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# Agricultural Groundwater Protection through Groundwater Co-operations in Lower Saxony, Germany, – a multi stakeholder task

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**Abstract** – Despite the fact that German agriculture is embedded in an intricate structure of regulative law for the protection of the environment, in the 1980s, groundwater in some areas still contained high nitrate concentrations and revealed a lack of law enforcement. This especially held true for a federal state like Lower Saxony where more than two third of agricultural value added comes from animal production, and liquid manure application on the field is a considerable source for groundwater pollution. As a response and supplementary to regulative law, the “Co-operation Decree” (“Kooperationserlass”) as a basis for the so-called “Lower Saxon Co-operation Model” was issued. Its objective was to initiate the formation of locally adapted and goal orientated initiatives (so-called “groundwater co-operations”) among farmers, water suppliers and local administrations in order to find solutions which satisfy both, the protection of groundwater, as well as the profitability of agriculture. Since traditional forms of professional organisation in agricultural and environmental protection interest groups were transcended, stakeholders had to negotiate “face-to-face” and, for the case of farmers, had to find new forms of organisation within these groundwater co-operations. Furthermore, a sound moderation in the beginning of the co-operations’ work was necessary. This brought private entities, engineering consultancies, in who, based on their technical expertise, at first mediated among conflicting parties, to then facilitate the joint development of groundwater protecting measures to be realised by farmers. The Co-operation Model’s “water extraction fee” further guarantees financial compensation of farmers in cases of yield losses caused by measure implementation. After an at times difficult start, work in groundwater co-operations up until now shows that through opening up and cooperating with other stakeholders, agriculture can considerably develop and improve itself, and at the same time respond to emerging new societal demands. A case will exemplify that farmers made use of the co-operation in the course of time and extended it to other areas of their concern in order to improve their agricultural business. Furthermore, according to the so-called “Lower Saxon Co-operation Model”, agriculture is not just a producer of a maximum of yield. The protection of drinking water resources is seen as a further societal interest which can be realised through groundwater protecting measures developed in local co-operations. This approach was further developed with the granting of the project H2Ö. Here, a change to groundwater protecting agriculture is not “compensated” through subsidies, but H2Ö tries to integrate organic agriculture, as one form of groundwater protecting agriculture, in a market structure, as well as it tries to support the development of this structure. At the same time, with a reform of the Co-operation Model, the financial autonomy of groundwater co-operations and their responsibility for the realisation of measures will increase. It remains to be seen how this new responsibility of co-operations may reinforce identification and creativity on the part of farmers to further develop groundwater protecting agriculture.

## Introduction

While the majority of German agriculture builds revenue gains on productivity increases, considerable agricultural growth rates nowadays can be found in a sector which sets on extensification. According to the German "Federal Ministry of Food, Agriculture and Consumer Protection" revenues from organic food sale increased from 1.48 Billion Euro in 1997 to about 4 Billion in 2005<sup>1</sup>. The 2006 agricultural report of the Federal Government would show that organic agriculture enterprises' economic results on average were above that of conventional enterprises (ibid.). Experts would furthermore assess a high growth potential for organic agriculture.

But a general shift in the position of agriculture in German society can furthermore be observed with the inclusion of consumer protection in the policy and name of the national ministry responsible for agriculture. Since agriculture produces for society, it should respond to societal demands, and, as for the case of organic agriculture, also be rewarded for this adjustment.

On that score, the protection of drinking water resources is a societal interest which can be hampered by e.g. hitherto agricultural production under high fertilizer inputs. A prevention of nitrate leakage nevertheless does not necessarily mean a turn to organic agriculture. Since agricultural nitrate leakage into groundwater depends on local hydro geological processes, measures to prevent groundwater pollution have to be designed in the respective local contexts. This means that conventional farmers, together with stakeholders representing water supply and the environment, may locally develop strategies which aim at both, sustained water quality and stable agricultural revenues.

The Lower Saxon "Co-operation Model", which will be presented in this article, shows that through increased efforts to open up and cooperate with other stakeholders, conventional agriculture can better develop responding to societal demands. The article will first illustrate the problem context, to then describe the formal institutional framework which underlies the so-called "Co-operation Model", i.e. the amendment of the Water Law, and the enactment of the Cooperation Decree. The following characterisation of stakeholders will resort to key institutional stakeholders. It will describe the tasks of these stakeholders in the Co-operation Model as well as their official view and assessment of co-operation between farmers and stakeholders of water supply. An analysis of stakeholders' "keys of success" for groundwater co-operations' achievements will further be given to examine whether they resemble across stakeholders. Such a correspondence could show whether, within the time of the Co-operation Model's existence, agriculture and water supply could find a common language of and perception on how to cope with the problem of agricultural groundwater pollution. This again would imply that agriculture in exchange with other stakeholders, could integrate new societal demands.

The article will then present two cases which show how the Co-operation Model has further developed. The first case will resort to these keys of success and describe them in the context of a groundwater co-operation. It further will show the development within this co-operation where farmers, after being rather sceptical at the onset, made use of it in the course of time and extended it to other areas of their concern in order to improve their business. This again shows that by increasingly taking in and building on external stakeholders' knowledge, agriculture can well develop. Furthermore, progress took also place on an institutional level with the initiation of a Lower Saxon project promoting organic agriculture which has the lowest potential for nitrate emission. This project – the second case study – could build on the existing network which had developed with the Co-operation Model and make use of an increasing "environmental" awareness on the part of farmers, who by experience became more open for alternative cultivation practices.

The article concludes with current administrative reforms of the Co-operation Model and their impact on groundwater co-operations. It seems that stakeholders of this multilateral constellation feel well prepared to take over more responsibility. For farmers, reforms imply that the task of representing themselves in local groundwater co-operations becomes more institutionalised, and a new kind of their local representation may emerge.

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<sup>1</sup>[http://www.bmelv.de/cln\\_045/nn\\_749972/sid\\_7E37864E307DB87F706AFC99F79DB4A6/DE/04-Landwirtschaft/OekologischerLandbau/OekologischerLandbauDeutschland.html\\_\\_nnn=true](http://www.bmelv.de/cln_045/nn_749972/sid_7E37864E307DB87F706AFC99F79DB4A6/DE/04-Landwirtschaft/OekologischerLandbau/OekologischerLandbauDeutschland.html__nnn=true), viewed September 2006

## Context of the enactment of the “Co operation Model”

German agriculture is embedded in an intricate structure of regulative law for the protection of the environment. For groundwater protection, regulative legal instruments apply like liquid manure application allowances or the establishment of groundwater protection areas with firm restrictions for agricultural producers. Since liquid manure and excessive fertilizer application are the main sources of diffuse groundwater pollution by agriculture, the successful implementation of these instruments is pivotal in federal states like Lower Saxony which in Germany ranks highest in its stock of pigs (30.2 % of the national stock), and second in stock of cattle (19.7% of the national stock)<sup>2</sup>. More than two third of Lower Saxon agricultural value added comes from animal production (NLpB 1999f). The application of liquid manure on agricultural land hence is a considerable source for groundwater pollution.

Particularly in areas prone to washouts and with high stock levels, the nitrate content of drinking water in the 1980s exceeded the quality standard for water suppliers of 50 mg/l (European Drinking Water Directive). The situation was sensitive since 86% of drinking water is ground and spring water (Lower Saxon Ministry for the Environment 2005<sup>3</sup>) and about 50% of drinking water extraction areas are under agricultural land use (arable land or grassland). The predominantly agricultural land use in drinking water extraction areas among others has its reason in the high groundwater replenishment rate of agricultural land (2000 m<sup>3</sup>/ha) in comparison to other land uses (grassland 1200 m<sup>3</sup>/ha, deciduous forest 800 m<sup>3</sup>/ha, coniferous forest 500 m<sup>3</sup>/ha) (ibid). “In quantitative aspects (...), agriculture therewith is an indispensable partner of water supply” (ibid).

But with high nitrate contents in groundwater, this relationship came to a test. After water suppliers had first reacted with deepening their wells, and after nitrate loads even reached these deeper aquifers, alternative solutions had to be thought of. The 1990’s “liquid manure decree” was a first legal response by the Federal Government of Lower Saxony (in the following also referred to as “Land”) and laid down the authorized quantities and times of liquid manure application. Though to some extent helping to improve the situation, it encountered implementation flaws. Regulative legal instruments like the decree require monitoring of farmers’ compliance which is costly and at times even impossible.

In 1992 then, the amendment of the Lower Saxon Water Law made a move away from monitoring and controlling agriculture to its integration in problem solving. The so-called “Lower Saxon Co-operation Model” was conceived in an attempt to improve the realisation of water protection by agriculture. The Co-operation Model has to be seen in the context of, and often is described as originating from the enactment of the “Water Extraction Fee” whose utilisation is laid down in the Lower Saxon Water Law. The realisation of groundwater protecting measures, which are devised by so-called “groundwater co-operations”, is financed out of this fee. About 27.5 Million Euro are annually allocated to cooperative groundwater protection as well as to nature conservation programs for the protection of water bodies in Lower Saxony<sup>4</sup>.

