AQUARIUS
Farmers as water managers

Conclusions and Recommendations

from Aquarius workshop in Sweden 7-10 June 2011






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Content

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1 Summary - Recommendations

1. Communication / involvement.

Communication between authorities, advisors and farmers is a top priority. It is also closely coupled to involvement of stakeholders in issues on water management. All pilots have examples of how important communication and involvement are for win-win solutions (see below). All relevant ***stakeholders need to be involved from the very beginning*** of the implementation process. It is also important to ***communicate target over and over again*** to all stakeholders and not lose sight of the goals during the process. Show farmers the positive effects of water management to act as incentives, through evaluations and demonstrations, and use innovative farmers as good examples.

Example from Denmark: Catchment groups comprised of all stakeholders seeking solutions for improved water quality – clean fjord.

Example from Sweden: WFD groups. Geographical division of e.g. a catchment in order to keep groups small and efficient. Farmers irrigation groups with support from authorities. Also invites groups of farmers to meetings with authorities.

Examples from Delft, NL: built on existing structure – the Water Boards involving stakeholders and authorities. Integrated sub - catchment plans. Organize groups of farmers down to 12 farmers depending on the problems.

Example from Scotland:Worked with farmers at a sub catchment scale so that the approach was to find local solutions to local problems enabling farmers to engage with the process.

2. Water management plans / adaptation on local scale

An important aspect is to use geographical specializations so that ***local farmers and local advisors work together***. Education program (for farmers, advisors and authorities) to spread and scale down knowledge from national or EU-level project will be important.

Water management plans at farm level should be used as a tool to obtain a cost efficient combination of measures in areas where the water does not reach good ecological status according to the Water Framework Directive. ***Water management plans must be flexible***, and not general. Plans should have a firm connection to local issues.

Action should be shared by authorities and farmers at the local scale. Authorities have to promote praxis and dialogue. Which water management tasks that can be performed by farmers also

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depend on the characteristics of an area. Who is responsible for water management, which water management problem need to be solved, what are the possibilities (e.g. space, land price) to solve the problem? The answers on these questions determine the design of a water management measure, such as the flexibility, size or type of measure.

Location specific actions require that ***EU and national legislation allow for flexible approaches for measures.***

Example from Norway: national rule is maximum 70% incentive for wetland construction. This did not lead to any new wetlands constructed. Local authorities raised the subsidies to 85% and results were reached –farmers reacted positive and wetlands were constructed.

3. Knowledge based communication.

Two way communication is as always important. Advisory organizations as well as authorities should ***respond to farmers initiatives*** to communication and/or solutions to specific problems. Justification for different measures must be ***well documented*** and scientifically sound. Preferably aims and goals should be illustrated and understandable in terms of benefits for the community – environment. ***Demonstration sites*** and other means of visualization of concepts/goals are very important for mutual understanding.

It is also important that authorities and advisory organizations ***coordinate information given to farmers***. Multiple and diverging messages will lead to confusion lack of trust. Avoid different messages from different directives and EU directives should have been checked prior to any suggested measures taken.

Example from Scotland: Held workshops for farmers, factors and landowners. The aim of the workshops was to get feedback on the draft flood risk maps and climate change scenarios, to ground truth the information generated by the models, and to get the farmer's views of themselves as water managers.

4. Profitable / win-win (use the problem wheel to verify profitability).

Influence policymakers to make environmental programs ***realistically accessible and financial viable*** for the farmers. Measures should at least be cost neutral or better.

Examples from Sweden: subsidies to farmers for constructed wetlands as environmental tool, giving increased biodiversity and reduced eutrophication at the same time as it can be used as irrigation by the farmer.

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2. Processes and preparatory work leading up to the meeting

All partners prepared for the meeting by producing several concluding documents regarding their respective pilot and conclusions and recommendations drawn from the project work. Since this was the last international partner meeting for the project (not counting the end conference), it was important that conclusions where reached, including final recommendations based on previous work in the project and with the overall purpose and aim of the project in mind.

Included in this work was the completion of pilot-specific templates where a number of questions were to be addressed. The guidelines for, and outline of, the template had been produced in advance by Lead partner and the Communication group in the project. The Communication group got the task of producing the template questions at the previous project meeting in Drenthe, Netherlands The template outline and thee templates from the different partners and pilots can be seen in Appendix *i* (section 5).

In addition to the templates all partners also produced and presented:

A) A short oral presentation of the pilots and results and findings from the project
B) A poster to complement the presentation.
C) Pilot specific conclusions and recommendations

The presentations and posters are not included in this report. The pilot specific recommendations for all partners are included below.

Parallel to this work, a magazine will be produced with a popularized report on the overall project and where each pilot produces a pilot specific article. This magazine is produced separately but with input and conclusions from this workshop. The magazine is ready for the End Conference in October.

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Pilot specific recommendations

Sweden:

Hydrology and legal matters

- Controlled flood areas should be set aside in order to avoid damage by flooding in other more important areas
- Downstream effects of various measures, e.g. flood regulation must be considered to a larger extent
- The legal aspects of all water activities must in the future be considered, regarding need of irrigation, flooding situations, water quality and biodiversity

Water quality and biodiversity

- Water management plans at farm level, including wetland and irrigation pond construction, should be used as a tool to obtain a cost efficient combination of measures in areas where the water does not reach good ecological status according to the Water Framework Directive.

Farmers' participation

- Support establishment of local water management groups to tackle the changes in climate conditions (e.g. stream-, river- or irrigation groups)
- Inform farmers about possible use of data from their own (cheap and easy to use) meteorological stations to determine soil water conditions and irrigation needs
- Show farmers positive effects of water management (e.g. wetland construction) through evaluations and demonstrations
- Update previous shown interests from farmers and handle applications for wetland construction faster.

Drenthe:

- Develop an integrated adaptation strategy:
  - New crop varieties (drought resistance);
  - Develop efficient water use:
- Irrigation with soil moisture sensors,
- Pivots,
- Groundwater use,
- Water conservation (weirs, multifunctional wetlands)
  - Efficient use of nutrients (fertilizer planning, irrigation planning)
  - Improving soil structure for better moisture content.

- Water management on a farm should be part of sustainable farming and the greening of the CAP
- Make irrigation-advice accessible via internet.

Improve knowledge on:

- Profitability of irrigation / water conservation

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- Different crops;
- Present and future climate conditions;
- Further developments on soil sensors:
- Cheaper;
- Water quality.

Delfland:

• Focus on the organisation of the process to make it effective (results) and efficient (time and money):
  - All relevant stakeholders need to be involved from the very beginning of the implementation process.
  - A farmers organization acting as intermediate appeared to be more efficient
• Focus on communication for better understanding, support and participation
  - Partners are willing to learn from each other.
  - Visualisation of ideas and discussion helps partners in the catchment to understand each other.
  - Participation of partners is based on reliability and trust.
• Seek for win-win situations:
- Farmers are interested when it is profitable, e.g. sufficient income.
- Farmers need higher maximum payments.

• Knowledge of the (European) legislation prevents errors and contributes to the reliability of partners in the catchment:
  - Funding of ecosystem services that will falsify competition on the Common Market is considered as state aid.
  - Government payments of no more than EUR 7.500 for agricultural enterprises over a period of three years are not regarded as state aid (Minimis aid).

Norway:

- Communicate target over and over again
- Work with the innovative farmers – both the positive ones and the skeptical ones.
- Increase of farmers awareness takes time
- Farmers confident that the measures will not be too expensive for them
- Knowledge based communication with farmers
- Maintain a good dialogue with the farmers
- Demonstrations on the farms
- Cooperation research/farmers
- If comprehensive measures are needed it might not be possible to reach the target by win-win solutions alone. Some important measures will cost money
- Contracts the way we have done it are expensive. To be used only when there is a need for comprehensive measures.

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Scotland:

- There is a need to brief Agricultural Advisors on Natural Flood Management so they can in turn raise awareness amongst farmers
- The Aquarius demonstration project can be used as an example for awareness-raising amongst farming community
- Make the various agri-environment schemes and other policies relating to agricultural support and land management more effective in encouraging farmer led approaches to good water/flood management.
- More awareness raising amongst farmers and land managers is required of the possible future implications of climate change.
- Ensure that information produced about flood risk management is farmer friendly
- Ensure the farmer is involved in development of flood prevention measure & does not feel 'singled out'
- There is a need for more research on legal and institutional alternatives to local authority owned capital projects when looking for natural flood management solutions.
- Promote catchment /landscape approach to flood management.
- A review of RDP/agri-environment incentives is required to provide more long term and financial attractive options aimed at flood risk management
- Currently the tools and incentives are not in place to encourage farmers to act as water managers in respect to flooding.
- The key challenge is to work with land managers to find a solution that works for the farmers, neutral effect on their business/or benefit while at the same time is a sustainable/cost effective solution in terms of local authority resources.

Germany:

Hydrological:

a) Initiate an additional hydrogeological study for the southern part of the critical area (Süd-Drawehn), because conclusions only are valid for areas with floating aquifers.

b) Extract water only from the lower aquifer (which is opposed to recent policy).

c) Measures on the surface – like those to increase seepage – only when active support of biotopes and creeks, that depend on the upper floating aquifer, is intended.

Limnological / Good Status of Creeks / biodiversity

a) The quality of the creeks' beds has to be improved dramatically before the benefits / problems of more / less water flow can become effective. Beds need to be reconstructed to more speedfull run off with more erosive power in the summertime by constructing "summer – beds" (lying in the larger winter–bed to tackle flooding situations).

b) Additional research necessary about the fauna of the dry – falling upper parts. This shall be done through the last year of AQUARIUS. In order to retain WFD–effective measures it has to be clear, what the good state is (i.e. naturally falling dry or not).

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Participatory / Structural / Legal

a) Assessment of the effectiveness of measures for upstream creeks or / and for groundwater quantity has to be continued.

b) Additional research on the fauna of the dry falling parts of the creeks has to be done to evaluate, if measures to increase the summer base flow are helpful (i. g. determine a definition of the good state of dry falling sections).

c) A political–administrative strategy should to be decided by the water authority, if measures and benefits are better to be balanced on a large scale or on a local scale.

d) Measures should be promoted by the water authority by

1. a supportive examination and by
2. only low-cost / no-cost obligations and by
3. defining on “exchange-rate” of measures to additional waterallowances.

e) A local frame should be installed which will allow compensation-“deals” between environment-authority (water, nature) and irrigation boards. For example should a farmer, who gives land for a buffer strip, be “paid” with additional water extraction–permits.

Irrigation:

a) Investment programs and legal frame should encourage farmers to install measures to retain water (for example with weirs in ditches) or to collect water (winter flow, drainage).

b) Research on farming methods for more effective (= economic!) use of rainfall and irrigation water should be continued after all.

c) Research on plant-physiological steering of irrigation should be extended (i. e. improve identification of growing phases, during which water is of high impact for the final yield and other phases with lower damage through a lack of water)

Other:

a) Develop further going information strategies.

b) Carryout research on public opinion (at regional and at national level) and evaluate need for and difficulties of advanced information-concepts.

Denmark:

• The catchment group deals with a limited and well defined area to which all stakeholders have a relation, for instance the catchment to a creek like Lundgaard’s Creek.

• The group should include stakeholders who have a role in the use and the management of the area. In the Lundgaard’s Creek group this means at least representatives from the land owners and the local authorities.

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• Its important that the different perspectives are understood by all stakeholders
It's important to achieve a common and visualized understanding of the N-problem based on scientific knowledge/data

How to upscale
- the cooperation model on Water Plan level
- how to communicate the findings
- how to make the setup for the cooperation
- the technical learnings like N transport model

3. Meeting

A) Excursions

The excursions were planned in order to show partners the Swedish work in the project and also to present points of interest suggested from other partners.

The Melby field trials was visited, and presented. The purpose of the field trials is to develop effective methods of cultivation in order to reduce the loss of nutrients in various cropping systems. At Mellby, we can study effects of different cropping procedures in sandy soils where extensive animal husbandry has existed for a long time. Ever since the start in 1983, the trial site has been under constant development. The number of trials has increased and, concurrently with the increasing demand for new knowledge, the trials are revised. At the trial site, 50 trial plots are used today (40x40 m). These are separately drained at a depth of about 1 metre. The drainage water is lead to a measuring station where sampling takes place. This is flow-related and works automatically. At Mellby there are also several climate stations measuring temperature, precipitation, insolation and wind speed. The Swedish Agricultural University is responsible for the trials and the work are carried out by REAS.

