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# The Sustainability of Intensive Livestock Areas (ILAS)<sup>1</sup>: Network System<sup>2</sup> and Conflict Potential from the Perspective of Animal Farmers

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## ABSTRACT

The present study has determined the perceived consequences of an ILA on the production conditions of livestock farming systems based on the advantages of an agglomerated agri-food industry and the disadvantages of an increasing livestock concentration. It became obvious that the benefits of such ILAs can be understood according to their human and social capital. These elements, however, are both associated with a low geographic responsiveness to any increase in problems and so cause land use conflicts to increase. Their perception of the effects of being located within an ILA caused the livestock farmers in this survey to consider their production conditions more when formulating their demands with respect to policies concerning regional development and land use planning. Understanding this type of perception may help to counter current problems and to enhance the success of structural policies in ILAs

*Keywords: sustainability; livestock; networks; conflict potential*

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## 1 Introduction

In the last few decades the geographic segmentation of the agricultural systems has led to the formatting of numerous ILAs throughout the world (Imke 2004). In many of these ILAs, there is already an obvious competition for the increasingly scarce resources through the growth of the various enterprises settled within such regions. The increasing spatial concentration of livestock has often reached the limits of the regional capacity, leading to the occurrence of more land use conflicts with respect to building legislation (e.g. the building of animal houses close to residential, industrial or recreational areas), nature conservation and water protection legislation (e.g. immissions and emissions), veterinary legislation (e.g. control of endemic disease dissemination) and even landscape conservation. This has engendered an overall negative image for such regions (Speir et al. 2003, Abdalla 2002, Wing & Wolf 2000, Caldwell 1998). Despite the rising number of conflicts over a limited potential within such regions, it is particularly the ILAs which have continued to show the largest growth in livestock density, while other regions have shown an overall reduction in animal numbers (Imke 2004). This is an indicator for the advantageous effects of these regions on the conditions of animal production systems (Gellynck et al. 2006, Lazzariniet al. 2001). Besides the impacts on the agricultural production conditions, the agricultural and the affiliated food industry in ILAs often have a very high importance for the whole economy and society in these regions.

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<sup>1</sup>The term "Intensive Livestock Area (ILA)" stands for regions with a very high livestock concentration [mean within the investigated region = 1.88 LU/ha (here a LU = 500 kg)]. ILAs also often have a higher productivity and a higher degree of business organisation than other regions (Windhorst & Grabkowsky 2008).

<sup>2</sup>The network system describes the agglomeration advantages in an ILA due to the cooperative integration of various stakeholders from all the different areas of the agri-food industry (c.f. The effects of ILAs on production conditions, below).

They represent the major employer and the citizens of these regions feel well connected with these branches.

The research undertaken so far with respect to ILAs within agricultural systems and regional sciences has concentrated on the sustainability of livestock farming as a whole and has been done from the aspect of the associated economic processes. Otherwise such research has analysed the conflict potential and acceptance in association with individual circumstances or problems (see literature overview in Table 1).

\*But how do livestock owners perceive the rising number of conflicts occurring in an increasingly crowded ILA and which advantageous effects do they see in being located in such a region for the production systems? The effects of these perceived advantages and disadvantages on the farmer's trust in the sustainability of their animal production system located in such an ILA are the main focus of this study.

Using the results of a questionnaire, it was analysed as to how the livestock farmers in an ILA perceived their region as a business location and which conclusions could be extrapolated from this for both the present-day and future production conditions within the area. This study utilised the previously reported explanations for the advantages and disadvantages of ILAs to show which incentive mechanisms and conflicts were perceived by the livestock owners as regional indicators for having trust in their farms' location. With this type of information, regional resources in an ILA could be better assessed, steered and developed. The general perception of the location factors in ILAs may be also usable in the formation of larger geographical structures involving animal farming outside of ILAs; for example, for the relocation of farms or to provide incentives for the setting up of farms in regions with a lower stocking density. In addition, understanding the perception of the location factors from the point of view of the livestock farmer will provide information regarding the motivating power of the present developments of animal production systems within an ILA, and this can in turn be used to suggest solutions for regional problems and possibilities for future regional development.

## 2 Effects of ILAs on Production Conditions in Animal Production Systems

Research looking into the positive effects of ILAs has been chiefly focused on the cooperative integration of actors from all the sectors of the agri-food industry involved in a region. This type of research is often mainly orientated to the elements of the regional embedment of the production systems in regional clusters.

Both from the perspective of the efficiency and the quality management in the supply chain collaboration is becoming an increasingly success element (Bahlmann 2009; Hofstede 2003). Particularly in the primary production the geographic dimensions in this discussion are growing up (Spiller et al, 2005; Theuvsen and Francis 2007) and this geographical characteristic was more and more included by questions around the agribusiness management (Lazzarini, Chaddad and Cook 2001; Müller, Bürgelt und Seidel-Lass 2007).

The innovation and learning chances within such network systems by the transfer of knowledge has been given an important position in the literature in association with the increase in efficiency of ILAs (often due to scaling effects) (Gellynck et al. 2006).

The disadvantages of the spatial concentration within an ILA are mainly considered to be due to conflicts over resources or objectives. Different claims on resources within a region lead to an increased potential for conflicts between the regional stakeholders<sup>†</sup> due to objective antagonism. In summary, the change in the function of rural regions and the structural change in agriculture have also led to such regional resource conflicts in ILAs in many places (Novek 2003, Wing & Wolf 2000, Caldwell 1998).

Table 1 provides a literature overview of both the advantages of an agglomerated network within the agri-food industry and the disadvantages due to resource conflicts arising in association with an increasing concentration of regional livestock farming, leading to a crowding of the region.