On the basis of the law amendment, water suppliers commenced groundwater co-operations with farmers whose land was located in water extraction areas. In the beginning, these two stakeholders faced difficulties to converge out of their respective interests and relation to the water resource. Considerable effort was required to get to an atmosphere of constructive communication. Since the legal framework had been reduced to a minimum of regulations, co-operations in the following could make use of it in different ways and devised locally adapted measures responding to their respective specific groundwater pollution problems, as well as hydro geology and socio-economic structure. Today, there are 115 roundwater co-operations in Lower Saxony, representing about 300,000 ha with more than 12,000 armers and encompassing about 400 drinking water extraction areas (Witte 2002: 28; Schultz-Wildelau and Schültken 2002).

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<sup>2</sup> Statistische Ämter des Bundes und der Länder, last updated 25.07.2006 [http://www.statistik-portal.de/Statistik-Portal/de\\_jb11\\_jahrab22.asp](http://www.statistik-portal.de/Statistik-Portal/de_jb11_jahrab22.asp), viewed August 2006

<sup>3</sup> [http://www.umwelt.niedersachsen.de/master/C1202043\\_N11329\\_L20\\_D0\\_I598.html](http://www.umwelt.niedersachsen.de/master/C1202043_N11329_L20_D0_I598.html), 18.02.2005

<sup>4</sup> [http://www.umwelt.niedersachsen.de/master/C1202043\\_N11329\\_L20\\_D0\\_I598.html](http://www.umwelt.niedersachsen.de/master/C1202043_N11329_L20_D0_I598.html), 18.02.2005

## **Amendment of the Lower Saxon Water Law and the enactment of the Co-operation Decree („Kooperationserlass“)**

Previous to the amendment of the Lower Saxon Water Law, environmental protection was enacted through regulative law, i.e. by means of orders and bans. Regulative law demands from stakeholders to comply with certain norms whose violation will be sanctioned. Since norms and standards attempt to restrain stakeholders from polluting actions without providing them with any means how they may better comply with law, the application of regulative law at times flaws since stakeholders try to circumvent it.

The idea of settling voluntary agreements for pollution prevention can be seen as a response to the discomfort of stakeholders with this rigid legal frame. Within agreements, stakeholders commit to the achievement of defined objectives within a certain time. Environmental agreements are known and welcomed in the industrial sector since they allow avoiding other governmental instruments and gaining room for manoeuvre. Their realisation in this context nevertheless is criticised as being limited to less costly environmental measures, while their potential of bringing about innovation is high lighted. A successful realisation of environmental agreements in industry would require further incentives as well as the backing of regulative law (Zerle, 004).

In the context of the Lower Saxon Co-operation Model, voluntary agreements became an important building block. The Model was issued with the 1992 amendment of the Lower Saxon Water Law which foresaw the introduction of a water extraction fee to be used for measures of the protection of water bodies and the conservation of the water balance, as well as for water suppliers' initiatives and nature conservation (Lower Saxon Water Law, NWG §47h, section 3). As regards agriculture, the fee should explicitly be spent:

- for monetary compensation of impediments on agriculture in drinking water extraction areas or for cases in which a compulsory change in cultivation practices in these areas entails additional expenses;
- for subsidies to water suppliers for the purchase or lease of agricultural land in water protection areas
- for the compensation of compulsory cultivation of riparian zones on agricultural land;
- for research on groundwater protecting agricultural practices in water reserves, drawing on model or pilot projects;
- in priority water extraction areas for the:
  - supplementary consultancy for water pollution control which informs farmers about groundwater protecting agricultural practices, including soil and water surveys;
  - compensation for the realisation of groundwater protecting agriculture in voluntary agreements, including compensation of losses in agricultural yield;
  - survey and assessment of groundwater pollution.

The law hence financially supports voluntary agreements in which farmers commit themselves to groundwater protecting agricultural practices. Furthermore, financial support is provided for a range of measures to be realised by different stakeholders, i.e. farmers, agricultural extension, water suppliers and researchers can apply for financial means which are administered by the Lower Saxon Corporation of Water Supply, Coastal Protection and Nature Conservation under the auspices of the Ministry of the Environment.

The responsibility for the administration of the water extraction fee in the beginning was not clear (Müller, 2002). The Ministry of Agriculture pled for one of its departments or the Chamber of Agriculture as the responsible body, the Ministry of the Environment supported its departments. In the end, it was the Ministry of the Interior who decided since it is responsible for internal organisational affairs. It saw the responsibility with the Ministry of the Environment since expertise and responsibilities for water conservancy were not with the Ministry of Agriculture, as well as financial means were under the authority of the Ministry of the Environment. Like this, a situation was created in which certain consultants of the Chamber of Agriculture were financed by the water extraction fee, receiving their salaries from the Ministry of the Environment.

After the amendment of the Water Law and the provision of financial means, a frame had to be found which would help local stakeholders to make use of these subsidies and realize groundwater protecting measures in a harmonised way. Based on the 1992 Decree, the Lower Saxon Ministry of the Environment and the Lower Saxon Ministry of Agriculture in 1994 set up this framework for the realisation of agricultural groundwater protection by issuing the “Co-operation Decree” (“Kooperationserlass”). It

foresaw the initiation of so-called “groundwater co-operations” between agriculture and water supply. According to a public note of the Ministry of the Environment<sup>5</sup>, the ministries finally could agree on a decree whose aim was to endow co-operations with only a minimum of regulations concerning their constellation and working methods, leaving sufficient room for the development of locally adapted groundwater protection strategies. The stakeholders developing these strategies again would make use of and integrate the above listed subsidised measures. They would agree upon them in annual so-called voluntary agreements.

It has to be emphasised that groundwater co-operations were seen as a presumably more efficient instrument than, but still only complementary to regulative law. Their measures have to abide to it, and, in case of violation of agreements, regulative law applies. Moreover, co-operations and their subsidisation depend on whether agricultural land lies in water extraction areas, which implies that in case a water supplier withdraws from an area, support (e.g. by supplementary consultation) ceases.

After the enactment of the Cooperation Decree, each of the Lower Saxon waterworks initiated a groundwater co-operation. The Co-operation Decree defines which key stakeholders have to be represented as permanent participants in co-operation meetings. They are:

- the Lower Saxon Corporation of Water Resources Management, Coastal Protection and Nature Conservation (NLWKN), and its offices;
- the county water departments, the so-called Lower Water Agencies (LWA);
- the water supplier;
- representatives of practicing farmers;
- the Chamber of Agriculture (ChoA);
- the consultant for groundwater protection, as well as,
- additional stakeholders, if required, e.g. representing nature conservation.

In practice, less participants are permanently present (see below). Still, today, the last listed “additional stakeholders” become more and more important. The bilateral partnership of agriculture and water supply is increased by further stakeholders like those of nature conservation and spatial planning, including communities planning to increase their settlement areas or develop tourism (Witte, 2002; Thiem *et al.*, 2002). We nevertheless remain with the description of the hitherto core stakeholders in groundwater co-operations.

Depending on the definition of stakeholders, water users may furthermore be integrated, since they pay the water extraction fee. The major revenues out of the fee originate from cooling water of power plants, as well as from the industry, contributing 44% of the total water extraction fee in 2004<sup>6</sup>. But since there is no institutionalised influencing control of non-agricultural fee payers or payers not dealing with water supply, they are not further considered in this article.

## **The Co-operation Model on and seen from the institutional level**

The key institutional stakeholders of the Lower Saxon Co-operation Model who are listed in the Cooperation Decree will shortly be characterised along their interest and role in the Model, illustrating its institutional level. The proceedings of the 7<sup>th</sup> Groundwater Workshop of the NLWKN will further provide the basis for an analysis of stakeholders’ assessment of groundwater co-operations as well as their keys of success. The analysis should reveal whether the “keys of success” for a co-operation between agriculture and water supply resemble among stakeholders. If this was the case, agriculture and water supply would have found a common language of and perception on how to cope with the problem. This again would imply that agriculture, in exchange with other stakeholders, could take in new approaches responding to societal demands. Section 5 will then show how a potential common understanding (of how to deal with the situation) materialised in new initiatives on the part of farmers.

In the following, the NLWKN will first be described since it was the initiator and is the financial administrator of the Co-operation Model, followed by the water suppliers who were the local initiators of the co-operations, and nowadays handle local financial issues. Further, the point of view of a farmer cooperation spokesman is given. Though Lower Saxon farmers have an official representation by a

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<sup>5</sup> [http://www.umwelt.niedersachsen.de/master/C1202043\\_N11329\\_L20\\_D0\\_I598.html](http://www.umwelt.niedersachsen.de/master/C1202043_N11329_L20_D0_I598.html), viewed 18.02.2005.