One of the pilot farms (Henrik Olsson), a local farmer involved in the Swedish pilot was visited. Henrik presented his experiences of the project and how he use constructed wetlands for irrigation.

A **constructed wetland** with flow-proportional sampling technique was also visited, where professor Stefan Weisner at Halmstad University presented the work with constructed wetland as environmental tools combating eutrophication of the sea and increasing the biodiversity of the agricultural landscape.

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After the meeting two extra half days of excursion were conducted after stated preferences from some of the partners. We visited a number of constructed wetlands with different purposes (retention, biodiversity, recreation) and different age (from under construction to 15 years old).

B) Pilot presentations and Poster session

The pilot presentations opened the general meeting (after steering group and communication group meetings) and gave all participating partners updated information on the 7 sub projects (pilots) and also formed a base for group discussions on conclusions and recommendations. The presentations further gave overviews of the pilots which facilitated good and in depth discussions at the poster presentations.

The poster presentations were held in the evening the first day, and it gave the opportunity to discuss particular points of interest between partners and pilot projects.

C) Workshops (conclusions and recommendations in groups)

Participants from the different pilots were divided into four groups with the aim of representation of all pilot in each group. The groups discussed conclusions and recommendations for the project based on common denominators between pilots. The findings were later presented and discussed in a plenum.

Group 1

Conclusions

Two way communication and dialog being knowledge based are important. Give time to reach common understanding. Develop integrated and adaptive strategies vs. climate change. Beware of scale challenges. Different levels from EU to local, and all directives and legislation should be taken into consideration to find the most cost efficient measure.

Recommendations

General

- Public participation
- Clear goals – based on knowledge (from everybody involved) and proof that is up to date
- Ask the farmer (stake holder)
- Look for win-win solutions – can be hard to find and often requires dialog
- Start with the quick solutions – gives good examples

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• Look at the local and the regional level at the same time – measures that seems good on a local scale may not always be good on a regional scale, and vice versa
• More demonstrations, good examples
• Find locally based solutions
• Be flexible – find (sometimes new) integrated and adaptive strategies, with regard to climate change and other challenges, such as European and national legislation and regulations
• Make room for innovative solution

Participatory
• Work on trust in the group
• Be aware of and visualize different perspectives
• Let it take time
• Make sure the groups are small enough

Hydrological
• Before taking measures – consider the effect downstream, upstream and on other environmental problems
• Let the floodplain be – do not build on it, plan it to be an area for flooding

Eutrophication
• Consider the limiting nutrient before taking measures – measures differ for different nutrients

Structural
• WFD, Flooding Directive, Habitat Directive and other European and national legislation and regulations need to be considered at the same time, together with CAP.
• Deal with the problem connecting to when different authorities are responsible for implementing different legislation and regulations
Irrigation
• Develop and practice precision irrigation

Group 2

Recommendations

1. Measures should at least be cost neutral or better. Financially beneficial if neutral.
2. Justification for the measure must be well documented. Illustrated and understandable in terms of benefits for the community – environment.
3. Reward risk takers for being guinea pigs at demonstration sites/pilots, for runners where the results are long term.
4. Water management plans must be flexible, cannot be general but must be flexible at farm individual. Deal with the individual farmer through an existing farm interest group or advisory service. Use existing structures.

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5. Location specific actions require considerations of EU and national legislation allowing flexible approaches for measurements. Not general rules. Norway: national rule max.70% incentive for wetland. Nothing happened – local 85% and results reached –farmers reacted positive.
6. Demonstrations and visualization is very important for mutual understanding.
7. Involve the farmers from the beginning and draw upon their knowledge and experiences.
7. Only one message to the farmers from authorities. Must coordinate. Avoid different messages from different directives. (water, river, soil etc.).
8. Recommendation to farmers: Seek your neighbors. Organize with colleagues to discuss and find suggestions for solutions.
9. Invite farmers to cooperation and working groups etc.
11. Use advisors / intermediary to bridge the gap between authorities and farmers.
12. Greening the CAP include water management /blue green services in a flexible way.
13. Organize catchment groups to work with water quality and quantity (water framework directive). Organize in a flexible way adjusted to local conditions and include all stakeholders.

Group 3

Recommendations

1. Farmer as water manager must be integrated into legislation and incentive schemes.
2. Involvement of all, looking for win-win situations.
3. Simple communication, visualize problems etc.
4. Integrated adaptation plan. Blue-green services, multiple benefits, etc.
5. Initiate farmers working together
6. Different stake holders have different time scale / time perspective. (short – long).

Group 4

Recommendations

Hydrology, water quality and legal matters.

1. Focus more on the processes, communication discussion, involvement in processes between stakeholders
2. Make more catchment oriented measures which often have effect on whole catchments or whole groundwater bodies.
3. Encourage sustainable and innovative farming.
4. Influence policymakers to make environmental programs realistically accessible and financial viable for the farmers.
5. The structure of agriculture must be considered to a larger extent.

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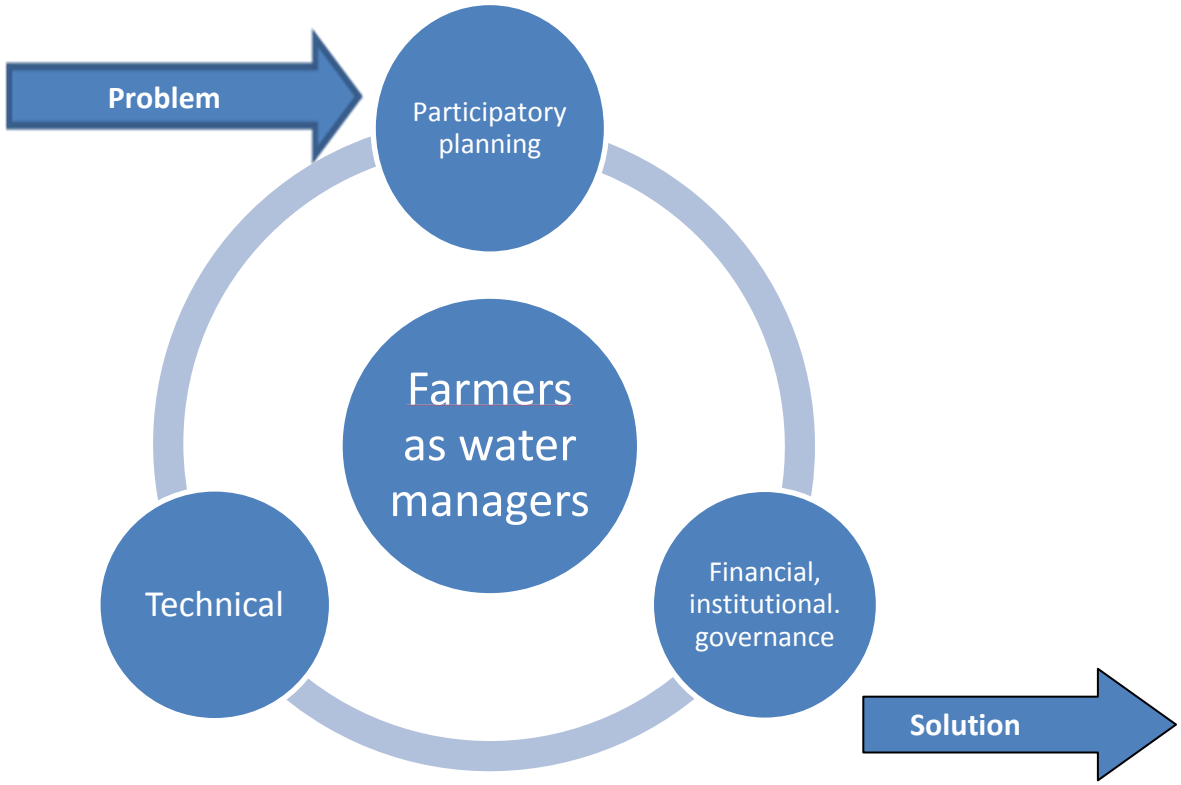
6. Evaluate the farming in practice to decrease the emissions and make water management plans at farm scale.
7. Hand over the responsibility to the farmers to get good water conditions.
8. Leave to the farmers to decrease the emissions and make water management plans at farm scale.

4. Results from plenum discussions (results and recommendations)

Sustainable solutions to specific problems should be found and evaluated in"the weel" after circulation in its three parts.

1. Participatory planning
2. Technical
3. Financial, institutional, governance



To search for the right mix between technical, economic and institutional methods during the plenum discussions at the meeting we used the "Problem-Solution wheel" with focus on the farmer as water manager under changing climatic conditions

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The meeting agreed on some "Headlines" indicating important areas as suggested by the partners pilot-specific recommendations and conclusions, as well as the groups work on overall recommendations and conclusions during the workshops at the meeting.

1. Communication / involvement.

Communication between authorities, advisors and farmers is a top priority. It is also closely coupled to involvement of stakeholders in issues on water management. All pilots have examples of how important communication and involvement are for win-win solutions (see below). All relevant ***stakeholders need to be involved from the very beginning*** of the implementation process. It is also important to ***communicate target over and over again*** to all stakeholders and not lose sight of the goals during the process. Show farmers the positive effects of water management to act as incentives, through evaluations and demonstrations, and use innovative farmers as good examples.

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depend on the characteristics of an area. Who is responsible for water management, which water management problem need to be solved, what are the possibilities (e.g. space, land price) to solve the problem? The answers on these questions determine the design of a water management measure, such as the flexibility, size or type of measure.

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Appendix *i* (Template Outline and filled out templates from pilots)

Welcome to the xx pilot – (insert map of pilot area here)

1. What were the problems the pilot wanted to address?
(Quality, flooding, droughts?) Describe the primary pilot problem – (Use text from postcards on the web):

2. Changed climate?
Scientific: How is climate change affecting the water environment in your catchment?
Catchment level: Do the farmers, the local authorities and the water board in the pilot recognize that climate change effecting the water environment?
Farmer: Are there differences between the farmers' attitudes towards changed climate among the farmers in the catchment? What are the farmers' expectations to future farming due to changed climate?
What were the main means in Aquarius chosen to address the problem? (Technical, participatory or financial?)

3. Farmers as water managers
Why do the farmers act as water managers in your catchment: (consider bringing in examples of incitements that leads to win-win solutions?)
How are the farmers working as water managers in the pilot?
What activities are being undertaken in the project
(Use examples); Technical, Participatory, Finance
You must choose to bring in examples of one or more of the following at catchment perspective and at farm level:
At catchment level: participatory, - how have you worked together at catchment level? How have the farmers been involved? Which authorities have been involved? Other stakeholders? (Challenges and barriers for the cooperation) Please supply contact information – names, addresses for journalistic use.
At catchment level: technical, - how did you find the technical solutions at catchment level? Bring in examples of technical methods. (Challenges and barriers for the techniques)
At catchment level: financial, - which financial solutions have you worked on? Bring in examples of financial solutions (challenges and barriers for the solutions)
Similar questions for farm level…
Here is could be good to use quotes from farmers. Please supply some quotes for the journalist's use.
Lessons learned and recommendations for the future?
At scientific level? (technical, financial, participatory)
Have knowledge gaps been identified? Why? What could be done to reduce the gap??

