Farmers as Water Managers within Tarland Catchment

Data collected by Steff Fergusson and Flora Grigor-Taylor, Landcare North East.

Analysis by Jill Dunglinson and Kirsty Blackstock, Macaulay Land Use Research Institute.

August 2010

Contents

Introduction

The purpose of this survey was to find out about the behaviours of farmers and their opinions on various issues relating to the water environment within the Tarland area. There are 54 land based holdings within the Tarland catchment, managed by 48 people. We approached 24 people (five holdings fall mainly outside the catchment; and 19 are very small patches of land that are not really 'farms') during the month of August 2009. We received 18 responses giving a response rate of 75%. Most of the questionnaires were conducted face to face; but three were mailed out and returned by phone at the request of the farmer.

European Union The European Regional Development Fund

Investing in the future by working together for a sustainable and competitive region

The Interreg IVB North Sea Region Programme

Background of Respondents

Within Tarland the majority of respondents[1] undertake farming as their primary industry (83%) and class farming as their main occupation (83%). All farmers are male; the most common age range is 51-65 years old (44%) and most have secondary school (28%) or (vocational) college (39%) level education. On the whole they are tenanted farmers (72%). Most farmers have long term leases (67%) and undertake a mix of activities. The majority (78%) manage the property/business on their own and those who do not, it is their sons which assist with the management, with an exception of one in which a land agent manages along with the farmer. In the last 10 years, 44% have made substantial changes or additions to their farms. These changes include the building of new sheds/stores, which are either financed by the farmers or landlords. The farmers differ in terms of their succession plans with 44% noting the farm will be passed to the next generation, 39% are unsure of their plans for the future and 17% said it would be passed to a third party.

Agri-environmental Measures

This section examines the environmental activities farmers undertake and plan to conduct in the future. 40% of the farmers are involved in an agri-environmental scheme often involving more than one measure (view Table 1).

Regarding water management measures taken under the schemes listed in Table 1; *water margins, wetlands,* and *field margins* are most popular, whereas *pond creation, riparian/river bank woodland* and *other* water options are not as common among the farmers, see Figure 1.

Table 1: Agri-environmental Schemes that Farmers Participate In (N=7)

Scheme	No.	Start Year	Notes
Scottish Rural Development Plan (SRDP)	2	2009 & 2010	
Land Management Contract and SRDP	1	2009	
Rural Stewardship Scheme	3	2004	Expired Autumn 2009
Moorland management	1	---	Applying through SRDP

Of the farmers that participate in the schemes listed in Table 1, 64% believe that they are making an improvement to the farm environment. The most common reason given is that the schemes are encouraging an increase in wildlife. 27% do not believe the schemes are making an improvement. Of those that provided a reason, one had only started taking part in a scheme and another noted that it is not making an improvement to the farm environment, because the scheme affects heather and hill ground rather than the farm. 9% of the farmers were unsure about the effects of the schemes.

Ten farmers applied other environmental measures not funded through the schemes above including: *environmentally friendly management of runoff and drainage water*; *establishment of buffer strips*, *field margins*, *fences or edges;* and *working out green accounts or environmentally*

[1] From here on in known as 'farmers'

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

targeted management plans (view Table 2). However, most farmers will not be applying any suggested environmental measures in the next couple of years (view Figure 2).

Figure 1: Water Measures (N=13) Farmers are Managing

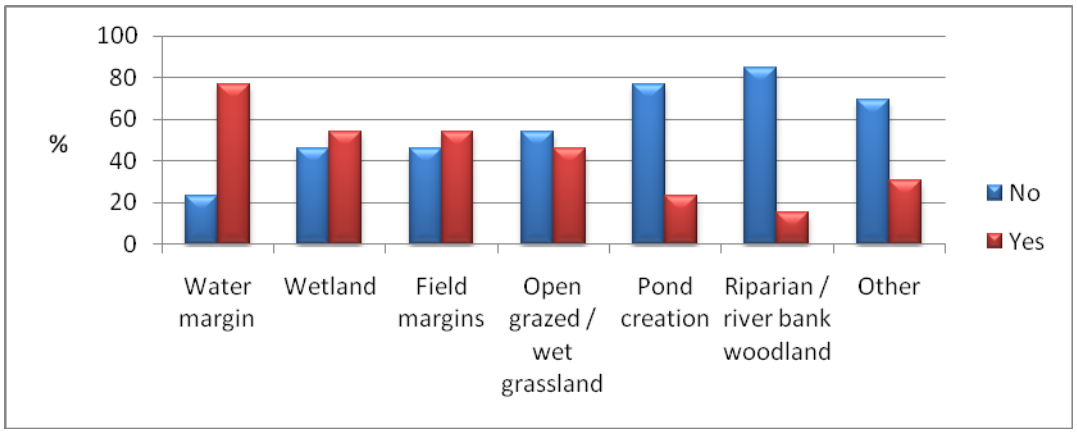
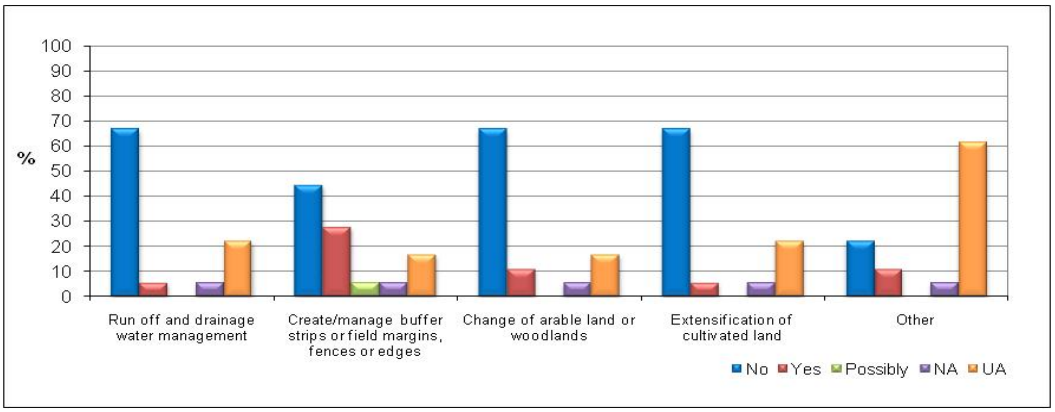


Table 2: Other Environmental Measures Applied by Farmers (N=10)

Measure	**No.**
Environmentally friendly management of runoff and drainage water	5
Establishment of buffer strips, field margins, fences or edges	8
Change in the management of arable land and woodlands	1
Extensification of cultivated land	2
Working out green accounts or environmentally targeted management plans	4
Other: *through 3-Dee Vision, installed improved design in-stream watering and diverted runoff from overland/road into ditch & main watercourse*	1

Figure 2: Environmental Measures Farmers Plan to Apply within the next Couple of Years