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<sup>†</sup> The term "regional stakeholders" includes all those people or groups that use the region in some form (e.g. for business, residence or leisure) and who can influence the development of the livestock farmer through competition or conflict (e.g. due to complaints, blocking of building applications, competition for land, etc.).

**Table 1.**  
Literature concerning the effects of ILAs on livestock production conditions

Agglomeration advantages of ILAs		Resource conflicts associated with an increasingly crowded ILA	
<i>Marketing structures within sales market</i>	Theuvsen & Franz 2007; Schulze et al. 2006; Spiller et al 2005; Theuvsen 2004; Den Ouden et al. 1996	<i>Increasing lack of land</i>	Breustedt and Habermann 2008, Nds. Landesamt für Statistik 2001-2007; BMELV 2005
<i>Possibility of outsourcing</i>	Igata et al. 2008; Belcourt 2006; Deavers 1997	<i>Building construction limitations</i>	Albersmeier et al. 2009; Mann & Kögl 2003; Tilman et al. 2002
<i>Social relationships &amp; personal contacts</i>	Scharper et al. 2010; Müller et al. 2007; Dannenberg & Kulke 2005; Wilson 2002	<i>Environmental and landscape conservation</i>	Cambra-López 2010; Ilea 2009; Berkhoff 2005; Hao et al. 2005 Miller 2001; Speir et al. 2003
<i>Close proximity to business partners</i>	Appleby et al. 2008; Deimel et al. 2008	<i>Areas of societal conflict</i>	Wing & Wolf 2000; Lohberg 2001; Caldwell 1998
<i>Transfer of knowledge &amp; know-how</i>	Dannenberg & Kulke 2005; Gellynck et al. 2006; Bathelt & Glückler 2003	<i>Animal hygiene &amp; disease</i>	Hartung 2007; BMELV 2005; Knickel 2002

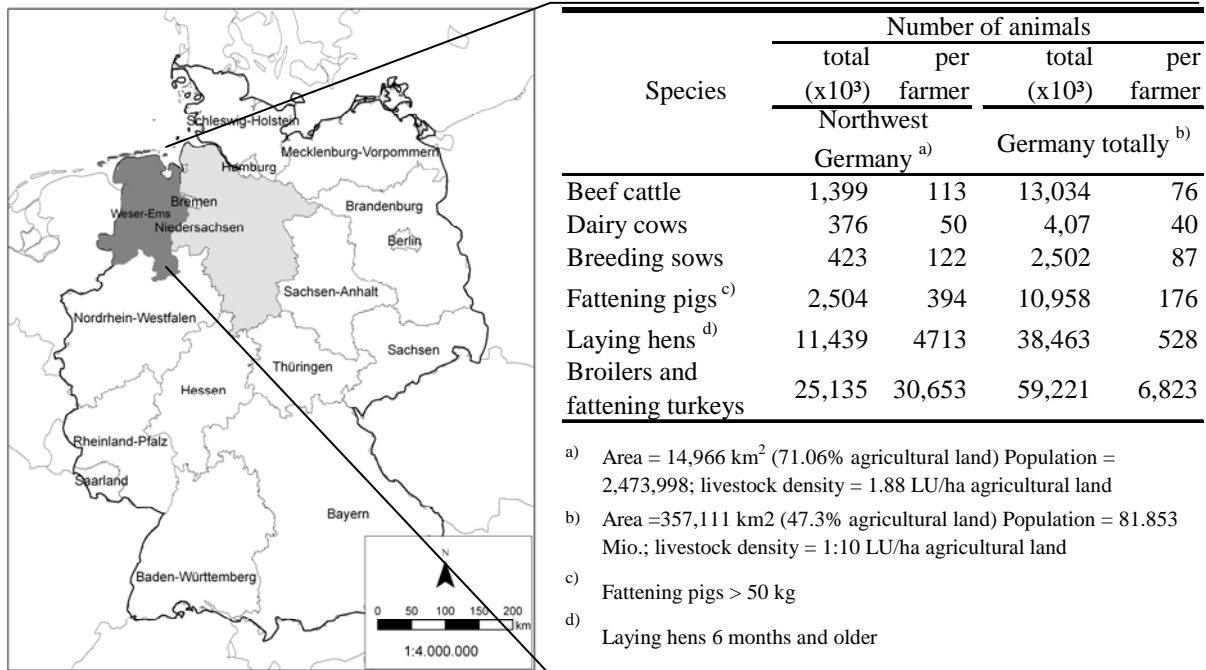
Among the advantages of an ILA, the improved organisation of the value-added chain has become increasingly the focus of agro-nutritional research in the past. Reflecting this, in Table 1, the “*marketing structures within the sales market*” refers to both the vertical and horizontal marketing structures within the value-added chain. In addition to the marketing advantages of ILAs, the high capacity milieu of the resident commercial enterprises provides the “*possibility of outsourcing*” of products and services for the local livestock owner both in the upstream and downstream areas of production.

It is known that in ILAs the commercial enterprises have a close cooperation with the primary producers. “*Social relationships & personal contacts*” refer to the positive effects of the network on the contact behaviour of the cooperation partners within ILAs. Many network theories consider that it is this social networking which is the main positive effect of agglomerations. In contrast to the close connection of cooperation partners, the “*close proximity to business partners*” refers purely to the overcoming of transportation distances, an aspect which still has an important significance in primary agricultural production. In addition to the transportation of material goods, the advantages of an ILA especially include the transfer of immaterial goods, which affects people’s participation in “*knowledge and know-how*”. The nonstandardised, implicit knowledge within such a region is given a special standing in this respect.