4. What is to be done in the future? (After the project in finished)
At catchment level? (technical, financial, participatory)
At farm level? (technical, financial, participatory)
Recommendations for the
Farmers:
Water authorities at different levels:
Others?:
Quotes: Please supply some quotes for the journalist's use.
Our greatest findings/learnings are: (at farm level and other levels)
How to make all farmers water mangers in the future

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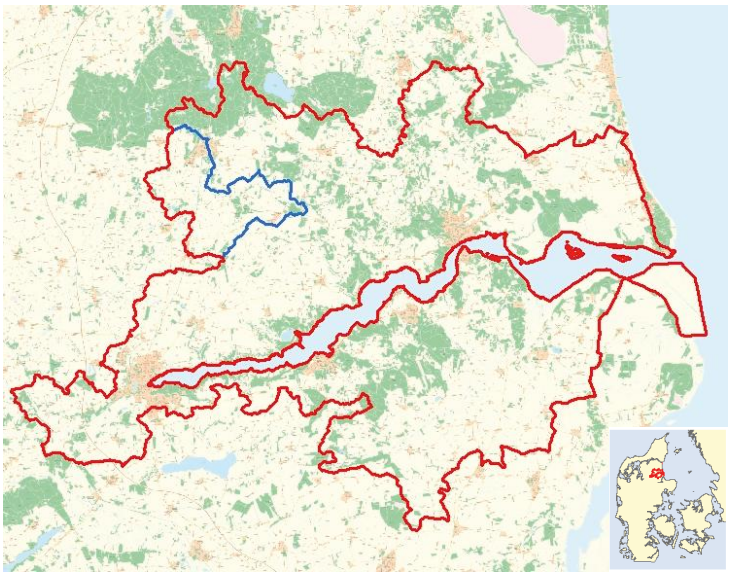
Denmark

Welcome to the Danish pilot – Mariager Fjord



1. What were the problems the pilot wanted to address?

(Quality, flooding, droughts?) Describe the primary pilot problem – (Use text from postcards on the web):

Mariager Fjord is a highly eutrophic fiord with very high production of algae, low secchi depth and extensive oxygen deficiency. The main problem of the fiord is eutrophication due to the high loading of nitrogen and phosphorus from the catchment area. The agricultural losses of nutrients are highly dependent on climate, and thus climate changes will have a strong influence on losses. In general, we expect higher losses of nutrients if there are no changes in current agricultural practices. Farmers as water managers are essential for reaching good ecological status.

2. Changed climate?

Scientific: How is climate change affecting the water environment in your catchment?

In general we don't expect any major problems. We expect a bigger difference between water flow in summer and winter and increased erosion and temperature.

Catchment level: Do the farmers, the local authorities and the water board in the pilot recognize that climate change effecting the water environment?

The question will be dealt with at the next meeting in the Lundgaards Creek group

Farmer: Are there differences between the farmers' attitudes towards changed climate among the farmers in the catchment? What are the farmers' expectations to future farming due to changed climate?

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the next meeting in the Lundgaards Creek group

What were the main means in Aquarius chosen to address the problem? (Technical, participatory or financial?)

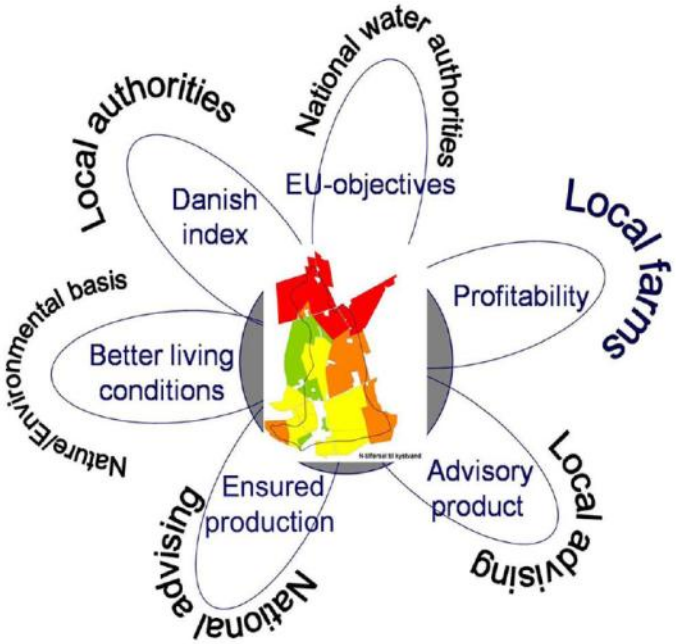
The participatory approach has been the basis for the work in the Danish pilot. Having the organizational structure in place we have worked on finding win-win solutions where technical and financial issues have been in use…..

3. Farmers as water managers

Why do the farmers act as water managers in your catchment: (consider bringing in examples of incitements that leads to win-win solutions?)

In our pilot we have seen an involvement of the farmers when they accept the problems in relation to the water environment and their production.

Further it's very important to use a holistic perspective where nature, water environment, production etc. are dealt with at the same time as illustrated in the below figure about stakeholder collaboration in catchments:



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How are the farmers working as water managers in the pilot?

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You must choose to bring in examples of one or more of the following at catchment perspective and at farm level:

At catchment level: participatory, - how have you worked together at catchment level? How have the farmers been involved? Which authorities have been involved? Other stakeholders? (Challenges and barriers for the cooperation) Please supply contact information – names, addresses for journalistic use.

Establishment of the Lundgaards Creek group: in order to find solutions for the catchment of Lundgaards Creek a stakeholder group was formed. The group consists of local farmers, the local farm advisory board, the municipality of Mariager Fjord, the regional water authority (environment centre Aalborg) and the knowledge centre for agriculture. The group meets approximately 4 times a year to discuss how to find solutions to environmental problems.

It is Important for the active involvement that all stakeholders have a good scientific knowledge about the problems and the potential effects of the possible solutions.

In relation to the farmers it is important that they are actually involved in finding solutions that benefit the farmers as well as the water environment (win-win).

Barriers: It's essential that the stakeholders trust one another, this was not the case right from the beginning of the project. The dialogue between the municipality and the farmers was critical.

At catchment level: technical, - how did you find the technical solutions at catchment level? Bring in examples of technical methods. (Challenges and barriers for the techniques)

In the dialogue in the Lundgaards Creek group a number of possible technical solutions to the problems about water quality have been identified.

5. Willow plantations to benefit the water environment, local energy, an extra production for the farmers
6. Grazing guild in the valley of Lundgaards Creek: for nature, for water environment, for production, - securing water for the cattle
7. Possible constructed wetlands: for nature and for the water environment
8. Cooperation among dairy farmers, - for the benefit of the farmers who get better advice and optimised production, for the water environment

At catchment level: financial, - which financial solutions have you worked on? Bring in examples of financial solutions (challenges and barriers for the solutions)

The basic idea has been that the solutions should be self-sustaining.

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If the solution is good for the production and good for the water environment, etc it's not needed to find extra finances in order to implement.

Similar questions for farm level…

Here is could be good to use quotes from farmers. Please supply some quotes for the journalist's use.

Lessons learned and recommendations for the future?

At scientific level? (technical, financial, participatory)

Have knowledge gaps been identified? Why? What could be done to reduce the gap??

4. What is to be done in the future? (After the project in finished)

At catchment level? (technical, financial, participatory)

At farm level? (technical, financial, participatory)

Recommendations for the

Farmers:

Water authorities at different levels:

Others?:

Quotes: Please supply some quotes for the journalist's use.

Our greatest findings/learnings are: (at farm level and other levels)

How to make all farmers water mangers in the future?

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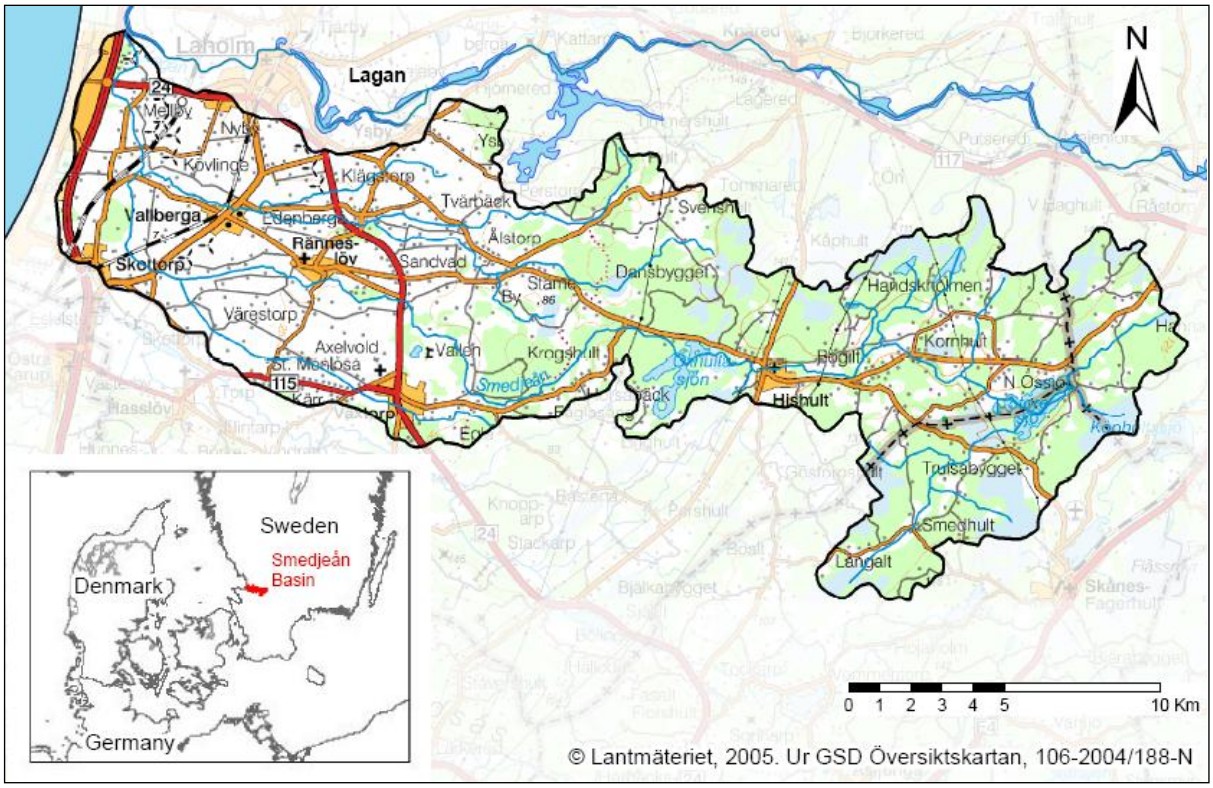
Sweden

Welcome to the Swedish pilot – River Smedjeån



1. What were the problems the pilot wanted to address?

(Quality, flooding, droughts?) Describe the primary pilot problem – (Use text from postcards on the web):

The river Smedjeån is an agricultural river in the county of Halland on the Swedish west coast with 43 percent arable land.
Main agricultural problem: Floods of arable land leading to loss of production, and also periods of droughts and shortages of irrigation water.
Main environmental problem: Eutrophication of the coastal sea (Laholm Bay), eutrophication and deterioration of the aquatic habitats of the river, low biodiversity in intensive farming areas. The acidification of land and water in the upland area and eutrophication in the lower part, together with hydromorphological changes, constitute the main pressures on the water bodies.

2. Changed climate?

Scientific: How is climate change affecting the water environment in your catchment?

We have already experiences of extreme weather. 2007 we had a flooding situation in June and 2008 a drought period of 6 weeks in summer without any precipitation at all. In general we expect a wetter

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autumn and winter and lower precipitation in summer with increasing irrigation need in combination with decreasing water for abstraction. Climate change leads to increased nitrogen leaching, erosion and phosphorus losses. It will be more difficult to reach Good ecological status in the water bodies.

Catchment level: Do the farmers, the local authorities and the water board in the pilot recognize that climate change effecting the water environment?

A catchment based irrigation group has recently been established with the aim to deal with the apportionment of the abstraction of irrigation water from the river and to apply for a joint license for abstraction of irrigation water. Both local authorities and the water board (County administration) are actively involved in the Aquarius-project. There is a cooperation between authorities, advisors and farmers in constructing wetlands and ponds as buffers and storage basins for irrigation.

Farmer: Are there differences between the farmers' attitudes towards changed climate among the farmers in the catchment? What are the farmers' expectations to future farming due to changed climate?

The fulltime farmers are conscious of the situation and accept that they have to adapt there agricultural practices to the coming changes. They want to hand over their farms and property in a good and sustainable condition, which for example means a good function of drainage- and irrigation systems. On smaller farms, where the farmers do not need to run the farm for a living, we assume that the climate change is not so important.

What were the main means in Aquarius chosen to address the problem? (Technical, participatory or financial?)

The participatory approach has been the basis for the work. We have also introduced local climate stations on 15 farms to get hydrological and meteorological data. The farmers have shown great interest in these measurements and it is possible for them to take over the equipment for their own planning, irrigation and water management.

3. Farmers as water managers

Why and how do the farmers act as water managers in your catchment: (consider bringing in examples of incitements that leads to win-win solutions?)

Two groups of water management incentives are identified in the catchment. On some farms irrigation and lack of water are the main reason for cooperation in water management. On other farms flooding is the main problem but the solutions are perhaps not on their own property and cooperation with other land owner is needed. The optimal solution is a combination of storage basins which both can combat flooding and be used for irrigation.

