Effects of a flat rate introduction: shifts in farm activity and impact on farmers' income.

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Abstract

Current thoughts on CAP changes, e.g. the 'Health Check', emphasize the necessity to move away from payments based on historical receipts towards a "flatter rate" system. The aim of current research is to simulate the impact of a flat rate system (equal payments per hectare of cultivated land) compared to the current historical system (payments based on individual historic entitlements). Impact on production and income of arable, dairy and cattle farms of two different flat rate scenario's, is assessed with a farm-based sector model for Flanders. The model maximizes income at farm level, calibrated to observed farming behavior in 2001-2003. Farm data can be selected by farm type, size and region, simulations could be run for specific sub sectors, size classes or regions. In the two simulated flat rate scenario's subsectors will gain subsidies at the expense of other subsectors. However, farms can compensate a substantial part of their income loss by changing activity choice.

Key words: Positive Mathematical Programming, farm model, Common Agricultural Policy, Payment Entitlements.

1. Introduction

The Mid Term review (MTR) of 2003 has led to a fundamental reform of the European Common Agricultural Policy (CAP). One of these basic reform principles is the decoupling of payments. The farmer receives a single farm payment (SP), which is a financial support at farm level instead of separate activity and production-linked payments. The main purpose of direct payments is to create a more market-oriented, competitive and sustainable agriculture while, at the same time, stability of the farmer's income remains guaranteed. Farmers have more flexibility to produce while receiving the same amount of aid. To receive direct payments, farmers must meet standards concerning public, animal and plant health, also environment and animal welfare and keep their land in good agricultural and environmental condition (cross-compliance).

In Belgium and some other countries (e.g. Ireland, The Netherlands, Spain, Portugal, etc.), payment levels are based on the coupled support received for agricultural land and livestock in the reference period 2000-2002. Per hectare reference area, one payment entitlement is allotted. The value of each payment entitlement (per farm) is calculated by dividing the individual reference amount (support during reference period) by the average number of hectares farmed in the reference period. The values of payment entitlements thus vary according to the historic origin of the right for support (historic model).

However, the European Commission recently unveiled the 'Health Check' of the CAP, in which they emphasize to move away from payments based on historical receipts towards a "flatter rate" system and to increase the rate of decoupling in those countries which opted in a number of farm sectors to maintain the link between subsidy and production. Therefore, making this variable amount more uniform within a given region becomes an option. The so-called flat rate subsidy system, equal payments per hectare of cultivated land within a region or country, would change the basis from a historical to a regional model. Arguments are (Bruins *et al.*, 2006): the influence of historical production is not further justifiable after 10 years; different levels of payment freeze different competitive capacities; trade in entitlements is rather undesired and will become useless with the implementation of a flat rate; almost all farms will anyhow fall within the scope of cross compliance; coupling to the social role of agriculture should increase; agricultural use of extensive land will be rewarded. Nevertheless, also arguments emerge against a change towards a flat rate: new starting-up costs; juridical instability; decrease of competitive advantage to member states that do not implement; income support for subsectors that have never been supported before (legumes, fruit, greenhouse crops); income transfers between firms, sectors and possibly also regions.

Current paper focuses on these income aspects, with the objectives to simulate the introduction of a flat rate system replacing the current historical system and to study the impact on firm and subsector income redistribution. The impact analysis does not only consider redistribution of the entitlements with unchanged production plans, but also takes into account possible crop or cattle shifts as a consequence of an enhanced freedom of production. The analysis is done with a multi-farm mathematical program and differs in method and objective from related other impact studies. For example, Himics and Potori (2007) used a partial equilibrium model, which uses farm groups as agents to investigate changes in agricultural output, in the production structure and in competitiveness.