The most commonly discussed issues of resource conflicts in ILAs are an “*increasing lack of land*” for the application of manure or “*building construction limitations*” due to immissions regulations. In addition to the competition within the agricultural community itself, agriculture is often constrained by “*environmental and landscape conservation*” because of its immissions potential. “*Areas of societal conflict*” also often arise due to the negative external effects of livestock husbandry (e.g. smell). A higher danger of infectious and epizootic diseases is associated with a regional concentration of livestock, so that the aspect of “*animal hygiene & disease*” has increasingly been included in the discussion about the consequences of an ILA for the animal production systems.

### 3 Study Area

The ILA region used in this investigation was chosen because it was and is affected to a great extent by the problems affecting ILAs in general. The region lies in Northwest Germany and was formerly the Weser-Ems<sup>‡</sup> administrative district. This region (subsequently referred to as Northwest Germany) not only forms the heart of German livestock production but with respect to its corporate structure and productivity is a modern, market-orientated stronghold of downstream processing respected by the world of international agribusiness (Windhorst & Grabkowsky 2008). Figure 1 shows the geographical position of the region within Germany, its livestock numbers and demographic structure.



**Figure 1.** Map showing the position of the investigated region in Germany with an overview of the different types of livestock present in the region

(Windhorst & Grabkowsky 2008; Niedersächsisches Landesamt für Statistik 2001-2007; Statistisches Bundesamt 2007)

The information about the livestock numbers in Figure 1 emphasise that pig and poultry farming play a central role in the region. If one compares the actual numbers of livestock in this ILA, which covers 5.5% of the land used for agriculture in Germany, then the high concentration of animals in this region can be underlined even further. In other words: only 3% of Germany's human population live in Northwest Germany, but the region virtually produces every third egg (29.74% of all laying hens), every second broiler and fattening turkey (43.44% of the total population) and every fourth pig (fattening pigs 22.85%, breeding sows 16.90%) in Germany. In addition to livestock farming, numerous specialised agri-food companies are resident in the region, which in addition to their mainly international sphere of action have pronounced knock-on effects for advantageous production conditions for the region's agriculture systems (Windhorst & Grabkowsky 2008).

Also, the agricultural and food sector is very important for the regional economy in Weser-Ems. 14 700 social insured inhabitants of the region work in agriculture (totally 716 210 social insured). The importance of the food industry is more considerable of all social insured inhabitants working at processing trade. One in five (36 639) in the region works in the food industry. Particular, slaughter and meat processing is important. One of ten jobs in this business in German is here located in the study area (15 574) (Baürle 2008).

<sup>‡</sup> The area is now divided into 11 districts (Ammerland, Aurich, Cloppenburg, Emsland, Friesland, Grafschaft Bentheim, Leer Oldenburg, Osnabrück, Vechta, Wesermarsch, Wittmund) and 5 urban districts (Delmenhorst, Emden, Oldenburg, Osnabrück, Wilhelmshaven)

## 4 Material and Method

A questionnaire was designed using the theoretical explanations for the effects of ILAs on production conditions as a basis (see Table 1), containing 39 questions – mainly coupled with 5-point Likert scales ([-2] < > [+2]).<sup>§</sup> The survey using this questionnaire was undertaken online throughout the whole of the study region. As the comprehensive questionnaire had a number of parts, filters were included in the online survey so that the probands could ignore the sections referring to a more in-depth analysis of the effects of location that did not apply to them<sup>\*\*</sup>. The sample consists of 136 farmers out of the study region in Northwest Germany, who represent all three major types of animal farming undertaken there. In the sample the number of pig farmers (27.7% breeding sows, fattening pigs 54.7%) is over-represented slightly towards the whole region Weser-Ems (18.2% breeding sows, fattening pigs 33.45%). This is also relevant for the poultry production (sample = broilers and fattening turkey 21.2%, laying hens 6.6% 4.3%; Region = broilers and fattening turkey 4,3%, laying hens, 12.8%). In addition to a nearly uniform proportion of dairy cow farms (32.1% sample; region 39.9 %), the beef cattle farms are underrepresented at sample (sample 19.0%, 65.1% of region). The animals per farm concerning the pig farms (258 sows and 1323 fattening pigs per farm) and the poultry production (broilers and fattening turkey 176137 and 31117 laying hens per Farm) are slightly higher in the sample than in the region (122 sows, 394 fattening pigs, 30600 broilers and fattening turkey and 4700 laying hens). The structure of the dairy cow farms is also bigger in the sample (sample = 70; region = 50), concerning the Beef cattle farms this is vice versa (sample = 93; Region = 113) (Windhorst & Grabkowsky 2008).

The statistical evaluation of the results of the questionnaire was undertaken using SPSS, Version 17 (PASW Statistics - SPSS 17. for Windows). For a more detailed analysis of the probands' perceptions of the ILA in Northwest Germany, a factor analysis was undertaken so that a summary of the strongly correlating variables could be achieved and assumptions about the underlying factors could be made (Berthold & Hand 2007). To recognise those factors involved in trust in sustainability, in addition to descriptive statistics, a factor analysis was subjected to a regression analysis, with the "trust in sustainability" (Q27) forming the dependent variable.

## 5 Results

### 5.1 Perceptions from an ILA

That their location in an ILA had an effect on their production conditions was confirmed by 96% of the probands from Northwest Germany (Appendix A: Q1, Q2 = -1, -2, +1,+2). This clearly reflects the importance of the objectives of this investigation for the animal production systems in this region. Purely disadvantageous consequences were perceived by 29% of the probands (Q1= -1, -2), while 13% perceived only advantageous ones (Q2= +1, +2). Indeed, the majority of the probands tended to have a negative attitude to the effects of their location on their business (54% saw both advantages and disadvantages). There were no significant correlations between the size of the farm and the farmer's assessment of the location effects.

