

Scotland's Rural College

Economic assessment of the impacts of post-Brexit trade and policies on Scottish farms

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Economic assessment of the impacts of post-Brexit trade and policies on Scottish farms

Shailesh Shrestha, Daniel Urban, Cathal O'Donoghue
and Andrew Barnes

Contents

Executive summary	2
1. Introduction	4
2. Methodology	5
3. Results	9
3.1 Model validation	9
3.2 Farm net profits	9
3.2.1 Specialist beef farms	9
3.2.2 Low land beef farms	12
3.2.3 Beef and sheep farms (LFA)	14
3.2.4 Specialist sheep farms	15
3.2.5 Mixed farms	17
3.2.6 Dairy farms	18
3.2.7 Cereal farms	20
3.2.8 General cropping farms	21
3.3 Microsimulation	23
4. Discussion	26
5. References	29

Executive summary

This report presents an analysis on impacts of post-Brexit trade and domestic policy scenarios on eight different Scottish farming systems. A farm level model, ScotFarm and a microsimulation model, ScotMS are used to simulate the impacts at a farm level and at an aggregated national level respectively. The analysis is conducted under the free trade agreement (FTA) between the UK and the EU as the post-Brexit trade scenario and four alternative domestic policy scenarios (two different levels of removal of farm direct payments and two production impact assumptions under such farm direct payment removals).

The price parameters under all scenarios used in this modelling work were taken from the AFBI Post-Brexit report (AFBI, 2020).

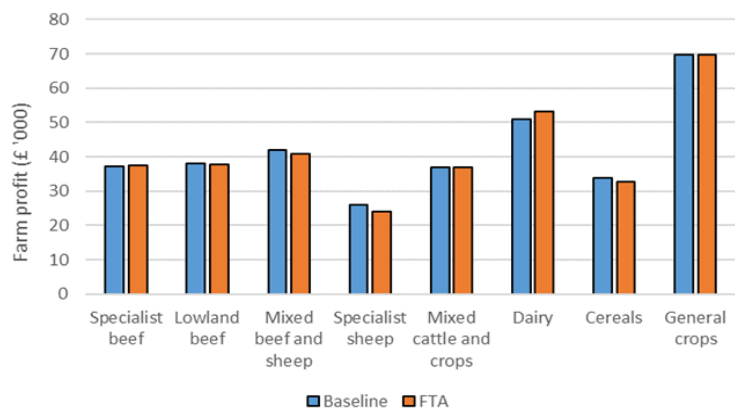


Figure i: Farm net profit under the baseline and FTA scenarios

The models estimates that the free trade agreement (FTA trade scenario) have a very small impact on farm net profit for all Scottish farming systems (Figure i).

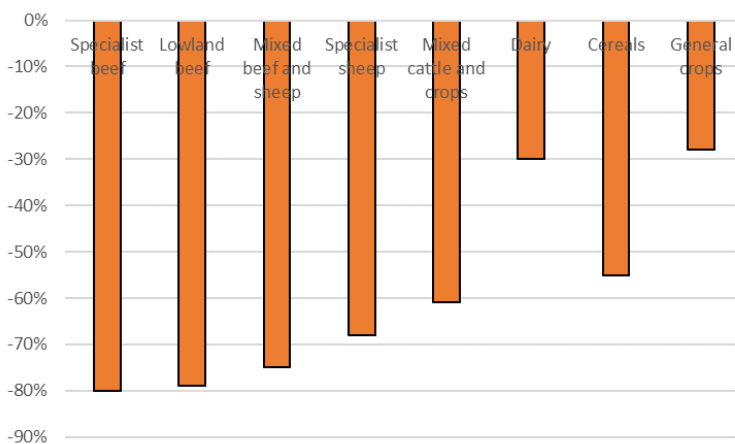


Figure ii: Percentage change in farm net profit under the FTA50% scenario compared to the FTA scenario

The production level on farms in each of the farming systems are also shown to have a negligible impact under this trade scenario.

However, all farming systems are projected to be negatively affected by the removal of farm direct payment (as shown under the 50% removal of payment in Figure ii). The beef and sheep farming systems are the most affected farms suggesting their higher dependency on farm direct payment. Many of these farms become loss making farms when farm payments are removed. For instance, around one third of the farms in the specialist beef farming system go from being profitable to loss making farms when 50% of the farm direct payments are removed from the farms.

The consequences of removal of direct payment on Scottish farms can also be observed on the changes in farm production levels. Farms in all farming systems are estimated to reduce production to different extent when farm direct payments are removed with the highest production reductions (> 10%) on farms within the lowland beef and mixed farming systems (Figure iii). Farms in these two farming system are also projected to have higher share of farms exiting farm production.

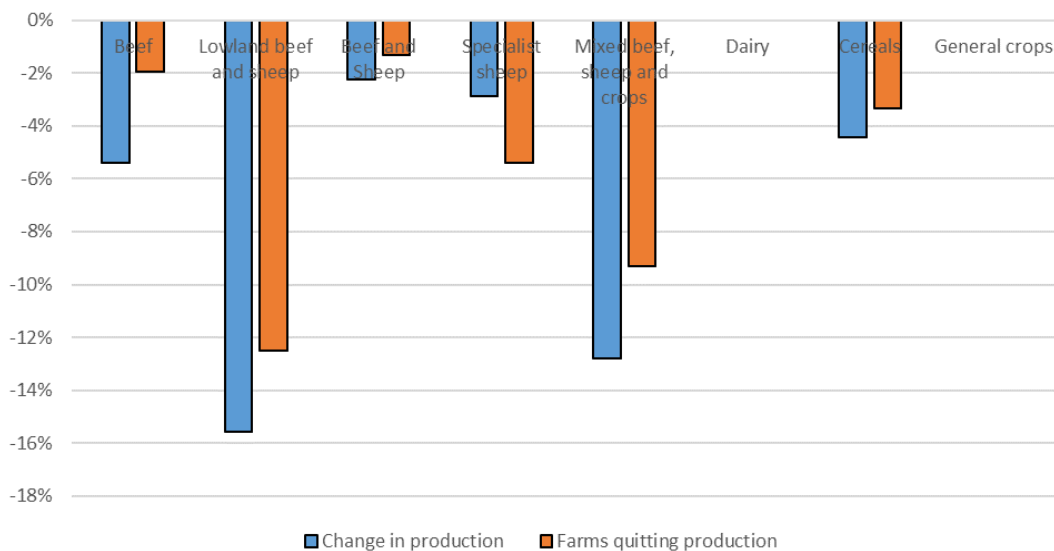


Figure iii: Percentage of farms quitting production and changes in production level for different farming systems under the FTA50% scenario compared to the FTA scenario

1. Introduction

On the 30th December, 2020, the UK and the EU negotiated an agreement for a tariff and quota free trade under an appropriate rule of origin which entered into force from the 1st May, 2021. Besides potential impacts of this trade agreement on farming systems, the UK agricultural sector will also see a major change in domestic farm support mechanism which arguably will have a larger impact on the UK farming systems. There will be a transitional shift from direct farm payment scheme towards more environment, biodiversity and low carbon targeted payment schemes. All devolved administrations in the UK have chosen separate mechanisms of implementing support payments during and after the transition period for CAP farm support payment ends in 2025. Scotland has adopted *'to shift by 2025 half of all funding for farming and crofting from unconditional to conditional support, with targeted outcomes for biodiversity gain and a drive towards low carbon approaches which improve resilience, efficiency and profitability'* as documented in the Scottish Government's *'A fairer and greener Scotland'* (Scottish Government, 2021). In this report, we are examining the economic and production impacts of the UK-EU free trade agreement and the reduction and removal of farm direct payments on Scottish agricultural farming systems. These scenarios were established for the FAPRI-UK report prior to the announcement above by the Scottish Government in 2021 and therefore do not correspond to intended policy in Scotland. As such, the results offer useful general insights but are limited in terms of considering the potential impacts of future policy. Although, there will be a provision to replace farm direct payments with the agri-environment and low carbon related farm payments, this report only includes the removal of farm direct payments at different extent without adjusting for other payments as there is no final decision on how the agri-environment and other payment will be implemented yet.

2. Methodology

This analysis uses a farm level model, ScotFarm, to present results at a farm level and a microsimulation model, ScotMS, to present results at an aggregated national level.