<sup>6</sup> [http://www.mu1.niedersachsen.de/master/C998365\\_N11328\\_L20\\_D0\\_I598.html](http://www.mu1.niedersachsen.de/master/C998365_N11328_L20_D0_I598.html), viewed January 2006.

general farmer association, which operates under the umbrella of the national association, the “Deutsche Bauernverband” (German Farmer Association), or are organised in sectoral associations like the horticulture or forestry association, these associations do not play a role in the realisation of local groundwater co-operations, since farmers are directly involved. Subsequently, the role of and assessment by the ChoA and the LWA as technical agencies will be described. The ChoA will be considered in two roles: On the one hand, it is a self-administered organisation under the authority of the Ministry of Agriculture and in this regard fulfils its role as a technical agency and provider of professional expertise to farmers; on the other hand, it employs consultants for groundwater protection in the frame of the Co-operation Model. Since these consultants are – like the private consultants – paid by the MoE, their role and assessment will be given in section below about consultancy.

## Survey Method

Analysis is divided into two parts. In section below the question for analysis was: What is the stakeholders’ general assessment of the work in the co-operations and of the Co-operation Model as a policy instrument? If possible, stakeholders’ perception of the role of agriculture in society was given, since the Model can be related to a new understanding of this role. The second question for the keys of success of groundwater co-operations will in this part only resort to keys which were not mentioned by other stakeholders. In 4.7., a clustering of keys of success is given, responding to the question whether stakeholders found a common understanding of what makes co-operation between agriculture and water supply work out well. Statements and words repeatedly used by different stakeholders here are the units for analysis<sup>7</sup>.

Speeches were selected after relevance, i.e. if they directly addressed the Co-operation Model, and whether they were held by a stakeholder of the Lower Saxon Co-operation Model (which excluded headquarter representatives of national associations). Further, an equal contribution across stakeholders should be given. After check for relevance, 21 out of 29 speeches remained. Further six speeches were held by representatives of national associations or other speakers not considered stakeholders. One speech was jointly given by several stakeholders so that it could not be assigned to a certain stakeholder. Another stakeholder gave two speeches, so that the more relevant was selected. Thirteen speeches were finally left for analysis, four on the part of agriculture, three by representatives of water suppliers, four by the governmental side of water supply and two by consultants. Both perspectives from local and institutional stakeholders are given.

The 7<sup>th</sup> Groundwater Workshop took place at the occasion of the 10<sup>th</sup> anniversary of drinking water protection in Lower Saxony. Speeches hence are comparable since they have the same audience. But as the addressees include the workshop’s organiser and donator of funds, i.e. the NLWKN, speeches will be critical only to a limited extent. Furthermore, due to the occasion at which they were held, they do not draw attention to areas of conflict, but predominantly point at the benefits of groundwater co-operations. It moreover can be assumed that no fundamental critics had been invited to give a speech. Despite this, it was assumed that a non-reactive survey method would provide representative data, i.e. a good base for the description of the official view on co-operations, especially of the “keys of success”.

## The Ministry of the Environment (MoE) and the Lower Saxon Corporation of Water Resources Management, Coastal Protection and Nature Conservation (NLWKN)

According to the undersecretary of state of the Lower Saxon Ministry of the Environment (MoE), “[g]roundwater protection is one of the central tasks of preventative environmental protection” (Eberl, 2005). To realise nature conservation, one guiding principle is to honour “efforts which are desired by society to achieve this objective” (Schultz-Wildelau and Schültken 2002: 55). The Co-operation Model in this regard meets with the policy of the MoE.

In the Co-operation Model, the role of the MoE and its executive, the NLWKN, is manifold. One of the NLWKN’s major tasks is the observation of long-term groundwater trends, and in this respect efficiency control of agricultural groundwater protection measures. In consultation with other stakeholders, it sets and updates the research agenda of groundwater protecting agricultural practices. It sees itself as a “neutral

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<sup>7</sup> The source text – the proceedings of the 7<sup>th</sup> Groundwater Workshop – is written in German and was translated by one of the authors.

moderator" in the realisation of drinking water protection (Eberl 2004a), but at the same time controls the financial means which are to be spent for the protection of water bodies (Lower Saxon Water Law, NWC §47h).

The Ministry and the NLWKN further are responsible for the publication and dissemination of the insights gained through research and in consultancy in the frame of the Co-operation Model. In this regard, in 1997, they published a "compilation of methods for supplementary consultation in water conservation" in which, for the first time, measures and methods for groundwater protection are described. In 1999, the "priority programme drinking water protection of the Ministry of the Environment" introduced efficiency considerations in the allocation of the water extraction fee. It contains a ranking of Lower Saxon water extraction areas along their pollution situation and their importance for water supply, including assigned concepts for taking action. With the publication of the „handbook for supplementary consultation of drinking water protection“ by the NLWKN and the MoE in 2001, longstanding experiences in consultation were compiled, focusing on the question how success in groundwater co-operations can be monitored.

As another platform, the NLWKN annually organises the so-called „Groundwater Workshops“ (the proceedings of the 7th Workshop providing the basis for this analysis) in which research results are presented and discussed, as well as practical guidelines and brochures for on-site utilisation are issued.

For these environmental institutional stakeholders, agriculture is seen in its role of providing society with certain goods. If the societal definition of the conditions for this provision changes agriculture needs to adapt. The undersecretary of state of the MoE admits:

"(...) We all have benefited from this agriculture. A lot of sectors of agriculture have increased the qualitative requirements on production security in the last 20 to 30 years, and at the same time moreover made considerable contributions to the preservation of the ecological balance. The achieved productivity increases are tremendous. And besides, society so far has above all demanded food at good value for money (...). In so far, we have to see today's discussed negative impacts by agriculture also as a societal conflict." (Witte, 2002)

But with changed societal objectives, it would be important "that consumer interests and sustainability goals will be more than before taken into consideration" (Witte, 2002).

Co-operations consequently seem to be a nucleus to negotiate these diverging interests for the benefit of all. Institutional stakeholders would have been "aware of the fact that this new way would only lead to success if both sides – that means agriculture and water suppliers – would change their behaviour and reach out to each other" (ibid.). The members of local groundwater co-operations again would "have set themselves the goal to combine drinking water protection (...) with a competitive agriculture in water reserves" (Schultz-Wildelau and Schültken, 2002). Goals would need to serve all stakeholder interests since "[s]uccess (...) can only be achieved through trusting teamwork of cooperation members. Economic targets of a cooperation lie, for example, in a satisfying revenue development of agricultural enterprises, as well as a positive budget of water suppliers (...)" (Schultz-Wildelau and Schültken, 2002). The focus on "local cooperation" would be "the foundation and organisational frame for an effective cooperation of agriculture and water supply" (Witte, 2002). Experiences of the last ten years would have shown that stakeholders could cooperate well. Co-operations would "have proved to be a modern instrument of the Land's development policy" (Schultz-Wildelau and Schültken, 2002).

An assessment of success regarding pollution loads would however be difficult since the results of groundwater protection would only be noticeable several years after its implementation. "Nevertheless, measuring data of water in several wells already clearly show the effectiveness of induced measures" (Witte, 2002), and "in R&D undertaken so far, it was shown that nitrate pollution (...) could effectively be reduced with the help of supplementary consultation" (Schultz-Wildelau and Schültken, 2002) in local groundwater co-operations.

## **The water supplier**

Co-operative agreements originally were initiated by water suppliers. On the part of the water works, groundwater protection coordinators are responsible for developing voluntary agreements together with farmers. Water suppliers administer the co-operations' funds which they receive from the NLWKN and hence handle local financial issues of the co-operations, as well as conclude the annual contracts with the consultants.



It is essential to the water supplier that drinking water standards are kept. Since the Co-operation Model aims at preventing groundwater pollution, investment in expensive technologies for the removal of pollutants is circumvented, so are the most often cost-intensive purchase of surface in groundwater extraction areas or long-term extensification contracts.

One perception of water suppliers is that initial “crucial convincing efforts towards farmers” (Müller, 2002) would have been necessary, whereas success “starts to now clearly take effect” (Hennies, 2002). On the other hand, collaboration between agricultural stakeholders and water supply also is emphasized: “Intensive efforts of water suppliers in co-operation with agriculture already today show measurable success” (Hennies, 2002). The process within groundwater co-operations is seen as one of their keys of success, starting with gaining mutual understanding for other stakeholders’ concerns to the development of trust, which again would have facilitated the design of measures. Only if farmers identified with measures, they would accept them and even monitor their application. Compensation payments for farmers are furthermore highlighted as providing with planning security. A lot of the keys of success given by the water suppliers reflect the opinion of other institutional stakeholders and can be found below.

A representative of the Federation of Water Resources Management, Waste Management and Civil Engineering (Bund der Ingenieure für Wasserwirtschaft, Abfallwirtschaft und Kulturbau, BWK) calls the Model a “concept of success” (Müller, 2002). The representative of the Union of Water Associations goes as far to conclude: “I very much want to praise the Co-operation Model” (Hennies 2002).

### **The Spokesman for co-operation farmers**

In the beginning of groundwater co-operations, a certain hesitance on the part of farmers could be observed. Farmers were concerned whether, after agreeing to join in such a co-operation, they, after some time, would have to take over financial responsibility. These worries no less came from an already considerable number of area declarations with respective impediments on agriculture which at times have to be shouldered by farmers, e.g. areas under the Habitats Directive, nature reserves, nature parks, protected biotopes, bird sanctuaries, etc. Since agricultural plots may be located in different protection categories, farmers furthermore faced difficulties to orientate at the respectively differing impediments on agricultural practices.

