4.0 Application Case Study: Noord-Brabant

4.1 Context & Objectives

Using the RAMEA for Noord-Brabant, the different production sectors of the economy have been ranked in relation to their relative contribution to the range of indicators and environmental aspects. A good indicator for ecological efficiency is the relationship between the relative contribution of a particular sector to emissions in Noord-Brabant and that sector's relative contribution to the region's economic performance. The economic variables used were output, gross value added (GVA) and employment.

The analysis highlighted potentially significant environmental impacts associated with the agricultural sector, in terms of the following emissions:

Environmental Aspect / Emission	Percentage of Noord-Brabant Total Emissions
Greenhouse Gases	15%
Eutrophication	65%
Acidification	51%
N_2O	51%
CH_4	91%
NH_3	96%
N	69%
P	63%

The RAMEA data and indicators for Noord-Brabant were then analyzed and compared with the data from the three other European regions of Emilia-Romagna, Malopolska and South East England. This was followed by a more detailed assessment of sub-sectoral aspects of the agricultural sector, to achieve a better understanding of these issues and to try to identify measures to improve the environmental impact of this sector, whilst maintaining economic performance.

4.2 Agricultural Sector Analysis

4.2.1 Application of RAMEA

The Environmental Dimension of Agriculture
An analysis of the RAMEA of 2003 produces the following results for the agriculture sector in Noord-Brabant (N B). In terms of economic output it contributes 2.84% in NB, compared to 17.9% for the Netherlands (NL) as a whole. It also contributes 1.87% to the gross value added, 1.2% to the compensation of employees, 2.8% to the gross operating surplus and 3.62% to employment in NB.

However, in relation to environmental impact, the agricultural sector in NB contributes 6.42% to the total CO_2 emissions of production (6.22% of total emissions), 51.24% to N_2O emissions (50.25%), 91.59% to the CH_4 emissions (87.83%), 16.07% to the NOx emissions (13.45%), 13.71% to the SO_2 emissions (13.44%), 96.52% to the NH_3 emissions (90.45%), 69.19% to N emissions (58.24%), 63.21 to the P emissions (53.99%), 1.1% to the waste (0.7%), 25.33% to the PM_{10} emissions (20.14%), 15.44% to GHG theme of production (12.88), 51.72% to acidification (46.12%) and 65.97% to eutrophication (55.96%).
From these numbers it is evident that the agricultural sector in NB has relatively high impact on the environment in terms of air emissions, which in principle, is also valid for the rest of the Netherlands. The agricultural sub-sectors of Noord-Brabant were then compared with data from the other regions, summarized in the table opposite.

Table 1

Agricultural Sector	NB	MP	SE	ER
GHG/output 2003	1.19	1.93	0.06	0.88
GHG/GVA 2003	3.94	5.21	0.14	1.40
GHG/pop.2003	1921,43	563.28	24.53	1142.33
Acidification / output 2003	0.02	n.a.	n.a.	n.a.
Acidification / output 2003	0.36	n.a.	n.a.	n.a.
Acidification / GVA 2003	1.19	n.a.	n.a.	n.a.
Acidification / capita 2003	577.32	0,40	n.a.	0,70

Data source: P Stauvermann Calculations and data from RAMEA partners

Unfortunately, comprehensive data is not currently available for ER and SE. However, looking at the available data of the agricultural sector, the GHG emissions per output, GHG emissions per gross value added and GHG emissions per inhabitant in NB in almost every case are higher than in ER and SE. Only the GHG emissions per output and per GVA in MP are exceeding the values in NB. Why is this so in NB?

To try to answer to this question, the number of farm animals in each region was analyzed, taking into account the farms grazing and / or breeding livestock; in NB farm animal ownership ranges between 52% (COROP West-Noord Brabant) and 67% (COROP Centraal Noord-Brabant) of farms[8].

[8]The figures are based on the work of Bos, de Haan & Sukkel (2007) and calculations by P Stauvermann.