The ScotFarm model¹ maximises farm net profit allowing optimal use of resources within a farm. The model is based on farming system analysis where a holistic approach is used to represent bio-economic activities on a farm. The model optimises farm resources using linear programming technique. The model runs on two sets of inputs; Farm Business Survey, FBS (Scottish Government, 2018) and FAPRI-UK price projections (AFBI, 2020). The model outputs include farm net profit, land use, feed, labour allocation and production. The farm level data were drawn from the FBS under 8 different types of farming systems in Scotland which are as follows;

- i. Specialist beef
- ii. Lowland beef
- iii. Beef and sheep
- iv. Specialist sheep
- v. Mixed beef, sheep and crops
- vi. Dairy
- vii. Cereals
- viii. Other general crops

This study includes a baseline scenario and a free trade agreement (FTA) scenario which are based on the FAPRI post-Brexit report (AFBI, 2020). The FAPRI work included a number of alternative domestic policy scenarios removing

¹ For details visit [ScotFarmManual.pdf \(sruc.ac.uk\)](https://www.sruc.ac.uk/~/media/Files/ScotFarmManual.pdf)

farm direct payment at different extent. It also considered a stimulating impact of farm payments on production relative to 'price impacts on production'. It used a number of coefficients representing stimulating impact of the decoupled Pillar I payments as proportional to price impacts. For instance, a coefficient of 30% used in the FAPRI model assumes that the physical production impact of a £1 increase in direct payment will be similar to 30% impact of that of a £1 increase in price. Among the alternative domestic reform scenarios, we selected two farm direct payment removal scenarios; a '50% removal' and a '100% removal' scenarios. These two alternative scenarios were considered under assumptions of 30% and 100% impact of farm payment on farm production for Scottish farm. The baseline, trade and 4 alternative policy scenarios included in this report are described below.

- **Baseline scenario** – This scenario assumes pre-Brexit policy and market conditions. This scenario is used to compare the FTA scenario and analyse its impact on economic status and production at farm level.
- **FTA scenario** – This scenario is based upon the UK-EU trade decision to implement a tariff free trade between the UK and the EU. It includes farm subsidy payments at pre-Brexit levels.
- **FTA50%** – This scenario is same as the '**FTA scenario**' except for 50% removal of farm direct payment. It assumes the 'decoupled' direct payment to have impact on production similar to 30% impact of market price on the production.
- **FTA50%Plus** – This scenario is similar to the '**FTA50% scenario**' except on the payment impact assumption where it is assumed that the impact of direct payment on production would be similar to 100% of price impact on the production.

- **FTA100%** – This scenario is similar to the '*FTA scenario*' with 100% removal of farm direct payment. The impact of direct payment is assumed to be 30%.
- **FTA100%Plus** – This scenario is similar to the '*FTA100% scenario*'. However, the impact of direct payment on farm production is assumed to be 100% instead of 30%.

A summary of these scenarios are presented in Table 1.

Table 1: Summary of assumption behind the scenarios

Scenario	Trade	Direct payment	Payment impact
Baseline	single market	included	
FTA	tariff free EU-UK trade	included	
FTA50%	tariff free EU-UK trade	50% removed	30%
FTA50%Plus	tariff free EU-UK trade	50% removed	100%
FTA100%	tariff free EU-UK trade	100% removed	30%
FTA100%Plus	tariff free EU-UK trade	100% removed	100%

Under all scenarios, it is assumed that farms with a change in herd size (for livestock farms) and production area (for arable farms) of more than 70% reduction will not be able to sustain production. Number of such farms are presented in this report as the number of farms quitting farm production.

The ScotMS model adopts a microsimulation model, SMILE, which creates a statistical match of two different datasets containing partial information to produce a single, data-rich synthetic database of individual farms with unique geographical references (O'Donoghue, et al., 2012; Farrell, et al., 2012). These references are used for spatial analysis of the impacts of policy change scenarios and present them in a visually enhanced geographical maps. For this report, Scottish Census data 2018 and Farm Business data 2018 were matched together to generate a synthetic database representing farm level information at parish level. Four farm variables; farm area, farm type, standard labour requirement (SLR) and standard output were used for matching purpose. Once a synthetic base data is produced, the model is populated with the baseline, FTA

and alternative policy scenarios results from the ScotFarm model to generate aggregated national level results for those scenarios. The distribution of farm standard outputs from the census database was used for spatial calibration of the microsimulation model on the parish level. The validation of the model was conducted by comparing the unconstrained variables, such as total animal numbers, for a set of random farms between the census and the survey to confirm that the microsimulation dataset accurately represents the real economy and spatial distribution of farms. This way the effects induced by changes on the survey level within ScotFarm accurately extend to the national-scale dataset in ScotMS. This method of combining a microsimulation model and farm level model to examine policy impacts were conducted successfully in past (Ballas et al., 2006; Shrestha et al., 2007; Argüello and Valderrama-Gonzalez, 2015). This technique has been used for the first time on Scottish agricultural sector.

A schematic diagram of the modelling work under taken for this report is presented in Figure 1 below.

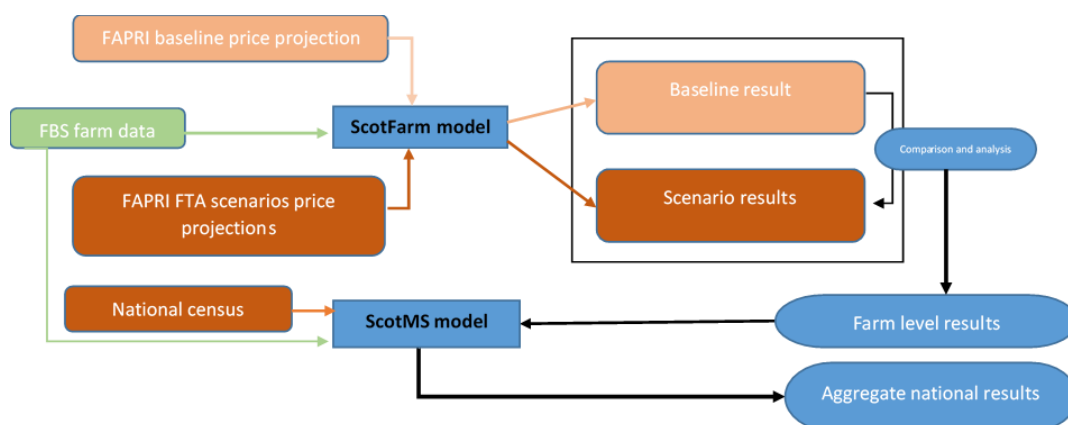


Figure 1: A flow chart of modelling work

3. Results

3.1 Model validation

The ScotFarm model runs under a 15 year time frame providing annual farm net profits. The first (base) year output was calibrated to the FBS 2018 data adjusting the production and cost function for each individual farm type. The calibrated base year results were fitted against FBS 2018 farm business income for the validation of the model. The model shows slightly higher projections for farm net profits compared to the FBS data for most of the farm types (Figure 2). This is due to optimisation nature of the model where farm resources were allocated in a most efficient way.

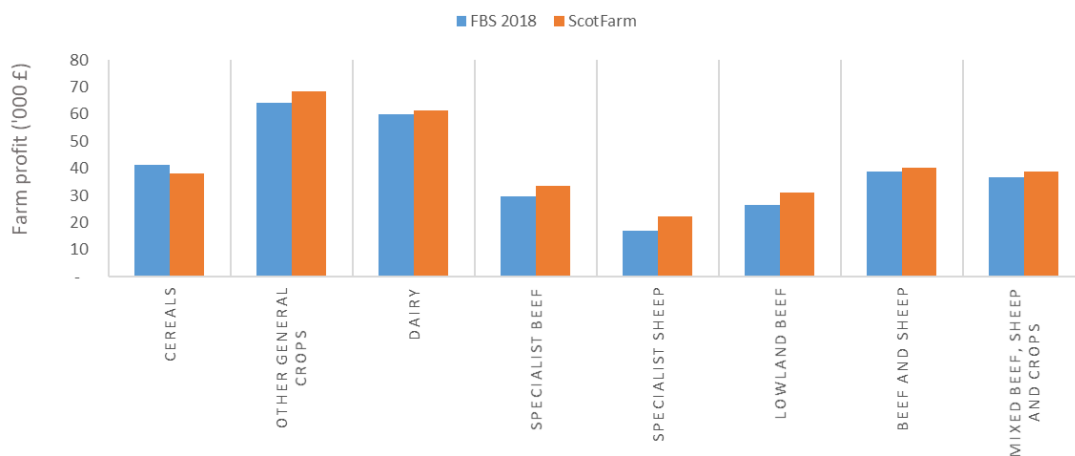


Figure 2: A comparison of farm profits under the ScotFarm base year and FBS 2018 database for different farm types.