Farmer Type and Environmental Activities

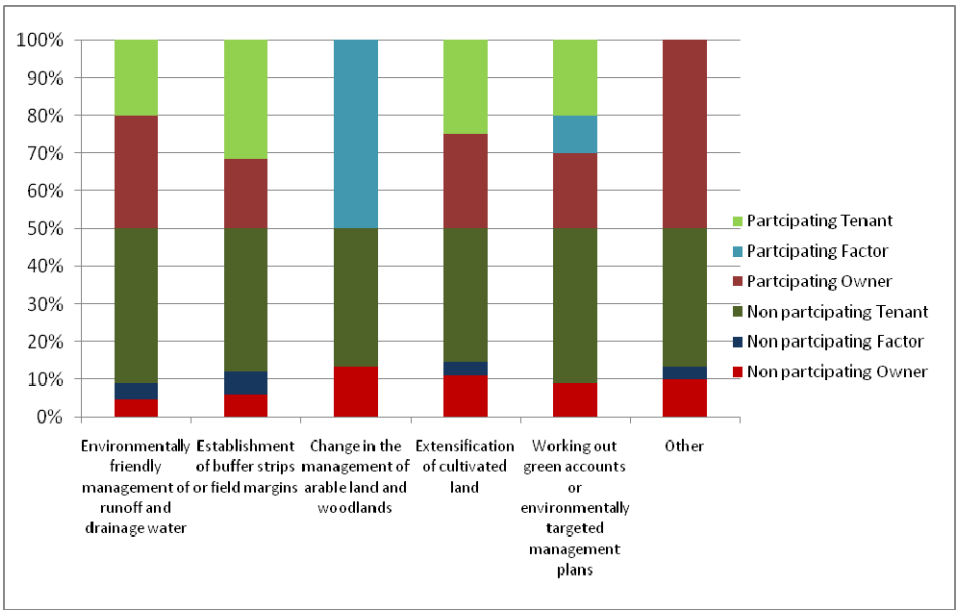
This section examines ownership and age of farmers, and their participation in agri-environmental schemes, other environmental measures and future environmental activities. Whilst more tenants and owners do not participate in agri-environmental schemes than take part, the distinction between owners who take part and do not is slightly more polarised, view Table 3.

Table 3: Tenure and Participation in an Agri-environmental Scheme (N=18)

Tenure	**Participate** No. (%)	**Do Not Participate** No. (%)
Owner	1 (25)	3 (75)
Factor	1 (100)	0 (0)
Tenant	5 (38)	8 (62)

Regarding the farmers relationship with the farm unit and participation in agri-environmental schemes; most who are on a long term lease do not take part in a scheme (69%), the one farmer on a short lease (less than 5 years) has undertaken a scheme and those that own land there is a 50% split between those who participate and do not.

In terms of other environmental measures however a lot more tenants do not participate in any of the measures compared with owners and factors. In terms of those who do participate in these other environmental measures there is more of a mixture of farmer types, i.e. owners, tenants and factors (view Figure 3). For example, of the farmers types which do not participate in environmentally friendly management of runoff and drainage water, 82% are tenants, 9% are factors and 9% are owners, and those that do participate, 40% are tenants and 60% are owners. These same patterns of participation are also true for future environmental measures (Figure 4).



European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

Figure 3: Participation in Other Environmental Measures and Tenure (N=16[2])

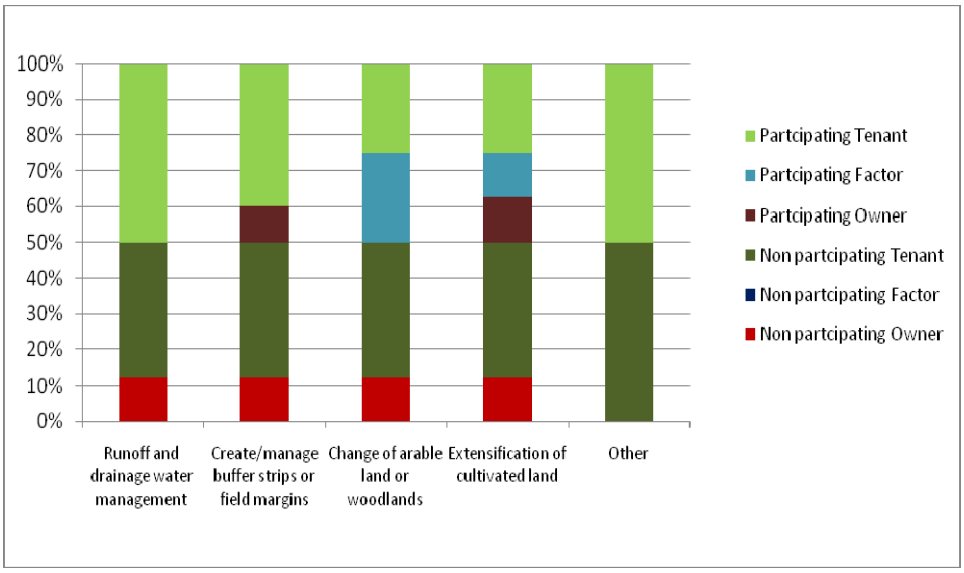


Figure 4: Participation in Future Environmental Measures and Tenure (N[3])

Farmers are almost divided between been involved and not involved in agri-environmental schemes across a range of age groups. However those aged between 51-65 years old, there are 6 who do not participate and 2 that do (Table 4).

Table 4: Participation in Agri-environmental Schemes and Age (N=17)

Age	**Participate** (No.)	**Do Not Participate** (No.)
21-35	1	1
36-50	2	2
51-65	2	6
65+	2	1

In terms of other environmental measures, although the farmers in all age groups tend not to participate in each of them, the two farmers in the age group of 65+ are more divided between participating and not participating. The total number of measures these farmers do not and do undertake is 7 and 5 respectively (Table 5).

[2] For Other N=6
[3] Runoff management N=13; Buffer strips N=13; Change arable / woodlands N=14; Extensification N=16; Other N=5

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

Table 5: Participation in Other Environmental Measures and Age

Age	21-35		36-50		51-65		65+		
									N
Participate in Other Env Measures (No.)	***No***	***Yes***	***No***	***Yes***	***No***	***Yes***	***No***	***Yes***	
Environmentally friendly management of runoff and drainage water	2	0	2	2	6	2	1	1	*16*
Establishment of buffer strips, field margins, fences or edges	2	0	1	3	5	3	0	2	*16*
Change in the management of arable land and woodlands	1	1	4	0	8	0	2	0	*16*
Extensification of cultivated land	2	0	4	0	7	1	1	1	*16*
Working out green accounts or environmentally targeted management plans	1	1	3	1	6	2	1	1	*16*
Other	2	0	3	1	8	0	2	0	*16*
TOTALS	***10***	***2***	***17***	***7***	***40***	***8***	***7***	***5***	

With regard to future measures, although again in the main the farmers do not plan to participate in any of them; it is the older farmers (51-65) which are more in favour of participating across the different age groups. The total measures for this age group is 7 compared to 1 for the age group 21-35, 3 for those aged 36-50 and no measures within the age group of 65+ would be undertaken, view Table 6.