Since groundwater co-operations aimed at discussions about locally explicit concepts for groundwater protection, farmers’ political representatives, like of farmer associations, from the beginning did not play a major role. None the less, the Lower Saxon farmer association (“Landvolk”), in a press report calls the Co-operation Model a “model of success”<sup>8</sup>. It is furthermore stated that the association and the MoE “agree with each other that there would be no alternative to the model of co-operation” (ibid.).

Each groundwater co-operation has spokesmen whose election follows locally dependent groupings, e.g. spokesmen are elected for each village within a co-operation, or for each enterprise type. This moreover implies a high variability of proportional representation, e.g. ten spokesmen may speak for 200 farmers, or three for thirty. An important criterion to be elected is professional expertise. Spokesmen up until today are not strongly institutionally anchored. This may change with the future role of the co-operations to decide about the utilisation of allocated funds. Spokesmen then will take over more responsibility.

The spokesman of one groundwater co-operation puts agriculture in perspective with his observation that “nowadays, we have much higher expectations on drinking water [quality]” (Neuberg, 2002), while at the same time “[m]any problems developed since awareness and knowledge were missing, and since the general set-up, especially in agriculture, required a certain kind of action” (ibid). With the water extraction fee, this set-up has changed and agriculture can respond to new societal demands. Before, “the relationship between water suppliers and farmers often was very conflict ridden since farmers were foremost held responsible for the problems of water suppliers, without being provided with any solutions (...). Now, the additional effort of groundwater protecting measures could be paid off and economic drawbacks were removed” (Neuberg 2002).

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<sup>8</sup> <http://www.landvolk.net/1691.htm>, viewed September 2006.

## Technical agencies

Technical agencies (“Fachbehörden”) are special agencies which are subordinate to their ministries, but belong to the respective territorial authority. Regarding groundwater protection, the LWA and the ChoA in its role as technical agency are of importance.

### The Chamber of Agriculture (ChoA)

The “Law about the Chambers of Agriculture” (LwKG, “Gesetz über Landwirtschaftskammern”) of the Land Lower Saxony stipulates that it is the task of the ChoA to support farmers in professional aspects, as well as to attend to the professional needs of agriculture and contribute to the development of rural regions. The Chamber should realise this task in accordance with public interest. As a first duty, the law foresees that the Chamber should promote agricultural production “under special consideration of nature and the environment” (LwKG §2, paragraph 2 point 1), while at the same time promoting productivity increase and good management and profitability, corresponding to its additional task of economic consultancy. It is emphasized that the Chamber is obliged to pursue goals of consumer protection. As a further duty, it should outline practically orientated guidelines for farmers about the standards of a duly and sustainable agriculture. In so far, the Co-operation Model goes well with the tasks of the ChoA.

In the Chamber’s role as a technical agency, the government of the Land can, per decree, assign certain governmental tasks to it aimed at promoting agriculture or monitoring and controlling the condition, production or processing of agricultural products, as well as the utilisation of agricultural land.

As a technical agency, it had already been responsible for calculation bases before they were needed in the frame of the Co-operation Model for the assessment of compensation payments in cases of cultivation impediments. The Co-operation Model’s calculation bases nowadays are up-dated by the results of research and consultation and published annually. The Chamber furthermore provides support in the economic assessment of complicated singular reimbursement cases, as well as incorporates calculations in individual business development plans.

The ChoA (as well as private consultancy) further is responsible for the realisation of model and pilot projects which aim at regional and locally specific insights about the groundwater protecting effectiveness of voluntary agreements, i.e. different land use systems and groundwater protecting agricultural practices (NLWKN, 2005). “For years, experimentation results are the basis for the evaluation and further development of voluntary groundwater protection orientated cultivation measures. On the basis of longstanding experimentations, reliable data can be gained as a regionally specific benchmark for monitoring success. It helps to prevent expensive clearing procedures [i.e. is used as a base for the calculation of compensation payments in water reserves, the authors]. The annually surveyed data furthermore serves as a benchmark for comparing cultivation practices in drinking water areas“(Knigge-Sievers and Uhlmann, 2006). Furthermore, experimentation results provide with an up-to-date data basis for supplemental consultancy in water reserves, as well as they help assessing and further developing voluntary agreements and measures regarding their efficiency. Results regularly are presented to consultants, farmers and water suppliers, as well as published in brochures or are downloadable from the web.

From the role as a technical agency, a positive balance of the work in groundwater co-operations is drawn. A representative of the Lower Saxon Ministry of Food, Agriculture and Forestry declares that “the collaboration in co-operations is important and – as the past has shown – water conservation cannot anymore be imagined without” (Narten, 2002). The Cooperation Model would be a policy which “up until today proved to be successful and very efficient” (Narten, 2002).

The Lower Saxon Chambers of Agriculture furthermore train their own water protection consultants (see above). Its departments for consultancy and those responsible for its task as a technical agency are separated. Nevertheless, this constellation bears potential of conflict since consultancy needs a basis of trust and the tasks of a technical agency at times require resorting to sanctioning measures. If a groundwater protection consultant would report back to the technical department about a farmer’s shortcomings in agricultural practices, his further co-operation with the farmer would certainly be at risk.

Hence, though the ChoA sees its role in providing with pragmatic expertise, as well as opening farmers for co-operation (Knigge-Sievers and Seitz, 2002) and remedying the initial “fear of contact” between agriculture and water supply, as a technical agency, it did not play a role on the field. The work of the Chamber’s water consultants is described below.

## **The Lower Water Agency**

The LWA is an agency under the auspices of a local authority. It is the inspectorate for the local implementation of water related decrees, hence, to the LWA agriculture makes itself felt in nitrate pollution of groundwater (Deppmeyer, 2002; Bake 2002). Local groundwater co-operations and their voluntary agreements are seen as an alternative to regulative law for the realisation of groundwater protection. Their benefit is hence perceived in avoiding to resort to these conventional measures, which, as mentioned before, require high monitoring effort. "It has to be said that farmers, after considerable persuasion effort, supported the project in an exemplary manner. Only in this way, voluntary cooperation for drinking water protection could be formed without resorting to measures of regulative law" (Deppmeyer, 2002).

The LWA draws an overall positive conclusion. Since "farmers already contacted the district during the drafting of measures in a water reserve, in order to clarify in advance permission requirements or discuss imminent questions" the administration was in closer contact with agriculture and could gain a better understanding for agricultural problems (Bake, 2002). The water extraction fee would furthermore have provided with room for manoeuvre on their part. A representative of a LWA sums up that "[t]he long standing Cooperation Model has very much proved its worth" (Deppmeyer, 2002).

## **Supplementary consultation for Groundwater Protection**

Both, private consultants as well as consultants of the ChoA consult farmers in direction of water protecting agricultural practices. Consultants generally are called "supplementary consultants" to indicate their additional role to classical production consultation which is orientated at profit optimization and foremost carried out by the "consultation ring" ("Beratungsring") and partly by the ChoA. Another naming would be "water protection consultants", but since it does not relate to agriculture, "supplementary consultation" established in the jargon.

Complementary to model and pilot projects carried out by consultants (as well as the ChoA), results out of consultation play a major role in further developing water protecting agricultural practices. A lot of innovations come from on-site experiments of farmers. Results of pilot projects are annually presented in the previously mentioned Groundwater Workshop of the NLWKN.

The NLWKN each year decides about the placing of orders. Either a consultant of the ChoA or a private consultant is attributed to one groundwater co-operation. The water suppliers decide with whom they consider to work together, which in practice most often implies a continuation of previous collaboration.

Consultants in the beginning, as well as until today, play a pivotal role in moderation, in finding a common language between farmers and water suppliers. Consultants furthermore look after continuity in the work of co-operations and monitoring of their success. Farmers are in continuous personal contact with consultants who can mediate water protecting measures in a solid way, as well as support farmers in and remind them of their realisation. They furthermore assist in the conclusion of the voluntary agreement, and inform about new groundwater protecting agricultural practices.

## **The Chamber of Agriculture**

The consultants of the ChoA are financed by the NLWKN, while their boss, the head of the ChoA, is an elected representative of agriculture. On site, they may at times face conflicts of competence with production consultants or technical agents of the Chamber.

The consultant of the Chamber highlights that for farmers, a change in their way of thinking and habits was required at the onset of work in groundwater co-operations, while at the same time the hitherto productivity paradigm still held its ground.

"The primary task of supplementary consultation for water conservation initially was to motivate farmers to think over their fertilizing habits. This alone was (and still is) often difficult enough. Nobody could take away the risk of loosing more than the calculated 1 – 2dt/ha wheat as a result of a reduction of 20 – 40 kg/ha nitrogen. (...) 'Good words' alone did not help, especially since with continuously increasing production expectations, gradually higher N-fertilisation was recommended from the other side (...) This request [to reduce fertiliser application, the authors] somewhat threw the traditional farmers: All of a sudden, yield should be 'given away', should the iron principle not apply to produce food in maximal amount and best

quality for the sake of securing the population's sustenance? At this point, supplementary consultation first had to gain trust, to then commence with convincing efforts" (Wildenhayn, 2002f).