3.2 Farm net profits

3.2.1 Specialist beef farms

The model estimates an average beef farm within this group of farms has around £37,000 farm net profit in the baseline (Figure 3). Compared to the baseline, there

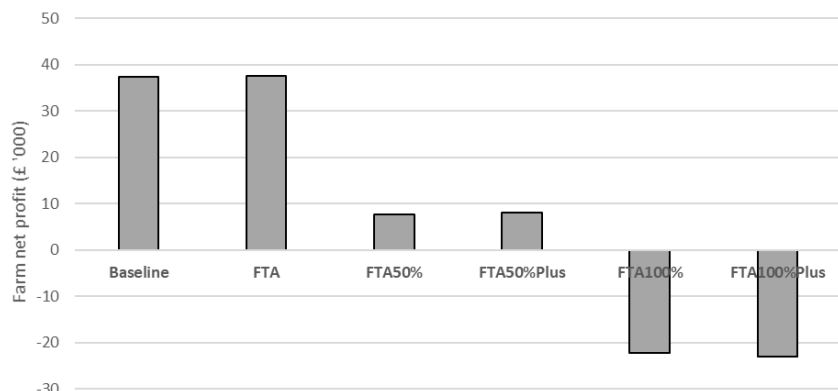


Figure 3: Average farm net profits under the baseline and alternative scenarios

is only a small but positive change in farm net profit under the FTA scenario. A 50% reduction in farm direct payment leads the farm to drop the net profit by 80%. These group of farms, however, still stay profitable on average. There is a small increase in profit when the payment impact is considered 100% under the FTA50%Plus scenario. When the farm payment is completely removed from a farm under the FTA100% scenario, the estimated farm net profit goes to negative

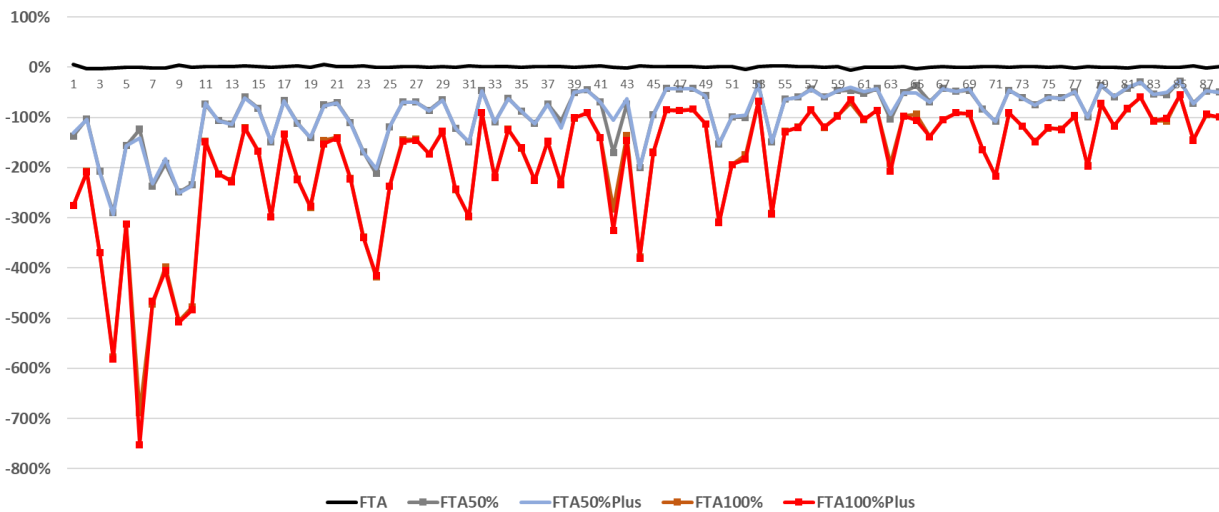


Figure 4: Percentage change in farm net profits on farms under FTA (compared to the baseline) and alternative scenarios (compared to the FTA scenario) [individual farms on x-axis ranked from smallest to largest baseline farm profit]

suggesting that removing all of the farm direct payment has a larger financial consequences on the beef farms. There is a small but further reduction in farm profit when payment impacts is considered to be 100% under the FTA100%Plus scenario.

There is only a small variability of the impact of the FTA scenario on individual beef farms in the FBS 2018 data as shown by the '**black line**' in Figure 4. The range of change in farm net profit under the FTA scenario is only $\pm 6\%$ compared to the farm net profit of corresponding farms under the baseline scenario.

There is a substantial variability in impacts of alternative policy scenarios on these beef farms. The changes in farm net profit under the alternative policy scenarios range from -30% to -300% under the 50% direct payment removal (FTA50%) and -55% to -750% under 100% removal of farm direct payment (FTA100%) scenarios. The farms in Figure 4 are ranked based on their baseline net profits, with farms with smallest profit on the left and farms with the largest profit on the right hand side of the graph. It shows that the impact of removal of farm direct payment is larger on farms with smaller net profit than farms with larger farm profit. There are 30% of farms moving from being profitable to a loss making farm under the FTA50% scenario and 67% of farms go from positive to negative farm profit under the FTA100% scenario.

The number of loss making farms increased substantially when farm direct payments are removed (Table 2). There are 11% of the beef farms estimated making loss under the FTA scenarios. This number increases up to 44% and 81% under the FTA50% and FTA100% scenarios respectively. There is only a small difference in these numbers when the production impact of subsidy reduction is included (under the FTA50%Plus and FTA100%Plus scenarios). Removal of 50% of the farm direct payment is estimated to have around 2% of farms out of production whereas a removal of 100% of farm direct payment is projected to lead 11% of farms quitting production.

Table 2: Changes in beef farming system under alternative FTA scenarios

	FTA50%	FTA50%Plus	FTA100%	FTA100%Plus
Loss making farms	44%	42%	81%	82%
Farms quitting production	2%	2%	11%	11%
Change in production	-5%	-5%	-13%	-14%

The impact on production is smaller compared to the farm net profit and many farms, although moving from being profitable to loss making farms keep producing though to a lower level. Price for beef for many farms under the scenarios are still profitable and they keep the herd and continue producing to cover farm fixed costs. However, farms may not be able to sustain production for a longer term and will need to reduce their fixed costs to stay in business under these conditions. Nevertheless, there are few farms which are projected to quit production under the policy alternative scenarios. There is a reduction of up to 5% in beef production under the FTA50% scenario and up to 14% reduction in production under the FTA100% scenario (Table 2).

3.2.2 Lowland beef farms

The model estimates farm net profit to be £38,000 for an average lowland beef farm under the baseline scenario

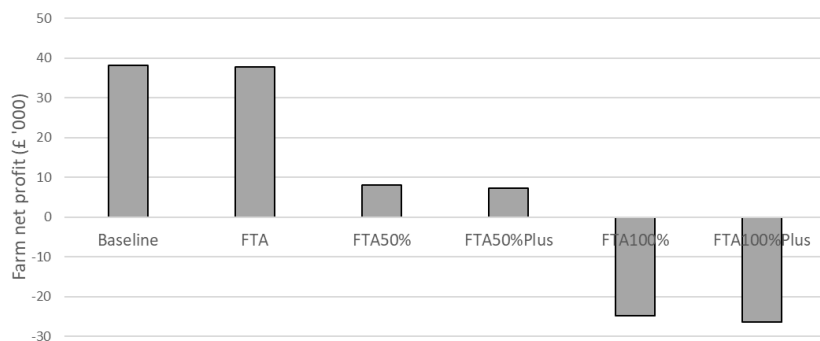


Figure 5: Average farm net profit for lowland beef farms under the baseline and alternative scenarios

(Figure 5). There is a small but negative (-0.6%) change in net profit under the FTA scenario compared to the baseline scenario. Under the removal of 50% of farm direct

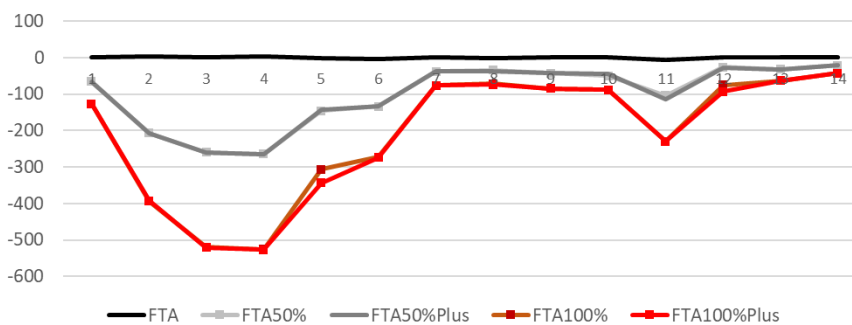


Figure 6: Percentage change in farm net profit under FTA (compared to the baseline scenario) and alternative policy scenarios (compared to the FTA scenario) [(individual farms on x-axis ranked from smallest to largest baseline farm profit)]

payment, an average lowland beef farm is estimated to reduce up to 81% in net profit under the FTA50% scenario. It is projected to go

from being a profitable farm to a loss making farm when farm direct payment is removed by 100% under the FTA100% scenario. The production impact of the subsidy removal had a small but negative impact on net profit as shown under the FTA50%Plus and FTA100%Plus scenarios in Figure 5.

