Aus dem Institut für Betriebswirtschaft, Agrarstruktur und Ländliche Räume

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Poster Contribution at the XXIV IAAE Conference, Berlin 2000
Manuskript, zu finden in www.fal.de

Braunschweig
Bundesforschungsanstalt für Landwirtschaft (FAL)
2000

IMPACTS OF AGRI-ENVIRONMENT PROGRAMMES – the case of Germany (background paper)

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Introduction

Agri-environmental programmes according to the EU Regulation (EEC) 2078/92 were introduced with the 1992 reform of the European agricultural policy. The regulation pursued three different objectives: to support environmentally friendly farming measures and landscape management through voluntary measures, to accompany changes of the policy reform, especially with the reduction of surplus commodities, and to provide an appropriate income for farmers. Nevertheless, payments are considered as compensation for the income foregone due to programme restrictions, including a limited incentive, and not as an income support. With the actual EU policy reform "Agenda 2000", agri-environmental schemes are even gaining in importance.

Agri-environmental programmes in Germany

In 1998, about 29 % of Germany's UAA was managed according to agri-environmental measures, and the expenses reached 470 Million EURO (BUNDES-MINISTERIUM FÜR ERNÄHRUNG, LANDWIRTSCHAFT UND FORSTEN 2000). The implementation of the programmes is carried out by the German Federal States. As a result, a high regional diversity of agri-environmental programmes emerged. The majority of the measures are offered within an entire region, and only few measures are targeted to specific areas. In most cases, flat rate payments per hectare are provided, calculated on the basis of average production conditions. Important measures are limits on the use of agro-chemicals, but also less restrictive measures like conservation tillage or maintenance of grassland management are supported in some regions.

Theoretical considerations on design and implementation of agri-environmental schemes

The broad framework for the design of agri-environmental programmes according to Reg. (EEC) 2078/92 has offered opportunities for new regional policies. This corresponds to the principle of subsidiarity in the EU. Due to the high flexibility for the programme design, these policies can be more adapted to local socio-economic and environmental conditions. However, this flexibility and the favourable co-financing of the programmes by the EU of 50 to 75 % offer also opportunities for new structural and income policies. Thus, inter-regional differences in the programme design may emerge which are not depending exclusively on different environmental problems.

Because programme participation is voluntary, it can be assumed that the cost due to programme requirements is at least compensated by the payments. Flat rate payments per hectare for voluntary standard measures, calculated for average conditions, probably result in a spatial concentration in areas, where the cost of adaptation to programme restrictions are lower (OSTERBURG et al. 1997). It can be supposed that a number of participants even do not have to change their farm management at all, because they already comply with the programme conditions. In these cases, effects of agri-environmental programmes will be limited to the maintenance of desired land use systems, an effect described by LATACZ-LOHMANN (1998) as 'adverse selection'. Such a support of maintenance of desired land use systems is only useful if otherwise land would be abandoned or used more intensively, and if this would result in undesirable environmental effects. For example, abandonment or intensification of extensive grassland would lead to undesirable impacts especially on biodiversity in many regions of Germany. Positive income effects resulting from programme participation can partly be attributed to the necessary incentive for voluntary participation, which is paid in addition to the compensation of income foregone due to programme restrictions. According to the EU legislation, this incentive is not allowed to exceed 17 % of the total agri-environmental payment, i. e., high information rents for programme participants have to be avoided. However, the income effects of agri-environmental payments are hardly ever empirically assessed. Finally, it has to be considered that a trade-off

exists between administration cost and income effects since better targeted schemes need more administrative effort. This means that a more targeted programme with lower income effects might result in higher administrative cost.

Research by the FAL

A study was carried out at the FAL, supported by the German Federal Ministry of Agriculture, in order to assess the impacts of agri-environmental measures on land use and environment, production, factor markets, farm structure and income. In order to measure environmental effects, the intensity of land use (e. g. share of grassland, use of agro-chemicals, stocking rates) and its changes over time are used as indirect environmental indicators. Due to fixed-rate payments and the support of less restrictive measures, agri-environmental payments might have considerable positive income effects. This could result in higher land rents and thus in distortions of competition. Environmental payments maintain farms producing in marginal areas, but at the same time programme conditions restrict the land use intensity and thus production. Therefore, market distortions of agri-environmental payments depend on the magnitude of these two opposite effects, the maintenance and restriction of production. Because of this, changes of factor use, production, as well as income effects, are included in the analysis.