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<sup>§</sup> The questionnaire statements used in the analyses are listed in Appendix A (Q1-Q27). The reason for the different number of questions (39 questions hole survey) toward the indicated questions (Appendix A: 27 questions) is, that only 27 questions are included in the analyses.

<sup>\*\*</sup> This resulted in a variation in the size of the sample for some of the statements (c.f. Appendix A).

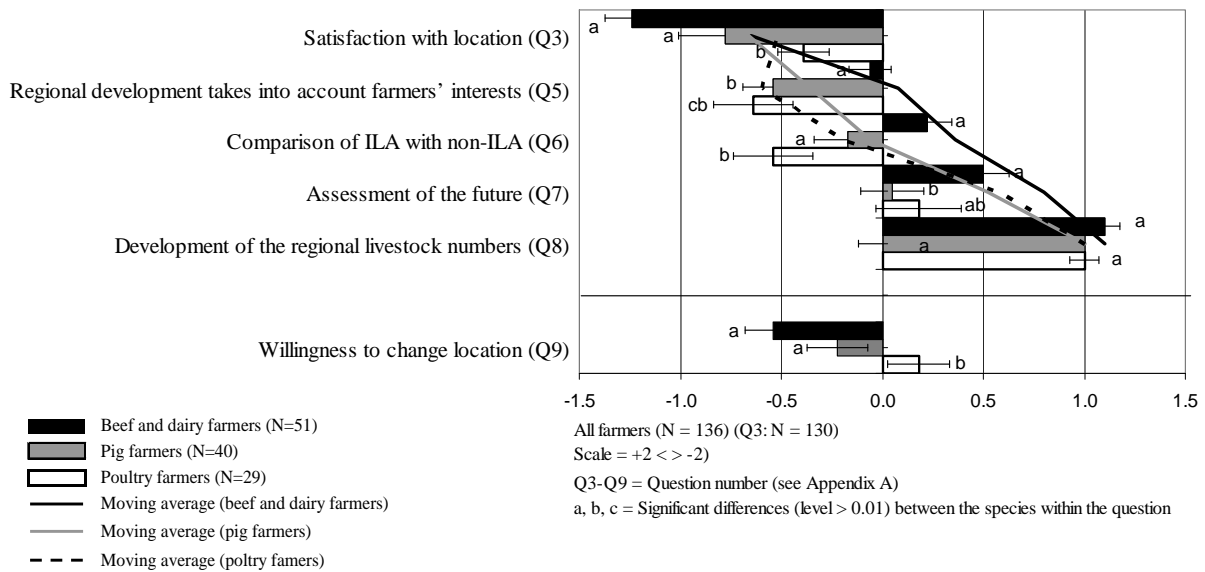
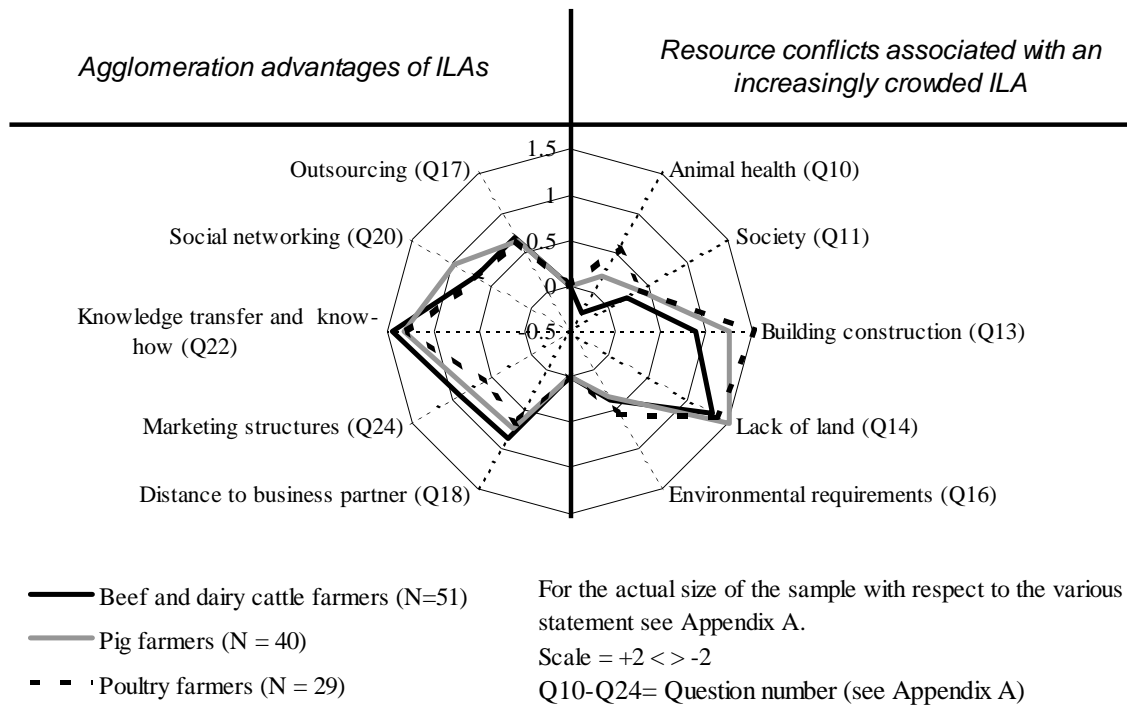


Figure 2. The probands' perception (LSM + SE) of their ILA as a production location