There is not a large variability in impact on farm net profit (-6% to +4%) under the FTA scenario between farms compared to the baseline scenario (**black line** in Figure 6). However, the variability in impact between farms is higher under the alternative policy scenarios compared to the FTA scenario with a range of -20% to -263 under the FTA50% scenario and a range of -42% to 465% under the FTA100% scenario. Farms with smaller profit are projected to have larger impact of the removal of the farm direct payment.

The number of farms making loss in the FTA scenarios consisted around 3% of total lowland beef farms in the sample. This number increased to 56% when farm subsidy was removed by 50% and by 69% when farm subsidy was removed by 100% (Table 3). There was no difference under the production impact on both of the subsidy removal scenarios. Under the 50% farm payment removal scenarios, there are 6% of farms quitting production when farm payment was assumed to make 30% impact (FTA50% scenario) and 13% farm quitting production when farm payment was assumed to make 100% impact (FTA50%Plus scenario).

Table 3: Changes in lowland beef farms under alternative FTA scenarios

	FTA50%	FTA50%Plus	FTA100%	FTA100%Plus
Loss making farms	56%	56%	69%	69%
Farm quitting production	6%	13%	19%	19%
Change in production	-9%	-16%	-23%	-23%

The number of farms quitting the production becomes higher (19%) when 100% of the farm direct payment is removed (FTA100% and FTA100%Plus scenarios). There is a large reduction in production of farm under alternative policy scenarios with up to 16% reduction in total farm production when 50% of farm

payment is removed and further up to 23% of reduction in production when 100% of the farm payment is removed.

3.2.3 Beef and sheep farms (LFA)

The baseline farm net profit for an average beef and sheep farm is estimated to be £

41,931 (Figure 7). It decreases slightly by -2.5% under the FTA scenario. The farm profit, however, is estimated to reduce substantially under the alternative policy scenarios with a 74% reduction under the FTA50% scenario and a 150% reduction under the FTA100% scenario. Inclusion of production impact would

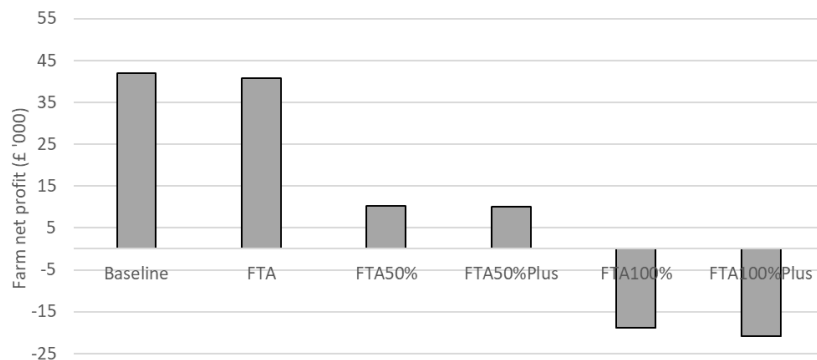


Figure 7: Average farm net profit on a beef and sheep farm under the baseline, FTA and alternative policy scenarios

further reduce the net profit by small extent under both the subsidy removal scenarios.

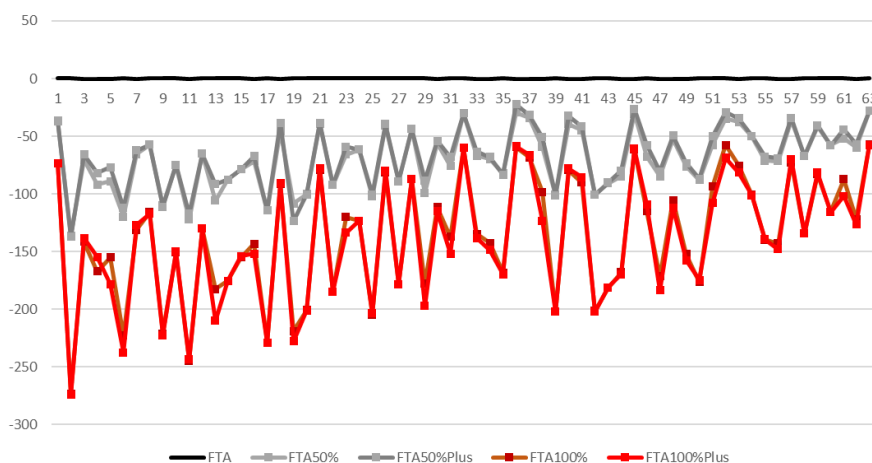


Figure 8: Percentage change in farm net profit on beef and sheep farms under the FTA scenario (compared to the baseline scenario) and alternative policy scenarios (compared to the FTA scenario)[individual farms on x-axis ranked from smallest to largest baseline farm profit]

There is almost a negligible amount of variability in impact of the FTA scenario on net profit between farms compared to the baseline scenario (**black line** in Figure 8). The variability in impact, however, ranges from -22% to -137% under the FTA50%

scenario and ranges from -57% to -274% under the FTA100% scenario. There is only a small difference between scenarios under farm payment production impact assumptions.

Table 4: Change in beef and sheep farming system under alternative policy scenarios

	FTA50%	FTA50%Plus	FTA100%	FTA100%Plus
Loss making farms	32%	31%	76%	80%
Farm quitting production	0%	1%	1%	4%
Change in production	-1%	-2%	-3%	-3%

There are 11% of farms estimated to be making loss under the FTA scenario. This percentage increases up to 32% under the FTA50% scenario and up to 76% under the FTA100% scenario (Table 4). There, however, is only a small number of farms (1%) estimated to quit production when 50% of farm direct payment is removed from a farm (under the FTA50%Plus scenario). The percentage of such farms increased up to 4% when 100% of farm direct payment is removed (under the FTA100%Plus scenario). Farms within this farming system are also estimated to reduce production by only a small margin (-3%) under the alternative policy scenarios.

3.2.4 Specialist sheep farms

The model estimated a baseline farm net profit to be £ 25,029 for an average sheep farm (Figure 9).

There is a reduction of 8% in farm net profit under the FTA scenario compared to the baseline farm profit. There is a substantial

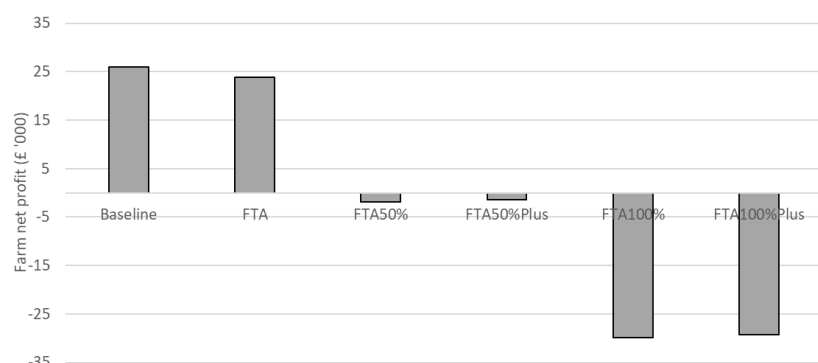


Figure 9: Averaged farm net profit on a sheep farm under the baseline, FTA and alternative policy scenarios

decrease in farm profits (-107%) under the 50% removal of farm direct payment (FTA50% scenario). This further reduces by -225% when 100% farm direct payment is removed (FTA100% scenario) compared to the FTA scenario. There is only a small difference in farm net profit when production impact assumptions are included for respective alternative policy scenarios (i.e., under the FTA50%Plus and FTA100%Plus scenarios).