At catchment level: participatory, - how have you worked together at catchment level? How have the farmers been involved? Which authorities have been involved? Other stakeholders? (Challenges and barriers for the cooperation)

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A reference group with farmers from the pilot, farmers association and local authorities has been established. A questionnaire about climate effects has been answered by 35 farmers to get information of what farmers think about climate changes. A study on the attitude to wetland construction shows that the farmers attitude are mainly based on economic considerations. Ten random sampled farmers have participated in a subproject with the aim to find technical solutions to reach Good ecological status and to investigate the irrigation need and capacity.

At catchment level: technical and financial, - how did you find the technical and financial solutions at catchment level? Bring in examples of technical methods. (Challenges and barriers for the techniques)

The study of 10 random chosen farms (tot 1537 ha) shows that N-fertilization needs to be reduced with x kg N/year, P-fertilization with z kg P /year and the K-fertilization with y kg K/year to meet the official fertilizing guidelines. The nitrogen leaching from the 10 farms can be reduced with 14 tons yearly if the all known measures are applied. If the P fertilisation should be kept within the guidelines ca 15000 tons *of* slurry manure must be disposed of in other areas. Measures regarding fertilisers, catch crops, tilling, irrigation etc, have been compiled in a "water management plan" for each of the 10 farms. There are large differences between the farms. The measures are not economically feasible for farmers and need outside financing in order to be carried through.

Constructed wetlands can be effective nutrient traps and have large instant effect on the biodiversity but the number of wetlands in the drainage area mush increase significantly in order to have a large effect of the nutrient transport between farmland and the sea.

Water management plans at the farm level should be used as a tool to get a cost effective combination of measures in areas where the water bodies do not reach good ecological status according to the Water Framework Directive.

Lessons learned and recommendations for the future?

At scientific level? (technical, financial, participatory)

Have knowledge gaps been identified? Why? What could be done to reduce the gap??

The general hydrological knowledge is not sufficient to combat climate change. It must also be locally adapted. Larger areas in the flood plain should, in flood sensitive areas, be set aside as "controlled flood areas" in order to avoid damage by flooding on other areas. Downstream effects of various measures (e.g. irrigation, river bed clearing, short-term water level regulation) must be considered to a larger extent.

The environmental scheme and water regulations must be more catchment adapted so that land and water usage as well as biological values can be retained and developed also under a changed climate.

In some areas there is a need of structural changes in agriculture to reach good ecological status. Intensive and specialized agriculture can result in unacceptable water conditions.

4. What is to be done in the future? (After the project in finished)

At catchment level? (technical, financial, participatory)

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At farm level? (technical, financial, participatory)

Our recommendations need to be addressed to different levels (municipalities, regional and national authorities and the farmers association. The water management groups of the pilot catchment must be supported in the future so that they can be good examples for other catchments. A deeper knowledge is needed to get broader acceptance of both problems and possible solutions.

Quotes:

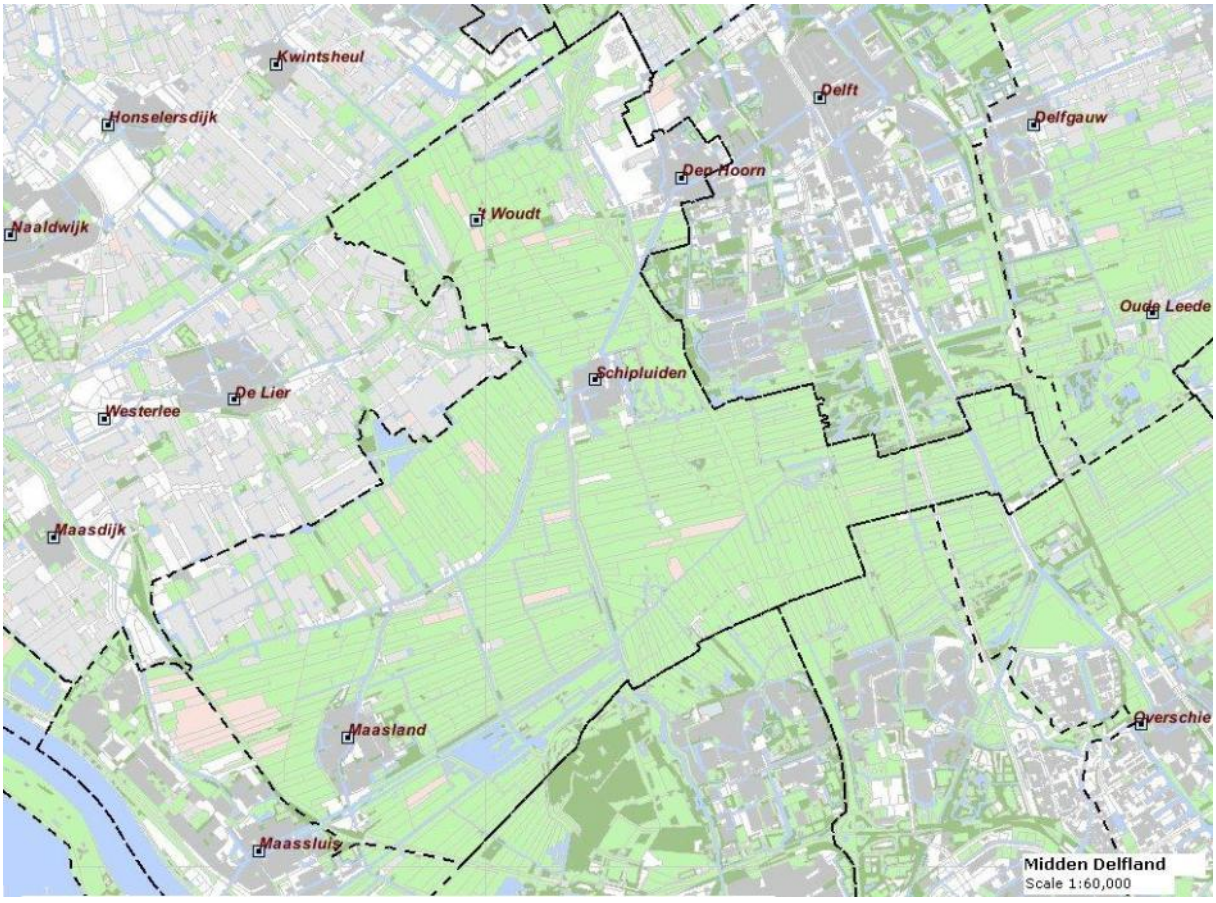
Our greatest findings/learnings are: (at farm level and other levels)

How to make all farmers water mangers in the future?

Netherlands – Delftland

Welcome to the pilot Mid-Delfland

In the pilot Mid-Delfland agriculture consist mainly of dairy farms. Only a very small part of the pilot area consists of greenhouse.



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1. What are the problems in the pilot Mid-Delfland?

Describe the primary pilot problem in the pilot Mid-Delfland (quality, flooding, droughts)

Flood risk and deterioration of water quality (nutrient releases) are the primary problems in the pilot Mid-Delfland.

2. Climate change

Scientific: How does climate change affects the water environment in the pilot Mid-Delfland?

Climate change in the pilot Mid-Delfland will lead to milder winters with higher winter precipitation and higher summer rain intensities causing flooding and leaching of nutrients from soil to water body.

Do the farmers, the local authorities and the water board in the pilot Mid-Delfland recognize that climate change affecting the water environment? Catchment level

Local authorities, Waterboard Delfland and farmers in the pilot Mid-Delfland recognize that climate is changing. Dairy farmers in the catchment are concerned (worried) with climate change affecting the water environment. They depend on the water environment and consider water quality and availability as very important.

Are there differences between farmers' attitude towards climate change? What are the farmers' expectations to future farming under changing climate conditions? Farmers level

Dairy farmers in the pilot Mid-Delfland are very much willing to search for win-win situations in water management to cope with climate change. Reliability and trust is important for a successful cooperation between farmers and water authorities.

Which subject(s) in the Aquarius project are in line with the research questions in the pilot Midden-Delfand? (Technical, participatory or financial)

Knowledge on methods for participation in water management and on financial methods is needed to implement green blue services in Mid-Delfland successfully. Green blue services are nature- (green) and water-related (blue) ecosystem services that go beyond Good Agricultural Practices (GAP*).

* farmers have to comply with environmental, food safety and animal welfare standards and have to borne the compliance costs themselves (Polluters-Pays-Principle).

3. Farmers as water managers

Why do the farmers act as water managers in your catchment: (consider bringing in examples of incitements that leads to win-win solutions?)

Farmers in Mid-Delfland feel responsible for the development, conservation and management of nature and landscape values in their environment. The cooperation with water authorities help them to finance and realize their goals.

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How are the farmers working as water managers in the pilot?

It is investigated in Mid-Delfland, by consulting the partners in the pilot area, which water-related ecosystem services can be implemented successfully. Services that are tested concerns: 1) management of nature friendly banks (mowing) and reed lands (mowing and grazing by sheep), 2) management of open grasslands serving water storage, 3) the application of biomass (reed, grass, slurry) as 'energy crop' in farm management, 4) measures in farm management to reduce the nutrient flow to water bodies.

What activities are being undertaken in the project (Use examples); Technical, Participatory, Finance. You must choose to bring in examples of one or more of the following at catchment perspective and at farm level:

At catchment level: participatory, - how have you worked together at catchment level? How have the farmers been involved? Which authorities have been involved? Other stakeholders? (Challenges and barriers for the cooperation) Please supply contact information – names, addresses for journalistic use.

1. Different methods have been used to involve partners in the pilot Mid-Delfland.

- Stakeholders, representing farmers, municipalities and water board, in Mid-Delfland had many meetings to discuss how to cooperate successfully and leading to results in the pilot.
- Water authorities organized information evenings with farmers. Farmers are asked by the responsible Executive board member of Water board Delfland to participate in the pilot. Farmers who were interested were selected and visited by the responsible Executive board member for discussion at the kitchen table and negotiation on (financial) conditions for participation.
- At regular meetings with farmers the Waterboard Delfland asked farmers to participate in the pilot. Farmers who were interested were interviewed and selected to test the research findings in their farm practice.
- The farmers nature organization (intermediate), the agricultural organization LTO and the Municipality in Mid-Delfland organized a workshop on agricultural nutrient cycles. The participation and enthusiasm of farmers turned out to be high. This was the reason for the municipality Mid-Delfland to start an incentive for integral sustainability of dairy farming in Mid-Delfland. The preconditions and targets of Waterboard Delfland have been included in a joint research plan.
- In cooperation with farmers to finance and realize joint nature, landscape and water management targets in Mid-Delfland, Water board Delfland asked the farmers' nature organisation (intermediate) for a tender.
- The official level of stakeholders, representing the agricultural organization LTO, the farmers nature organization (intermediate) and Water board Delfland, in Mid-Delfland have regular meetings (every 6 months) to keep all partners informed.

2. In the pilot Mid-Delfland two methods on farmers' participation in water management are investigated.

<u>Domain tender green blue services Mid-Delfland</u>

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The ‘domain tender green-blue services’ includes an experiment of drawing up a polder tender for every possible green blue service in Mid-Delfland. In the experiment the enthusiasm of farmers for all possible forms of green-blue services is investigated. The (fictitious) ‘polder tender’ includes measures, prices and how to implement the measures. The project results will give more insight in the practical needs for organizing the market.

Visual aids to support communication between partners

Visual aids are developed to ease the communication between cooperative partners (supplier and demander) in Mid-Delfland. The results include pictures of a nature friendly bank according to the perception of all partners (farmers and Waterboard Delfland), as well as pictures of water storage on agricultural land according to the ideas of all partners.

What activities are being undertaken in the project (Use examples); Technical, Participatory, Finance. You must choose to bring in examples of one or more of the following at catchment perspective and at farm level:

At catchment level: technical, - how did you find the technical solutions at catchment level? Bring in examples of technical methods. (Challenges and barriers for the techniques)

Different measures that goes beyond Good Agricultural Practices to improve water quality or nature and landscape values in the pilot Mid-Delfland are implemented and tested:

Maintenance of nature friendly banks and reed lands

Nature friendly banks (water quality): The focus of this pilot is on farmers in Mid-Delfland maintaining nature friendly banks and fences between banks and farmland. It is tested how to organize the implementation of this green blue service and how to deal with the European state aid rules.