Table 6: Participation in Future Environmental Measures and Age

Age	21-35		36-50		51-65		65+		
									N
Participate in Measures in Future (No.)	***No***	***Yes***	***No***	***Yes***	***No***	***Yes***	***No***	***Yes***	
Runoff and drainage water management	1	0	3	0	6	1	2	0	*13*
Create/manage buffer strips or field margins	1	0	0	3	5	2	2	0	*13*
Change of arable land or woodlands	1	1	3	0	6	1	2	0	*13*
Extensification of cultivated land	1	0	3	0	6	1	2	0	*13*
Other	1	0	0	0	3	1	0	0	*5*
TOTALS	***6***	***1***	***9***	***3***	***26***	***7***	***8***	***0***	

Local Land Management Decision Making

The factors that influence famers land management decision making, how they measure their success of their management objectives and also their thoughts on how land management impacts on the water environment are discussed in this section.

In terms of making decisions about land management, the use of advice by farmers is limited, with most farmers stating that their decisions are not influenced by others. However regarding environmental advisors; 45% stated they have had a major or medium influence compared with 44% stating environmental advisors have had no influence. Likewise the farmers are divided on the influence of the estate management; 39% stated estate management has had a major or medium influence on their decisions and 39% stated it has no influence. This could be due the fact that some farmers are tenants and others own their businesses. Looking specifically at tenants however although over half (54%) believed estates had a major or medium influence, 36% stated they had no influence and 10% thought they had a minor influence.

Only 5 farmers have used professional advice whether it is for production or environmental advice. See Table 7 for details.

Table 7: Average Time and Hours Spent on External Advice per Year

Advice	**Average Amount**	**Average Hours**	*N*
Private production	£1217pa	-	*3*
Private environmental	£500pa	8hrs	*1*
Public production	-	-	*0*
Public environmental	-	10hrs	*1*

The most important indicators for management decision making is the farmers' own *observation of crops and stock*, and the *overall timing of their management plan*, with 94% and 83% respectively assigning great importance. *Machine capacity; workforce availability* and *published vocational information* are also viewed by farmers as important but not to the same extent. In contrast *other farmers* or *advisors* do not play an important role in their management decisions. In terms of farmers evaluating the success of their management objectives, all (100%) farmers gave great importance to the *appearance of their land, crops and stock*, 94% to *margins and cost efficiency* and 89% to *yields*. On the other hand *nature and wildlife* was not as important to the farmers *and comments by neighbours and friends* even less so (view Figure 5).

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

Figure 5: The Importance of Nature and Wildlife, and Comments by Neighbours and Friends for Farmer Evaluation of Achieving their Objectives. (N=18)

Regarding the impact of local land management on a selection of water related issues, the farmers had very mixed views (view Figure 6). However with regards to *variety of plants and animals in local water courses,* 61% stated that local land management impacts to some extent.

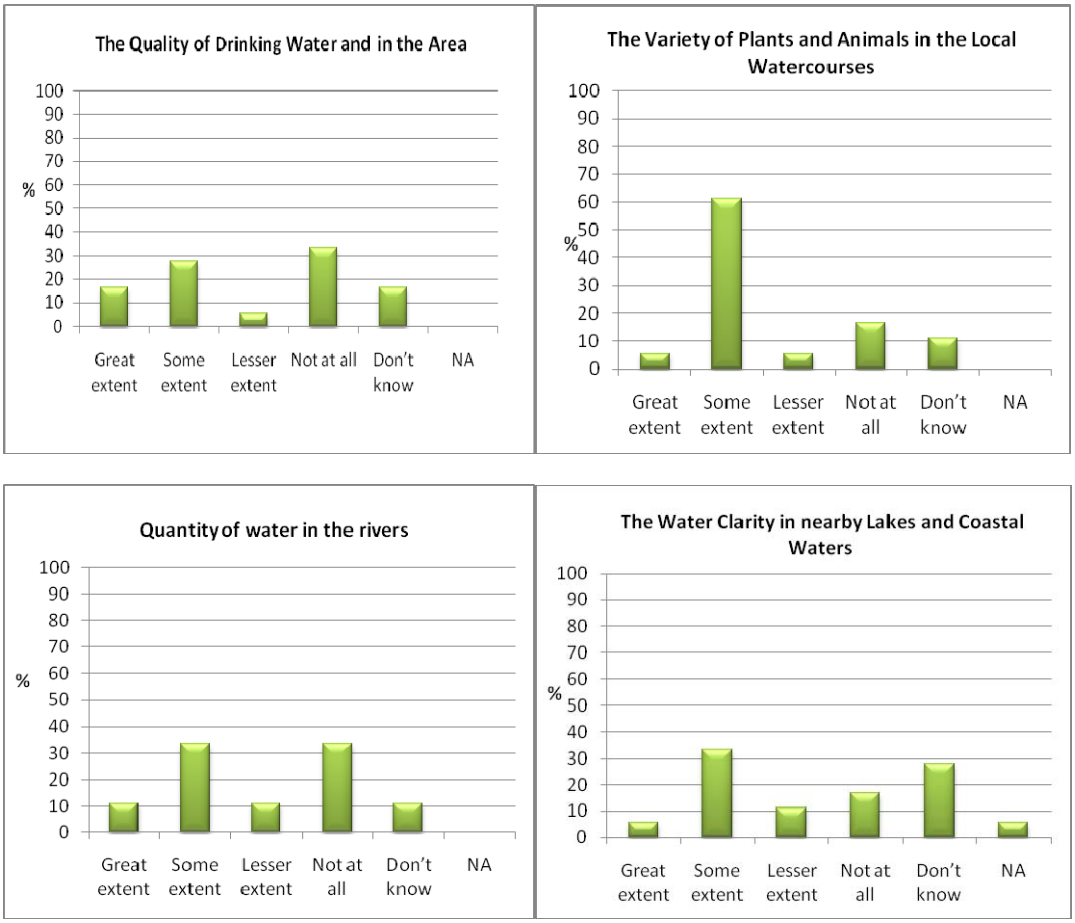


Figure 6: the Impact of Local Land Management on a Variety of Water related Issues (N=18)

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

Views on Current Water Environment and Impact on Farm Management

This section concentrates on farmers views of water related problems in the Tarland area and the impact such issues have on farm management, and more specifically farm income. It also examines their uptake of environmental practices in the context of these factors.