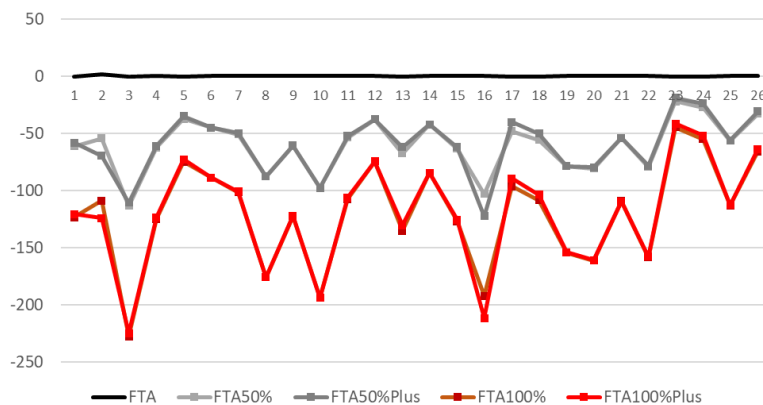


Figure 10: Percentage change in farm net profit on sheep farms under the FTA scenario (compared to the baseline scenario) and alternative policy scenarios (compared to the FTA scenario) [individual farms on x-axis ranked from smallest to largest baseline farm profit]

There is no variability in impact of free trade agreement on farm net profit compared to the baseline scenario (black line in Figure 10). The impact of 50% removal of farm direct payment is ranged from -22% to -

113%. This variability between farms increases to a range of -44% to -227% when 100% removal of farm payment is considered. There is only a very small difference in these ranges when production impact of farm payment is assumed.

There were 11% farms that were making loss under the FTA scenario. This number increased to 32% when 50% of farm subsidies were removed and 78% when 100% of farm subsidies were removed (Table 5). The number of farms quitting the production stay the same at 5% under these alternative policy scenarios compared to the FTA scenario. There is a loss in production of up to 5% under these alternative policy scenarios compared to the FTA scenario.

Table 5: Percentage changes in sheep farming system under alternative policy scenarios compared to FTA scenario

	FTA50%	FTA50%Plus	FTA100%	FTA100%Plus
Loss making farms	32%	32%	78%	78%
Farms quitting production	5%	5%	5%	5%
Change in production	-4%	-2%	-5%	-3%

3.2.5 Mixed farms

The model estimates farm net profit on an average mixed farm to be £36,298 under the baseline scenario (Figure 11). There is a negligible change in farm net profit under the FTA scenario compared to that of the baseline farm

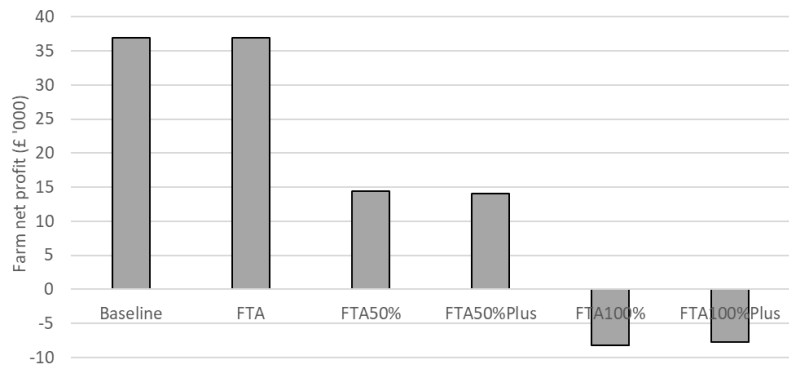


Figure 11: Average farm net profit on a mixed farm under the baseline, FTA and alternative policy scenarios

net profit. The profit reduced by 62% when 50% farm direct payment is removed (FTA50% scenario) and by 122% when 100% of farm payment is removed (FTA100% scenario) compared to the farm net profit under the FTA scenario. There is only a small difference between the production impact assumptions under both of the alternative policy scenarios (FTA50%Plus and FTA100%Plus).

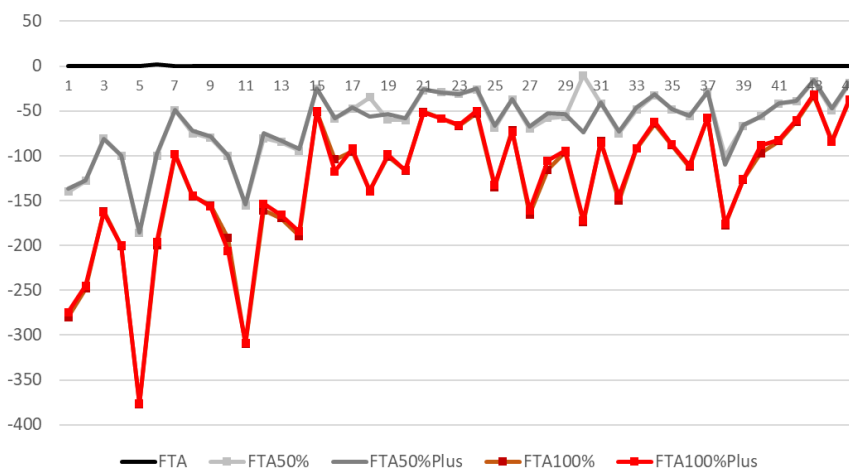


Figure 12: Percentage change in farm net profit under the FTA scenario (compared to the baseline scenario) and alternative policy scenarios (compared to the FTA scenario) [individual farms on the x-axis]

The impact of FTA scenario on farm net profit only show a very small variability between individual farms. But there is a substantially larger variability in impacts of alternative policy

scenarios between farms (Figure 12). The range of variability of this impact ranges from -10% to -186% under the 50% removal of farm payment (FTA50%)

scenario and ranges from -31% to -378% under the 100% removal of farm payment (FTA100%) scenario compared to the FTA scenario.

Table 6: Percentage change in mixed farming system under the alternative policy scenario compared to the FTA scenarios

	FTA50%	FTA50%Plus	FTA100%	FTA100%Plus
Loss making farms	18%	18%	35%	34%
Farms quitting the production	7%	9%	23%	23%
Change in production	-12%	-13%	-24%	-23%

There are 9% farms estimated to make loss under the FTA scenario. This number increases to 18% when 50% of farm subsidies were removed and increased up to 35% when 100% of farm subsidies were removed (Table 6). There are also a number of farms estimated to quit production (up to 9% under 50% removal of farm payment and 23% under 100% removal of farm payment) and production is estimated to reduce by up to 12% with the 50% removal of farm payment and up to 24% with 100% removal of the farm payment.

3.2.6 Dairy farms

An average dairy farm is estimated to have a farm net profit of £50,835 under the baseline scenario (Figure 13). This profit is projected to increase by 5% under the FTA scenario. But as in

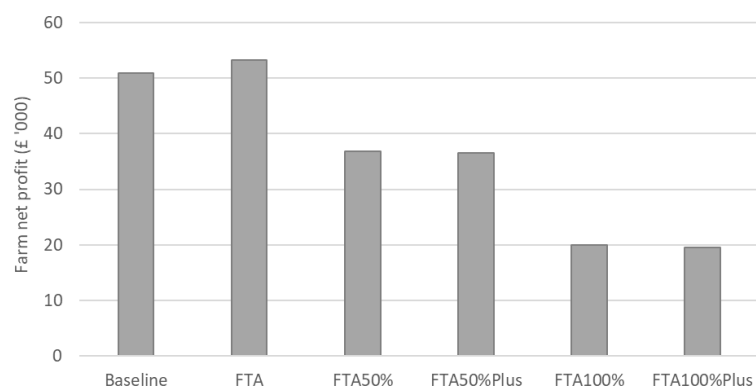


Figure 13: Average farm net profit on a dairy farm under the baseline, FTA and alternative policy scenarios

other farming systems, the profit decreased but to a smaller extent when farm direct payments were removed. The farm profit is reduced by around 30% when half of the farm direct payments are removed under the FTA50% and FTA50%Plus scenarios respectively. The farm net profit further reduces by 63%

when 100% of farm payment is removed under both FTA100% and FTA100%Plus scenarios.

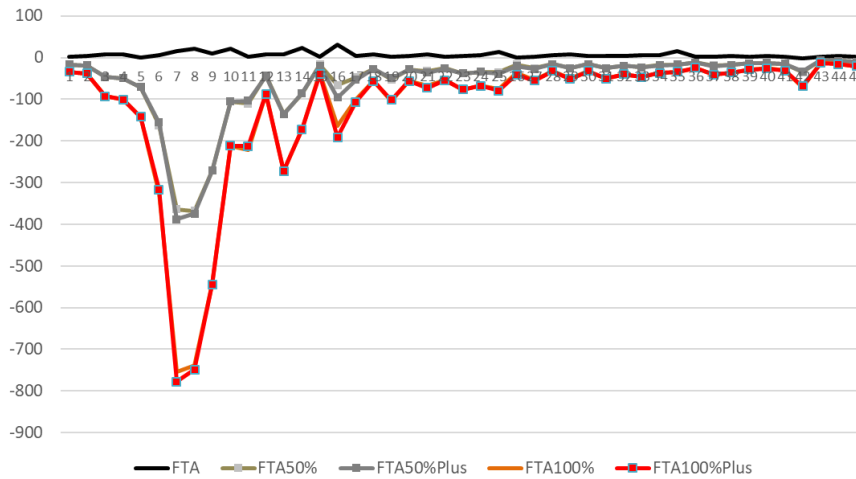


Figure 14: Percentage change in farm net profit on dairy farms under the FTA scenario (compared to the baseline scenario) and alternative policy scenarios (compared to the FTA scenario) [individual farms in x-axis]

The farm net profit changed in a range of -1.2% to +31% under the FTA scenario compared to the baseline scenario (**black line** in Figure 14). Most of the dairy farms have an increase in

farm profits under the FTA scenario. The profit however, changed in a range of -6% to -388% between farms when 50% of farm direct payment is removed and changed in a range of -11% to -778% between farms when 100% of farm direct payment is removed compared to the FTA scenario. The production impact assumptions have only a small effect on these farms compared with the corresponding payment removal scenarios.

