schemes were implemented. Under the coupled “calf pay” scenario, all beef farms show an improvement in their net margins although they are still lower compared to the baseline scenario.

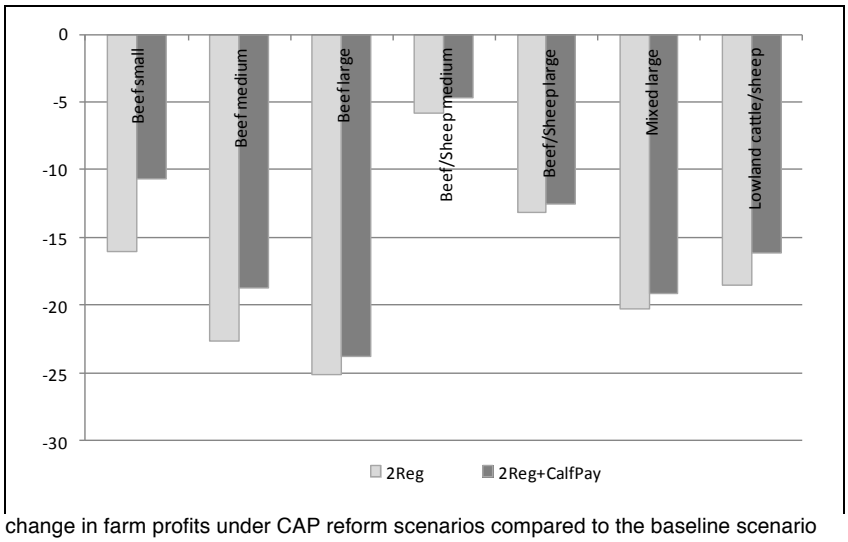

Figure 1. Percentage change in farm profits under CAP reform scenarios compared to the baseline scenario

The results also show that most of the beef farms reduce beef numbers on farms by under 10% compared to the baseline scenario. However, mixed large farms do increase beef numbers by 15% in a bid to reduce the negative impacts of reduction in payments under CAP reforms. All the beef farms show an increase in beef numbers under the "2Reg + CalfPay" scenario to exploit higher coupled calf payments. The medium beef and sheep and mixed large farm groups show a substantial increase in beef numbers under the scenario only because these farms have a small number of beef animals on farm (<20) under the baseline scenario

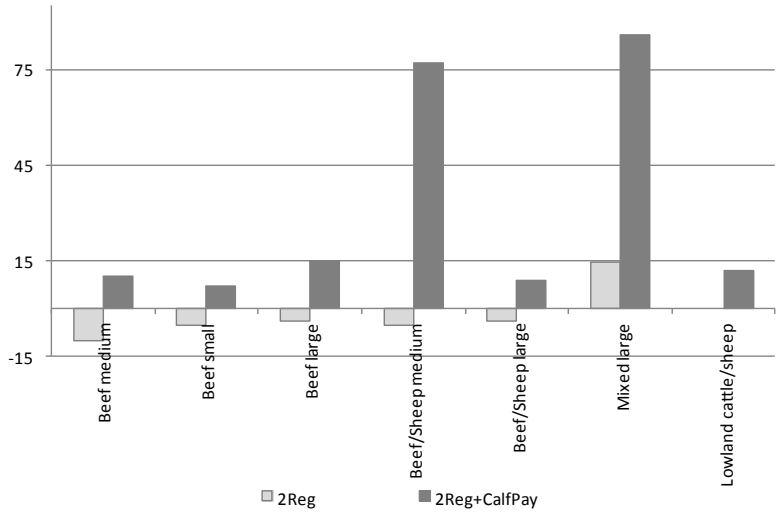

Figure 2: Percentage change in beef animal number on farm under CAP reform scenarios compared to the baseline scenario

3.2. Survey Results

Table 3 shows the results of a probit model related to increasing a range of activities with respect to CAP reform. These reveal a broad level of similarity, with, as expected, the one option of exiting showing

the converse of the other activities. The most consistent estimators seem to be those related to past activity change in 2005, changes to payment rates, age and identification of a successor.

For exiting the business, no observations were related to past activity or increasing payment, but clearly a reduction in payment will have a large impact in the risk of exiting. Specifically, a proposed reduction of payment of 25% on current levels would quadruple the chances of exiting the business. In addition increasing age proves a significant factor in exiting the business, as would a reduced odds ratio for identifying a successor. Notably, structural and spatial factors such as size, tenancy and region do not have any influence on the decision to exit.