Figure 2 shows the farmers' general assessment of their farm's location according to species. In accordance with the probands' general negative attitude to the effects of location, it is obvious that the majority of farmers were clearly dissatisfied with their location in the ILA (Q3  $\mu=-0.89$ ;  $\sigma=0.115$ ); especially the beef and dairy farmers lie above the mean value (Q3  $\mu=-1.24$ ;  $\sigma=0.130$ ). In contrast to the high degree of dissatisfaction of these farmers, they considered that the regional development did not take into account farmers interests (Q5  $\mu=-0.06$ ;  $\sigma=0.105$ ) than either those of the pig (Q5  $\mu=-0.54$ ;  $\sigma=0.149$ ) or poultry farmers (Q5  $\mu=-0.64$ ;  $\sigma=0.128$ ). Indeed, the beef and dairy farmers showed a preference for having a business location in an ILA in the general comparison of location (Q6  $\mu=0.22$ ;  $\sigma=0.125$ ).

Despite having a high perception of the negative effects of being located in an ILA, the majority of the probands – with differences between the species – considered the future of their farm in Northwest Germany to be positive (Q7  $\mu=0.26$ ;  $\sigma=0.091$ ). Also the probands were almost unified in their opinion that there is abundant potential for an increase in the number of animals in the study region (Q8). Virtually nine of ten probands assumed that there will be an increase in livestock numbers within the next ten years ( $\mu=1.01$ ,  $\sigma=0.057$ ). This clear discrepancy between the perception of the negative consequences of the ILA on the one hand and the positive assessment of the regional and business development on the other (see the trend lines in Figure 2 for questions Q3, Q5, Q6, Q7 and Q8) is due to the livestock farmer's lack of geographical flexibility (Q9): only every fifth proband was willing to change to another location for commercial reasons ( $\mu=-0.22$ ,  $\sigma=0.084$ ).

To enable a closer analysis of the effects of location, Figure 3 shows the mean values of the previously described advantageous and disadvantageous effects of being located in an ILA on the production conditions (see also Table 1).



**Figure 3.** Comparison of the means of the probands' perceived effects of location on the production conditions for their farms

It is clear from these results that the effects of location described in the literature (Table 1) were perceived at the farm level; however, there are clear differences between the location factors and the species farmed. Under the agglomeration advantages, the significance of the transfer of knowledge and know-how within the ILA stands to the fore (Q22  $\mu=1.40$ ;  $\sigma=0.070$ ). The importance of implicit and nonstandardised knowledge described in the literature was also perceived by the probands, as they gave importance to the learning curve effects of knowledge being shared between cooperation partners (Q23). For 71.1% of the farmers, the enhanced knowledge for their business resulted from the exchange of information with similar enterprises within the ILA (Q23d  $\mu=1.24$ ;  $\sigma=0.083$ ). In addition to this implicit knowledge, the specialised advisory services present within the region (Q23e  $\mu=1.04$ ;  $\sigma=0.082$ ) coupled with the possibilities for training and further education (Q23a  $\mu=0.84$ ;  $\sigma=0.089$ ) were considered to be of high influence. Scientific institutions had – according to the probands – little influence on the knowledge at the farm level (Q23b  $\mu=0.03$ ;  $\sigma=0.090$ ).

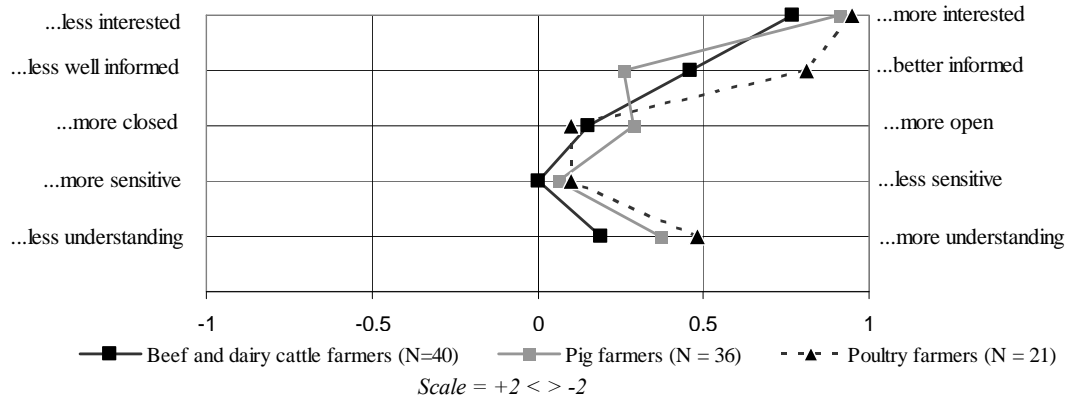
The importance of social networks (Q20  $\mu=0.82$ ,  $\sigma=0.098$ ) underlines the effects of agglomeration on the farmer's contact behaviour, with personal contacts having an especially high value (Q21d,  $\mu=1.08$ ;  $\sigma=0.070$ ). Advantageous marketing structures (Q24  $\mu=0.79$ ;  $\sigma=0.090$ ) were particularly appreciated by the pig farmers (Q24  $\mu=0.93$ ;  $\sigma=0.138$ ). The greater choice with respect to buyers in the region formed an important determining factor (Q25a  $\mu=1.13$ ;  $\sigma=0.069$ ). Next to the middling importance of marketing cooperatives (Q25c  $\mu=0.62$ ,  $\sigma=0.106$ ), there was no preference for the more large-scale buyers resident in the region; at least this was not evident in the perception of a higher disbursement (Q25d  $\mu=-0.13$ ;  $\sigma=0.091$ ).