Methods

A data set on the implementation of agri-environmental measures on the county level has been compiled for a statistical analysis of their spatial distribution. Because indicators for land use intensity and natural conditions are highly inter-correlated, a simple correlation analysis according to SPEARMAN has been carried out. The institutional conditions in the Federal States are very different, so the analysis was done on the level of Federal States. In this analysis regional characteristics are identified which are connected with high participation rates.

In addition, about 22,000 farm accounts of identical farms over 10 years (1989-1999) are used to compare farms participating in agri-environmental schemes with non-participants and to analyse their respective development. Payments per hectare for agri-environmental schemes are used to classify farm data. For each farm in the

sample with high agri-environmental payments ('participants') in 1997-1999, five similar farms receiving no or few environmental payments ('non-participants') are selected through a cluster analysis. Criteria for similarity are 15 indicators for soil quality, farm structure and land use intensity in the base situation 1989-1991, before the boom of agri-environmental measures.

For the scale-independent aggregation of selection variables, a z-transformation is carried out. The following formula has been used for the cluster analysis:

$$d_{pi} = \sqrt{((z_{p1} - z_{i1})^2 + (z_{p2} - z_{i2})^2 + ... + (z_{pm} - z_{im})^2)}$$

with $z_{im} = (y_{im} = \bar{y}_m) / s_m$ (Z-transformation)

d_{pi} = Euclidean distance between farm p with high agri-environmental payments per hectare and farm i in the sample of farms with no/low agri-environmental payments per hectare

y_{im} = Variable y_m of farm i

$\bar{y}_{im}$ = Arithmetic average of variable y_m in the sample of farms

s_{im} = Standard deviation of variable y_m in the sample of farms

z_{pm} = Z-transformed variable z_m of farm p with high agri-environmental payments per hectare

z_{im} = Z-transformed variable z_m of farm i in the sample of farms with no/low agri-environmental payments per hectare

The following 15 variables were used for the selection:

- soil quality index
- utilised agricultural area (UAA) per farm in hectare
- hired land in hectare and payments for hired land per farm
- farm income (representing the remuneration for all land, capital and labour)
- farm profit (family farm income, representing the remuneration for the family-owned land, capital and labour)
- cereal yield per hectare
- grassland in hectare per farm
- livestock units per farm
- dairy cows per farm and milk production per farm
- expenses for fertiliser, for pesticides and for feed concentrates

For one farm with high agri-environmental payments, the five farms with the lowest Euclidean distance out of the sample of farms with no/low agri-environmental payments

per hectare were selected as the most similar farms. A detailed description of this method is given in SCHULZE-PALS (1994). In Baden-Württemberg and Bavaria almost no farms without agri-environmental payments can be found. Therefore, the sample of conventional farms comprises farms with low payments per hectare, too. Another problem is that often the same, more extensive farms with no/low payments are selected and appear several times in the sample. Differences between the farm samples in the base situation and with respect to changes between 1998-91 and 1997-99 were statistically tested with a non-parametric statistical test according to WILCOXON.