Farmers did not think there were many major water related problems in the Tarland catchment. More than 60% of farmers did not agree that the following: *erosion, drought (including drinking water), rainfall pattern and pollution* were an issue in the catchment. Regarding *flooding* however the farmers were slightly more divided in their opinions with 56% stating it is not a major issue and 33% believing it is (11% did not answer this question). The farmers that thought there were water related problems had mixed views regarding how such problems (such as *water shortages, silage/crop quality* and *animal welfare/health issues)* affected management. *Crops washed out* was the most frequent issue farmers faced whereas staying *compliant with regulations* was not seen as a problem, view Figure 7. The Other category included:

- 'unable to utilise crops in winter e.g. lambs not put on neeps as too wet'
- 'just after harvest, had to shift bales onto higher ground at 2am during heavy prolonged rain'
- 'No long periods of settled weather'
- 'draining water for houses on supply'

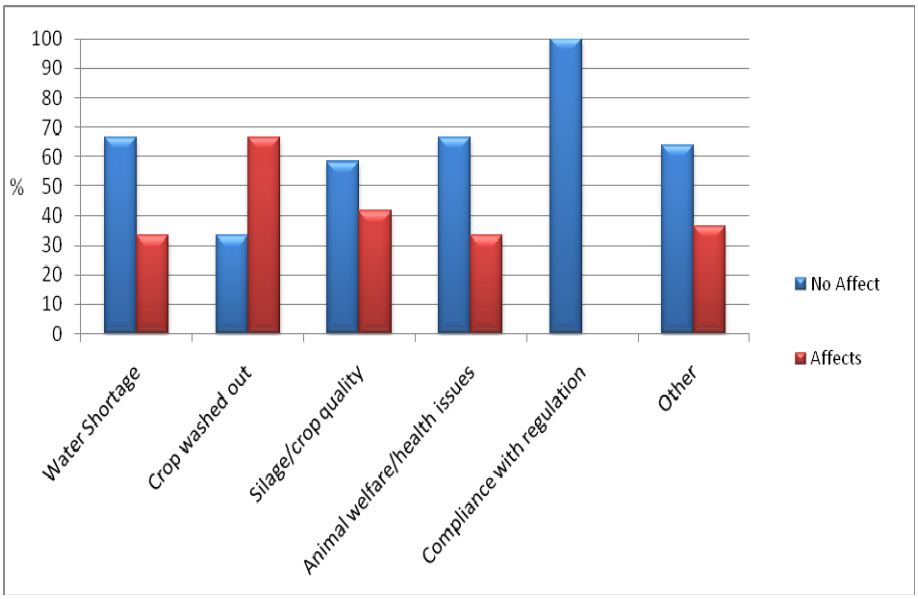


Figure 7: Affect of Water Related Problems on Farm Management Issues N=12[4]

These farmers were also divided on whether such problems had affected their income, 39% stating there was an impact on their income, whilst 56% stating there was not (6% noted not applicable). A couple of farmers commented on weather conditions affecting costs. One farmer commented that

[4] For 'Other' N=11

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

during wet periods more silage was needed and cattle would have to be kept indoors longer, whilst another noted a dry period prevented crop germination, which would lead to a lower yield.

Given the fact that some farmers believe water related issues are impacting on their business it could be assumed they would participate in environmental measures. However of those that believe income has been affected 6 are not involved and only one is involved in an agri-environmental scheme. Conversely those that don't believe their income is affected 6 of the farmers are involved in such schemes and 4 are not[5]. Again there was no relationship between water related issues impact on income and uptake of other environmental measures. The total number of measures undertaken for both farmers who believe income is impacted and not impacted on by water related problems is almost equal (10 compared to 12 respectively). Regarding the totals of measures not undertaken, although a higher amount, 42, of these are under the category of not believing water related issues impact on income, 26 are under the grouping of farmers who believe income is affected, view Table 8. This illustrates that some farmers although they believe water related issues are impacting on their income they are not undertaking environmental activities to lessen this impact. In terms of future measures also, the farmers who state that water related issues are impacting on their income more of them are not planning on undertaking them (view Table 9).

Table 8: Comparison between Participation in Other Environmental Measures and Views on Water Related Issues Impacts on Income

Participate in Other Environmental Measures	**Do Not Participate**		**Participate**		
					N
Impact on Income (No.)	***Yes***	***No***	***Yes***	***No***	
Environmentally friendly management of runoff and drainage water	3	7	3	2	*15*
Establishment of buffer strips or field margins	4	3	2	6	*15*
Change in the management of arable land and woodlands	5	9	1	0	*15*
Extensification of cultivated land	6	7	0	2	*15*
Working out green accounts or environmentally targeted management plans	3	7	3	2	*15*
Other	5	9	1	0	*15*
TOTALS	***26***	***42***	***10***	***12***	

[5] One respondent did not answer the question about the impact of water related problems on their income

Table 9: Comparison between Participation in Future Measures and Views on Water Related Issues Impacts on Income

Impact on Income	Impacts		No Impact		
					N
Participate in Measures in the Future (No.)	***No***	***Yes***	***No***	***Yes***	
Runoff and drainage water management	3	1	8	0	*12*
Create/manage buffer strips or field margins	2	2	5	3	*12*
Change of arable land or woodlands	3	2	8	0	*13*
Extensification of cultivated land	3	1	8	0	*12*
Other	1	0	2	1	*4*
TOTALS	***12***	***6***	***31***	***4***	

Climate Change

The issues of water related changes in the Tarland area and the impact of climate change on the area, and more specifically on farm businesses are the focus of this section. It also examines farmers' participation in environmental activities, currently and in the future, in the context of such issues.

When asked about water related changes in the Tarland/Aboyne area over the past ten years, there were mixed views among the farmers. A high proportion, 61%, of the farmers believed that there had been a change in *precipitation and water quantity* (with some stating there is now more rainfall, and others commenting there is less snow). The same number of farmers (61%) believed there were more *days with extreme weather*, particularly highlighting rainfall once again. There was a division between farmers on the issue of *frequency of flood events and erosion*; with 44% noting they had noticed a change, i.e. an increase, and 50% had not (6% stated they did not know). Most farmers had not noticed changes in *frequency of droughts/drinking water shortages* (89%), *quality of drinking water* (83%) and *growing season* (61%). Regarding *variety of plants and animals in watercourses*, farmers are of varying opinion with 50% stating no change, 17% believing there has been a change and 33% are unsure. For example one farmer remarked there are 'still eels' and another noted 'use to be eels, now gone'.

The farmers were divided in their thoughts about the impact of climate change on their neighbourhood; with 45% believing climate change has affected it, 44% thinking it has not and 11% of farmers were unsure. With regard to their businesses however 72% farmers thought that climate change had not had an affect on their businesses and in turn 72% also stated that they had not adjusted their farm management in light of climate change. Of the ones that have made adjustments please view Table 10 for details.

Table 10: Adjustments made to Farm Management in light of Climate Change (N=5)

Adjustments	No.
Changed management of runoff, irrigation, drainage, water or drinking water	1
Altered rotation cycle	2
Changed soil management	1
Other: 1. cattle all come in during winter - used to outwinter some 2. no hay production 3. changed management of shoot quarry and field drainages/lochs etc	3

In terms of age, both the young farmers and older farmers do not believe climate change has affected their businesses; however those of 36-65 do have varying views, view Figure 8.