Those intentions, related to increasing agricultural activities (namely size of the business, intensification and on-farm investment), are strongly related to past activity responses and changes in payment rates. For all these intentions, increasing activities in response to the Fischler Reforms in 2005 are positive, significant predictors that farmers intend to continue along this trajectory. Of these, increasing on-farm investment generates the highest odds, and this could reflect the influence of habits within farmer decision-making, as well as economies of scope, to have the confidence to continue with this activity. Generally both payment increases and decreases infer an increase in agricultural activity, though payment increases indicate a greater probability to do this activity than a decrease. Thus, this may highlight a number of issues raised around subsidy payment itself, whereby reducing payment would enact a response by increasing present activity, including investment.

TABLE 3. ODDS RATIOS OF A RANGE IN INTENTIONS RELATED TO SUBSIDY CHANGE, STANDARD ERRORS IN ITALICS

	Intentions to Increase levels of activity						
	Sell Up	Size	Intensity	Employed labour	Diversify	Family labour	On-farm invest.
Activity Conducted in 2005	.	2.306***	4.006***	3.296***	2.260***	5.078***	9.251***
Reforms Payment (+25%)	.	2.155	2.860***	3.422***	4.345***	7.424***	11.984***
Payment (-25%)	3.960***	1.720**	1.834*	1.807*	9.892***	0.964	2.858*
Age	3.000***	0.507***	0.500***	0.429***	0.395***	0.570***	0.577**
Size	0.991	1.243	1.363**	1.133	1.186	1.344	1.436*
Successor	0.170***	2.897***	2.174***	2.087***	1.711**	1.117	0.84
LFA	1.092	0.534*	0.97	0.587**	1.111	0.694	0.956

* significant at 0.05, ** significant at 0.01, *** significant at 0.0001

Labour activities relate the amount of labour both family and employed the farmers claim to intend to increase by 2020. As before activity response to the Fischler reform give high odds ratios for both intentions, as does a payment increase of 25%. Less significant is the effect of a payment decrease which would still lead to increased intentions, perhaps as before echoing the response to increasing size as a means of making the business more robust under lower income scenarios. In addition, younger ages of farmers (odd ratio<1) predicts increasing activity (new entrants scheme). In addition, employment of more (non-family) labour may be predicted by higher levels of education, and this reflecting a more progressive attitude to the future of the farm, as does the identification of a successor, which again may reflect these wider inter-generational issues. Notably, those within an LFA are less likely to employ more labour, as would be expected given the more fragile economic conditions these are under. In addition size of business does not seem to be a predictor of more employment intentions. A final driver behind increasing family farm labour, is being a member of an agri-environmental scheme. This perhaps reflects the cost-foregone rationale of agri-environmental payment schemes and thus reflective of the perceived lower opportunity cost of family labour relative to employed labour.

4. Page Layout and Main Text Sections

One of the major changes in current CAP reform is to replace the historical single farm payment with a flat rate basic payment scheme. The objectives behind this change are firstly to update the payments (which were based on what farms did some 10 years ago) to the current farm activities and secondly to redistribute the payments among all agricultural farms. The rationale behind this is to assist farms with smaller farm payments who are finding it difficult to survive. But as the national pot of payments stays the same as under current CAP reforms, any additional payments to the smaller disadvantaged farms emerge from payments to farms that are receiving larger payments at the moment. An ideal payment redistribution scheme therefore should be able to improve farm payments on small farms without having a large negative impact on other farms. The results from this paper suggests that Scottish beef farmers will not benefit from this redistribution of payments under both fully decoupled and partially decoupled payment scenarios used in the study. Smaller farms do have a smaller reduction in farm net margins compared to their larger counterparts, but nevertheless they also lose out financially. The results however, show that beef farms mixed with sheep production on farm have the lowest reduction in farm margins under CAP reform scenarios. These farms have the largest land when rough grazing is

included, suggesting that lower land capabilities (such as SDA sheep farms) would benefit from current CAP reforms.

The stated response to payment reforms tend to show a robust approach to farming. Clearly aspects of modeling which may be under-represented, such as complete exit from the industry, can be estimated through a survey approach. Whilst expected, the effect of an increasing payment would induce more activity in agricultural and non-agricultural activities, there is some robust responses to decreasing payment rates, for both agricultural and non-agricultural activities. As a means of ensuring future sustainability of the business, the importance of identifying a successor cannot be underestimate.

These factors highlight significant factors for future modelling of European farmers. These are i) the adoption of rationality within farming, when farmer decisions may be considered sub-optimal, ii) the consideration of social and environmental factors within decision-making, which dictates the annual choice of allocation between productive and non-productive land resource, iii) the consideration of farmer exit and how this could be modelled within future farm level models, and iv) the inclusion of capital asset items and long-term planning as a source of rational decision-making.

5. Acknowledgments

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6. References

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