Table 7: Changes in dairy farming system under alternative FTA scenarios

	FTA50%	FTA50%Plus	FTA100%	FTA100%Plus
Loss making farms	15%	15%	19%	19%
Farms quitting production	0%	0%	0%	0%
Change in production	0%	0%	0%	0%

There are 11% of farms estimated to make loss under the FTA scenarios. This number increased by 15% and 19% under the 50% removal and 100% removal of farm subsidies respectively (Table 7). There is only a negligible change (< 0.1%) in milk production and none of the dairy farms is expected to exit production under these scenarios.

3.2.7 Cereal farms

In the case of cereal farming system, the model estimates a farm net profit of £33,786 for an average farm under the baseline scenario (Figure 15). The profit is projected to decrease slightly by 3% when the FTA conditions are implemented compared to the baseline net profit. The average farm net profit

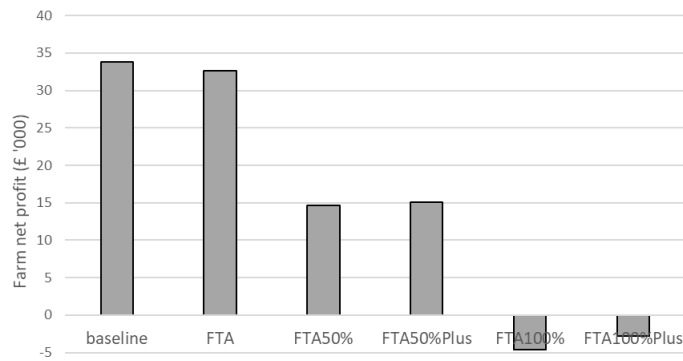


Figure 15: Average farm net profit for farm types under the baseline, FTA and alternative policy scenarios.

decreases by 55% under the FTA50% scenario and 53% under the FTA50%Plus scenario respectively compared to the FTA scenario. The average cereal farm is

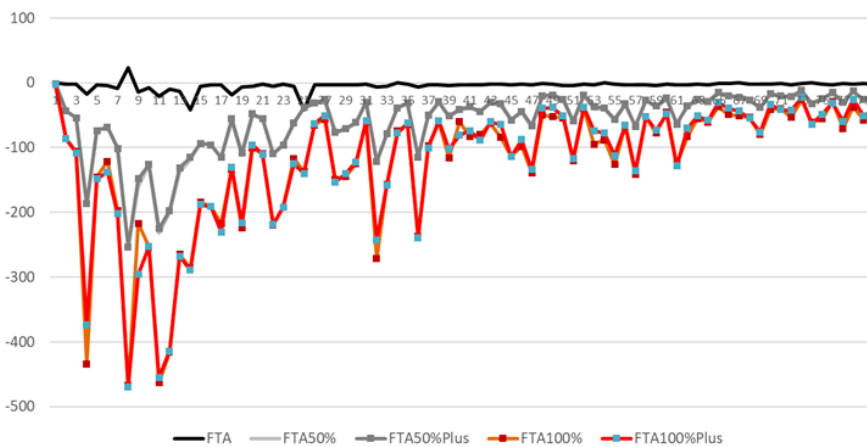


Figure 16: Percentage change in farm net profit on cereal farms under the FTA scenario (compared to the baseline scenario) and alternative policy scenarios (compared to the FTA scenario) [individual farms on x-axis].

not projected to stay profitable anymore when 100% farm payment is removed with farm net profits reducing by -114% under the FTA100% scenario and by -109%

under the FTA100%Plus scenario.

There is a small variability in impact of the FTA scenario on cereal farms with the impact ranging from +23% to -42% on farm net profit (**black line** in Figure 16). The variability in impact of alternative policy scenarios is substantially higher compared to the variability under the FTA scenario. The removal of farm payment at 50% is estimated to reduce farm net profit within a range of -1% to -

253%. This range is further reduced to -2.5% to -470% when 100% farm payment is removed. There is only a very small difference in variability when production impact assumptions were considered under the FTA50%Plus and FTA100%Plus scenarios.

The number of farms making loss is estimated to be 18% under the FTA scenario. This number increased to 36% and 56% when farm subsidies were removed by 50% and 100% respectively (Table 8). There are a small number of farms quitting crop production (up to 3%) under these sets of alternative FTA scenarios. The total production of cereal also reduced by up to 5% compared to the FTA scenario.

Table 8: Percentage changes in cereals farming system under alternative policy scenarios compared to the FTA scenario

	FTA50%	FTA50%Plus	FTA100%	FTA100%Plus
Loss making farms	36%	36%	56%	56%
Farms quitting production	2%	3%	2%	3%
Change in production	-4%	-4%	-3%	-5%

3.2.8 General cropping farms

The farm net profit for an average general cropping farm is estimated to be £69,579 in the baseline (Figure 17). There is almost no change in farm

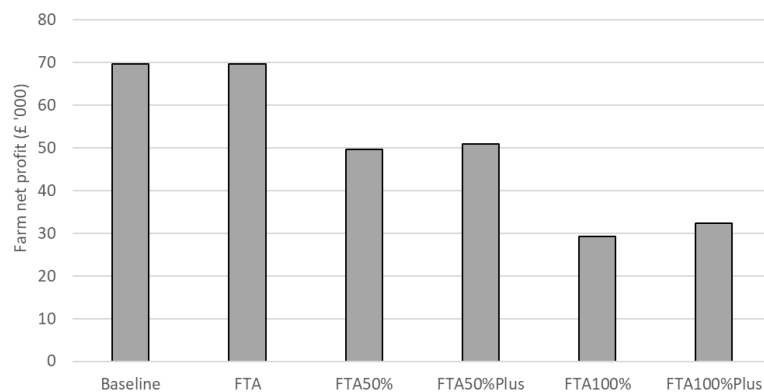


Figure 17: Average farm net profit on a general crops farming system under the baseline, FTA and alternative policy scenarios

net profit under the FTA scenario. There is a 28% and 57% reduction in farm net profit under the 50% removal and 100% removal of farm direct payment scenarios (FTA50% and FTA100%) compared to the FTA scenario respectively.

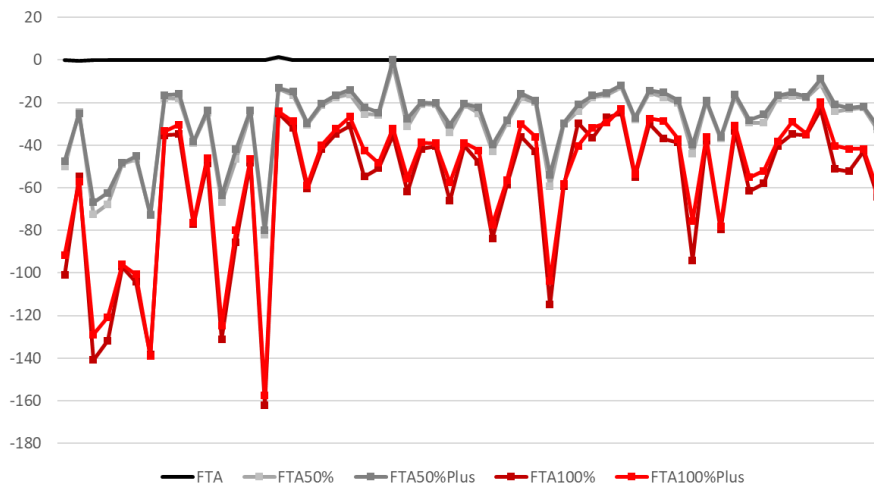


Figure 18: Percentage change in farm net profit on general crop farms under the FTA scenario (compared to the baseline scenario) and alternative policy scenarios (compared to the FTA scenario) [individual farm on the x-axis]

There is almost no variability in the impact of FTA between these farms (**black line** in Figure 18). There, however, is larger variability in impact of alternative policy scenarios on these

farms. Under the 50% removal of direct payment scenarios, the impact on farm net profit ranges from 0% to -89% and under the 100% removal of farm direct payment scenarios, the impact on farm net profit is estimated to range from -20% to -162% compared to the farm net profit under the FTA scenario. There is only a small difference in impact of production assumption on farm profit under respective policy scenarios.