According to the livestock farmers questioned in Northwest Germany, the most important resource conflicts were associated with an increasing lack of land (Q14  $\mu=1.45$ ;  $\sigma=0.063$ ) and an increase in the problems associated with the construction of new buildings (Q13  $\mu=1.06$ ;  $\sigma=0.090$ ). Environmental requirements were considered to be less of a problem (Q16,  $\mu=0.36$   $\sigma=0.079$ ), however, the probands considered that environmental protection organisations, in general, keep a particularly beady eye on livestock farmers working in an ILA (Q17b  $\mu=0.36$ ;  $\sigma=0.75$ ).

Figure 3 clearly shows that, in contrast to the cattle and pig farmers, poultry farmers have little perception of the advantages of an ILA and they are particularly sensitive to resource conflicts associated with an increasingly crowded region. There was a consensus under all the probands that existing conflicts were due to competition within the agricultural sector, with other stakeholders playing a subordinate role (Q4 a-f). A total of 77.3% of the probands considered adverse effects caused by other farmers as being either "significant" or "highly significant" (Q4f  $\mu=1.11$ ,  $\sigma=0.073$ ).

The probands considered that society's attitude to agriculture was more positive in ILAs than in regions with fewer animals (see Figure 4). This figure shows only those probands who considered societal prejudices as being important (Q11 = +1/+2).

"What is your assessment of the local population's attitude to animal husbandry in ILAs? Does this differ from the attitude in people living in other types of region? The local population in Northwest Germany is/has..." (Question 12; Appendix A)



**Figure 4.** Comparison of the means of the societal attitude to animal husbandry in ILAs and other locations according to the probands' perceptions

It is obvious that the farmers thought that the society within the ILA had an enhanced interest in animal husbandry (Q12a  $\mu=0.91$ ;  $\sigma=0.069$ ). Also the probands felt that the local population was better informed (Q12b  $\mu=0.44$ ;  $\sigma=0.100$ ) and that they were more open-minded (Q12c  $\mu=0.22$ ;  $\sigma=0.086$ ) than people living in other types of regions. With respect to the negative effects of livestock husbandry, almost all the probands thought that the local population did perceive these negative effects. However, the probands did not think that ILAs' population was more sensitive to this than in other regions; indeed, they thought the local people were somewhat less sensitive (Q12d  $\mu=0.02$ ;  $\sigma=0.114$ ) and they deemed that the society within the ILA had a more understanding reaction to such negative effects (Q12e  $\mu=0.31$ ,  $\sigma=0.104$ ).



## 5.2 Trust in Sustainability

Table 2 depicts the results of the regression analysis and the composition of the factors used

**Table 2.**  
Results of the regression analysis and the composition of the utilised factors

Dependent variable: "How much trust do you have in the sustainability of your business in the ILA in Northwest Germany?" (Q27)										
Factor	Variable	No.	Factor analysis		Regression analysis					
			Factor weight- ing	Explained variance	Cron- bach's $\alpha$	$\beta$ value	T value	Signifi- cance		
(a)	Transfer of knowledge & know-how	...specialist knowledge	Q23(f)	0.838						
		...specialised advisory services	Q23(e)	0.756						
		...knowledge & know-how within the whole ILA	Q22	0.613	11.68%	0.674	0.166	2;291	0.024	
(b)	Spatial & social proximity to sales market	The close proximity to my business partners is advantageous for my business relationships	Q20	0.802						
		Competitive edge due to the close cooperation with companies in the upstream and downstream areas	Q23(c)	0.733	24.56%	0.713	0.298	3;961	0.000	
		...provides advantages due to the shorter distances to your business partners	Q18	0.697						
		...distance to buyers (abattoir, dairy, merchants etc.)	Q19(e)	0.623						
(c)	Environmental & landscape conservation	...as a farmer in an ILA I am more closely watched	Q17(b)	0.805						
		...in general, the environmental constraints are very strict	Q17(a)	0.741	9.75%	0.631	-0.19	-2;449	0.016	
		Regional environmental, landscape or water protection areas constrain my development possibilities	Q17(c)	0.698						
(d)	Increasing lack of land	I have to rent land as there is not enough land to buy	Q15(c)	0.722						
		Due to the area being an ILA, there is strong competition for agricultural land	Q14	0.706						
		The cost of land is very high	Q15(b)	0.696	15.24%	0.651	-0.2	-2;663	0.009	
		Despite only average soil quality, high rents have to be paid	Q15(d)	0.66						
(e)	Perceived need for regional developmen*	Q5			0.313		-4;178	0.000		
(f)	Relationship network between business partners	...business relationships are uncomplicated	Q21(b)	0.771						
		...the trust relationship is better adapt themselves better to my needs	Q21(a)	0.682						
		...the exchange with similar farms from the surrounding area	Q21(c)	0.665	13.23%	0.72	0.131	1;732	0.086	
		...the exchange with similar farms from the surrounding area	Q23(d)	0.528						

$R^2 = 36.7\%$ ;  $Q = 11.997$

\* Individual statement: "What do you think? How well are your interests represented by the region's politicians with respect to these target groups?"

The results reflect the important theoretical explanations of the effects of an ILA (see Introduction Table 1). Under the advantageous effects on the trust in sustainability, the *“transfer of knowledge and know-how”* has a high position (a). Next to the importance of the transfer of knowledge between cooperation partners, the advisory services (Q23e) and the specialist knowledge within the region (Q23f) also have a positive influence. Further advantages were considered to be due to social components and underline their importance for livestock farmers within an ILA. In particular, the *“relationship network between business partners”* (f) and the *“spatial & social proximity to sales market”* (b) were found to be of significance. The social components were not only expressed in the low degree of geographic flexibility (Figure 2, Q9), but also had an important influence on the economic processes within the ILA. The *“perceived need for regional development”* (e) was included in the regression as a single statement as it underlines the significance of the study’s objectives.

