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## **Der Einfluß ökologischer Produktionsverfahren auf die Betriebsstruktur: Eine deskriptive Analyse basierend auf der EU Agrarstrukturerhebung 2000**

The impact of organic production methods on farm structure in the EU:  
A descriptive analysis based on farm survey data for 2000

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### **Zusammenfassung**

Der ökologische Landbau innerhalb der EU ist durch Richtlinien klar definiert. Einschränkungen durch diese wirken sich auf die Betriebsorganisation aus. Basierend auf aggregierten Daten aus der Agrarstrukturerhebung 2000 wird die Betriebsstruktur von ökologischen und konventionellen Betrieben verglichen. Weiterhin wird die regionale Verteilung ausgewählter Charakteristika des ökologischen Landbaus im Vergleich zum konventionellen Landbau in der EU diskutiert. Die Anbaustruktur im ökologischen Landbau ist von einer weiteren Fruchtfolge als im konventionellen Landbau gekennzeichnet, die ökologische Tierhaltung durch eine geringere Viehdichte. Dies trifft jedoch nicht auf alle Regionen und alle Tiergruppen zu. Mögliche Bestimmungsgründe für die regionale Verteilung ökologischer Betriebe werden diskutiert.

**Schlagerworte:** Ökologischer Landbau, Agrarstruktur, regionale Verteilung

### **Summary**

Organic farming within the European Union is defined by legally binding standards resulting in changes in farm organisation. Differences in farm structure between organic and conventional farming in the EU are compared based on aggregated national farm census data of the year 2000. The regional distribution of selected characteristics of organic farming within the EU is discussed. Land use in organic farming is characterised by wider crop rotations, organic livestock husbandry by a

lower stocking density. However, this does not apply to all regions and for all livestock categories. Potential reasons for the regional distribution of organic farming are discussed.

**Keywords:** organic farming, farm structure, regional distribution

## Introduction

Organic farming is defined as an agricultural production method which largely reduces or avoids the use of synthetic chemical inputs such as pesticides, fertilisers, etc. In the EU, Council Regulation (EEC) No. 2092/91 and 1804/99 (EC 1991 & 1999) and amendments provide binding legal standards, compulsory inspection schemes and certification procedures for organic farms. This allows specific labelling schemes, providing the basis for marketing in a specific organic market. Restrictions by these standards result in a modification of farm organisation and thus structure, which may differ between regions.

The objective of this paper is to compare the farm structure of organic and conventional farming based on aggregated farm census data for the EU. Differences in farm organisation observed in farm level studies shall be confirmed at this higher aggregation level. Furthermore, the regional distribution of certain characteristics of organic farming within the EU is discussed.

## Data

Data on organic farming was provided by Eurostat (2002). For the first time, member states collected data on organic farming in the general farm census of the year 2000 covering all farms (full-time and part-time) with more than 2 ha or more than certain numbers of livestock.

According to Council Regulation 2092/91 farms may convert only part of the farm. Data presented, therefore, overestimates total organically cultivated land area and farms. For this analysis data was available at a combined NUTS<sup>1</sup> 1&2 Level. Data is presented at various levels of aggregation, highlighting some regional aspects.

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<sup>1</sup> NUTS: Nomenclature of territorial units for statistics

## Land use

Cropping activities in organic farms are defined by Council Regulations (EEC) No. 2092/91 and in part influenced by 1804/99. They are characterised by

- i) abandonment of mineral N-fertiliser compensated by higher input of manures and wider crop rotations with cultivation of legumes, green manures, etc. or higher stocking density
- ii) abandonment of synthetic pesticides compensated e.g. by selection of appropriate species, natural enemies, mechanical weed control, etc.
- iii) livestock reared preferably by feed from the unit, resulting in a higher requirement of arable forage, grassland or a reduced stocking density.

These restrictions naturally result in farm organisational changes when converting to organic production methods. At the farm level, a lower share of cereals, roots crops and oilseeds and a higher share of pulses, arable forages and grassland is expected (Rantzau et al. 1990, Nieberg 1995, Kirner 2001).

A comparison of the production structure of the organic and conventional farming sector based on aggregated figures for the EU confirms these assumptions. Higher shares of extensive land use options and wider crop rotations are observed in organic farming (Figure 1):

- a lower share of cereals,
- a higher share of pulses,
- a lower share of root crops,
- a higher share forages & leys,
- a higher share of permanent grassland,
- and a lower share of other (intensive) land uses (vegetables, fruits, olives, vine, nurseries, permanent crops under glass and other permanent crops).