Table 2

2003	Emilia-Romagna	The Netherlands	Noord-Brabant	Malopolska	South East England
units	'000	'000	'000	'000	'000
Beef Cattle	652.4	3759.2	638.9	273.9	496
Cows	301.6	1621.8	238.5	183.2	180
Buffalos	0.6	0	0	0	0
Pigs	1579.9	11169.1	4787.3	538.3	289
Sheep	89.8	1184.6	83.3	79.1	980
Goats	8.4	274.2	105.2	25.1	na
Horses	na	126.3	27.4	33.8	na
Poultry	na	81232	23198.5	6340.1	na
Total surface in 1000 ha	2211.7	3735.8	508.2	1519	na
Agricultural Surface in 1000 ha	1166.6	1924.3	260.3	749	1065.5

Data source: Eurostat 2007

This indicates that the numbers of cattle and cows in NB are higher than in the other regions. The agricultural land area is also much larger. The number of pigs in NB is at least twice as high as in the other three regions. Additionally, just around 43% of all Dutch pigs are located in Noord-Brabant. The table below assesses the density of animals per ha (100m x 100m) of the total regional area.

Table 3

2003	Emilia-Romagna	Netherlands	Noord-Brabant	South-East England	Malopolska
Animals/ha					
Beef Cattle	0.294	1.00	1.252	0.168	0.180
Cows	0.136	0.434	0.469	0.091	0.120
Buffalos	0.0002	0	0	0	0
Pigs	0.714	2.989	9.420	0.589	0.354
Sheep	0.040	0.317	0.163	0.010	0.052
Goats	0.003	0.073	0.207	0.006	0.016
Horses	Na	0.033	0.053	0.010	0.022
Poultry	Na	21.744	45.648	4.679	4.173

Data source: Eurostat and P Stauvermann calculations

This shows that NB also has the highest density of cattle, cows, pigs, goats, horses and poultry. The average occupancy of on an average ha of land in NB comprises 1.2 cattle, 0.5 cows, 9 pigs, 0.2 goats, 0.05 horses and 46 poultry and 0.21 humans. From this viewpoint it could appear that NB is overcrowded with farm animals. If we only take into account the agriculture area of each region we get the following results for NB per ha; 2.5 cattle, 0.9 cows, 18 pigs, 0.4 goats, 0.1 horses, and 89 poultry.

The next table examines the relationship of animals per capita.

Table 4

2003	Emilia-Romagna	Netherlands	Noord-Brabant	Malopolska	South East England
Animals per inhabitant					
Cattle	0.160	0.231	0.265	0.084	0.061
Cows	0.074	0.099	0.099	0.056	0.022
Buffalos	0.0001	0	0	0	0
Pigs	0.389	0.688	1.991	0.165	0.035
Sheep	0.022	0.073	0.034	0.024	0.121
Goats	0.002	0.016	0.043	0.007	na
Horses	na	0.007	0.011	0.010	na
Poultry	na	5.00	9.651	1.953	na

Data source: Eurostat (2007) and P Stauvermann calculations

In NB this averages out at around 12 animals per capita, compared with an average of around 6 animals per capita for the whole of the Netherlands. This explains why the emissions from farms in Noord-Brabant are relatively high in comparison to the three other European regions, because of the relatively high number and density of farm animals.

Of course other economic sectors are also responsible for emissions; however it should be noted that the agricultural sector is the only economic sector that has been subsidized over the last 40 years both nationally and by the EU. This might raise the question whether, given its high share of emissions, the agricultural sector should continue to be subsidized in the future. The next section looks at the economic dimensions of the Common Agriculture Policy (CAP) subsidies.

The Economic Dimension of Agriculture

The following table gives an overview of the extent of the Common Agricultural Policy (CAP) of the EU. It should be noted that the reasoning behind the subsidies is not based solely on economic efficiency considerations, but also on historical decisions. The idea in the 1950's was to give subsidies to farmers to guarantee a sufficient level of food production and to avoid the famine experienced during the war years. Since the 1970s it could be argued that this position is no longer tenable, because from a global perspective there is an excess supply of food.

Table 5

CAP subsidies 2005	**Taxes for CAP**		**Budgetary Loss/ Gain**	
	Total billion EUR	Per capita EUR	Total billion EUR	Per capita EUR
Netherlands	2.493	153.00	-1.225	-75.00
Noord-Brabant	0.368		-0.180	
Poland	1.542	40.00	0.394	10.00
Malopolska	0.130		0.032	
United Kingdom	5.580	90.00	-1.033	-17.00
South East England	0.727		-0.137	
Italy	6.818	118	-1.29	-22
Emilia-Romagna	0.479		-0.089	

Data source: http://farmsubsidy.org

The second column of the table above indicates the total amount of taxes paid by Dutch taxpayers to the EU, the third column - the amount of taxes per Dutch inhabitant per year, the fourth column - how much CAP subsidies a region or country receives total and in the final column, what that means per capita.