Under the reasons for resource conflicts, in addition to *“increasing lack of land”* (d), the adverse effects caused by *“environmental and landscape conservation”* (c) became obvious. On top, the need for large land for the distribution of manure and the environmental requirements within the ILA were considered by the probands to be responsible for the unfavourable situation present there. Not only the local environmental and landscape conservation areas (Q17c) but also the particular surveillance of farmers within the ILA is considered as being responsible for these adverse effects (Q17b). The building construction problems related to the farm being in an ILA seen in the descriptive statistical analysis (Q13) could provide no further explanatory for the trust in the sustainability.

## 6 Discussion

The probands’ perceptions of their farms’ location in Northwest Germany make clear that the effects of being located in an ILA are not just theoretical, but actually exist for the livestock farmers living in such a region. Although the livestock numbers in ILAs tend to increase disproportionately with respect to other regions, the probands perceived their ILA as having advantageous production conditions even though they were confronted with increasingly crowded conditions with respect to animal numbers.

Even when public discussion has given the impression that there is always a primary conflict potential between the livestock farmer and other regional stakeholders, the interviewed farmers saw societal conflicts as being first and foremost due to competition within the region’s agricultural sector. In fact, society’s attitude to animal husbandry in the study ILA was rated by the probands to be far more positive than in regions with a lower concentration of farm animals.

The resource conflicts which had an important negative effect on the probands’ trust in the sustainability of their farms were an increasing lack of land for the application of manure and the constraints put on the farmers by environmental and landscape conservation. The increasing problem of building construction restrictions must be included in the most important sources of competition for resources, too. In addition, it should be noted that the probands’ perceptions of the resource conflicts differed according to which species they farmed.

In contrast to the higher perception of the negative effects of having their farm located in Northwest Germany, the probands considered that there is still a great potential for increasing the livestock numbers even further in this region. One of the reasons for this is the probands being highly tied to their location as only every fifth of the livestock farmers was willing to change the location for commercial reasons.

Another reason is the probands’ perception of the ILA’s also generally considered to have significant advantages for production. The perception of the specialist know-how and the transfer of knowledge had a substantial influence on this for the livestock farmers questioned. The probands’ perception of such advantageous effects also indicates, that the significance of subliminal and social contacts in networks has also an important standing in the advantages of agglomeration in ILAs and things are not completely just orientated to the mental make-up of Homo oeconomicus. The probands’ social embeddedness in their region also supports this.

The high influence of these social elements supports the demand that network connections should be considered more in the analysis of value addition in ILAs (Lazzarini et al. 2001, Wilson 2000). The perceptions of location of the investigated livestock farmers make clear that a limitation of value-adding activities to being just sequential supply chains is not adequate for describing the significance of network relationships in ILAs and social network analysis should also be included in such studies. Also Deimel, Theuvsen Ebbeskotte (2008) confirmed the results and indicate the good structural requirements for network participation in Weser-Ems.

## 7 Conclusion

In conclusion, the perception of location of the 136 livestock farmers in Northwest Germany shows that it is imperative to assess the future perspectives of ILAs according to the principles of precaution. The perceived consequences of the high concentration of animals in the region revealed that the present development of increasing livestock numbers cannot *per se* be assumed for the future because the probands already perceived the occurrence of resource conflicts clearly.

The study has shown that livestock farming systems in ILAs are in a dilemma at present: the location has advantages which are due to its human elements and social capital, that in turn lead to a low geographic flexibility of livestock farmers. The analyst mobility barrier prevents the farmers from responding to changing conditions within an ILA and is an indicator for a further increase in conflicts in such regions. In the future, for this reason, the development of strategic solutions with respect to the use of land and the construction of animal housing will become more important. Therefore, the perceived advantages and disadvantages of an ILA found in this study must be included as part of the overall context of regional targets in any future discussions about measures ensuring the sustainable development of ILAs. Certainly, the probands' perceptions about the agglomeration advantages and resource conflicts in the ILA in Northwest Germany have made clear which location factors are important according to the opinion of livestock farmers, which have to be considered for the sustainable development in these regions.

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**Appendix A: List of questionnaire statements included in the analysis**

	n	$\mu$	$\sigma$
Q1 Do you basically think that the ILA can also have negative effects on the development of your farm?	135	1.16	0.08
Q2 Do you think that in general that the intensive ILA in your area has had advantageous effects on your farm (e.g. by having highly qualified companies close by, better marketing opportunities, etc.)?	136	1.32	0.04
Q3 How happy are you with the present perspectives of your farm in the ILA of Northwest Germany?	130	-0.9	0.12
Q4 <i>In the following you should assess the significance of the regional stakeholders for your enterprise. The regional stakeholders include the farmers and other people or groups who use this region of Northwest Germany for commercial, residential or leisure purposes.</i> Which stakeholders are important for the development of your farm (e.g. competition for land, protests against stall construction, etc.)?			
a) Industrial enterprises	136	0.04	0.08
b) Tourists and people doing leisure activities	136	-0.1	0.08
c) Environmentalists (including nature protection areas)	136	0.63	0.08
d) Villagers	136	0.6	0.08
e) Local politicians	136	0.66	0.09
f) Other farmers	136	1.11	0.08
Q5 What do you think? How well are your interests supported by regional politics against these stakeholders?	136	-0.3	0.07
Q6 Do you think that being located in an ILA is better or worse than being situated in a less intensively farmed area?	130	-0.1	0.09
Q7 How sustainable do you think your farm in Northwest Germany is? Do you think that the future prospects for your farm at its present location are good or bad?	136	0.26	0.09
Q8 What do you believe will be the development in livestock numbers in Northwest Germany over the next 10 years? Will the number of animals increase or	136	1.01	0.06
Q9 Would you be willing to set up a farm in another region (>100 km) if at your present location you have no possibility of developing your enterprise any further?	136	-0.2	0.08
Q10 <i>A high regional concentration of animals can cause negative effects on animal health (e.g. transmission of disease, danger of epidemics, etc.).</i> How have negative effects due to the high concentration of animals in the region affected your farm?	110	0.09	0.1
Q11 <i>In addition to the internal effects on your farm from intensive animal husbandry, the ILA can also have negative effects on the local population (e.g. smell, noise, etc.).</i> Do you consider that conflicts with the local inhabitants arising due to the intensive animal husbandry within the region have affected the development of your farm?	110	0.31	0.1