There are 3% farms estimated to make loss under the FTA scenario. This number increases by 7% and 14% when farm subsidies were removed by 50% and 100% respectively (Table 9). There are no change in farm production and none of the farms are projected to quit the production when subsidies are removed.

Table 9: Percentage changes in general crops farming system under alternative FTA scenarios

	FTA50%	FTA50%Plus	FTA100%	FTA100%Plus
Loss making farms	7%	7%	14%	14%
Farms quitting production	0%	0%	0%	0%
Change in production	0%	0%	0%	0%

3.3 Microsimulation

The ScotMS model results show distribution of higher farm net profit across southern and eastern part of Scotland (Figure 19 a). Farms in these regions have an average farm net profit of £ 60,000. Most of these farms, consisted mostly of commercial dairy, beef and arable farms, represent highly profitable farms in Scotland. Farms in the northern region of Scotland, on the other hand, have the

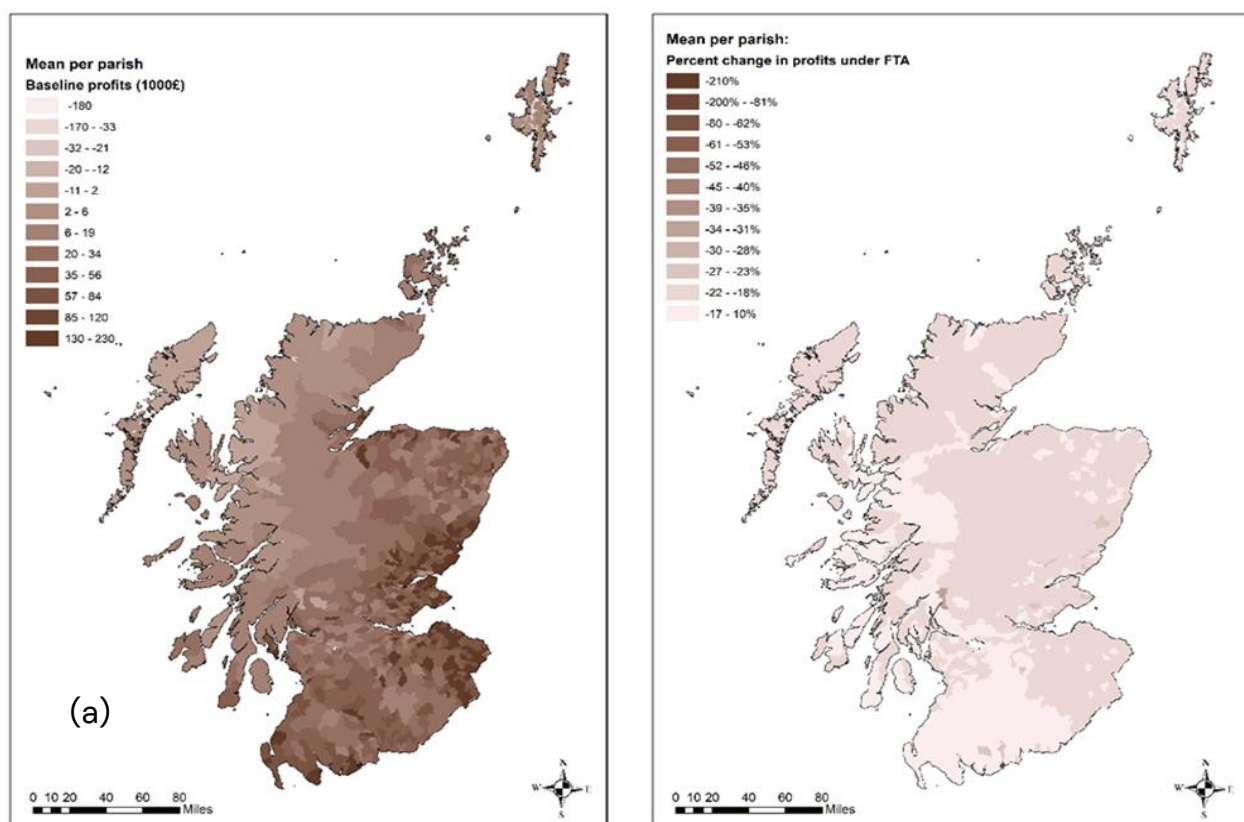


Figure 19: (a) Mean distribution of farm net profit at parish level across Scotland under the Baseline scenario; (b) Percentage change in farm net profit at parish level under the FTA scenario

lowest farm net profit with an average profit on these farms lesser than £ 7,000 per farm. These farms are the highland and island farms including crofts and small scaled farms that have lower farm resources, limiting market accessibility and poor land quality. Under the FTA scenario, there is a clear indication of a higher negative impact on these farms compared to the farms in the southern

region of Scotland (Figure 19 b). Farms in the northern region of the country are estimated to have reduction of up to -30% on average in their farm profits. On the other hand, farms in the southern part of Scotland show only a small change in farm profit under the FTA scenario. Amongst these farms, most of the dairy farms are expected to benefit from a slight increase in dairy price under the FTA scenario.

There is a larger impact on farms when farm direct payments are removed under the alternative policy scenarios (Figure 20). For a representative purpose, results under 100% production impact assumption of direct payment under both 50% and 100% removal of farm subsidy scenarios (i.e., FTA50%Plus and FTA100%Plus scenarios) are presented here. The effect of 30% production impact assumption

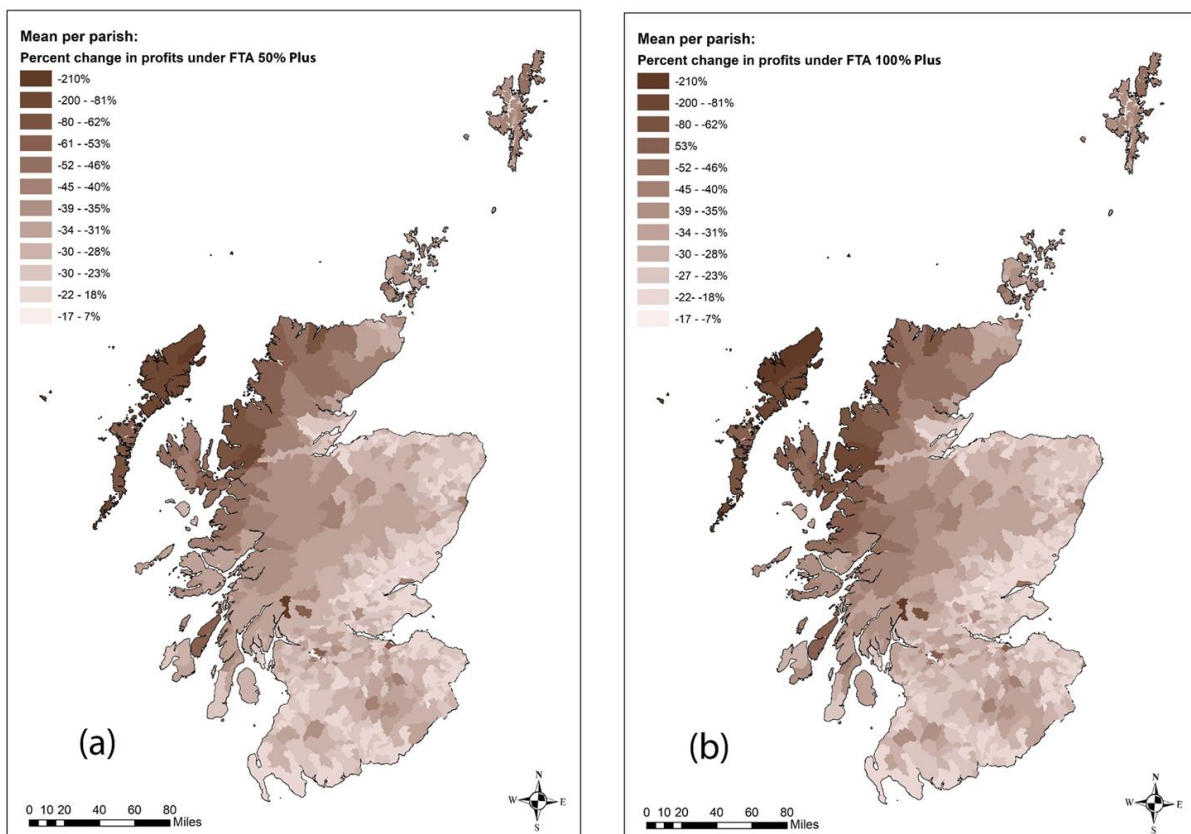


Figure 20 (a) Percentage change in farm net profits under the FTA50%Plus scenario; (b) percentage change in profits at parish level under the FTA100%Plus scenario

under these policy scenarios are similar but to a smaller extent compared to that under the 100% production impact assumption results. The north-west regional farms have substantially higher reduction in farm net profit (with an average of -60%) under FTA50%Plus scenario (Figure 20 a). Many farms in this region have farm net profit reduction by more than 100% reduction in profits moving them from being profitable to loss making farms. The impact of the scenario within the region increases further under the FTA100%Plus scenario (Figure 20 b). In the south and eastern regions, the impact is much smaller with an average of 20% reduction in farm net profit. However, there are few farms (mostly beef and sheep farms) which have a larger impact (up to -55% reduction) under these scenarios.