Reed lands (nature and water storage): Reed lands in the pilot Mid-Delfland, developed for water birds, need to be maintained to keep a part of the water body open. The farmers nature organization (intermediate) wanted to maintain the reed lands year round by mowing and grazing with sheep.

Nutrients: agricultural management measures

Farmers and Water board Delfland in the pilot Mid-Delfland prepared three lists of possible agricultural management measures: A) Good Agricultural Practices measures, B) Interesting measures for dairy farms but investments are needed, C) measures beyond Good Agricultural Practices and legal obligations. The measures include buffer strips, reduced fertilizer use, organic farming, constructed wetlands or new drainage techniques. It is investigated, by consulting farmers, which measures are appropriate as green blue services.

Application of biomass by farmers

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Possibilities for application of biomass in farm practices have been explored and include 3 options: 1) biomass as deep litter, 2) biomass for composting, 3) biomass as ingredient of a mixture of manure, sand and slurry to fertilize farmland. These 3 options will be investigated in practice.

At catchment level: financial, - which financial solutions have you worked on? Bring in examples of financial solutions (challenges and barriers for the solutions)

In the pilot Mid-Delfland two methods concerning the financial aspects of green blue services are investigated.

Catalogue green blue services Mid-Delfland

The European Commission approved the Dutch green blue catalogue in Spring 2007. The catalogue is a tool for everyone who wishes to pay for green blue services. Blue services were intentionally left out of the catalogue, but applications for additional (green) blue services in the catalogue can be done. In this pilot a guideline is developed to determine the opportunities, within the existing (European) legislation, for green blue services in Mid-Delfland.

Social cost-benefit analysis (SCBA) open water storages Mid-Delfland

In the pilot Mid-Delfland it is investigated which option: permanent or temporarily open water storage (on farmland), is preferred. The cost-benefit analysis of both options include economic and social effects.

Similar questions for farm level… Here is could be good to use quotes from farmers. Please supply some quotes for the journalist's use.

Maintenance of nature friendly banks: Farmer Nico van Vliet

For a number of years the dairy farmer Nico van Vliet maintained two nature friendly banks adjacent to his property in the pilot Mid-Delfland. 'That pilot actually went well', according to Van Vliet. 'The financial compensation and the co-operation with Delfland was great. But, since the pilot ended, it is unclear how things will move forward. The problem hinges mainly on the strict European rules and regulations. A pity, because it only makes things unnecessarily difficult when trying to start up an initiative of this kind.

Van Vliet remarks further: 'I think that the "Green-blue services" is a fine idea as long as clear arrangements can be made and a reasonable financial compensation is agreed upon. If you ask me, this is the cheapest and most simple solution for all parties. I already manage my terrain anyway'. Asked if he thinks that ecologically friendly banks indeed improve the water quality he remarks: 'I can imagine that the extra plants prevent fertiliser from reaching the water, but I can't say that for certain. But, certainly during the summer, when everything is in bloom, I think that it looks beautiful'

Nutrients: agricultural management measures: Farmer Marien Boekesteijn

Dairy farmer Marien Boekesteijn is very enthusiastic about 'Sustainable farming in Midden Delfland. She participates in the pilot Mid-Delfland and it brought her some benefits: 'Thanks to the pilot I keep the cost low by using byproducts like potato pulp instead of extra power food'. And there is another aspect that

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Boekesteijn wanted to highlight: 'I would like to go one step further in the pilot by analysing more dairy farms. I think that dairy farmers, like me, are able to achieve even greater results'.

Domain tender green blue services Mid-Delfland: Executive board member Delfland and farmer Arie van den Berg

The Domain tender green blue services Mid-Delfland will be a result of all relevant stakeholders being involved in the very beginning of the implementation process of green blue services. In the kick off of the pilot the official level of stakeholders, representing the Municipality Mid-Delfland, the farmers nature organization in the catchment and Water board Delfland, visited the first implemented green blue service run by farmers in Mid-Delfland. The partners involved experience a positive cooperation and the Executive board member of Delfland and farmer Arie van den Berg remarks: 'Water board Delfland consider the pilot as very important. So important, ..., that we work with other northern European countries in the project Aquarius to seek internationally for opportunities to work with farmers in water management.....'.

Lessons learned and recommendations for the future? At scientific level? (technical, financial, participatory)

Lessons learned and recommendations for a successful implementation of Farmers as water managers

- Examples of water quality measures in Mid-Delfland:
  - Maintenance of nature friendly banks and reed lands.
  - Application of biomass 1) as deep litter, 2) for composting, 3) as ingredient of a mixture of manure, sand and slurry to enrich the land.
  - Agricultural management measures: Nutrient free buffer strips, Reduction in artificial nutrient supply, Reduction in nutrient use, Bio-farming, Application of biomass, Reduction in cracking grassland, To improve the manure quality, Keep cows (for a longer duration) in the barn, Different manure regime (start later and stop earlier), etc.
- Focus on the organisation of the process to make it effective (results) and efficient (time and money):
  - All relevant stakeholders need to be involved from the very beginning of the implementation process.
  - A farmers organization acting as intermediate appeared to be more efficient
- Focus on communication for better understanding, support and participation
  - Partners are willing to learn from each other.
  - Visualisation of ideas and discussion helps partners in the catchment to understand each other.
  - Participation of partners is based on reliability and trust.
- Seek for win-win situations:
  - Farmers are interested when it is profitable, e.g. sufficient income.
  - Farmers need higher maximum payments.
- Knowledge of the (European) legislation prevents errors and contributes to the reliability of partners in the catchment:

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  - Funding of ecosystem services that will falsify competition on the Common Market is considered as state aid.
  - Government payments of no more than EUR 7.500 for agricultural enterprises over a period of three years are not regarded as state aid (Minimis aid).
  - There are different European Community guidelines on state aid that may be of interest for granting green blue services.
- Management schemes, like the Dutch catalogue green blue services, should match more with a) local characteristics, b) farmers' interest and c) water management:
  - more water-related measures need to be included in the schemes
  - more activities in a cluster or package of measures need to be compensated for.

Have knowledge gaps been identified? Why? What could be done to reduce the gap??

In the pilot Mid-Delfland there are no knowledge gaps identified yet, because the practical experiments are still running.

4. What is to be done in the future? (After the project in finished)

At catchment level? (technical, financial, participatory)

At farm level? (technical, financial, participatory)

Recommendations for the

Farmers:

Water authorities at different levels:

Others?:

Quotes: Please supply some quotes for the journalist's use.

Our greatest findings/learnings are: (at farm level and other levels)

How to make all farmers

The results of the pilot Mid-Delfland will be presented in an official opinion for the Executive board members of Water board Delfland. The Executive board members and general members of Water board Delfland will decide together, based on the official opinion, whether green blue services will be implemented in Delfland water management policy.

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Netherlands – Drenthe

Welcome to the Dutch (Drenthe) pilot - De Monden

The pilot area “De Monden” in Drenthe (The Netherlands) is part of the catchment area Veenkoloniën. The Veenkolonien is part of a much bigger catchment area of the river Ems. The Pilot area is 160 km2 and lies at about 5-10 m above NAP (Normal Amsterdam Water Level).

The Veenkoloniën is a former high-moor bog area. From the 16th till the early 20th century all the peat was reclaimed, dried for turf and transported by boat to be used as fuel. A detailed network of straight canals was created to drain the area and enable transportation.This dense network of canals is still present. At the moment the area is mainly flat and sandy and used for agriculture. The so-called ‘ribbon’ villages are characteristic of the former peat colony and these developments are still present along the larger canals.

Farming is mainly arable (80%) and some grazing (18%). Averages for crops grown (2005) are as follows: starch potatos 47%, sugar beets 19%, grain 28% and green maize (fodder) 6%.

1. **What were the problems the pilot wanted to address?**

Because of the sandy soils “De Monden” is part of an area that is relatively susceptible to drought. Like most of the north of the Netherlands, during summer the area depends to a great extent on the IJssel

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Lake (*IJsselmeer*) for its water. It is expected that water from the IJssel Lake will become increasingly scarce as a result of climate change.

2. Changed climat

In the future it is expected that water shortage, prolonged periods of drought and more heavy showers will result in negative effects for crop growth and production.

Hence reducing the demand for water becomes more important, for example by retaining 'local' water longer.

Another approach is the efficient use of water resources. Bespoke irrigation control structures and new, more efficient irrigation technology are therefore becoming more and more important. Water conservation (using water-level control) is required to maximize the water supply in the area. Weirs that can be operated quickly increase the opportunities for water conservation because flooding after sudden, heavy storms can be avoided by switching swiftly from 'maintaining levels' to discharging water. Drainage ditches can be fitted with small weirs that can be operated by the farmers themselves.

Drenthe's pilot within Aquarius aims at finding solutions for problems of drought in the Veenkoloniën using a strategy focussed on water retention and efficient irrigation. This efficiency is achieved using 'soil moisture sensors'and related decision support systems. The pilot project is closely linked to two other projects; 'Hotspot Climate and Agriculture in the North of the Netherlands' and 'Watersense'. The Hotspot provides information for the Northern provinces regarding the opportunities and challenges for agriculture in this region in relation to climate change and the consequences for related policy. Within the Aquarius project this information has been used to focus on the pilot area of the Veenkolonieën. The Watersense project has developed decision-supporting models for more effective irrigation and water-level control. Thanks to Aquarius the necessary infrastructure has been introduced in the field. Farmers have installed retention weirs and existing larger weirs have been fitted with a remote control system. More efficient irrigation techniques have been introduced and the policies for groundwater use have been adapted so that more groundwater can be used for irrigation. In this way the existing groundwater reserves in the area are used optimally.

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3 Farmers as water managers

During the initial phase of the project 50 farmers were asked to fill in a questionnaire to get an overview of farmers' anticipations regarding drought and their attitudes towards irrigation, whether it be linked or not to the use of sensors. Results showed that farmers, although preferring traditional methods for dealing with drought and flooding, were surprisingly keen to use the so-called 'farmer's weirs' and sensors as a new measures.

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What has been achieved – catchment and farm level

The tests and experiments have resulted in regular contact between involved farmers and all the other stakeholders at informative sessions, workshops, special crop-growers meetings and field trips (including a visit to farmers in Germany to exchange knowledge and experience). During three growing seasons about 50 farmers used soil moisture sensors to optimize their planning of irrigation. As a result of all these project activities farmers have started to think about optimizing the water management in their fields. Also, there has been a gradual increase in the number of large scale energy and labour saving pivots for sprinkling in the area. Some farmers even bought neighbouring plots to get the optimal area of land for a central pivot. The farmers now participate in the use of small weirs for water conservation. Besides quantitative water management, ideas have also been developed to optimize the application and use of nitrogen. Combined with optimal irrigation this is expected to reduce the leaching of nitrogen. Furthermore, a groundwater model study has been completed that provides the basis for the water board's latest policy amendments regarding groundwater extraction. The new policy for groundwater extraction is expected to be official in February 2012.

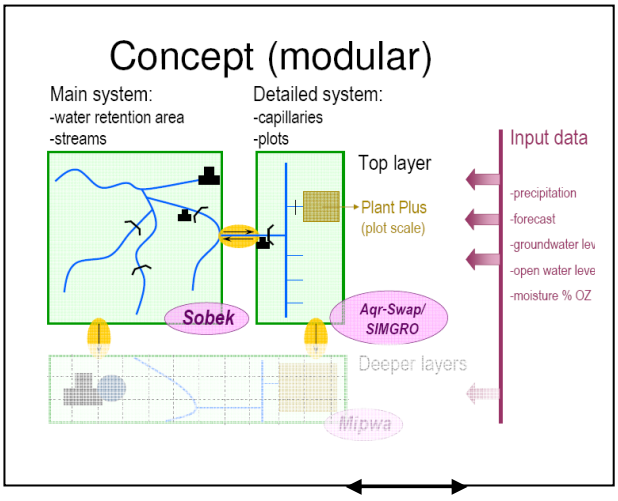
The technical experiments in Drenthe have also drawn attention on a national level, particularly from the Delta Freshwater Programme in which the strategy in relation to freshwater facilities is being developed for the coming years.

Experiments on Applied Plant Research

Irrigation on starch potatoes (Seresta and Festien)

Using sensor technology to measure the soil moisture

- effect on water use
- effect on nutrient loss
- effect on yield



The participation of farmers in the Aquarius project's pilot in the Veenkoloniën has shown the importance of their role when developing a strategy regarding water and climate-related issues. The use of innovative measures aimed at, amongst other things, efficient water usage in farming, has been put sturdily on the regional agenda in relation to the new European agricultural policy.