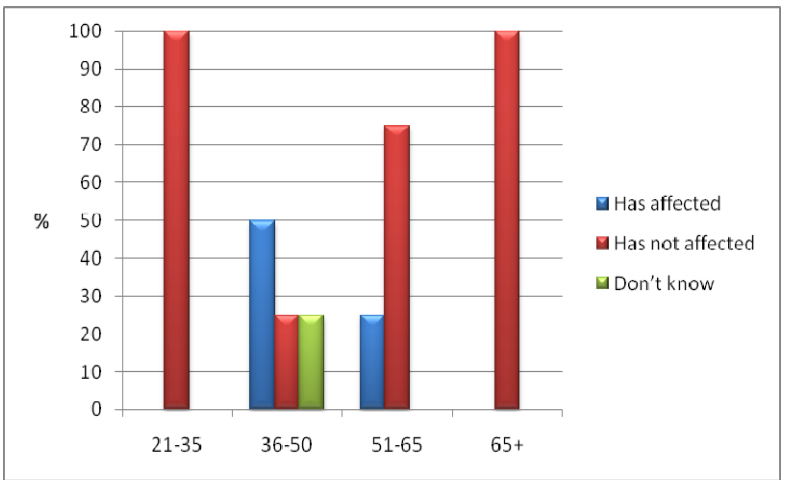


Figure 8: Affect of Climate Change on Farm Business and Age (N=17)

Of the farmers that said climate change had an impact on their business 25% are involved in an agri-environmental scheme and 75% are not involved. Of those that believe climate change has not impacted on their business there is little difference between those that take part (46%) and do not take part (54%) in such schemes. Regarding the other environmental measures, the majority of farmers who believe climate change has no impact have not taken part in such measures. However of the farmers that do think climate change has impacted on their business, there is a mixture across the measures of uptake and not participating in them. View Figure 9.

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

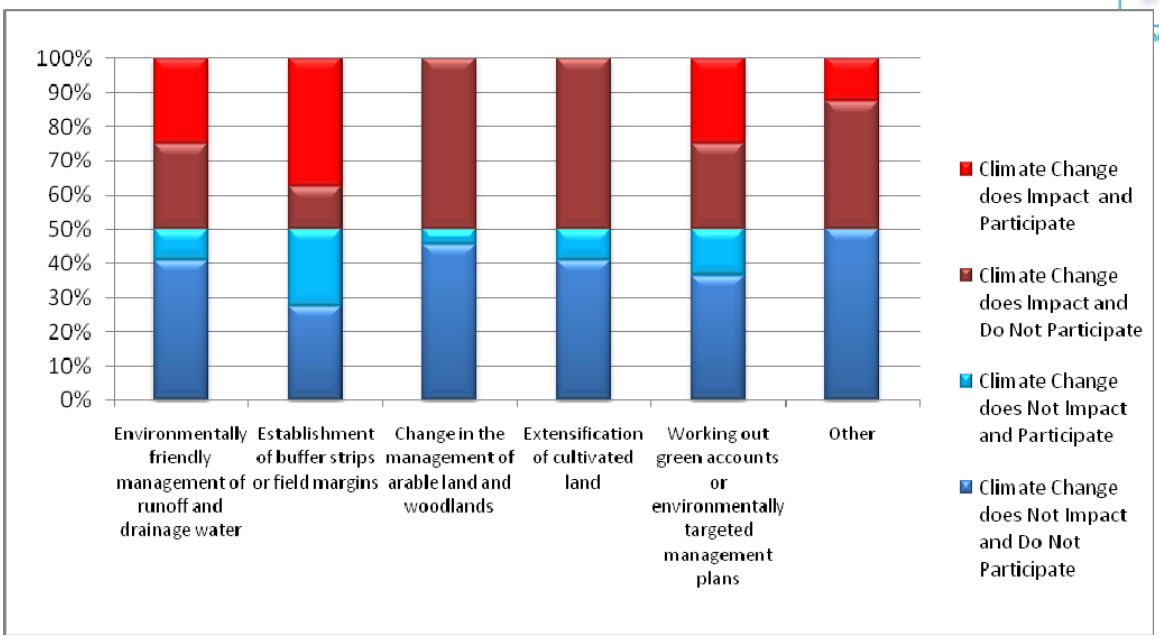


Figure 9: Participation in Other Environmental Measures and the Views on Climate Change Impacting on Business (N=16)

In terms of taking part in environmental measures in the future, the majority of farmers that believe climate change has no impact on their business would not consider taking part in any of the suggested measures. Likewise, those that think there has been an impact on their business are also more of the opinion that they would not take on such environmental measures. Buffer strips or field margins are however an exception with 3 stating they would and 1 said they would not use such a method, view Table 11.

Table 11: Participation in Future Measures and Views on Climate Change Impact on Business

Impact on Business	**Impacts**		**No Impact**		
					N
Participate in Measure in the Future (No.)	***Yes***	***No***	***Yes***	***No***	
Runoff and drainage water management	1	3	0	9	*13*
Create/manage buffer strips or field margins	3	1	3	7	*14*
Change of arable land or woodlands	1	3	1	9	*14*
Extensification of cultivated land	1	3	0	9	*13*
Other	0	1	1	3	*4*
TOTALS	***6***	***11***	***5***	***37***	

The farmers were asked about their expectations for changes in the future (over the next 10 years) regarding the following issues;

- *quality of drinking water*
- *variety of plants and animals in watercourse*
- *the water clarity in nearby lakes and coastal waters,*
- *precipitation and water quantity,*
- *frequency of flood events and erosion,*
- *frequency of droughts / drinking water shortages*
- *growing season*

The majority felt that either there would be no change to most of these factors or were unsure. However the difference between change, and no change and don't know regarding *frequency of flood events and erosion*, and *growing season* was not as clear cut, view Figure 10.

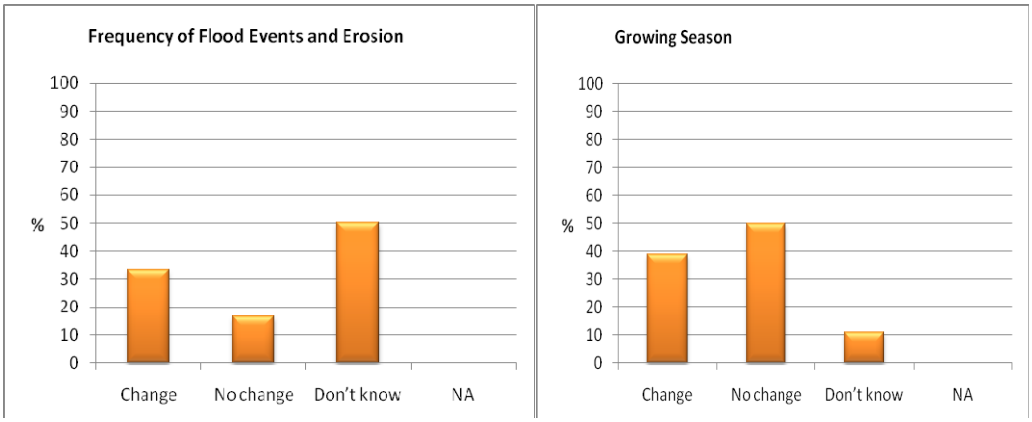


Figure 10: Farmers Expectations of Changes in Flood Events and Erosion, and Growing Season over the next 10 Years. (N=18)

Flooding and Environmental Activities

This section examines farmers' opinions about flooding and their participation in environmental activities, i.e. agri-environmental schemes, other environmental measures and future environmental measures. Measures only relevant to flooding however are discussed in detail.