Severini and Valle (2005), on the other hand, used a simple model of farm behavior to focus only on the market of exchange of entitlements. Serra *et al.* (2006) extended the model of Leathers and Quiggin's (1991) to study policy impacts on not only input use, but also on output. Mean and variability tended to decline by decoupled payments. Britz *et al.* (2002), Casado and Gracia (2005) and Guindé *et al.* (2005) have developed models operating at regional or higher level. However, transfers of direct payment entitlement among farms require simulations at the individual farm level. Furthermore, responses on decoupling and effects of modulation require a farm level approach as farms can try to avoid this modulation by exchanging direct payment entitlements.

2. Method

Impact on production and income of arable, dairy and cattle farms is assessed with a farm-based sector model (SEPALE, System for evaluation of agro- and agro-environmental policies, Buysse 2006) for Flanders. The agricultural model SEPALE is composed of a set of farm-economic mathematical programming models, each representing the optimizing farmer's behavior at the farm level. Parameters of each MP model are calibrated on observed data at a base period exploiting the optimality first order conditions and the observed opportunity cost of limiting resources. Further comprehensive descriptions of the basic model and how to simulate single farm payments can be found in Buysse *et al.* (2005, 2007) and Henry de Frahan *et al.* (2007).

The basic idea for simulating the single farm payment is to introduce a variable denoted by aa_f accounting for the farm area that can activate the single farm payments with the following bounds. The first constraint (1) prevents the single farm payments to exceed the entitled amount while the second constraint (2) prevents the farm to activate payments on ineligible area:

$$aa_f \leq \text{ entitled single farm payment area} \quad (1)$$

$$aa_f \leq \text{ area of eligible crops} \quad (2)$$

Mean production and cost data of 2001, 2002, 2003 of 243 FADN farms were used for calibration. The limitation to arable, dairy or beef cattle farm types (Table 1) is justified because the SEPALE-model runs with soil-linked farms. In addition, most direct payments based on historical entitlements are distributed among these farm types. Crop shifts and income effects were simulated for specific sub sectors (farm types). To compare within farms with dairy cattle (174 farms), simulations were run for different size classes and regions (Table 2 and 3). As the SEPALE model maximizes profit on farm level, farms can be selected by farm type, farm size and region. Following assumptions are made: farms cannot start new activities, neither payment entitlements nor milk quota can be traded and the total area can be activated.

Table 1. Classification of the 243 FADN farms, used in the simulations, into farm types.

farm type	number of farms
Arable farms	39
Dairy farms	99
Dairy farms + other cattle (secondary)	32
Dairy farms + other cattle	20
Beef cattle farms	15
Arable farms + dairy cattle	24
Arable farm + other cattle	14

Table 2. Classification of the 174 FADN farms with dairy cattle, used in the simulations, into size classes.

size	gross balance	number of farms
XXL	SGE*>75	0
XL	23<SGE<75	65
X	16<SGE<23	48
L	11<SGE<16	27
S	0<SGE<11	34

* 1 SGE = 5380 euro

Table 3. Classification of the 174 FADN farms with dairy cattle, used in the simulations, into agricultural regions.

region	number of farms
Kempen	60
Leemstreek	8
Polders	10
Zandstreek	41
Zandleemstreek	55

The gross margin for each farm (subsidies from Pilar I included) was calculated by subtracting the variable costs from the sum of production value and payments. However, crops less than 1% of the gross balance were not taken into account. Two alternative flat rate scenarios were simulated and compared with one MTR scenario as a reference. This reference scenario is the situation of 2005. However, due to administrative transformations, FADN data of 2005 are not available at this time. Therefore, average gross margins of the years 2001, 2002 and 2003 served as a base to calculate the MTR reference scenario and the impact of the two flat rate scenarios described below. The areas of the reference year 2005 were simulated with SEPALE. Furthermore, payment entitlements for the reference year 2005 were defined with the simulated areas, taking into account a modulation of 3 % and a dispensation of the first 5000 euros. Nevertheless, we could validate simulated data (area and total payments without milk premium) with observed data for 38 farms. The analysis of variance revealed no significant difference in mean between the two groups for both variables ($p = 0.42$ and $p = 0.41$ for area and total payments respectively).