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Regarding the adaptation of farming practices to climate change, some conclusions have been made within the project. The findings of the research project 'Hotspot Climate and Agriculture in the North of the Netherlands' in the pilot area of the Veenkolonieën are:

- Adaptation can be difficult within the sphere of current farm management;

- We need to learn more about the influence of climate change on diseases and plagues and do more in depth research into adaptive measures;

.; Investing in good soil structure is an important measure when adapting to climate change;

;- Choosing the most suitable crops races can offer positive results;

- Cooperation and fine tuning between water authorities and farmers on sustainable water usage is necessary;

- Introducing new races could make arable farming more resistant to the influences of climate change;

- Governments must stimulate and facilitate the transition to new crops;

- There is an evident willingness from the agricultural sector to work together with the government bodies on a long term agenda.

4 What is to be done in the future? (After the project is finished)

A general conclusion is that adaptation to climate change is natural for farmers. Awareness is growing, and climate data will play a role when making investments in the near future. Governments should facilitate, more research is needed.

Quotes:

Peter Prins, project leader for Climate & Agriculture and Secretary of the Dutch farmers' organisation LTO Noord calls for a programmatic approach, field experiments and exchange of best practices: '*farmer organisations can connect!'*

Recommendations

'No regret' measures that farmers can easily take are, for instance, improving the soil, creating wetlands and irrigation.

A bottom line in legislation with clear EU goals is needed. Important aspects to be looked at are the public acceptance of the (mainly) ecological driven goals and finding flexible solutions. Support from the EU in the coming years is necessary when looking for answers. Authorities will also take into account the position of the EU globally, food production in crisis and discussions about effects.

Quote

Robert Schröder (Union of Dutch Water Boards): 'The regions should send clear messages when addressing the EU - *'What do we need?'*.

In 2013 EU financing and programmes should be clear regarding water measures executed by farmers (which is a relatively new approach). This means that preparation of regional programmes should anticipate on the future approach before 2013. Some aspects are important, such as plain objectives, transparent measures in line with legislation, enough means for cooperation and active sharing of practical experiences.

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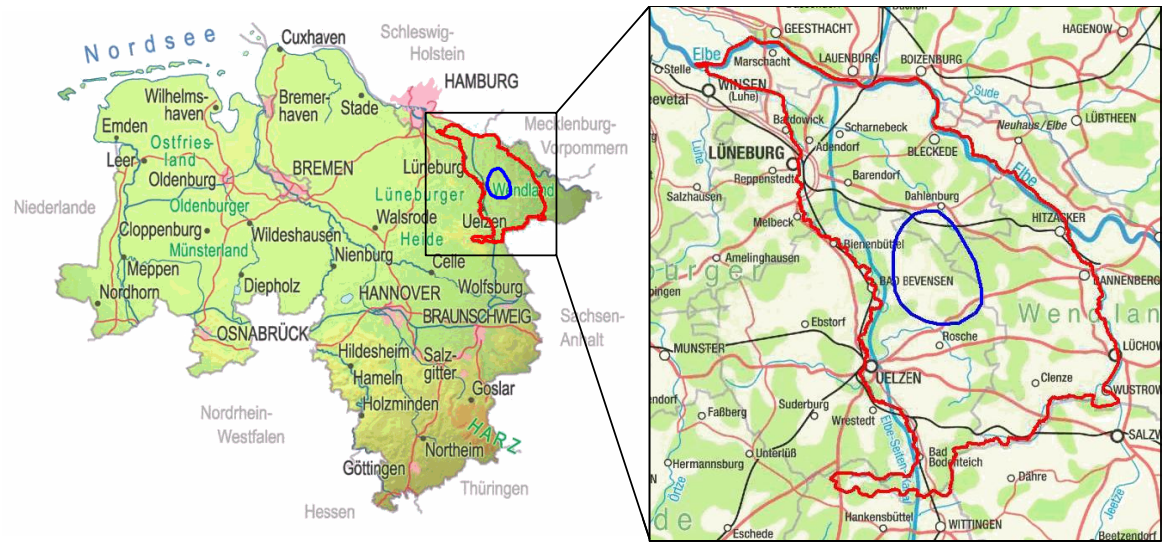
Germany



Welcome to the German pilot – Ilmenau-Jeetzel

1. What were the problems the pilot wanted to address?

(Quality, flooding, droughts?) Describe the primary pilot problem – (Use text from postcards on the web):

Watershortage for irrigation of farmland; Nitrogen leaching from agricultural land:

The eastern part of Luneburg Heath is a unique man-made environment formed by agriculture. The climate is subcontinental and light soils have a high rate of water permeability. That is why farmers have been using since 3 generations ground water for irrigation in dry periods. That guarantees the amount and quality of fruit. At the same time irrigation helps to supply crops with nutrients and let not them flow into the ground water body. The quantity of ground-water in eastern Luneburg Heath is great. That is why flow conditions of heath creeks are until today rather balanced.

2. Changed climate?

Scientific: How is climate change affecting the water environment in your catchment?

Climate change has been leading to increased need for irrigation due to dryer and hotter springs, summers and falls and will do much more so (Niedersächsisches Landesamt für Bergbau, Energie und Geologie, 2010). The effects of CC on groundwater recharge and on discharge of GW to springs, creeks and groundwater-depending biotops is not known yet; research is going on in other projects (for example KLIMZUG-NORD TP 3.5 AP 1)

Catchment level: Do the farmers, the local authorities and the water board in the pilot recognize that climate change effecting the water environment?

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Yes

Farmer: Are there differences between the farmers' attitudes towards changed climate among the farmers in the catchment? What are the farmers' expectations to future farming due to changed climate?

Basically no differences. Fear about lack of irrigation water; what to do if by farming the land there will no more be sufficient income because of limited irrigation. Some farmers have been "returning" to animal breeding incl. biogas-production. Fear that water authorities will shorten the water permits while the need for water is increasing.

What were the main means in Aquarius chosen to address the problem? (Technical, participatory or financial?)

- Hydrologygeological modelling of a subcatchment area to enhance knowledge and to deliver the basis for different scenarios like:
  - identification of sensitive areas
  - localising the impact of measures
  - transitions to flexible water extraction allowances
  - analysis of the impact of increasing water extractions
  - round table discussions with a group of experts

- Analysis and modelling of creeks (hydraulic and ecological) for evaluation of impacts of measures and for planning measures for an ecological upgrading

- Farmers interviews to identifiy measures for groundwater protection and for decreasing nitrate output ⇒ recommendations
- Estimation of prospective water demand of agriculture
- Precision–Irrigation: testing of new irrigation systems and technologies
- Field testing: Recommendations for different plants because of water scarcity; Increasing of water holding capacity in light soils by using compost

- Looking for possibilities to augment annual groundwater recharge, for example by reconstruction of coniferous forests to deciduous forest; measures for retention of rainfall => "Rain Harvesting"
- Round table of "Smootheners": platform of stakeholders. Results of AQUARIUS will be evaluated and improvements discussed.
-

3. Farmers as water managers

Why do the farmers act as water managers in your catchment: (consider bringing in examples of incitements that leads to win-win solutions?)

See "climate change"

How are the farmers working as water managers in the pilot?

a) waterquantity:

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Some irrigation boards and/or farmers applied to install measures to increase groundwater recharge. For example application to change coniferous forest to decidoues forest and "receive" the calculated additional seepage of rain as irrigation permit. But no successful application yet. Other example: Pond to be installed for retention and seepage of drainage water. No permit for construction yet.

b) Councelling and programs for reduction of nitrogen seepage recently installed by Land Niedersachsenoutside AQUARIUS. Acceptance unknown yet.

Knowledge gaps: future groundwater recharge => Interdependencies between 1) surface water, 2) floating aquifers (= locally limited aquifers) and 3) deep major aquifers. This is a subject of the German pilot, but it will need further research and monitoring at surface water level.

What activities are being undertaken in the project : see list at 2)Climate Change

(Use examples); Technical, Participatory, Finance

You must choose to bring in examples of one or more of the following at catchment perspective and at farm level:

At catchment level: participatory, - how have you worked together at catchment level? How have the farmers been involved? Which authorities have been involved? Other stakeholders? (Challenges and barriers for the cooperation) Please supply contact information – names, addresses for journalistic use.

At catchment level: technical, - how did you find the technical solutions at catchment level? Bring in examples of technical methods. (Challenges and barriers for the techniques)

At catchment level: financial, - which financial solutions have you worked on? Bring in examples of financial solutions (challenges and barriers for the solutions)

Similar questions for farm level…

Here is could be good to use quotes from farmers. Please supply some quotes for the journalist's use.

Lessons learned and recommendations for the future?

At scientific level? (technical, financial, participatory)

Have knowledge gaps been identified? Why? What could be done to reduce the gap??

4. What is to be done in the future? (After the project in finished)

At catchment level? (technical, financial, participatory)

At farm level? (technical, financial, participatory)

Recommendations for the

Farmers:

Water authorities at different levels:

Others?:

Quotes: Please supply some quotes for the journalist's use.

Our greatest findings/learnings are: (at farm level and other levels)

How to make all farmers water mangers in the future?

a) Find and install a system how measures to harvest rain or/and to increased groundwater recharge shall be honoured.

That means: Clear regulations serving as incitement to install measures for more groundwater recharge. This includes the need for generous and transparent regulations, because measures are very expensive. It also includes the need, the farmers/irrigation boards can act at other places than their own land, in order to become active and get more water.

b) Close knowledge gaps (see 3.)

c) Install a monitoring to find out more about the hydrogeological "system" and interdependancies

d) Program to financially support Rain Harvesting measures.

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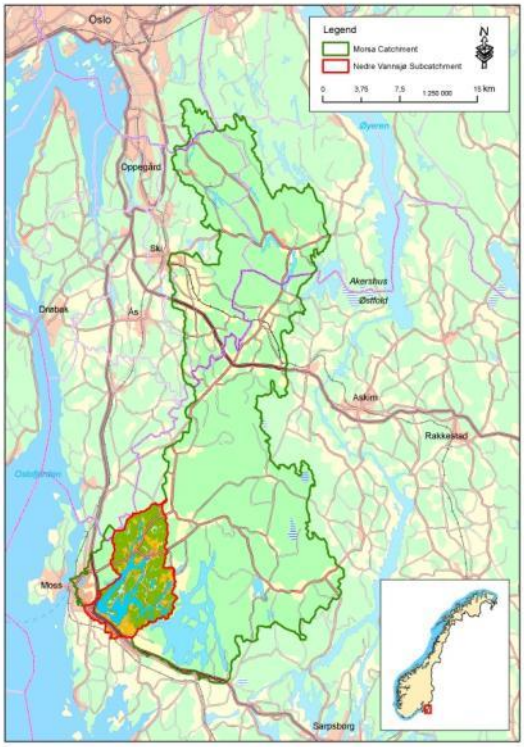
Norway

Welcome to the Norwegian pilot – western Vansjø



1. What were the problems the pilot wanted to address?

(Quality, flooding, droughts?) Describe the primary pilot problem – (Use text from postcards on the web):

The western part of lake Vansjø is highly eutrophic. Large phosphorus loads to the lake is pointed out as the main reason for the eutrophication problems. The phosphorus loads from point sources is now low. Therefore, the main focus for further reduction in phosphorus loads to the lake is to reduce phosphorus losses from agricultural areas.

2. Changed climate?

Scientific: How is climate change affecting the water environment in your catchment?

Milder winters and more rainfalls with high intensity are expected. This will increase the risk for erosion and phosphorus losses from agricultural areas. There may also be a larger risk for flooding of agricultural areas.

Catchment level: Do the farmers, the local authorities and the water board in the pilot recognize that climate change effecting the water environment?

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Years with mild winters and more rainfalls have already demonstrated the impact of changing climate; namely higher erosion and more flooding of agricultural areas.

Farmer: Are there differences between the farmers' attitudes towards changed climate among the farmers in the catchment? What are the farmers' expectations to future farming due to changed climate?

Most farmers are positive to implement mitigation options for reduced phosphorus losses. Many farmers expect more erosion and flooding, but few farmers expect a longer growing season in the next 10 years.

What were the main means in Aquarius chosen to address the problem? (Technical, participatory or financial?)