Results

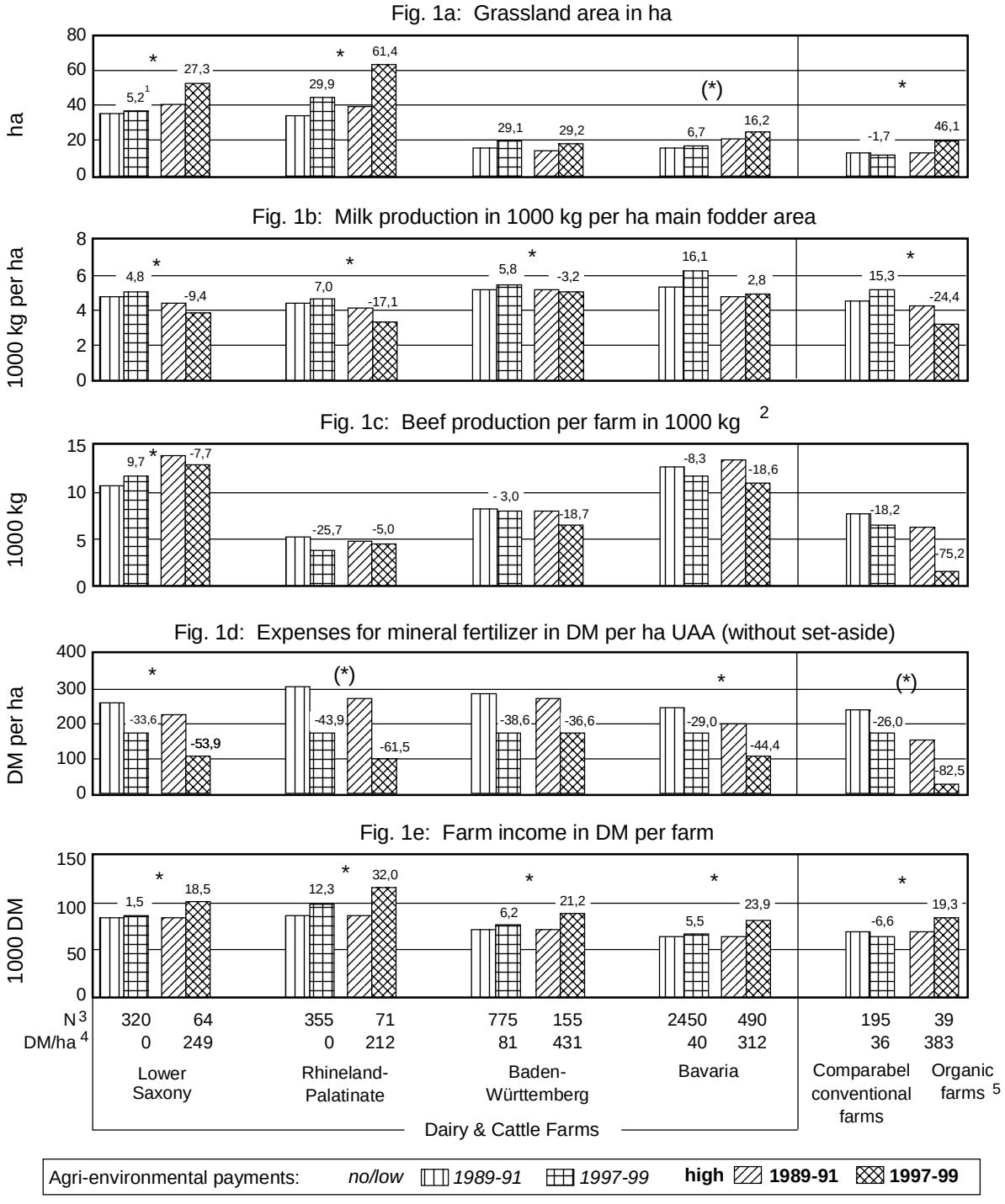
A **comparison of the programmes** implemented by the different Federal States reveals a high variety of agri-environmental measures, budgets and amounts of payments per hectare for similar measures. These different regional policies have led to a high variance in the rates of acceptance (see map).

The **analysis of the regional data** shows that participation in agri-environmental schemes is high in regions with relatively poor natural conditions (poor soil quality or high altitude), lower yields, lower stocking rates and hence a lower land use intensity. Thus, in intensively used areas only limited environmental benefits can be expected.

The **analysis of farm accounts** came to similar results. Even using a cluster analysis for the selection of similar farms, the about 1,150 farms participating in environmental schemes show a lower production intensity in the base situation compared to non-participants. The following observations can be made for farm changes between 1989/91 and 1997/99 (2-year-averages):

- Participants increased their grassland area more than non-participants, mainly through land rent (see fig. 1a), while the relative importance of forage maize decreased.
- Milk production per hectare main fodder area decreased, while in non-participating farms it still increased (fig. 1b). Milk production per farm increased considerably through acquisition of quota, but less than in non-participating farms.

Figure 1: Changes in farms with no/low or high environmental payments between 1989/91 and 1997/99



[1] Change between 1989/91 and 1997/99 in percent of 1989/91 (2-years-average); Asterisk indicates significance at the 0.05 level; *: no significant difference in the base situation between farm groups with no/low and high agri-environmental payments per hectare,but significant differences between both groups with respect to changes until 1997/99. (*): Singificant difference in change, but also in the base situation.

[2] Data of the years 1989/91 and 1996/98, sample with less farms.

[3] N: Number of farms.