The two flat rate scenarios are based on alternatives that have been earlier described and quantified by Campens *et al.* (2006). This enables us to place the simulation in the context of options that are at stake. In addition, current study simulates possible shifts in crop and cattle husbandry. In the first flat rate scenario (FR1), the total value of payment entitlements and coupled subsidies in 2005 are grouped and divided by the total available eligible area, excluding potatoes, vegetables, fruit and permanent cultures. These crops are not allowed to be cultivated with payment entitlements. The FR1 scenario, under Flemish conditions, resulted in a payment entitlement of 416 euro per hectare. The second scenario (FR2), based on the reform of the common market organization for fruit and vegetables (CMOs) does also take into account areas on which potatoes, vegetables, fruit and more permanent cultures are cultivated, resulting in a payment entitlement of 365 euro per hectare.

3. Results

3.1. Production shifts

Simulated shifts in crop, dairy and beef production caused by the FR1 and FR2 are evaluated (Figure 1). The biggest shifts occur in the cattle sector. As the premium for suckler cows is being decoupled, this production is losing a main incentive and shifts towards beef cattle. The CMO of fruit and vegetables reform does not have a considerable effect on this shift. Furthermore, the fodder crops will not change as drastic when a flat rate is introduced. As the FR1 scenario encloses less alterations of the reference situation compared to FR2, the crop shifts are less substantial under FR1. Crops favored by MTR (grains, grain corn), enhance at the expense of fodder crops. Potatoes and green legumes also increase, which is remarkable as farmers cannot activate payment entitlements with these crops in FR1. As the cultivation of potatoes and green legumes do activate payment entitlements in FR2, these crops augment further in disadvantage of grains and grain corn. Furthermore, grassland is increasing in FR2.

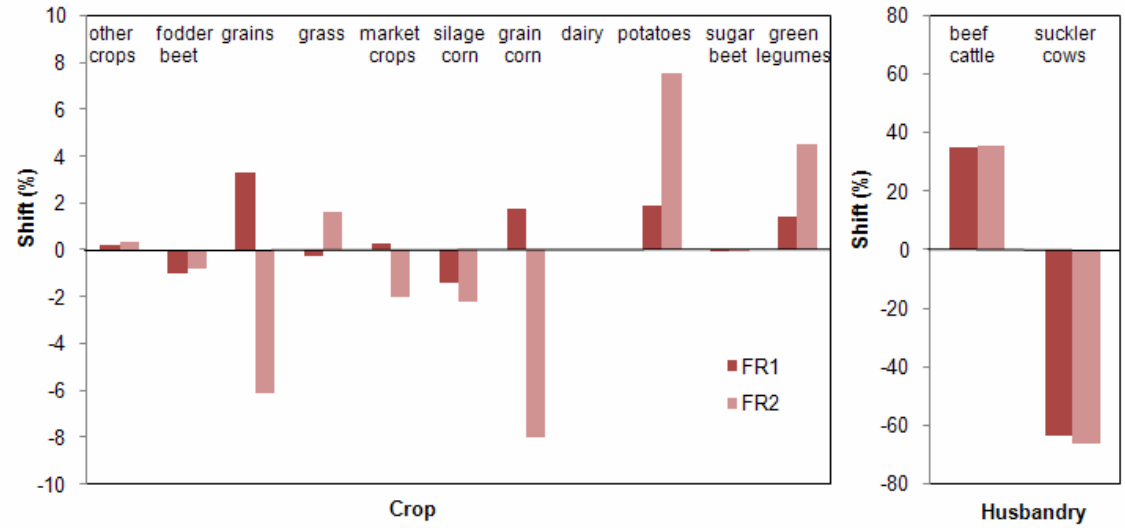

Figure 1. Shift in farm activities caused by 2 flat rate scenarios (FR 1 : flat rate scenario with areas of potatoes, vegetables and fruits excluded; FR 2: flat rate scenario with areas of potatoes, vegetables and fruits included) with the MTR scenario as a reference.