In this context, consultancy supported farmers through thoughtful completion of groundwater co-operations on the spot: „intensive consultation and professional assistance throughout the vegetation period contributed to it [an understanding of the necessity to minimize nitrate loads, the authors] as much as the setting up of signs at the border of the fields, which pointed visibly at the participation in a voluntary co-operative agreement. They on the one hand honoured participating farmers, while at the same time served as an encouragement for hesitating farmers, as well as were an instrument of social control on the spot" (Wildenhayn, 2002).

Concluding, "work so far can be judged as a success" (Wildenhayn, 2002). But, "[i]n many regions, a long breath moreover is required: in spite of many years of effort, the nitrate content in groundwater does not noticeably decrease. The reason is not so much with a lacking cooperativeness of farmers, but often grounded in hydro geological conditions. Here, hope remains – as well as the undiminished effort of all stakeholders in drinking water protection" (Wildenhayn, 2002).

### **Private Consultants**

In the beginning of the Co-operation Model, as one of the preconditions for a successful consultation, private consultants carried out soil mapping for the whole consultation area since the ChoA did not have the respective infrastructure. They hence were partly acting in their role as consultants for the water suppliers, partly as service provider for the ChoA.

In this initial phase, supplementary consultancy saw its task in a "mediation of conflicts between agriculture and water supply" (Geries *et al.*, 2002) and to "generate a climate of mutual understanding and trust" (Geries *et al.*, 2002), but it further would have had a "central role in informing about and in the realisation of groundwater protecting measures in agriculture" (von Buttlar, 2002). Consultancy furthermore wants to "promote the knowledge transfer into practice, as well as out of practice develop new approaches und solutions for efficient drinking water protection." (ibid.)

Private consultants wrote the contributions to the „handbook for supplementary consultation of drinking water protection“, edited by the NLWKN and the MoE. They developed methods like those for efficiency control to further improve the work of groundwater co-operations. These methods were then taken over by consultancy of the ChoA.

A lot of the keys of success provided by consultants correspond to the other stakeholders' keys. Nevertheless, consultancy additionally emphasises a low "regulation density" which would have allowed co-operations to work freely. "This motivates participants to actively work for water protection and take over responsibility." (Geries *et al.*, 2002)

### **Joint Keys of Success**

As can be seen from previous sections, the work in groundwater co-operations generally was perceived as a success. Though stakeholders are involved in different tasks on different levels of the Co-operation Model, as well as have differing stakes in the issue of groundwater pollution, they seem to be confident with the approach taken in groundwater co-operations and the Co-operation Model as a whole. What moreover becomes clear is that their tasks were brought together in the various activities within the Model, e.g. farmers' experimentation results being integrated in other co-operations, model projects together with farmers being presented in the Groundwater Workshop, entering into the "handbook for supplementary consultation", etc.

Figure 1 furthermore shows that the understanding of what made groundwater co-operations work to some extent resembles across stakeholders. Out of the keys of success given in speeches of seven stakeholders, six clusters could be compiled. In each of these clusters, citations are presented, each stakeholder citation being underlain by a "bubble", but colours being assigned to the respective "stakeholder party" (light grey for consultancy, white for water supply and grey for agriculture). Through the colouring, the distribution of keys of success among parties can be disclosed. Furthermore, in their speeches, stakeholders related the keys of success to each other, which is evident in arrows across clusters. In Figure 1, an "order" of keys of success in this way is discernable.

The role of the “local assessment of the groundwater and soil situation” (four citations by four stakeholders) is especially seen in its contribution to the kick-off of groundwater co-operations. Through the assessment and presentation of the local water and nitrate situation, an objectification of the discussion could be achieved. With the help of “conflict management”, and through “constant exchange” and “frequent talks” (see “Dialogue” cluster, seven citations by six stakeholders), mutual understanding could be gained. The cluster “mutual understanding and trust” with ten citations, covering all seven stakeholders, is the most often mentioned key of success. It not only is seen to be achieved by transparency of the geo hydrological situation and dialogue, but also through transparency in subsidies to farmers. Building up mutual trust hence seems to be a major building block for co-operations. Mutuality seems moreover to be important, expressed in “mutual understanding”, “mutual trust” or “mutual agreement”.

Eventually, all keys of success result in the “acceptance of measures”, except for “local assessment of the groundwater and soil situation”. “Financing of groundwater protecting measures” (six citations by five stakeholders) is perceived in different functions, partially reflecting the different roles that stakeholders take in groundwater co-operations. It is only twice mentioned in its role of compensating farmers’ potential yield losses. For consultancy, it provides for a “financial room for manoeuvre” to develop adapted concepts of agricultural groundwater protection, similar to a LWA’s perception that financing allowed for a “starting point for further measures”. A water supplier highlights planning security through the funds, allowing for constitutive planning steps.

Another cluster which ends in “acceptance of measures” but does not link to other clusters is that of “taking action” (seven citations by three stakeholders). In the cluster, citations refer to the competition of ideas which came up within groundwater co-operations and across consultants, as well as stakeholders’ effort and commitment in general. The reasons for this active co-operation are not directly given. Only one consultant refers to a “low regulation density” which would have motivated stakeholders to take action. From other remarks, motivation out of a certain identification potential with groundwater co-operations may be construed. “[T]rusting teamwork of cooperation members” (Schultz-Wildelau and Schültken, 2002), identification with measures developed in co-operations (see “Taking Action” cluster in Figure 1, remark of the spokesman), or the statement that “participating farmers (...) want that the jointly developed measures will bring about success” point at such an identification. Nevertheless, it is not made very distinct.

The “quality of measures” is an assemblage of statements describing what, according to the stakeholders, made measures successful (four citations by four stakeholders). It seems that their quality lies in their soundness and concreteness (including calculable interventions), as well as their constant modification through new insights within and outside of groundwater co-operations.

The fact that the “local assessment of the groundwater and soil situation” is not directly linked to the acceptance of measures can be attributed to its pivotal role in the beginning of co-operation, making the water situation transparent to all stakeholders<sup>9</sup>. Often, stakeholders describe co-operation as a process which itself seems to be a success. One result may be an “improving capability to negotiate” (Hennies, 2002) within the cooperation, but also a shift in groundwater co-operation objectives: “The priority goal at first was a clarification of and awareness raising for the concerns of groundwater protection. Meanwhile, the focus lies on concrete measures for the reduction of agricultural pollution loads.” (ibid.) In this context, “long-term planning” (Schultz-Wildelau and Schültken, 2002) and “work which is designed with a long-term perspective and by nature does not aim at quick or spectacular success, but at results which have a long-lasting effect” (Witte, 2002) seem to be crucial. Since it is directed to the process as a whole, it is not shown as one building block in Figure 1.

With the process being mentioned as important for the functioning of groundwater co-operations, but not being represented in the analysis of keys of success in this section, it will be described along the following case study. It will also exemplify and concretise the keys of success in the context of the setting up of a local co-operation. Out of a view of consultancy, a case of a groundwater co-operation is provided which exemplifies that within the process of co-operation, the shared approach even resulted in farmers making use of the groundwater co-operation and extended it to other areas of their concern.

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<sup>9</sup> Nevertheless, they still provide with an up-to-date data basis for supplemental consultancy in water reserves and the calculation of compensation payments, as well as they help assessing and further developing voluntary agreements and measures regarding their efficiency.