There has been a combination of technical, participatory and financial approach to reduce phosphorus load from the agricultural areas. Subsidies to farmers that sign a contract with restrictions on their farming practise have been important for a comprehensive implementation of mitigation options in a short term. The contracts included restrictions regarding P fertilization and soil tillage, requirement of establishing bufferstrips and sedimentation ponds/constructed wetlands where it was recommended. 75 % of the farmers in the catchment signed the contracts the first year of the project. However, the basis for the high degree of participation was more years with meetings with the farmers where the farmers were educated about the effect of the mitigation options. Further, an agricultural adviser played an important role by direct contact with each of the 40 farmers in the catchment. The challenges on the farm were discussed and the farmer was encouraged to sign the contract. The 25 % of the farmers who didn't want to sign the contracts, could still choose to implement some of the mitigation methods and get a reduced payment.

3. Farmers as water managers

Why do the farmers act as water managers in your catchment: (consider bringing in examples of incitements that leads to win-win solutions?)

The awareness about factors important for P losses has increased among the farmers . Most of the interviewed farmers predict improved water quality and variety of plants and animals in watercourses in the next 10 years. The farmers have accepted that their actions for reducing phosphorus losses are important for improving the water quality. The lake is an important recreation area also for the farmers, and therefore, they have an own interest in improved water quality in the lake.

How are the farmers working as water managers in the pilot?

The farmers have made changes in their field management which reduces the risk of phosphorus losses. In addition they have established buffer strips and sedimentation ponds/constructed wetlands where it was recommended.

What activities are being undertaken in the project

(Use examples); Technical, Participatory, Finance

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You must choose to bring in examples of one or more of the following at catchment perspective and at farm level:

At catchment level: participatory, - how have you worked together at catchment level? How have the farmers been involved? Which authorities have been involved? Other stakeholders? (Challenges and barriers for the cooperation) Please supply contact information – names, addresses for journalistic use.

At catchment level: technical, - how did you find the technical solutions at catchment level? Bring in examples of technical methods. (Challenges and barriers for the techniques)

At catchment level: financial, - which financial solutions have you worked on? Bring in examples of financial solutions (challenges and barriers for the solutions)

Within the project, local authorities, agricultural advisors, farmers and the Norwegian Institute for Agricultural and Environmental Research (Bioforsk) collaborate to attain the target of improved water quality.
The role of Bioforsk has been to study the effect of some of the implemented mitigation options and the effect of other possible mitigation options on yields and P losses. In yearly meetings the research tasks going to be performed by Bioforsk was discussed, insuring that the research aimed at answering relevant questions for the farmers and local authorities. The research has been important for implementation of reduced phosphorus fertilization in the catchment, as it was demonstrated in field experiments that the phosphorus fertilization could be reduced without losses of yield. Recording of the phosphorus fertilization at farms that have signed the contract showed that the phosphorus fertilization was reduced with more than 50% since 2007.

New knowledge from the research project has been combined with existing knowledge about the effect of e.g. reduced soil tillage and constructed wetlands to make a package of mitigation options for reduced phosphorus losses.

An agricultural adviser played an important role by direct contact with each of the 40 farmers in the catchment. The challenges on the farm were discussed and the farmer was encouraged to sign the contract. An environmental plan for each farm that signed the contract was worked out by the farmer in collaboration with the agricultural extension service.

Funding from the Norwegian Ministry of Food and Agriculture has been crucial for the comprehensive implementation of mitigation options within a short term. The Ministry has funded the research performed by Bioforsk. Further, they have funded the subsidies given to the farmers that signed the contracts with restrictions on their farming practise. 80% of the costs for building constructed wetlands have been funded from the Ministry and the County Governor of Østfold , giving 12? new constructed wetlands within the project period.

Similar questions for farm level…

Here is could be good to use quotes from farmers. Please supply some quotes for the journalist's use.

Even though a lot of the farmers are positive and try to implement the mitigation methods recommended, some also find it difficult. One farmer says that he tried to do a job for the environment. He wanted to produce cattle, and have ecological grassland on his fields, but he could not get it to pay off. His solution to this is to continue with vegetable production, and move his production to other areas that are not so sensitive. He can do this because a lot of his production is on rented fields.

Another farmer says that the restrictions imposed by the contract, especially as he cannot longer produce winter wheat, reduce the profitability. But since he understands the importance of the measures, he will take on responsibility. For him it is important that all the farmers contribute, and that free-riders are not accepted.

Lessons learned and recommendations for the future?

At scientific level? (technical, financial, participatory)

In a meeting with farmers December 2010, the farmers pointed out that requirement of no autumn tillage is an important bottle neck for continuing the contracts in the present form. No autumn tillage makes it impossible to grow winter wheat and rye and more use of herbicides is needed. Some farmers think it is difficult to succeed with spring ploughing on clay soils. If restrictions on autumn tillage are going to be continued, subsidies are still needed as spring cereals give less income compared to winter wheat.

Farmers growing vegetable and potatoes pointed out that reduced phosphorus fertilization give challenges by lack of mineral fertilizers with a lower phosphorus concentration which are suitable for these crops. Consequently, reduced phosphorus fertilization requires more work as more operations are needed to apply the different nutrients in required amounts.

Have knowledge gaps been identified? Why? What could be done to reduce the gap??

We need more knowledge to differentiate between the fields where no autumn tillage is important and the fields where autumn tillage can be performed without significant increase in erosion risk. More knowledge will make it possible to target the subsidies more efficiently.

There is also a need of more knowledge on what impact flooding of the fields has on the water quality on the lake, and what mitigation methods should be used to deal with this problem.

More research is needed to reduce this knowledge gap.

4. What is to be done in the future? (After the project in finished)

At catchment level? (technical, financial, participatory)

The water quality in the lake has improved the last years, and it is important to maintain the high degree of mitigation options in agriculture to further improve the water quality. Contracts with the farmers, with some modifications, will be continued.

At farm level? (technical, financial, participatory)

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Recommendations for the

Farmers:

Water authorities at different levels:

Others?:

Quotes: Please supply some quotes for the journalist's use.

Our greatest findings/learnings are: (at farm level and other levels)

How to make all farmers water mangers in the future?

Lake Vansjø has special large challenges regarding water quality, and large efforts and resources had to be spent on mitigation options in the catchment to significantly improve the water quality. The high use of financial resources cannot be defended in most other catchments. Therefore, to make all farmers water managers, the main focus has to be on educating farmers on mitigation options that do not increase the costs or reduce the income for the farmers significantly.

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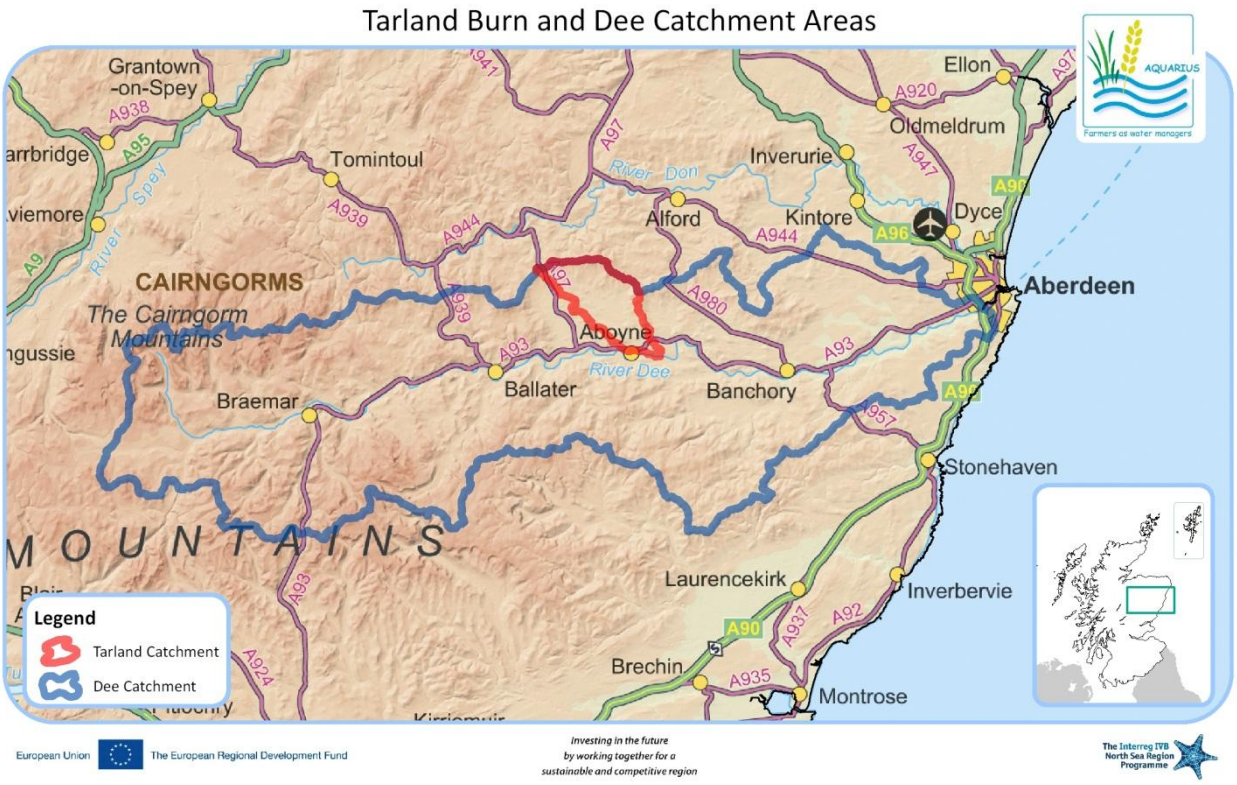
Welcome to the Scottish pilot – Tarland Catchment



Area: 2,083 km^2, Max Elevation = 1304m, Mean Elevation = 410m

1. What were the problems the pilot wanted to address?

(Quality, flooding, droughts?) Describe the primary pilot problem – (Use text from postcards on the web):

The Tarland Burn Catchment is located in Aberdeenshire, North East Scotland, and covers an area of approximately 72 square kilometres (km²). The Tarland Catchment comprises of the Tarland
Burn, and a series of small tributary watercourses which drain from the surrounding sub-catchments.
The Tarland Burn, is one of the most western major tributaries of the larger River Dee catchment, which covers an area of approximately 2100 km². The catchment displays a range of terrain including farmland, upland moorland, conifer plantation, semi-natural broad leaved woodland and urban settlements.

In response to flooding in the Tarland Burn catchment, most recently in November 2002, which affected property and population in the settlements of Tarland and Aboyne, Aberdeenshire Council

has undertaken investigations to understand the flooding and the feasibility of proposals to manage it through creating flood storage areas preferably through more natural flood management options. The Aquarius Project is contributing to finding better ways to promote water management projects (flooding, water quality, drought or a combination of these) in conjunction with the landowners themselves. Part of this project is to construct a demonstration site for flood alleviation which may / should also offer other benefits, water quality / habitat improvements as well. The main thrust of this work though is to establish how, and if, land managers predict their businesses and livelihoods may be influenced by predicted climate change and how they themselves might be affected by flood alleviation works. In addition the project investigates how land managers can be actively encouraged to contribute to the overall goals as part of their business. This includes detailed discussions with European partners on issues of financial payment/incentives, regulations and examples of good practice.

2. Changed climate?

Scientific: How is climate change affecting the water environment in your catchment?

The overall patterns are that we are to experience wetter springs and warmer drier autumns, with more field access problems in the spring and greater potential for crop failure due to seeds being washed out following spring sowing. However, these changes may offer more potential for grazing stock into the autumn, if late summer drought does not impact on grass production. This may have an impact on whether winter or spring cropping is used and on animal housing/feed regimes. Extreme events could be more severe and more frequent. Tarland has less change in field access indictors than other east coast case studies, due to lower evapo-transpiration.

Catchment level: Do the farmers, the local authorities and the water board in the pilot recognize that climate change affects the water environment?

The Authorities and Research Institutes are aware of the effects of climate change on the water environment. At present these are not always obvious but in the last 10-15 years there have been more instances of low flow in the rivers during spring/summer periods, in some cases due to lack of snow melt following a winter of low snow fall but in the winters of 2010 and 2011 snow fall increased again. The catchment has also experienced periods of intense rain particularly in late summer causing localised flooding events. However, the view of some farmers is that these weather patterns are part of the natural cycle of weather.

Farmer: Are there differences between the farmers' attitudes towards changed climate among the farmers in the catchment? What are the farmers' expectations to future farming due to changed climate?