3.2. Income shifts

Effects of FR1 and FR2 on the farmers' income are compared with and without possible shifts in farm activities. As expected, the results for Flanders (Figure 2) of the FR1 scenario without possible shift, show only minor income decreases for the supported firms, because funds are mainly redistributed through farms that already received payment entitlements. This calculated income decrease should be seen with respect to the traditional entitlement to support these firms. Redistribution of payment entitlements through all Flemish firms would of course give an overall zero transaction. In the FR2-scenario, the effect on income is negative as some amount of subsidies will drain away to other sectors.

When the differences between farm types are evaluated (Figure 2), we observe that specialized and mixed arable farms will receive more payment entitlements thanks to their arable area, and this at the expense of mainly the beef cattle farms. The decrease for the cattle farms is even more extreme in the FR2-scenario, as the ineligible area is also taken into account. However, a farm could turn around this negative situation by changing crop and/or cattle husbandry. Farms, with other than beef cattle, can mainly compensate for their income loss by changing activities. The biggest change in income arises in the dairy and arable farms with other cattle, where the model assumes a shift from suckler cows towards beef cattle. Dairy farms with no or less other cattle (secondary) experience the slightest influence.

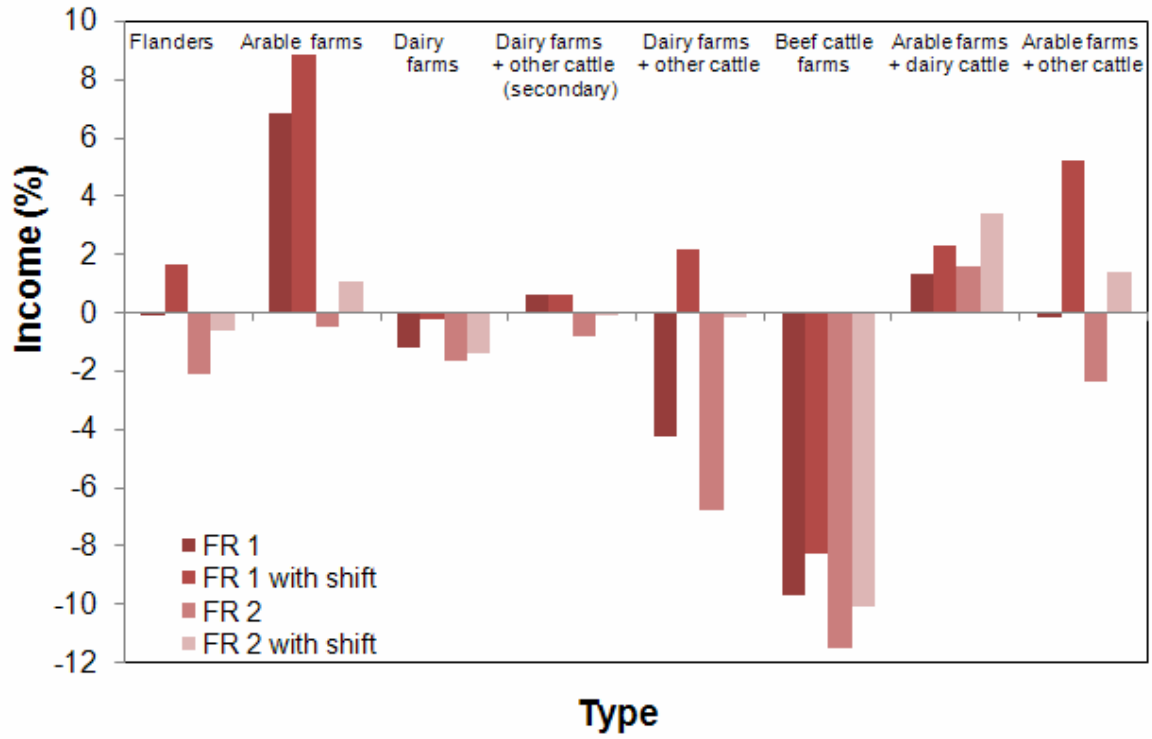

Figure 2. Change in income of Flemish firms, categorized in farm types, caused by 2 flat rate scenarios (FR 1 : flat rate scenario with areas of potatoes, vegetables and fruits excluded; FR 2: flat rate scenario with areas of potatoes, vegetables and fruits included) with and without possible shift in farm activities.

Furthermore, looking to differences between farm categories sizes of dairy farms (Figure 3), the income of big farms declines mostly in both scenarios. However, also here, big farms can mainly compensate for their income loss by changing crop and/or cattle husbandry. On the other hand, medium-sized and small farms could even enlarge their income with more than 1 %, but only in the FR1-scenario and when they change their crop mix. Doing so, they can also compensate a deteriorated income in the FR2 scenario.

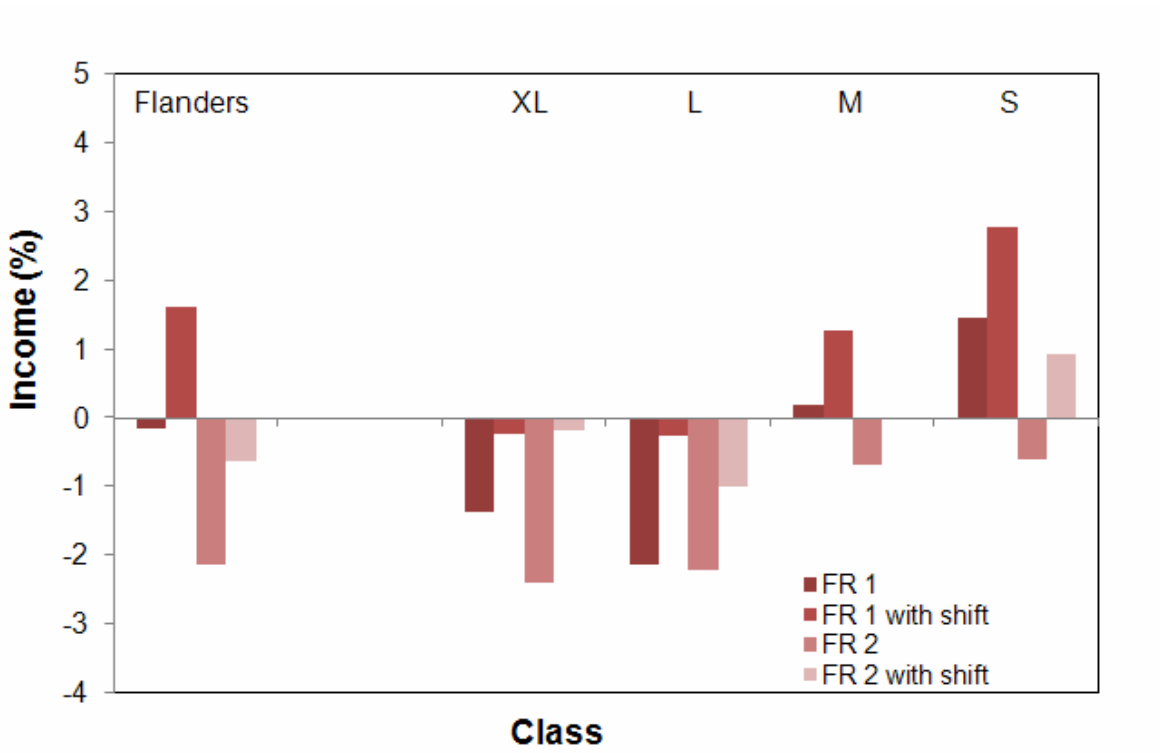

Figure 3. Change in income of Flemish firms and farms with dairy cattle, categorized in size classes, caused by 2 flat rate scenarios (FR 1 : flat rate scenario with areas of potatoes, vegetables and fruits excluded; FR 2: flat rate scenario with areas of potatoes, vegetables and fruits included) with and without possible shift in farm activities.