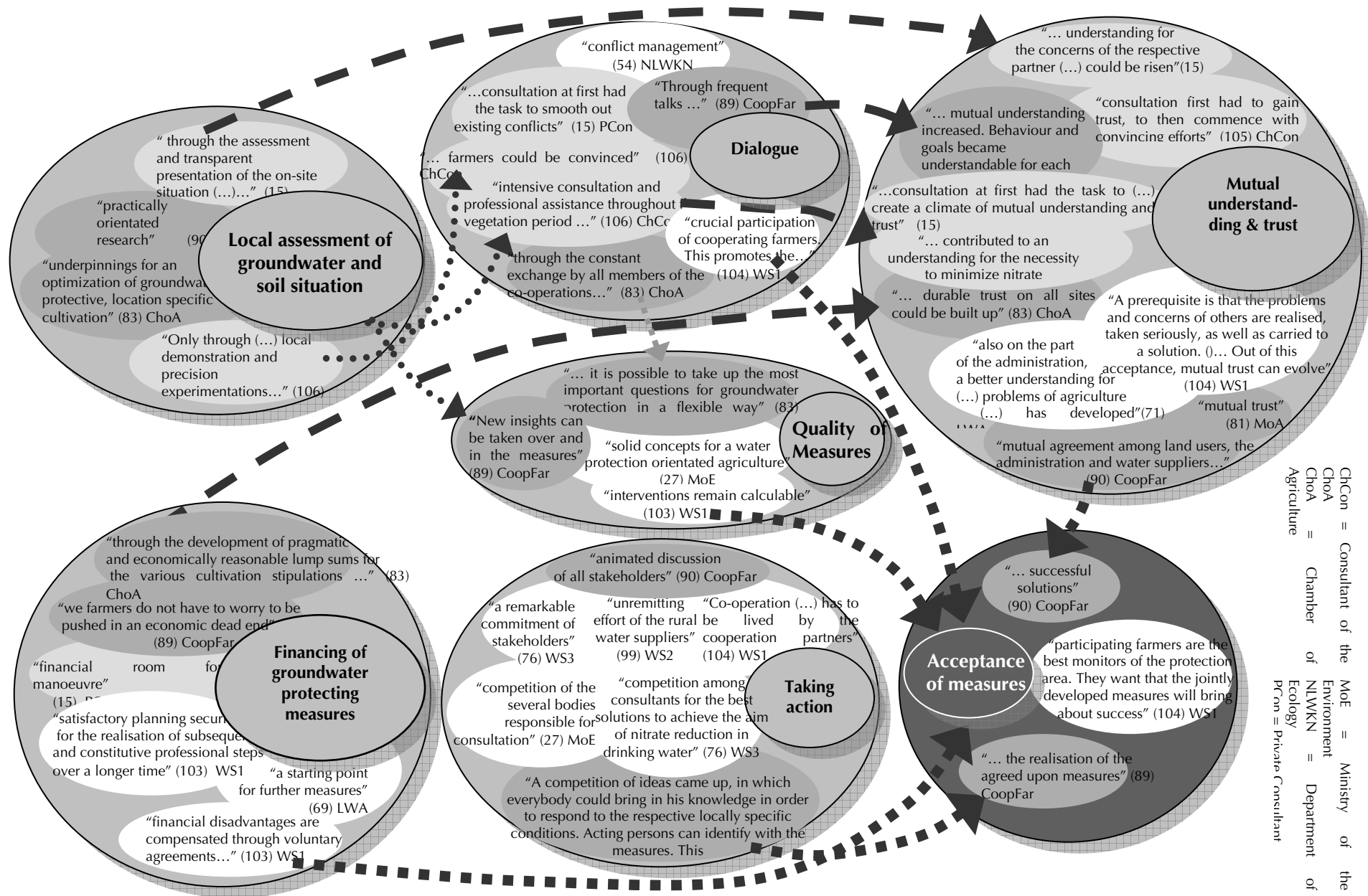


Figure 1. Keys of success for local groundwater protecting co-operations.

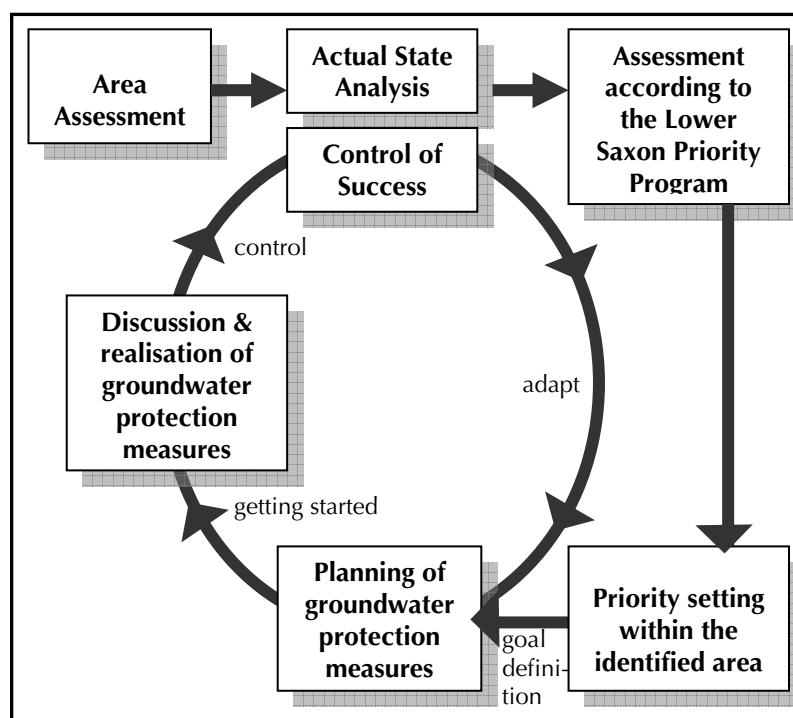
## Realisation of groundwater co-operations

Depending on the respective local conditions, groundwater co-operations vary in number of farmers and total area covered. In general, they are realised with one water supplier, who may embrace several water extraction areas. The number of further co-operation members may be limited to farmers, consultancies and local authorities<sup>10</sup>.

A general sequence of activities can be described for the process of a co-operation (Figure 2). After an area assessment by the consultant, an actual state analysis allows for an evaluation according to the Lower Saxon priority program. It on the one hand helps to effectively allocate financial means out of the water extraction fee to the most concerned areas, while on the other hand, it can support argumentation vis-à-vis farmers. In cases where the nitrate polluter of an area is not clear, e.g. in the proximity of a waste disposal site, area assessment is important to prove the need for taking action in agriculture.

In most of the cases however, agriculture is the major pollutant. A priority setting within the identified area follows by all groundwater co-operation partners, out of which co-operation objectives result. They enter into the concrete planning of groundwater protecting measures, embedded in a general strategy.

Measures can be classified in three categories, that is, measures with an annual perspective (voluntary agreements), measures with a mid-term perspective and the complete conversion of agriculture. They can be seen as subsequent within the development of groundwater co-operations. Voluntary agreements are a common instrument. Every year, more than 10,000 agreements on groundwater protecting agriculture are made. Measures with a mid-term perspective require investment, like in machines for water conserving agricultural practices or in facilities to stock liquid manure. Some farmers may consider the conversion to organic agriculture. Monitoring of success of groundwater protecting measures is done by the consultants and given account of in annual reports.



**Figure 2.** Sequence of measure work in groundwater co-operation.

<sup>10</sup> Local authorities often act as representatives of communally owned water supply or local planning authorities.

In the case at hand, the groundwater cooperation in the water extraction area "Pöhlder Becken" was founded in 1996 and comprises an area of about 30,000 ha with 7,000 ha under agricultural land use, cultivated by about 200 farms. Three water suppliers provide with about 2.8 Million cubic meter drinking water out of several wells. Groundwater nitrate content in the beginning was between 10 mg and 50 mg / litre in different wells. Representative for the region, problems primarily emanated from excessive fertilizer application of both, farm liquid manure and sewage sludge. The consultant IGLU was assigned to carry out supplementary consultation. The agency hosts engineers out of the fields agriculture, forestry and water resources management, pedology and data processing.

Before the groundwater cooperation was established, water suppliers and farmers faced difficulties to communicate and the process was slowed down by disputes about conservation area boundaries and bylaws' impediments on agriculture. On the basis of on-site surveys and surveys of the farms' business structures, and adapted to the local problem situation, a consultation concept was developed. Consultation provided farmers with *information about the generation and extraction of groundwater, as well as about nitrate pollution*. It then discussed the role of agriculture in improving the groundwater situation as well as local potential options. Information about actual soil and water interrelationships supported *mutual understanding* between water supply and agriculture. It furthermore raised farmers' hope that the problem would be solvable, as well as it encouraged them to support the co-operative and *undertake new initiatives*. Apart from the benefit of being based on facts, the "face-to-face" talk among stakeholders helped to melt rigid fronts since no "general interests" had to be represented. In this regard, it can be considered helpful that engineers could *communicate* with both, water resources management and agriculture, as regards content and language. Supplementary consultancy furthermore makes sure that the topic is constantly present in farmers' mind.

Components of the consultation concept are soil and plant surveys, consultation of individual farms or groups of farmers, the initiation of field days as well as farmer assemblies, or the performance of demonstration trials. Particularly supporting for the acceptance of groundwater protecting measures were surveys which were carried out under the participation of farmers and on their proper compound, as well as individual consultation.

If farmers agreed to protect groundwater quality, they concluded voluntary agreements on areas with high priority for groundwater protection. They contractually assure to undertake certain groundwater protecting measures. In cases of yield losses, they are financially reimbursed. The level of reimbursement in general lies between 25 and 150 €/ha. New area measures usually at first are *tested by farmers in demonstration trials*, to then be proposed to other farmers. Through the experiences of co-operation farmers, the range of area measures for groundwater protection could be augmented and up-dated. Partly, they were coordinated with other consultants within a district and further integrated by the NLWKN in the annually published catalogue of measures for agricultural groundwater protection (e.g. legumes free intercropping, reduced tillage after colza, mulch seeding, etc.). But there is a variety of area measures which can only be offered in the respective region (GPS crop yield assessment, in particular time targets e.g. in rain shadow areas etc.).

After initial scepticism on the part of farmers, voluntary groundwater protection more and more expanded. Through the presentation of measures at co-operation meetings and the annual winter assemblies, through map overviews on the internet, or signposting on the fields, co-operation farmers and their measures got known, which to a certain degree effected a social control among farmers. The statement "It is the water quality of the water which we drink" moreover shows the *identification of farmers* with efforts of water protection. Especially the cooperation with the press, e.g. regarding the optimisation of farm manure application, supported a change. Positive reports about new technologies carried farmers to the insight: "Now, we cannot do else than also change our application".