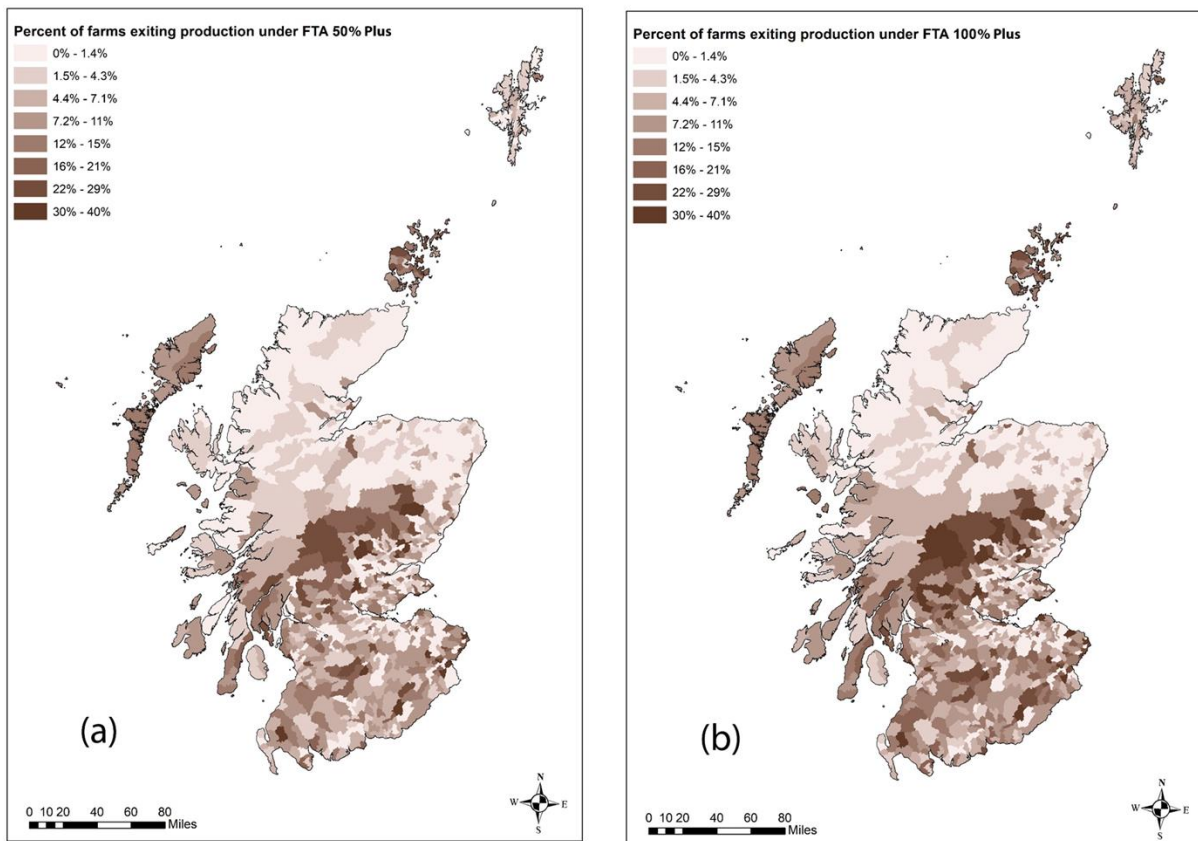


Figure 21: Percentage of farms exiting production under; (a) FTA50%Plus scenario and; (b) FTA100%Plus scenario

Figure 21 presents percentage of farms to exit production under FTA50%Plus and FTA100%Plus scenarios. The spatial distribution of the farms exiting production suggest that the central, southern and Scottish islands would be the regions where larger number of farms are projected to quit production. This result is driven by the location of the most severely affected farm types; namely the beef and mixed livestock and cropping farms in the central Highlands and islands; and lowland beef production in the south and eastern regions. Farms in the north eastern regions of Scotland, mostly small beef and sheep farms and general cropping farms, are estimated to have lesser impact on their production patterns, even with regard to the considerable reduction in profits.

Besides spatial representation of exiting farms, the ScotMS model also estimated the number of farms exiting production for each of the farm types used in this study (Table 10). The results suggest that specialist beef, lowland cattle and sheep and mixed cattle and crop farming systems have the highest number of farms exiting production. The highest share of farms exiting production (up to 9% farms) is projected to be in the mixed farming system under the FTA50% scenario. The FTA100%Plus scenario leads to a substantial increase in number of farms exiting production for all farm types except for the dairy and general crop farm types which have only a negligible number of farms exiting the production under these scenarios.

Table 10: The total number of farms within all farm types projected to exit production under alternative FTA scenarios

	Total farms*	Number of farms exiting production			
		FTA50%	FTA50%Plus	FTA100%	FTA100%Plus
Specialist beef	10403	208	211	1132	1144
Lowland beef	9112	0	91	102	365
Beef and sheep	2708	0	27	27	108
Specialist sheep	3742	185	185	187	187
Mixed	1625	113	146	374	389
Dairy	1869	0	0	0	0
Cereal	2068	40	44	62	63
Other general crops	1516	0	0	0	0

* ScotMS estimate

4. Conclusions and discussion

This report analyses the financial and production impacts of the UK-EU FTA and a number of alternative domestic policy reforms on different Scottish farming systems. The alternative policy reform scenarios used in this report were the 50% and 100% removal of farm direct payments under assumptions of 30% and 100% impact of farm payments on farm production. We found a very small impact of the UK-EU FTA on the Scottish agriculture farming systems compared to when the UK was in the single market with the EU. There is also almost no change in farm production under the FTA scenario compared to the baseline scenario except for sheep and mixed farms which are estimated to have a very small reduction in farm production. This is expected as the UK-EU free trade agreement (FTA) is considered as the trade option that would have the least adverse impact on the UK agriculture sector compared to the single market with the EU pre-Brexit.

Under the alternative policy scenarios, farms with the beef, sheep and mixed farming systems are projected to have economic consequences of removal of farm direct payments. Within these farming systems, farms with smaller profits show bigger negative impact compared to the farms with larger profits. This highlights higher reliance of these farms on farm subsidies to become profitable. Some farms such as sheep farms go from being profitable to loss making system when farm direct payment is reduced by 50% but most of the beef and mixed farms become non-profitable when all of the farm direct payment is removed from a farm. There is up to 13% reduction in farm production especially on lowland and mixed farms when 50% of farm direct payment is removed. These farms, in addition to higher reliance on farm subsidies, have the lowest prices generated for beef and sheep on average as well as have higher variable costs compared to other beef and sheep farms and hence, are more sensitive to price and policy changes. Although, most of these farms become loss making farms

when farm payments are removed but only one fourth of these farms are expected to quit farming. For many farms, the beef and sheep revenues generated are still stay higher enough under these policy scenarios to compensate the farm fixed costs to some extent and keep producing. However, for a longer term sustainability, these farms will need to reduce overhead costs to improve farm profitability and continue farming.

For an average dairy and general crop farm, although, there is a large reduction in farm profit when direct payments are removed, yet they do not show large reduction in farm production and there are none of the farms quitting production under the policy change scenarios. These farms are generally less reliant on farm payments, more efficiently run and generate higher revenues on farms.

At aggregated level, changes in farm payments are projected to have substantial adverse economic impact on smaller farms in the northern, central highland and island regions. Many farms with mixed beef, sheep and arable production are estimated to be more vulnerable and have higher risk of quitting farm production.

It can summarised that, alternative policy scenarios that were included in this study resulted in higher economic consequences on farms than the free trade scenario. Most of the small beef, sheep and arable farms are vulnerable to changes in farm direct payments. Many of those farms will not be able to survive unless alternative support mechanism, such as agri-environment or public goods support payments, is implemented to replace farm direct payments.

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