Finally, farms located in different regions have apparently different abilities to respond to the simulated scenarios. When the possibility to shift in crop and/or cattle husbandry is included, the low flexibility of the dairy cattle farms in the Kempen is remarkable (Figure 4) and increases the difference in income in comparison with other regions in both scenarios. Dairy farms of the Leemstreek (silt loam soil) seem to have the highest flexibility and turn a negative effect of a flat rate into an income raise by changing activities.

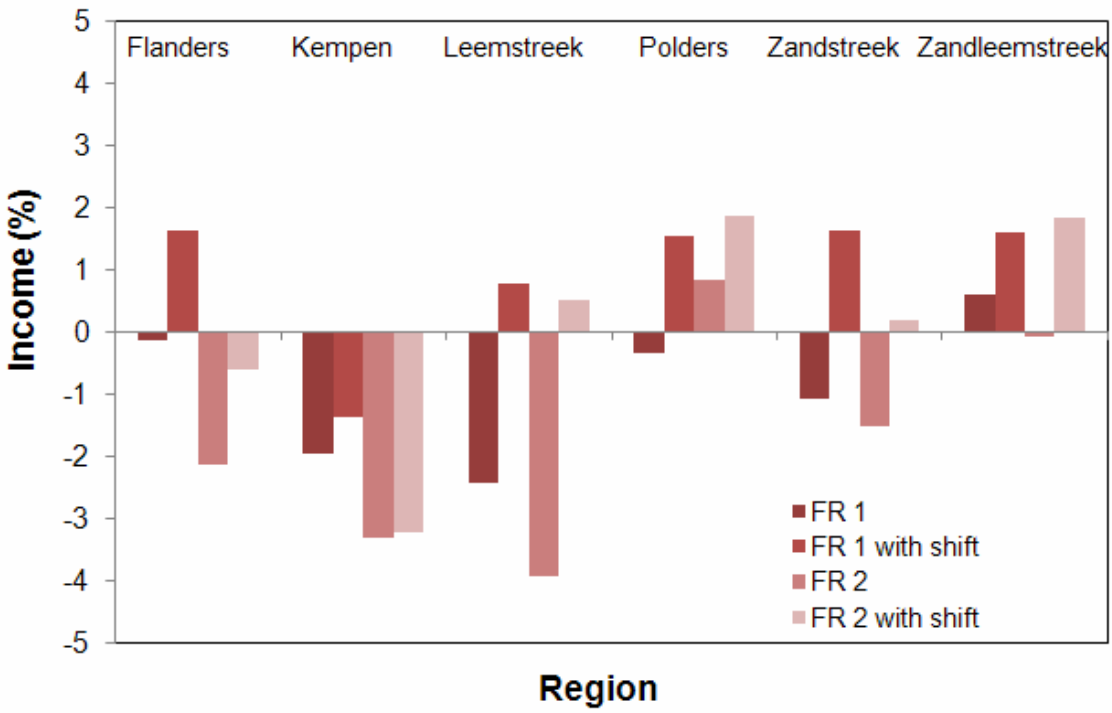

Figure 4. Change in income of Flemish firms and farms with dairy cattle, categorized in regions, caused by 2 flat rate scenarios (FR 1 : flat rate scenario with areas of potatoes, vegetables and fruits excluded; FR 2: flat rate scenario with areas of potatoes, vegetables and fruits included) with and without possible shift in farm activities.