Although the farmers on the whole did not view Tarland as suffering from any major water related issues, as stated above, there was a division regarding flooding. Could this be the case that some of these farmers have had first hand experience of been affected by flooding events? 4 of the 6 farmers that said flooding was an issue noted that crops washed out had been a problem for them. Furthermore there are differences between farmers' views on flooding; whether it is an issue or believe it will be in the future, and the environmental activities they undertake.

Of the farmers that see flooding to be an issue in the area only one is involved in an agri-environmental scheme. The farmers that don't view flooding to be a problem, 60% are involved in the schemes and 40% are not. In the same respect, farmers who think flooding is an issue were

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

more inclined not to take part in each of the other environmental, which are relevant to flooding (view Figure 11).

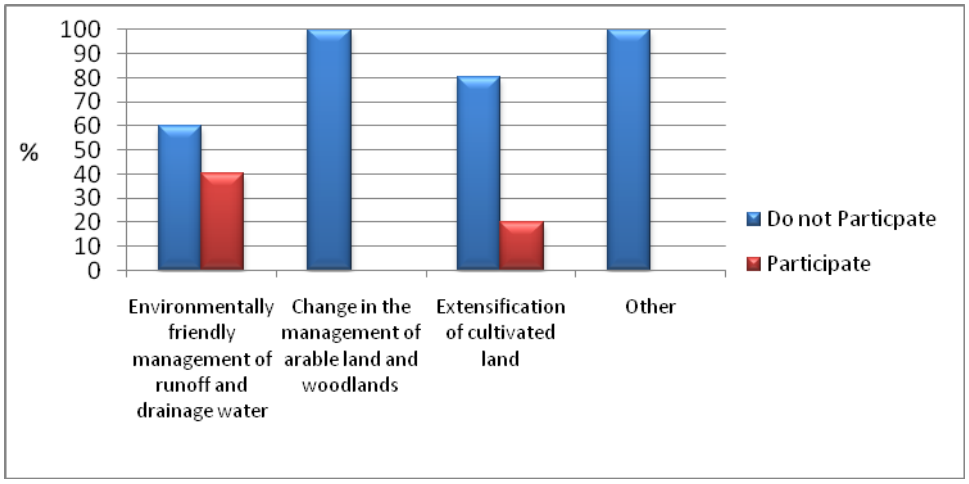


Figure 11: Participation in Other Environmental Measures and Views that Flooding is an Issue (N=5[6])

Looking specifically at those that do take part in the measures, there were mixed opinions on whether flooding was an issue. For both management of runoff and drainage water, and extensification of cultivated land for example, farmers were divided, 50% believing flooding was an issue and 50% who do not think it is a problem (view Figure 12).

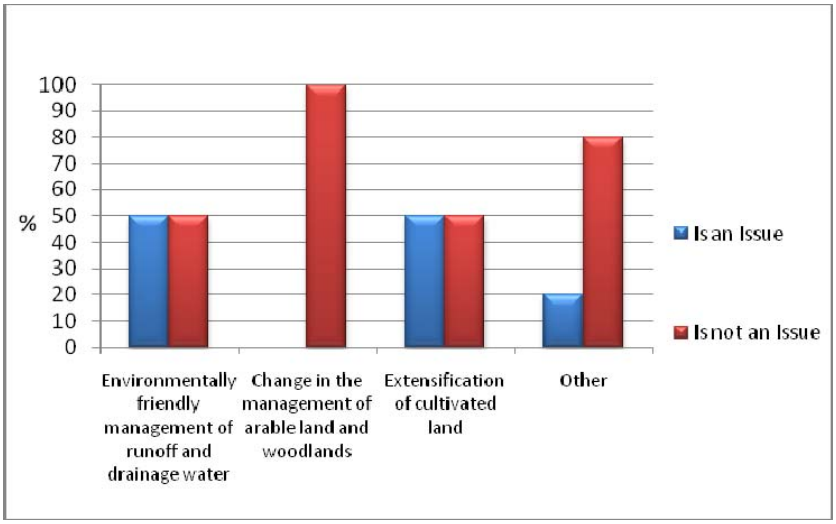


Figure 12: Farmers who do Participate in Other Environmental Measures and Views on whether Flooding is an Issue (N[7])

In terms of expectations of flooding in the future, those farmers which believe there will be changes in flooding, 67% are involved in agri-environmental schemes and 33% are not. The farmers that do

[6] One respondent did not answer
[7] Runoff management N=4; Change in arable / woodland N=1; Extensification N=2; Other N=5

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

not expect to see changes are not involved in such schemes. The farmers that participate in the other environmental measures are mixed in their viewpoints on whether there will be changes in the future. Within this group of farmers'; those who say there will be changes in flooding there is a total of 4 measures undertaken; the farmers, who believe there will be no changes there are 2 and those that are unsure about future flooding events 3 measures are undertaken within this set of farmers. For those that do not take part in the measures, most of these farmers are unsure about whether there will be changes in flooding in the future (Table 12).

Table 12: Participation in Other Environmental Measures and Views on Future Changes in Flooding

Participate in Other Environmental Measures	**Do Not Participate**			**Participate**			
							N
Future Changes in Flooding (No.)	***Yes***	***No***	***Don't Know***	***Yes***	***No***	***Don't Know***	
Environmentally friendly management of runoff and drainage water	3	2	6	2	1	2	*16*
Change in the management of arable land and woodlands	4	3	8	1	0	0	*16*
Extensification of cultivated land	5	2	7	0	1	1	*16*
Other: *through 3-Dee Vision, installed improved design in-stream watering and diverted runoff from overland/road into ditch & main watercourse*	4	3	8	1	0	0	*16*
TOTALS	***16***	***10***	***29***	***4***	***2***	***3***	

Regarding flooding relevant activities in the future, most farmers that do not plan on participating in them were unsure of whether flooding changes would occur. On the other hand within the group of farmers that would take part in these measures; those who believe there will be changes in flooding a total of 1 measure would be undertaken, the farmers that think there will be no change 3 measures and those, who are unsure about changes none of the measures are planned to be carried out between these farmers (view Table 13).

Table 13: Participation in Future Environmental Measures and Views on Future Changes in Flooding

Participate in Measures in the Future	Will Not Participate			Will Participate			
							N
Future Changes in Flooding (No.)	***Yes***	***No***	***Don't Know***	***Yes***	***No***	***Don't Know***	
Runoff and drainage water management	3	2	7	0	1	0	*13*
Change of arable land or woodlands	3	2	7	1	1	0	*14*
Extensification of cultivated land	3	2	7	0	1	0	*13*
TOTALS	***9***	***6***	***21***	***1***	***3***	***0***	

Referring back to the impact of land management all those that think it impacts to a great extent on water quantity do not take part in agri-environmental schemes. The majority that are involved in such schemes believe that land management effects water quantity to some or a lesser extent (view Figure 13).