This would indicate that every Dutch inhabitant is losing around 75 EUR per year and the Dutch farms receive a total of 1.225 billion EUR, of which the farmers in Noord-Brabant receive 180 million EUR. What does that mean for the specific farm workers and farm land? This can be shown in the following table.

Table 6

CAP subsidies 2005	Average payment per farm in EUR	Average payment per ha farm land in EUR	Average subsidy per farm worker in EUR	Share which is going to the to the top 10 % of those receiving subsidy
Netherlands	9753.00	435.00	4503.00	47.00
Poland	652.00	87.00	647.00	42.00
United Kingdom	14473.00	238.00	11546.00	49.00
Italy	2722	406	3622	69

Data source: http://farmsubsidy.org and P Stauvermann calculations

From the table above it can be seen that the highest subsidy per hectare was paid in the Netherlands (435 EUR per ha) and 47% of all CAP subsidies in the Netherlands are going to the 10% who are receiving the highest subsidies[9]. Probably the average man on the street believes only farmers gain from the CAP subsidies, however this is not the case. The subsidies are going for the most part to food-producing firms such as Nestle or Campina, and not to farmers.

Additionally, this indicates that every job in the agricultural sector in NB is subsidized by 4503 EUR, which equates to around one third of the average yearly disposal income per capita in Noord-Brabant[10]. The labour costs per employee[1] (compensation per employee) are 12556.26 EUR per year. This means that the CAP subsidies reduce the labor costs of an agricultural employee in NB by around one third.

So far this analysis has demonstrated that the agricultural sector is highly subsidized - while the Dutch agricultural sector and the food sector realized a trade balance surplus of 13,235 million EUR in 2005. This means that the NL has produced much more in food and agricultural sectors than is consumed in the Netherlands.

For example in 2005 the Netherlands exported live animals and meat[12] with a value of 99,901,000 EUR to West-Africa (Mauritania, Mali, Burkina Faso, Niger, Chad, Cape Verde, Senegal, Gambia, Guinea Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin). On the other hand, the Netherlands imported live animals and meat with the value of only 584,000 EUR from West Africa. This imbalance of trade, especially with less developed countries, may inevitably have some negative impacts in relation to development policy.

[9]The top subsidy receivers in Noord-Brabant are for example; COOPERATIE VOEDINGS TUINBOUW NEDERLAND U.A. (27 539 488 EUR in 2005); EUR INTERFOOD BV (11.604.815 EUR in 2005); KONINKLIJKE BUISMAN ZUIVELEXPORT BV (10.808.556 EUR in 2005) ALPHA DAIRY B.V. (230.585 EUR in 2005); AGRI-BEST B.V. (3.382.796 EUR in 2005); VAN MELLE NEDERLAND B.V. (2.944.062 EUR in 2005); SENSUS OPERATIONS C.V. (12.588.603 EUR in 2005); CAS FOOD SERVICES B.V. (11.468.910 EUR in 2005). (data from: http://farmsubsidy.org).

[10]The average disposable income per capita in NB was 12800 EUR in 2003 (CBS).

[11]Labour costs are defined as the sum of the gross salary and social security contributions. The figures are based on the CBS and P Stauvermann calculations.

4.2.2 Analysis of the Findings - The Development Aid Dimension

A key objective of development policy is to help less-developed countries (LDCs) to develop their own industries, with particular emphasis on the agricultural sector to avoid famine. However, we have seen that a large part of the Dutch agricultural production is exported. What are the consequences for LDCs?

Taking the poultry market in Ghana as an example, in 1992 the Ghanaian poultry farmers provided 95% of their domestic poultry market, but by 2001 the Ghanaian poultry farmers served only 11% of this market.[13] It has been estimated that Ghana has just around 400,000 poultry farmers, a large proportion of which are unemployed. One third of the poultry meat sold in Ghana has been supplied by Dutch poultry-meat-producing firms, e.g. Nutreco, located in Boxmeer, Noord-Brabant, sold poultry-meat worldwide to a value of just around 3.5 billion EUR. On aggregate 8% of the total poultry exports from the EU are sold to the Ghanaian market.

It should be noted that the exported poultry meat has in principle, no value, because it consists only of the parts of the poultry, which can not be sold within the EU (e.g. chicken legs, chicken necks, chicken wings, chicken heads etc.) like chicken fillets. Alternatively within the EU, these parts could only be sold for the production of animal meal, which is not very attractive. It should also be noted that most of the exported poultry is frozen.