4. Discussion

Our analyses reveal redistribution effects that can be taken into account by policymakers when they consider future flat rate strategies. In both flat rate scenarios some subsectors will gain subsidies at the expense of other subsectors. Specialized or mixed arable farms will receive more direct payments compared to cattle farms. When looking within the dairy sector, medium and small sized firms will receive more strength. In contrast, big farms will lose most on income. Income losses in given subsectors will have to be considered and compared with the advantages of a flat rate scenario for the entire agricultural sector. However, farms can compensate a substantial part of their income loss by changing crop and/or cattle husbandry. For example, farms with suckler cows seem to shift towards beef cattle husbandry. Also in the research of Bascou *et al.* (2004), market projections in Europe indicate that agricultural production in key areas (cereal, beef and dairy production) will rather be altered because of the new CAP while agricultural income will be little affected.

An important assumption of the model is that farms cannot start new activities, which explains the rigidity of some regions or farm types. A farm with various activities is more flexible in altering its activities. However, this is closely linked to reality, as specialized farms will struggle more when a new activity has to be introduced. For example, the flexible farms from the Leemstreek can modify their crop mix more easily and can therefore change an income decrease into an income increase.

While, on the other hand, specialized farms from the Kempen are very rigid and have difficulties in altering their crops or cattle. The region, linked to soil type and current specialism, is therefore an important factor in how farms deal with a newly introduced flat rate. These differences in income between dairy farmers can have an effect on the trade market of milk quota. For example, in most regions, farmers will have the intention to substitute dairy cattle for beef cattle, which might cause quota prices to drop. On the other hand, in the Kempen, prices might raise as these farmers are more specialized and thus less flexible in changing cattle husbandry.

The increase in production of beef cattle, appearing in the flat rate scenario's, is remarkable as the farmers' income is declining in this particular sector at that time. Dairy cattle farms will reduce their suckler cow production, because the current coupled direct payments are decoupled in both scenario's. However, these farms will not substantially increase their area as transfer of land between farms is linked to payment entitlements, which are not tradable in this model. Therefore, a decrease of the suckler cow production implies an increase in beef cattle production. As a result, this intensification and the newly formed beef cattle farms appear to lessen the mean income of this sector. We want to remark that young beef cattle - calves from suckler cows – are required in the beef cattle production. In our simulations, more young beef cattle will be imported from other regions. However, this might not differ a lot from reality as the suckler cow production is presumably more profitable in regions outside Flanders. Furthermore, the reduction in suckler cow production implies a drop in profitability fodder crops, which may well explain the unexpected augmentation of potatoes and green legumes in the FR1scenario - these crops do not activate payment entitlements in this scenario. As a conclusion, lack of trade possibilities of payment entitlements between farms implies thus certain rigidity. Although land can be traded, land shifts between farms will be limited as farmers need area to activate payment entitlements. Nevertheless, this is close to reality at short term.

We would like to emphasize that some results have to be taken with precaution. A possible criticism can be the lack of the not selected farm types, the very small firms and the farms with young beef cattle, which are underrepresented in the FADN network of farms. Also on the calculation of payment entitlements from the historic area and subsidies instead of the effectively assigned payment entitlements one can comment, as during calculation a full activation of the entitlements was assumed. However, in practice, almost all entitlements were activated in 2005. In addition, data were validated with observed data. Nevertheless, we still consider this study qualitatively providing trends of possible crop and cattle husbandry shifts in Flanders if a flat rate subsidy system were be implemented. Another reason to perceive this study qualitatively is the assumption that producers base their production decisions on market signals only (profitability expectations). Producers' behavior could also be influenced by other considerations, such as social inertia, the maintenance of some crops for agronomic purposes, the need to depreciate long-term investments, etc. , which could all be expected to mitigate the overall impact of decoupling on the farm sector (Bascou *et al.,* 2004). For that reason, future research should attempt to include these aspects.

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