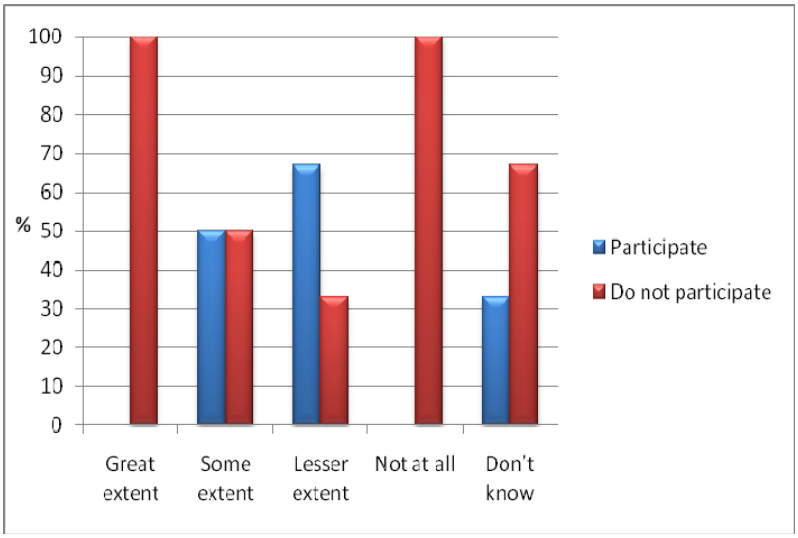


Figure 13: Participation in Agri-environmental Schemes and Views on Land Management Impacts on Water Quantity (N=18)

The farmers, who have applied other environmental measures, have mixed opinions on whether land management has an impact on water quantity. Within this group of farmers; a total of 2 measures are undertaken for those who believe it has an impact to some extent, a lesser extent, not at all or do not know the impact. There is one exception, only measure is undertaken for the farmer who believes it has a great impact. The farmers, who have not applied them, are of the general opinion that land management has an impact to a lesser extent or don't know (Table 14).

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

Table 14: Participation in Other Environmental Measures and Views on Land Management Impact on Water Quantity

Participate in Other Environmental Measures	**Do Not Participate**					**Participate**					
											N
Impact on Water Quantity (No.)	***Great extent***	***Some extent***	***Lesser extent***	***Not at all***	***Don't know***	***Great extent***	***Some extent***	***Lesser extent***	***Not at all***	***Don't know***	
Environmentally friendly management of runoff and drainage water	0	1	4	1	5	1	1	2	1	0	*16*
Change in the management of arable land and woodlands	1	1	6	2	5	0	1	0	0	0	*16*
Extensification of cultivated land	1	2	6	2	3	0	0	0	0	2	*16*
Other:*through 3-Dee Vision, installed improved design in-stream watering and diverted runoff from overland/road into ditch & main watercourse*	1	2	6	1	5	0	0	0	1	0	*16*
TOTALS	***3***	***6***	***22***	***6***	***18***	***1***	***2***	***2***	***2***	***2***	

Further, the farmers that say they will apply the suggested future measures are in more agreement that land management does impact on water quantity. Whilst the farmers, who are not planning to participate in future measures are more divided in their opinion, for example for both land

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

management impacts to a lesser extent and don't know of its impact on water quantity; a total of 15 measures are undertaken for both (Table 15).

Table 15: Participation in Future Environmental Measures and Views on the Impact of Land Management on Water Quantity

Participate in Measures in the Future	**Will Not Participate**					**Will Participate**					
											N
Impact on Water Quantity (No.)	***Great extent***	***Some extent***	***Lesser extent***	***Not at all***	***Don't know***	***Great extent***	***Some extent***	***Lesser extent***	***Not at all***	***Don't know***	
Runoff and drainage water management	1	0	5	1	5	0	0	0	1	0	*13*
Change of arable land or woodlands	1	0	5	1	5	0	2	0	0	0	*14*
Extensification of cultivated land	1	0	5	1	5	0	1	0	0	0	*13*
TOTALS	***3***	***0***	***15***	***3***	***15***	***0***	***3***	***0***	***1***	***0***	

In sum the results of this section show that famers are very mixed in terms of their opinions on flooding and uptake of environmental practices. It can be said that of the famers that are undertaking environmental practices some are not only undertaking them for flooding reasons. Further supporting this is the fact that some of the farmers who do not participate in the measures believe there are flooding issues to contend with and that farming does has an impact on such issues.

Views on Flood Management Measures

This section examines farmers' opinion about possible flood management measures and both the barriers to and incentives for implementing them. It also enquires about farmers' thoughts on their own and also agencies roles and responsibilities in flood management.

More farmers felt the suggested flood management measures were impractical than practical, with the exception of *move housing and infrastructure off floodplain* (view Figure 14). However, there was only a slight difference in opinion, 50% agreed it would be a practical response and 44% disagreed (6% did not answer). Some farmers added that the floodplain should not have been built on in the first place.

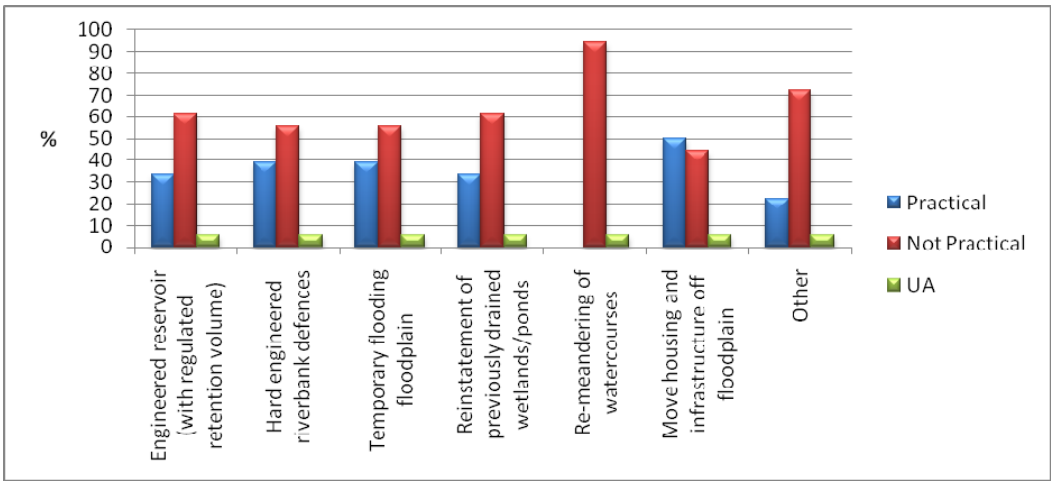


Figure 14: Practicality of Options to Respond to Flooding in Tarland and Aboyne (N=17)

When asked about farmland based flood interventions, most farmers agreed that *financial reasons* (94%), *disruption to farm management* (78%) and *limitations due to availability/suitability of ground* (67%) were barriers to such interventions. Famers were divided however on their opinion as to whether *dislike of the flood prevention measure/approach taken* would be a barrier, with 44% agreeing and 56% disagreeing. Considering the farmers' uncertainty about the prospect of interventions, when asked which incentives would encourage such interventions, the most popular were *financial gain* and the *ability to tailor the measure to suit their individual farm management,* with 89% and 72% agreeing respectively. *A collective farmer led approach, a sense of responsibility to prevent flooding downstream* and *avoidance of regulatory or statutory measures* were not popular measures among the farmers, with 78%, 72% and 83%, disagreeing that these incentives would encourage farmers to uptake flood prevention measures respectively.