It is also important to note that in addition to the CAP subsidies, the EU also pays an export subsidy so that the export price is competitive. This has also had a significant impact on the Ghanaian poultry market. The minimum local price[14] per kg of locally-produced poultry meat is just around 28,000 cedis (Ghanaian currency) in 2005 whereas the price of imported poultry meat is only 16,000 cedis per kg. The consequence was and is that Ghanaian poultry farmers are being driven out of their own market and becoming increasingly unemployed.

According to Khor (2005) around 40% of all poultry farmers in Senegal have gone out of this business because they could not compete with the European suppliers. The price difference is mainly due to the fact that the export value per ton of poultry of 809 EUR was subsidized by 254 EUR per ton in 2002.

A second negative impact of the imported frozen poultry meat is that maintaining the freezing temperature during transit cannot be guaranteed, which can lead to health problems associated with salmonella and other dangerous bacteria. Interruptions to the refrigeration systems are partly due to a lack of cold stores and refrigerators and partly to a lack of knowledge amongst local consumers on how to treat frozen meat. As a consequence, between 15% and 85% of the imported poultry-meat is infected with salmonella (see Khor (2005)). It is easy to imagine that the consequences of an infection in West Africa are likely to be much more significant compared to a similar infection in Europe.

This is further emphasized if one takes into account the fact that 78% of the Ghanaian population has a per capita disposable income lower than 2 US-$ a day and 45% of the population has a disposable income of less than 1 US-$ a day; and the GDP per head is only 2700 US-$ a year. As a measure of the importance of the agricultural sector in Ghana, it should be recognized that agricultural share of total production is 37.3% (2006) and 60% of the labour force is employed in the agricultural sector.

[12]consisting of: live animals, meat and edible meat offal, fish, crustaceans, molluscs and other aquatic vertebrates, milk and dairy products; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included.

[13]See Atarah (2005).

[14]This minimum price would guarantee the subsistence level of poultry farmers.

However, the Dutch government donates 24,000,000 EUR to Ghana per year - or just around one EUR per Ghanaian inhabitant per year. The Netherlands are the fourth largest supporter of Ghana, behind the World Bank, USA and United Kingdom. It would therefore appear that whilst on the one hand the Dutch government is helping Ghana to develop the economy, on the other, the economic development of the country is being undermined by subsidized Dutch exports of agricultural goods. These two policy measures would therefore appear to be in direct contradiction with each other. While this case study has only concentrated on one example, the same may be true for other agricultural goods and other less-developed countries.

4.2.3 Implications of the Findings

On the basis of the analysis so far, it could be concluded that the agrarian policy of EU cannot be justified on normative grounds. In short, the farmers receive subsidies which lead to an excess supply of agricultural goods and thereby to an increase in emissions. Because the excess agricultural supply can not be sold within the EU, the EU offers export subsidies to export these goods. However, because these goods are sold at a price that is below the world market price these exports are undermining the agricultural sectors in less-developed countries. As a consequence of the poor economic performance of these less-developed countries, the EU countries compensate part of the economic damage with development aid.

[15]60% of the poultry meat market will be served by firms from the Netherlands and Belgium. (see Khor (2005).
[16]See Khor (2006).
[17]The numbers are taken from the Dutch ministry of development aid affairs and the CIA world fact book. See: www.minbuza.nl and www.cia.gov

4.2.4 Use of the Findings

Without doubt, the agriculture in both Noord-Brabant and the Netherlands has an intrinsic value to the majority of Dutch people. The abolition of the whole sector is thus not an option. An alternative could be to look to changing the production processes within the agricultural sector, e.g. changing to less-intensive farming and /or from conventional to organic farming.[18]

It should be noted that the Noord-Brabant's agricultural land area is just around 19% (2003) of Dutch agricultural land, but the proportion of land used for organic production in Noord-Brabant amounts to only 11% (2003) of the whole country. The share of organic farms is only 1.35% (2003) in the Netherlands and only 0.84% (2003) in Noord-Brabant.[19] These shares are very low in comparison to e.g. Austria, where the share is 10%. A change towards organic farming could lead to a significant reduction in emissions, as can be seen in the following table, which compares the emissions per ha for two types of soil.