	n	$\mu$	$\sigma$
Q12 What is your assessment of the local population's attitude to animal husbandry in ILAs? Does this differ from the attitude in people living in other types of region? The local population in Northwest Germany is/has ...			
a) ... less interested <=> ... more interested	87	0.91	0.07
b) ...less well informed <=> ...better informed	87	0.44	0.1
c) ...less open <=> ... more open	87	0.22	0.09
d) ...more sensitive <=> ...less sensitive	87	0.02	0.11
e) ... less understanding <=> ... more understanding	87	0.31	0.1
Q13 <i>One possible negative effect in ILAs is the increasing lack of land for constructing stalls.</i> How important is this problem for your farm?	113	1.06	0.09
Q14 <i>In addition to this problem, there is often a lot of competition for agricultural land in ILAs.</i> How true is this for the location of your farm?	112	1.45	0.06
Q15 Which of the following statements about competition for land apply to your situation?			
a) There is very little agricultural land offered for sale.	110	0.85	0.09
b) The price of land is very high.	110	1.6	0.05
c) I have to rent land as there is not enough land for sale.	110	1.21	0.1
d) High rents have to be paid despite only average soil quality,	110	1.68	0.06
Q16 How severe are the adverse effects due to environmental legislation for your farm?	110	0.36	0.08
Q17 What is your opinion with respect to the following statements or environmental requirements?			
a) Overall, the environmental constraints put on my business are very high.	96	0.76	0.08
b) I, as a farmer in an ILA, am subjected to a greater degree of surveillance with respect to environmental protection than other farmers.	96	0.89	0.08
c) The regional nature, water and landscape conservation areas in Northwest Germany restrict my farm's development.	96	0.79	0.11
Q18 How high are the advantages of the ILA for your farm with respect to having shorter distances to your business partners (cooperatives, feed merchants, stall fitters, buyers, etc.)?	91	0.78	0.08
Q19 To which of the following business partners is distance of special importance to you?			
a) Feed merchants	84	0.52	0.11
b) Stall construction and fitting companies	84	-0.02	0.09
c) Agricultural organisations (Chamber of Agriculture, farmers' organisations, etc.)	84	0.6	0.09
d) Veterinarians and other people involved in animal health (e.g. AI technicians)	84	1.17	0.08
e) Buyers (abattoir, dairy, merchants, etc.)	84	0.62	0.09
f) Advisory services	84	0.73	0.09
g) Business partners in arable farming	84	0.68	0.1

	n	$\mu$	$\sigma$
Q20 To what extent does the following statement reflect your own situation? "The close proximity to my business partners has a positive effect on my business relationships".	91	0.82	0.1
Q21 How do you value the following statements about your relationship to your business partners? Through our close proximity,...			
a) ...we have a greater degree of trust in each other	85	0.64	0.1
b) ... our business relationship is less complicated	85	0.61	0.1
c) ... my business partners can adapt themselves to my needs better	85	0.72	0.09
d) ... my business partner can visit me in person	85	1.08	0.85
Q22 <i>Having a knowledge "edge" in downstream processing is often talked about in the region.</i> How important do you think specialist knowledge and know-how from the whole ILA is for your farm?	91	1.4	0.07
Q23 Where does your knowledge "edge" come from? It comes from...			
a) ... training and further education possibilities	90	0.84	0.09
b) ... scientific institutions	90	0.03	0.09
c) ...the close cooperation with companies in both upstream and downstream production areas	90	0.81	0.09
d) ...the information exchange with similar enterprises within the region	90	1.24	0.08
e) ... specialised advisory services	90	1.04	0.08
f) ...general specialised knowledge about animal husbandry found in the ILA	90	1.16	0.08
Q24 Do you agree that the location of your enterprise in an ILA works advantageously with respect to your marketing structures (e.g. to cooperatives, producer groups, etc.)? Or do you tend to reject this notion?	91	0.79	0.09
Q25 What is your assessment of the following statements about the marketing structures in Northwest Germany with respect to your farm? Are they applicable?			
a) I have a higher degree of choice between buyers.	85	1.13	0.07
b) The working together of a number of farmers increases their bargaining power with respect to the buyers.	85	0.55	0.11
c) The producer and marketing cooperatives are better organised.	85	0.62	0.11
d) The large-scale buyers resident in the region pay better prices to the farmers than the smaller ones.	85	-0.1	0.09
e) The cooperation is better (e.g. coordination, flow of information, etc.).	85	0.42	0.08
Q26 <i>Due to the settling of many agricultural service organisations in Northwest Germany, there is a greater possibility of outsourcing work from the farm (e.g. cleaning of stalls, AI, mobile milling and mixing systems).</i>  How much is this an advantage for your farm?	91	0.77	0.11
Q27 What would you say is your level of trust in the sustainability of your farm in the ILA of Northwest Germany?	130	-0.6	0.2