With the personnel interconnection of consultancy, research and agricultural practice in groundwater co-operations, farmers could build on this expertise. Especially regarding liquid manure storage and application, considerable progress could be made with the help of investment allowances. In the process of farmers' co-operation, machine user co-operatives were formed for the joint use of mulch seeding equipment, curry combs or schlep hoses. Three years ago, farmers even used the co-operation to rearrange their territory: Since the parcelling with two hectare plots impeded smooth cultivation, farmers redistributed 400 ha through mutual agreements, and by this could increase the average plot size to 7 ha. They on the one hand could increase their farm's economic efficiency by saving workforce; while on the other hand, overlapping of liquid manure and pesticide application could be avoided, with its positive impact on groundwater protection, as well as on an economization of production costs.



Nitrate seepage water concentrations in the soil and in groundwater are frequently examined by consultants for impact and performance assessment of the measures. The extent of these surveys has to be commensurable to the measures, and can only be exemplary, not area-wide. Through the surveys, consultation concepts as a whole are repeatedly put to a test and adapted to new insights. In this context, the question of the most efficient use of financial means constantly has to be answered anew. A major difficulty hereby are the long response times between measure and effect on groundwater due to the slow seepage speed.

An important aspect for the maintenance of the *dialogue* within the cooperations are an up-dated consultation, innovative recommendations and the capability to deal with conflict.

The *financing* of the consultation, of surveys and voluntary agreements to carry out measures for groundwater protection (=“Vertragswasserschutz”) has *considerably increased farmers’ interest and acceptance of water protection efforts*. Furthermore, only after the introduction of the water extraction fee, water suppliers started to become active in their respective water extraction areas since if they didn’t, they could not take benefit of governmental subsidies. The water extraction fee guarantees financial security and continuity for long-term designed water protection efforts.

IGLU annually coordinates the contents of supplementary consultancy with the NLKWN who then grants respective subsidies to the water supplier. The water supplier subsequently concludes a consultancy contract with IGLU as the supplementary consultant.

As can be seen from this case study, out of an informed dialogue among stakeholders, a co-operation developed within which farmers extended the original task of groundwater protection to other areas of their concern. It points at two additional issues. Motivation for taking action on the part of farmers could considerably be triggered through the financing concept, as well as motivation comes from the drive to prevent pollution of farmers’ drinking water. They are stakeholders in two regards, effecting and being affected by the situation. Another key of success may lie in the diverse activities and comprehensive information in the frame of the Co-operation Model, may it be local hydro geological information, surveys carried out under the participation of farmers, information about measures developed in other co-operations, field days, farmer assemblies, or the performance of demonstration trials. They seem to have led to a certain social acceptance of agricultural groundwater protection and even provoked an adaptation to it (“Now, we cannot do else than also change our application”).

The following second case study made use of both of these consequences: farmers’ increased awareness for groundwater pollution, as well as the regionally developed network among stakeholders, especially consultants, out of the coordination of the various activities within the Co-operation Model. The case study in addition further develops the approach of the Co-operation Model on an institutional level by bringing the market in to water protecting agriculture.

## **Extension of the institutional framework – the project H2Ö**

As described before, one option for agriculture in water extraction areas could be a complete change to organic agriculture. The Land Lower Saxony promotes the augmentation of land under organic agriculture in water extraction areas, among others with the project H2Ö. It is partly financed by the water extraction fee and the European- Lower Saxon program “ProLand”. The objective of H2Ö is:

- to expand organically cultivated area in water extraction areas through special consultancy and
- to increase the marketing potential of organic enterprises through the changeover to organic produce by processing enterprises and trade.

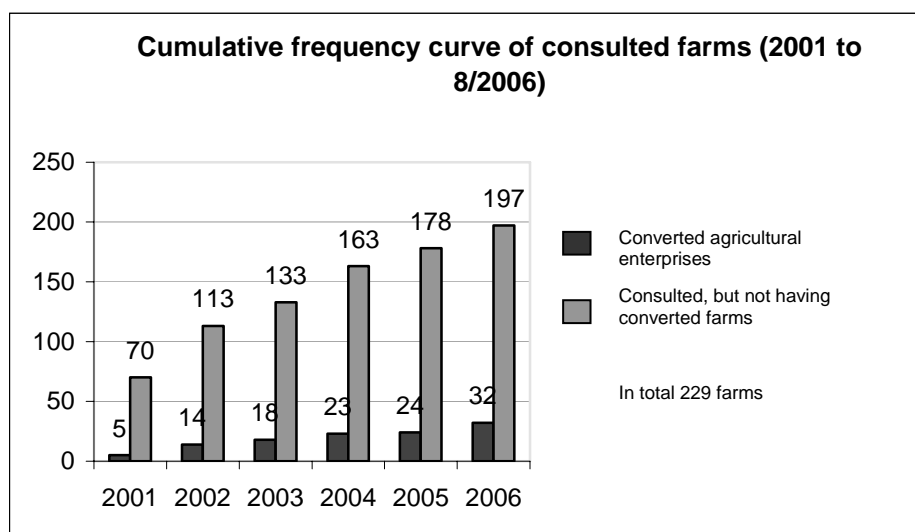
H2Ö consists of IGLU, the Lower Saxon branch of “Bioland” (the largest German association for organic agriculture), the Ökoring (agricultural consultation in Lower Saxony for the conversion to organic farming and of organic farms) Lower Saxony and the University of Kassel. In a concerted effort, H2Ö consults groundwater co-operation farmers in direction of a change to organic agriculture, as well as marketing for an improvement of the market position of organic produce.

Consultation is more intensive as well as more detailed in knowledge than consultation in the frame of the Co-operation Model. It may focus on the farm’s potentials for a change to organic agriculture, on subsidies for organic farmers in general or for area specific measures, or it may even take the dimension of a consultation for a total conversion to organic agriculture.

The area of this special consultancy for organic agriculture comprises 111.000 ha agricultural surface in 401 water extraction areas, out of which supplementary consultation covers 228 water extraction areas. 3,900 farmers, 121 water suppliers and a multitude of regional and supraregional marketing organisations and processing industries should be made familiar with the potentials of organic agriculture and its market. Since not all farmers or marketing organisations show interest in a changeover, the identification of the best partners for consultancy is a major building block for the success of the project. To this end, the existing network of groundwater protection consultancy is used for the mediation of offers and the transfer of information. An interested farmer in a water extraction area addresses his respective cooperation consultant who then mediates him to a H2Ö consultant.

By analogy with voluntary agreements for groundwater protection, organic agricultural farmers are offered subsidies for land located in water extraction area. This area subsidy, since considered a measure in the frame of ProLand, is financed out of the same funds like the special consultation and is provided additionally to the changeover premium or maintenance premium (137€/ha/year).

Consultation can build up on an increased sensitivity for groundwater protection on the part of farmers due to the longstanding experiences in groundwater co-operations, so that farmers who intend to convert to organic farming may not face legitimacy problems in front of their neighbours. Furthermore, consultation could make use of co-operation farmers' knowledge. As an example, fertilization plays a pivotal role in organic farming since nitrate has to be kept within the cycle, and washouts can cause high losses which cannot be compensated through additional fertilizer application. Co-operation farmers already had learned about soil and fertilizer relations, nitrate washout and the importance of fertilizer management in the course of groundwater co-operation consultancy. This also helped farmers interested in organic agriculture who, from an ideological point of view, are more "organically" thinking and in general do not much pay attention to chemical issues of fertilisation.



**Figure 3.** Cumulative curve of consulted farms (2001 to 8/2006).

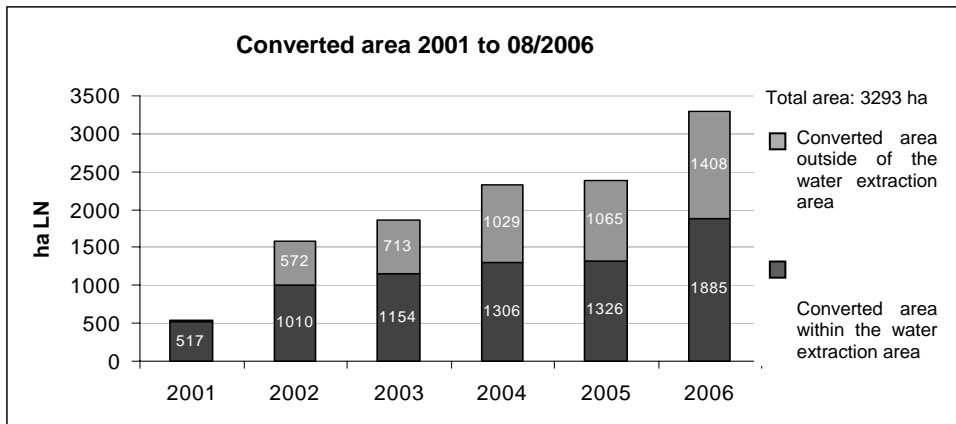
Figure 3 shows the ratio of farms which were consulted in the frame of H2Ö and converted to organic agriculture, to farms which did not change to organic agriculture, though having been consulted. Within six years, H2Ö consulted 229 farmers, out of them, 32 (=14%) converted all of their land to organic agriculture, except for one who undertook a partial conversion.