Table 7

Soil	**Alumina**			**Sandy Soil**		
	Conventional Artificial fertilizer	Conventional Animal fertilizer	Organic	Conventional Artificial fertilizer	Conventional Animal fertilizer	Organic
CO_2/ha	3140	3041	2072	2644	2435	2230
N_2O/ha	9.0	11.3	5.8	10.2	11.1	7.0
GHG/ha	5942	6558	3844	5900	6071	4652

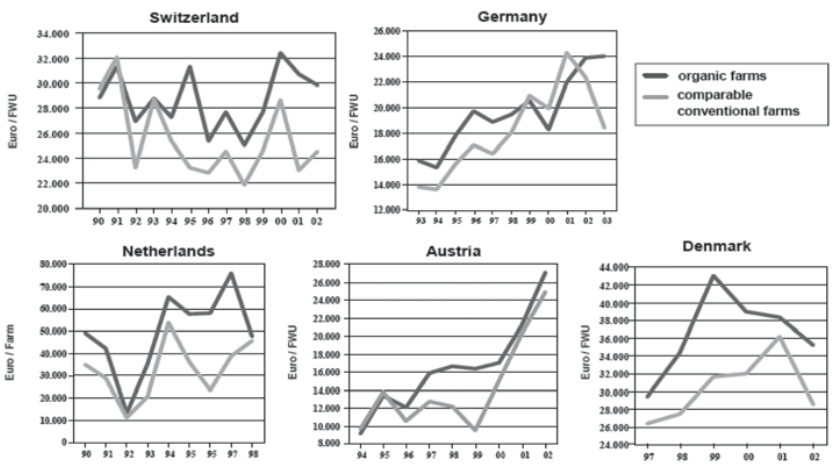
Data source: Bos, de Haan & Sukkel (2007)

Given these numbers, it is possible to calculate the possible emission reduction of a change from conventional to organic farming; the change lies between 8.41%-48.67% with an average reduction rate of 27.73%. A rough estimate of the absolute reduction of CO_2 emissions in Noord-Brabant for 2003 would indicate a reduction of 450 million kg CO_2. The whole country could thus reduce CO_2 emissions by 2619 million kg CO_2. For the province of Noord-Brabant that would mean a reduction 1.77% of all CO_2 emissions, and 1.59% reduction of CO_2 emissions for the whole of the Netherlands.

One of the principal arguments against organic farming is based on the higher production costs in comparison to conventional farming. However taking a look at the literature[20] gives a slightly different picture, where it is shown the even for different farm types organic farmers are ultimately better off because although the costs are increased, the organically-produced goods are sold for a higher price than conventionally-produced goods. The price difference of both types of farming lies between 60%-90%, depending on the product. The following graphs represent the income differentials between conventional farming and organic farming.

[18]Here we use the term "organic farming" in the sense of the International Federation of Organic Agriculture Movements (IFOAM), which defines organic farming: "The role of organic agriculture, whether in farming, processing, distribution, or consumption, is to sustain and enhance the health of ecosystems and organisms from the smallest in the soil to human beings." (See: http://www.ifoam.org/about_ifoam/principles/index.html). This definition coincides with the European Union regulations EEC 2092/91 in combination with EC 1804/1999.
[19]Note: the percentages are average values, because some differences exist regarding the different types of farms.

Graph 1[21]



This indicates that the incomes of organic farmers were almost equal to or higher than the incomes of comparable conventional farmers in the period 1990-2003.

What powers does the regional government have at its disposal to improve this situation? In the first instance, an advisory institution could be formed, to give farmers advice about the advantages to the farmer in converting their farms into organic farms. As investments must be made mainly in the transition phase, the region could offer credits at a lower rate of interest than the market rate, possibly even at a rate of zero.

This could possibly be financed by through the removal of CAP subsidies, where Noord-Brabant would gain just around 180 million EUR per year. This money could be used to compensate the interest rate loss to finance the credits and to finance the advisory institution.

For example, if the government could offer a loan where the interest rate is 4% lower than the market interest rate, then the credit could be 250,000 EUR per average farmer in Noord-Brabant (15136 farms). This would leave an additional 28.63 million EUR per year to finance the advisory institution. This would also not require any additional government expenditure.

Additionally, positive and / or negative incentives could be provided to encourage the transition. For example, the regional government could set higher standards for emissions per hectare for animals or the quantity of fertilizers allowed. Finally it should be noted that the production of ethanol and biogas from corn and other crops cannot be considered in isolation as a means to reduce greenhouse gas emissions, because the production process can cause more emissions than can be saved by driving with biogas.

[20]See e.g. Eukert & Simons (2006), Omelko (2004), Gernig (2001), Kratochvil (2003), Latacz-Lohmann, Recke, & Wolff (2001), Nieberg & Offermann (2001), Schneeberger & Lacovara (2003). or Pimentel, Hepperly, Douds & Seidel (2005).

[21]Taken from Offermann (2004).