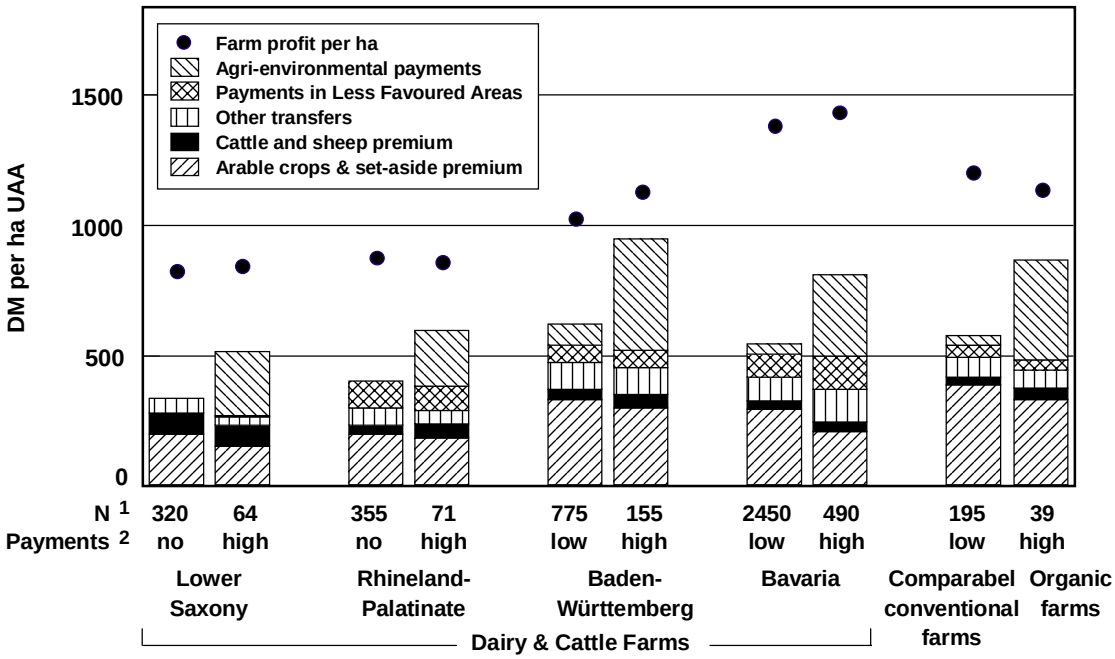
[4] DM/ha: Agri-environmental payments in DM/ha in 1997-99.

[5] Organic farming: Farms of different Federal States, mainly Bavaria.

Source: Own calculations on the basis of Land Data farm accounts of the years 1989/90, 1990/91, 1996/97, 1997/98, 1998/99

- Participating farms reduced beef production in most cases more than non-participants, but differences were normally not significant because of a lower number of farms with this data (fig. 1c).
- Cereal yields of participants increased less than those of non-participants.
- Expenses for mineral fertiliser decreased in most cases in both groups, but in most cases more in participating farms (fig. 1d).
- Expenses for pesticides were reduced in participating farms, but increased in most cases in non-participating farms.
- Organic farms show more pronounced extensification effects (higher reduction of expenses for fertilisers, pesticides and feed concentrates, decreasing cereal yields and high reduction of livestock density).
- The increase of farm income (representing the remuneration for all land, capital and labour) was significantly higher in participating farms than in non-participating farms (see fig. 1e and fig. 2). Differences of the change of farm profit per hectare UAA between participating and non-participating farms are difficult to analyse because of the different increase of UAA per farm.

Figure 2: Transfer payments and profit (family farm income) per hectare UAA in farms with no/low or high environmental payments in 1997-99



[1] N: Number of farms. [2] Payments: Agri-environmental payments (DM/ha) in 1997-99.
Source: Own calculations on the basis of Land Data farm accounts of the years 1989/90, 1990/91, 1996/97, 1997/98, 1998/99

Conclusions

Flat rate payments for voluntary agri-environmental schemes, calculated on the basis of average production conditions, lead to regional concentration of participation in areas with lower land use intensity. In intensively used areas, these schemes have only limited effects, while in less favoured regions they contribute to the maintenance of extensive land use. This is especially important for the conservation of biodiversity. Farms participating in agri-environmental schemes reduced land use intensity and production, starting from a comparatively lower level. For example, they increased their grassland area and reduced milk production per hectare main fodder area. Positive income effects could be shown as well as relatively high competitiveness of programme participants on land (grassland) and milk quota markets.

Final results of this research will be published in the year 2001.

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