The process from the first consultation to a change to organic farming may take several years. This is why a net annual ratio of having converted to not having converted farms may not represent the actual picture. If one compares the ratio of the accumulated number of converted farms to the number of total consulted, it ranges at 12 % for 2003 to 2005, to then increase to the final share of 14%, indicating a rather constant conversion process<sup>11</sup>.

<sup>11</sup>

2001	2002	2003	2004	2005	2006
5:75 = 6.7 %	14:127 = 11%	18:151 = 11.9%	23: 186 = 12.3 %	24:194 = 12.3%	32: 229 = 14 %

In Figure 4, the area of these farms is given, i.e. 3.293 hectares. Land is located outside of as well as within water extraction areas, a slightly larger share (57% of the total area) being inside. Given that 300,000 ha of Lower Saxon water extraction area (=50%) are under agricultural land use (arable land or grassland), H2Ö helped to increase the share of organically cultivated land by 0.6% in water extraction areas. In relation to total cultivated surface in Lower Saxony, H2Ö helped to increase the share by 0.1 %.



**Figure 4.** Area converted to organic agriculture in the frame of H2Ö.

This figure on the one hand has to be seen against the background of a total of 2% Lower Saxon land being organically cultivated.<sup>12</sup> On the other hand, for the period 2001 to 2005, a total increase of 21,000 ha under organic agriculture is reported for the whole land<sup>13</sup>, which means a growth by 0.77%. With a consultation area of 111.000 hectares, the converted 2,391 ha (until 2005) of H2Ö equal to an increase by 2.15% under organic cultivation, which is three times the average of the Land. Comparability of course is in so far limited as H2Ö consulted farmers for free and farmers received much more support during their decision making than conventionally converting farmers. Nevertheless, H2Ö could reach out also to farmers who converted to organic agriculture less out of an ideology, but rather out of an economic interest and based on insight and experience with agricultural groundwater pollution. They may be sound multipliers of organic farming.

To further support farmers in their conversion to organic agriculture, and since organic agriculture demands more responsibility for marketing from the farmer as structures are not yet well developed, H2Ö also started “at the other end”, at the consultation of retailers and processing enterprises. Attention had to be paid to a balance in production patterns of organic farmers since marketing of these products is foremost regional. But here, the variability of agricultural production conditions in the area also supports a diversified marketing structure.



**Figure 5.** Marketing firms having converted with the support of H2Ö.

<sup>12</sup> [http://www.umwelt.niedersachsen.de/master/C1202043\\_N11329\\_L20\\_D0\\_I598.html](http://www.umwelt.niedersachsen.de/master/C1202043_N11329_L20_D0_I598.html), viewed September 2006

<sup>13</sup> [http://www.ml.niedersachsen.de/master/C20770461\\_N8825\\_L20\\_D0\\_I655.html](http://www.ml.niedersachsen.de/master/C20770461_N8825_L20_D0_I655.html), viewed September 2006

within six years has consulted 400 processing enterprises, out of which 25 changed to organic produces' marketing or processing (6%). Especially meat producers and bakeries lend themselves to an ecological marketing concept since a connection between food quality and drinking water protection can easily be made. Furthermore, for meat, grassland cultivation is guaranteed, which especially in water extraction areas is of advantage.

## **Conclusion and outlook - The future of groundwater co-operations and groundwater protecting agriculture**

The last case study, the project H2Ö, points at a consequent further development of the idea which stands behind groundwater protecting agriculture in the frame of the Co-operation Model. In H2Ö, a change to groundwater protecting agriculture is not "compensated" through subsidies, but H2Ö tries to integrate it in a market structure. Like this, responsibility for supporting drinking water protecting agriculture gets back to regional consumers. The approach on the one hand is much more constructive than a "compensation of losses". On the other hand, it needs to – as H2Ö shows – work on several ends, with farmers, retailers and processing enterprises, as well as at consumer awareness. Yet, though organic agriculture can be considered an appropriate way to protect groundwater, a changeover ratio of 14% out of H2Ö consultation shows the limits in its realisation. The ratio may nevertheless increase when access to the market improves.

Conversion results to organic agriculture, as well as experiences within the Co-operation Model nevertheless show that, under certain conditions, farmers are willing to integrate concerns of groundwater protection in their agriculture and may even further develop groundwater protecting measures for their agriculture. The frame which was provided within groundwater co-operations seems to have been crucial for this success. By providing with a sound basis of information for a discussion about local nitrate problems, through a mediated dialogue among stakeholders, integrated in a long-term perspective and in the best case being based on a basis of mutual trust, measures were developed out of a range of ideas and concepts with which farmers could identify and which they would eventually implement. These results for the "keys of success" however have to be seen against the background of their source, i.e. speeches given at the occasion of the 10<sup>th</sup> anniversary of the Co-operation Model. But in general, the analysis may allow for the conclusion that through increased efforts to open up to the expertise of other stakeholders, agriculture can better develop responding to societal demands. It will be interesting to see how the responsibility increase of farmers within these groundwater co-operations will take effect on their agricultural practices.

Up until now, spokesmen of co-operation farmers had a rather informal anchorage, but their position in future will be more important with groundwater co-operations taking over more financial responsibility. Recent reforms on the level of the Land which aim at reducing administrative costs require changes in responsibilities for the Co-operation Model. The MoE "came to the conclusion that the policy task of the Land should be reduced in favour of water suppliers and farmers' own authority." (Eberl, 2005) The undersecretary of state believes that this shift is possible due to the "good co-operation between water suppliers and farmers with its longstanding experience and the mutual trust which has evolved" (ibid.). In the new frame, stakeholders have to draft, on the basis of their hitherto experiences, a five years' protection concept of necessary measures with the required financing. The concepts should be submitted for proof to the NLWKN. Since responsibility lies with the water suppliers, they and the NLWKN sign it as a five years contract under public law.

This new frame should allow for longterm planning, both on the part of water suppliers as well as farmers. Groundwater co-operations decide who is going to be their consultant, which measures may be taken and how controlling and evaluation may be realised (NLWKN, 2005). This modification does not only respond to the need to reduce administrative load of the Land, but also to an appeal to enlarge the local decision making power of groundwater co-operations, expressed by consultants and farmers likewise. "If the work in the co-operation is to be understood as a dynamic process, a certain flexibility of local stakeholders is vital. According to the supplemental consultants, it allows for a stronger identification – especially of farmers – with the agreed upon measures and goals. At the same time, stakeholders' mutual control is increased" (Schültken, 2002). The new regulation would "give the work in the co-operations a very high importance since some measures now do not require permission if settled in the co-operation agreement" (Bake, 2002). A pilot project by the water supplier of Hannover with farmers shows first positive results of this new structure.

In this new frame, groundwater co-operations may develop their own “dynamics” and farmers may be more open to experiment with alternative practices if a planning security of five years is guaranteed. At the same time, a more formal organisation on the part of farmers will be necessary since groundwater co-operations now have to manage their own funds.

Nevertheless, some doubts remain regarding the financial load for water suppliers, especially for small enterprises. If they take over coordination of groundwater co-operations, some are too small to operate cost-efficiently. This is why a lower project volume limit is under discussion, on account of which smaller water suppliers would have to some extent join forces. Such coordination may also work against upcoming competition among water suppliers. Still, the responsibility for projects like the financing of a better marketing of organic produce, as in H2Ö, may not be shouldered by them.

Further, a common criticism is that if such an intensive agricultural consultation like in the Co-operation Model was to be realised for all Lower Saxon farmers, it would be rather costly (Kastens and Newig, 2006). The question came up whether one may “spoil” farmers since they get used to these payments, which for example in the context of the EU Water Framework Directive is not foreseen. Why should one pay agriculture for not polluting groundwater when in general, the “polluter pays” applies in environmental policy? An argument which stands against this question is that raised by the undersecretary of state of the MoE that current agricultural groundwater pollution can be seen as a societal conflict, society having for a long time demanded food at good value for money. Now that the paradigm slightly changes, hastened by environmental standards like the Drinking Water Directive, agriculture has to be supported in this transformation. A project like H2Ö further tries to find the reimbursement for water protecting agriculture in the market itself.

A further change goes in direction of multilateralism. “In recent times, transdisciplinary co-operations were established in view of a bundling of measures and an utilisation of synergies” (Schültken 2002: 8). This expansion could be further integrated in the general development planning of rural regions, which makes groundwater co-operations reaching out to other stakeholders of nature protection, communal planning, tourism, etc. Co-operations could here get a nucleus for the realisation of the EU Water Framework Directive on the scale of the “work areas”. The MoE, which is responsible for its implementation, is rather optimistic since with the co-operations, “a culture of a joint deliberation of the most cost-efficient solutions” (Eberl 2004b) would have developed on which the WFD could further develop.

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