The results of a questionnaire survey undertaken by the Scottish Aquarius pilot in the summer of 2009 indicated that the local farmers have mixed views as to the effect of climate change witnessed over the past 10 years. 61% believed that there had been some change with comments about more extreme rainfall and less snow (with 2010 & 2011 at present being exceptions). Regarding flooding 33% felt it was a major issue with crop wash out being one of the affects of flooding. However, 72% did not think that climate change had affected their business and so had not adjusted their farm management. Of the ones that had made changes these included, altering the crop rotation cycle, changing soil management and bringing cattle in all winter.

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What were the main means in Aquarius chosen to address the problem? (Technical, participatory or financial?)

All three

Technical – natural flood management solutions. For the Aquarius Project, looking to establish a demonstration site where farming practice can more or less continue as before but during periods of heavy rainfall the site can act as a temporary flood storage area.

Initially 101 potential flood storage areas (FSA) were identified based on a simple review of the topography from maps and a walk over survey. It is prohibitively expensive to test each and every potential FSA in the model so a screening process was developed to derive a short list of those sites which had potential to alleviate flooding in the built up areas of Tarland and Aboyne. This shortlist of sites was then modelled by Atkins the consultants working up the Model to determine the suitability of each site on the list. The results indicated that most of the sites had very low potential to alleviate the major floods either because they could not store sufficient water or they were too far away from the towns and so could only impact on a relatively "small" percentage of water flowing in the burn.

Two preferred sites were however identified, one upstream of Tarland and one upstream of Aboyne. These were based purely on flood alleviation potential.

More detailed assessment of the preferred sites involves further modelling to assess:

1. Flood alleviation performance and the extent of flood inundation of the fields used to store water for a range of rainfall events which are lower than previously modelled i.e. more frequent flood events that the land managers can expect to happen regularly and hence have to deal with the (additional) consequences of flooding of their land.
2. Determine the footprint of different embankments scenarios to provide an evaluation of potential land-take required for the implementation of the selected Flood Storage Area.
3. Where appropriate investigate a Flood Storage scheme which is optimised for lesser events (e.g. 1 in 10, 1 in 20, 1 in 50 year events as opposed to the 1 in 200 year) This means that flooding would be alleviated to a lower standard but the land take, costs and consequences for landowners would be less.

Participatory – Using workshops and questionnaires with the farmers to discuss likely future changes in weather patterns and the impact on farming practice and what options would be available where farming practice could be integrated with flood management measures.

Financial – to look to move to more natural solutions that do not mean taking land out of agricultural use in a hope to find a more cost effective way to work at catchment level to manage flooding**.**

The solution in the Scottish pilot requires all three aspects of “Aquarius wheel” to work towards a solution as we are looking to deliver natural/sustainable flood management in a way that works with current farming practice. As there is no existing example of this approach in Scotland (as far as we know) we are working with farmers on the technical and financial aspects of such a scheme to find a workable solution.

3. Farmers as water managers

Why do the farmers act as water managers in your catchment: (consider bringing in examples of incitements that leads to win-win solutions?)

The villages of Tarland and Aboyne in the Tarland catchment both suffer from flooding events. During periods of prolonged heavy rain or rapid snow melt, much of this flooding is as a result of water overtopping the banks of the Tarland Burn. Historically the Burn has been heavily channelized which also results in the spate waters being transferred quickly to the villages of Tarland and Aboyne, occasionally causing localised flooding of properties and businesses. An approach to natural flood management is being used to manage these extreme events and the farmers will be contributing through use of their land as temporary flood storage areas but still kept in agricultural production rather than the land being leased or purchased by the Flooding Authority for flood protection and removed from agricultural production.

How are the farmers working as water managers in the pilot?

The Scottish pilot is still in the development stage. A Flood risk management model has been completed for the catchment and various sites identified as possible flood storage areas but a demonstration site has still to be formalised and the negotiations with the farmer(s) undertaken as to what will be developed and the financial arrangements agreed.

What activities are being undertaken in the project?

(Use examples); Technical, Participatory, Finance

Technical

- Development of the Flood Risk Model and identification of small and large scale potential flood storage areas. (see above)
- Scottish Tour investigating what flood schemes methods have been used throughout Scotland.
- Habitat Survey of the key flood storage sites identified by the model to provide baseline information on potential demonstration site

Participatory

- Questionnaire surveys. These were carried out by Landcare North East (Aquarius Partners in the Scottish Pilot). The surveys were carried out in the summer of 2009. Most were face to face with the farmers but with a small number carried out over the phone (at the farmer's request). In total 24 of the 54 land based holdings were surveyed. The remaining land holdings were either largely outside the catchment or they were very small and not commercially farmed. A summary of the responses is found in the Report Farmers as

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Water Managers within the Tarland Catchment produced by The Macaulay Institute in August 2010.

- Workshops with agencies and advisors. This was held in October 2009 at the Macaualy Institute. Attendees included agricultural advisors, regional and local agencies, local estate owners and NGO's. The aim of the workshop was to get information about how advisors and authorities work with farmers: their views on climate change and to brief them on the Aquarius Project.

- Workshops for farmers, factors and landowners. These were held in Tarland on the 9th March and 26th April respectively. The aim of the workshops was to get brief them on the Aquarius Project: get feed back on the draft flood risk maps and climate change scenarios and the farmer's views of themselves as water managers.

- One-to-one meetings onsite with farmers. These have been held more recently (2011) with farmers who own/tenant land that has come out of the Flood Model as areas that may be suitable as a flood storage areas.

You must choose to bring in examples of one or more of the following at catchment perspective and at farm level:

At catchment level: participatory, - how have you worked together at catchment level? How have the farmers been involved? Which authorities have been involved? Other stakeholders? (Challenges and barriers for the cooperation) Please supply contact information – names, addresses for journalistic use.

See above

Copies of all the reports are on the Aquarius local website

http://www.macaulay.ac.uk/aquarius/documents.html

Challenges and barriers

- Although the new Flooding legislation advocates natural flood management at a catchment scale, there are limited examples of Natural flood management in Scotland, and of those that do exist they are not focused on land still in agricultural use so it is difficult to provide the farmers with an example of what we would like to achieve.

At catchment level: technical, - how did you find the technical solutions at catchment level? Bring in examples of technical methods. (Challenges and barriers for the techniques)

- Atkins model is based on the whole of the Tarland Burn Catchment

Challenges and barriers

- Currently the tools and incentives are not in place to encourage famers to act as water managers in respect to flooding.
- The key challenge is to work with land managers to find a solution that works for the farmers, neutral effect on their business/or benefit while at the same time is a sustainable/cost effective solution in terms of local authority resources.
- What level of flood risk should we be trying to alleviate with natural flood management 1:200 year events or focus on the smaller but more frequent events and accept that 1:200 year events need a different approach.

At catchment level: financial, - which financial solutions have you worked on? Bring in examples of financial solutions (challenges and barriers for the solutions)

The Scottish pilot is looking into a broad range of financial options that could be used to develop a flood scheme with the farmers as water managers. As mentioned above there is not one solution that that been used in Scotland as an example of good practice and this is what is hoped to be achieved by the Aquarius demonstration project. The Partners have identified a range of financial options and these have now to be discussed with the local farming community to see which options would work for them. Options range from land purchase or lease to compensation payments for flooding/insurance for loss of crops. For the latter, consideration would also have to be given to additional payments for the alleviation of flooding provided by the scheme.

Challenges and barriers

- There are limited examples of Natural flood management in Scotland, and of those that do exist they are not focused on land still in agricultural use so no comparable financial solution to work with that is considered to be cost effective.
- Need to ensure that there are no further developments on flood plain. Key issue that farmers have raised during workshop sessions and the reason many of them believe has resulted in the flooding issues.

Similar questions for farm level…

Here is could be good to use quotes from farmers. Please supply some quotes for the journalist's use.

- Looking at financial solutions that allow the farmer to retain responsibility for the agricultural use of the land but give the authority (Aberdeenshire Council) the ability to maintain the flood prevention measure and ensure it can be retained well into the future
- Complexities of land owner/tenant arrangements

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- Complexities of finding a financial solution where there is both a land owner and a tenancy with long term tenancy agreements
- Limited incentive/lack of catchment wide approach in current RDP options
- Unpredictability of cereal and beef markets, fertiliser and straw prices, etc
- Reluctance on farmer side to commit to land use change, especially as flood events are based on models so will have level of uncertainty which can affect forward planning for farmers.
- Perception of natural flood management, what do we mean by “natural”? Not all farmers consider the processes in the same way.

Lessons learned and recommendations for the future?

Still too early for the Scottish pilot but see below (Gaps) for general lessons

At scientific level? (technical, financial, participatory)

For the approach to have any hope of success there clearly needs to be an opportunity for the land manager to derive benefit. A structured system of compensating the farmers must therefore be developed which sets out what they can expect to receive in order to allow them to consider the financial impact on their farming businesses. The system must, however, strike a balance between what is best for both parties in terms of the farmer receiving a fair return for his assistance and the promoting authority achieving value for money.

A balance also needs to be struck when involving land managers in participatory discussions. Approaching land managers at too early a stage could be counterproductive and result in a loss of interest, especially if the initial details are a bit sketchy. Far better for the promoting authority to undertake more preparation first then have fewer but more focused discussions with farmers on what are seen as the important issues and features. These discussions must identify any possible business opportunities for the land manager.

Have knowledge gaps been identified? Why? What could be done to reduce the gap??

Main issue is the lack of good examples of natural flood management techniques and the associated financial incentives that can be used which would be cost effective and transferrable to a catchment-wide scale. However, the aim of the Aquarius Project is to identify new and innovative solutions so hopefully that is what will be achieved by the end of the project. Meantime we will work closely with the Scottish Government to identify what information/knowledge is required to plug the gaps and to assist in raising the awareness within the farming community of how they can help as water managers in the future.

- Need to get Agricultural Advisors briefed on Natural Flood Management so they can in turn raise awareness amongst farmers

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- Use Aquarius demonstration project as an example for awareness-raising amongst farming community

4. What is to be done in the future? (After the project in finished)

Recommendations for the Farmers: Water authorities at different levels: others

At catchment level? (technical, financial, participatory)

- Making the various agri-environment schemes and other policies relating to agricultural support and land management more effective in encouraging farmer led approaches to good water/flood management.
- More awareness raising amongst farmers and land managers of the possible implications of climate change.
- Ensuring that information produced about flood risk management is farmer friendly

At farm level? (technical, financial, participatory)

- Use Aquarius demonstration project as an example for awareness-raising amongst farming community for on-site events, general promotion, etc
- Ensuring farmer is involved in development of flood prevention measure & does not feel 'singled out'

Our greatest findings/learnings are: (at farm level and other levels) How to make all farmers water mangers in the future?

- There is a need for more research on legal and institutional alternatives to Council owned capital projects when looking for natural flood management solutions.
- Review of RDP/agri-environment incentives to provide more long term and financial attractive options aimed at flood risk management

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3. Appendix *ii* (Meeting programme)

Swedish Work shop 7-9 (10) June 2011 at Pensionat Enehall, city of Båstad

7 June: arrival of participants during the day

12 - 13 Lunch Enehall

15.00 – 18.00 Steering – and communication group meetings at Enehall

15.00 – 18.00 Extra excursion for those who have arrived and are interested

19.00 Dinner at Enehall

20.30 (if needed) short follow up meeting with steering group and communication group

8 June:

8.30 – 8.45 Lead Partner presents discussions from Steering – and Communication groups

8.45 – 10.30 Pilot presentations (with Recommendations from pilots) (15 min/pilot) at Enehall

10.30 – 12.00 Work with Recommendations in groups at Enehall 4-5 groups working with recommendation matrix (will be distributed) (coffee in the groups). Chairmen will be appointed.

12-13 Lunch

13 – 17 Excursion

17 – 19 Garden party at ”Vallens säteri”

20.00 – ca 22.00 Scientific café with poster presentation and drinks from pilots at “Vallens säteri”

Ca 22.00 back to Pensionat Enehall

9 June:

9.00 – 10.00 Work with Recommendations in groups

10.00 – 12.00 Work with recommendations, all together

12.00 Lunch

End of official program and departure of some friends and colleges

13.00 – ca 18.00 extra excursions to wetlands

10 June:

8.30 – 11.00 More wetland excursions
12.00-13.00 Lunch and thereafter Departure.

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