There is general consensus among the farmers that the roles that public agencies play with regard to flooding in Tarland and Aboyne should be to *facilitate a voluntary approach* (67%) and to *finance measures on private land* (78%) and that they *should not enforce a regulatory approach* (78%).

The farmers are divided in their views as to whether the community see them playing an important part in flood management. 45% believe the community views farmers as having an important role, whilst 44% do not (11% did not answer). Conversely the majority of farmers see themselves as having an important role to play as water managers in the future, with 56% stating they have quite an important role and 28% believing farmers have a very important role to play.

Discussion

The results of this study support other studies that have investigated farmers' attitudes and behaviours toward farming and environmental issues (see for example Crabtree et al 2001, Evans et al 2002, Lobley et al 1998, Mather et al 2006, Walford 2003, Wilson et al 2001). On the whole our respondents have a production oriented outlook on their farming activities, in that their first purpose is to produce food. Our respondents could be identified as what is popular viewed as the 'typical farmer'; within the age range of 51-65, male, have secondary to college (vocational) education, work on their own or with their sons in what is primarily agricultural work. They have come from a generation in which producing food is a key priority; it is their duty to feed the nation.

European Union The European Regional Development Fund
Investing in the future by working together for a sustainable and competitive region
The Interreg IVB North Sea Region Programme

Regarding farm management, what they view as key importance are factors related to the 'business' of producing food, for example the look of their crops and timing of their management plan. Also they feel they are successful farmers in terms of producing food efficiently, noting the importance of margins and cost efficiency, and yields.

From a differing viewpoint, the importance of the appearance of their land, crops and stock could be seen as famers wanting to look good within the farming community. This for them provides them with status (Burton et al 2008) of been a 'good farmer' i.e. a good 'food producer'. The farmers are less inclined to be influenced by outside advice, with very few taking professional advice. In this respect the farmers want to keep themselves to themselves, are not willing to be influenced by others (i.e. a collective approach). They are individual business men, who will make their own decisions.

The farmers have mixed views on changes in water related factors, although it is interesting to note that nearly two thirds of the farmers had noticed a change in precipitation but only 44% had noticed a change in flooding. They also have mixed views about land management affecting such issues. In the same vein there were mixed views about the impact of climate change on their neighbourhood, although the majority felt that climate change has not affected their businesses and nearly two thirds did not believe there was any water related problems. This general air of uncertainty and mixed viewpoints within the farming community about the variety of environmental issues shows that there is still scepticism about their role in environmental management and adapting to or mitigating climate change impacts. If farmers are not convinced about the impact of their business on the environment and or their role in managing climate change and water related issues, they will not alter their farming practices or jeopardise their farm productivity.

In light of the Tarland farmers' mixed views on these environmental issues it is not surprising that less than half (40%) are involved in agri-environmental schemes. Nor is it surprising that the most popular water measures are those that are not putting pressure on the farm business, i.e. do not greatly impede the production elements, for example field margins. Others which require more effort to establish or land, for example pond creation and woodlands are unpopular in comparison. An interesting result was that although most farmers believed the schemes are making an improvement to the environment, almost a third (27%) disagreed and 9% were unsure. Are they therefore just taking part in such schemes for the financial incentives to help support their business? Further to this, it has been illustrated that farmers who undertake environmental activities do not necessarily believe there are environmental issues to deal and contend with. Also some of the farmers who do not undertake environmental measures are of the opinion that there are environmental problems occurring and that farming does impact on such issues.

Although financial incentives might be the main motivation for participation in agri-environmental schemes, there is evidence that some farmers support, environmental conservation, because some are implementing environmental activities that they are not getting paid for. In addition over half the farmers said their management decisions impact to some extent on plants and animals in water courses, and consider wildlife and nature to be of some importance within their land management decision making. A number of farmers (45%) are been more proactive, stating that they are influenced by environmental advisors when making decisions. This highlights the fact that when farmers do not have the knowledge about water related issues; some are taking on board advice to improve their understanding of such issues.

Given the Tarland farming community's current views on the water environment and climate change, it is not surprising that many think there will be no change in many water related issues in the future. Flooding however was an exception. Given the general productionist attitudes across the farming community, It is also not surprising that flood prevention measures that would impede production were not viewed as practical but those not affecting farming i.e. do not build on the floodplain, were viewed as more practical. Furthermore the most popular incentives for farmers to undertake flooding interventions were financial and those which would not disrupt their farm management.

In summary, Tarland farmers are considering environmental (water related) issues to an extent, but are not convinced there is a major problem and thus not proactive in their responses to such factors. However it was interesting to see that the majority of the farmers do see themselves to be water managers of the future. This rather contradicts their views on environmental issues and their present and future plans for water related measures. Is it because farmers already see themselves as stewards of the land or that the possibility of incentives will influence them to be more proactive?

Next Steps

This information will be combined with the information arising from the farmer and factor meetings held in Spring 2010. The combined analysis will be used to underpin our local objective to implement a pilot flood management measure and our transnational objective to inform natural flood management and river basin planning policies. Further information on the project can be found at: http://www.macaulay.ac.uk/aquarius/.

References

Burton, R.J.F., Kuczera, C. and Schwarz, G. (2008) 'Exploring Farmers' Cultural Resistance to Voluntary Agri-environmental Schemes', *Sociologia Ruralis* **48**(1): 16-37

Crabtree, B., Chalmers, N. and Eiser, D. (2001) 'Voluntary incentive schemes for farm forestry: uptake, policy effectiveness and employment impacts', *Forestry* **74**(5): 455-465

Evans, N.J., Morris, C. and Winter, M. (2002) 'Conceptualising agriculture: a critique of post-productivism as the new orthodoxy', *Progress in Human Geography* **26**(3): 313-332

Lobley, M. and Potter, C. (1998) 'Environmental Stewardship in UK Agriculture: A Comparison of the Environmentally Sensitive Area Programme and the Countryside Stewardship Scheme in South East England', *Geoforum* **29**(4): 413-432

Mather, A.S., Hill, G. and Nijnik, M. (2006) 'Post-productivism and rural land use: cul de sac or challenge for theorization', *Journal of Rural Studies* **22**(4): 441-455

Walford, N. (2003) 'Productivism is allegedly dead, long live productivism. Evidence of continued productivist attitudes and decision making in South-East England', *Journal of Rural Studies* **19**(4): 491-502

Wilson, G.A. and Hart, K. (2001) 'Farmer Participation in Agri-Environmental Schemes: Towards Conservation-Orientated Thinking?' *Sociologia Ruralis* **41**(2): 254-274