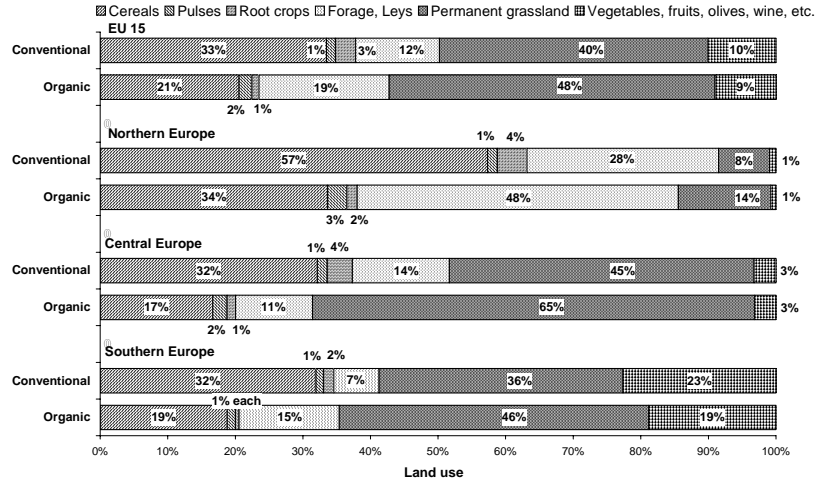


Figure 1: Organic production structure in comparison to conventional production structure (Source: Own calculation based on Eurostat 2003)

These trends are observed in all three greater European regions. The strongest increase in arable forage and ley area is observed in Northern and Southern Europe, while surprisingly, in Central Europe the share of arable forage and leys is lower in organic than in conventional farming.

Such differences can also be observed at the regional level (Figure 2) as is shown for the example of the share of cereals in the crop rotation of organic and conventional farming. In regions with intensive arable cropping in conventional farming, organic farming is expected to have significantly lower shares of cereals than conventional farms.

For example, in Scotland, Sweden and Finland the share of organically grown cereal area is high. However, the total production of organic cereals of these countries to total production in the EU is low despite high shares: Sweden and Finland together (2.321.050 ha) cultivate only the equivalent of 1/3 of total German cereal area (6.634.680 ha).

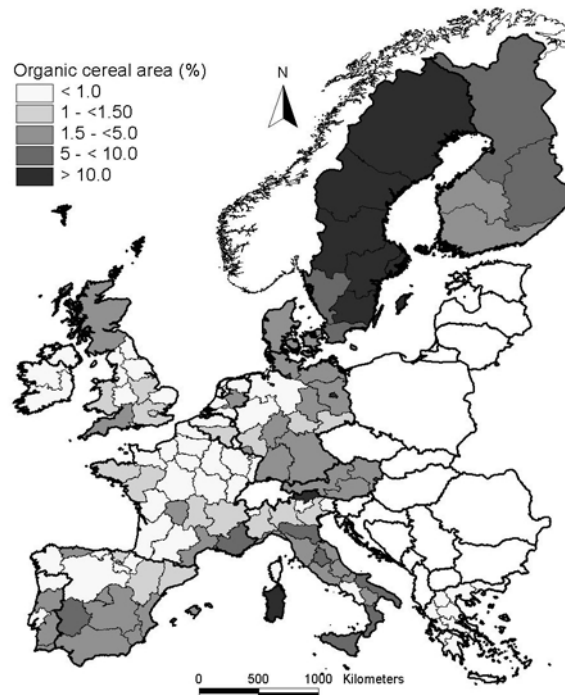


Figure 2: Organic cereal area in % of total cereal area (Source: Own calculations based on Eurostat 2003)

In contrast, traditional cereal growing regions such as Northern France (50% cereals in crop rotation) and Castilia y Leon in Spain (47% cereals in the crop rotation) exist, in which organic farming is characterised by a lower share of cereals. Other regions with high cereal shares in the conventional crop rotation (e.g. Germany with 42%) are, however, characterised by a high share of organic of conventional cereals. The reasons for such differences remain to be examined.

## Livestock

Livestock husbandry in organic farming is defined by Council Regulations (EEC) No. 2092/91 and 1804/99. It is characterised by

- i) land related management where the stocking density is limited;
- ii) livestock rearing preferably based on feed from the unit;
- iii) mandatory access to a free-range area for livestock.

Generally, on livestock rearing farms this is expected to lead to a reduction in livestock or an extension of forage area, and thus in a reduced stocking density (e.g. Nieberg 1995). Farms without or with little livestock may increase their livestock to contribute to nutrient cycling without relying exclusively on their crop rotations. Furthermore, the composition of livestock is expected to be different in organic farming (e.g. Kirner 2001): more cattle, sheep and goats are expected to be reared.

Data has shown that on average organic farming produces less intensively in terms of livestock density than conventional farming (Figure 3). In this figure average livestock density of conventional farming is assumed to be 100% and average livestock density in organic farming is given in relation to conventional farming. For example, total average livestock density across all livestock categories in organic farming is only 70% of average livestock density in conventional farming in the EU.

This is also confirmed by a significantly ( $p = 0,008$ ) negative ( $r = - 0,23$ , Pearson's correlation coefficient) interrelation between the livestock density (ln) with the share of organically farmed area at the used combined NUTS 1 / NUTS 2 level. Thus, the higher the share of organic land is the lower is the encountered livestock density and vice versa.

Differences in organic and conventional livestock density are only minor for foraging livestock categories (sheep & goats, cattle and dairy cows). The largest difference in livestock density between organic and conventional farming is expected for non-foraging livestock such as pigs and poultry which are often reared quite intensively in conventional farming, i.e. in landless production systems.

The case of pigs confirms this assumption, while in poultry rearing, surprisingly, the stocking density in organic farming is not much lower

than in conventional poultry rearing. This may be due to the fact that in some countries large conventional poultry farms tend to be non-agricultural firms and are thus not considered in these data.

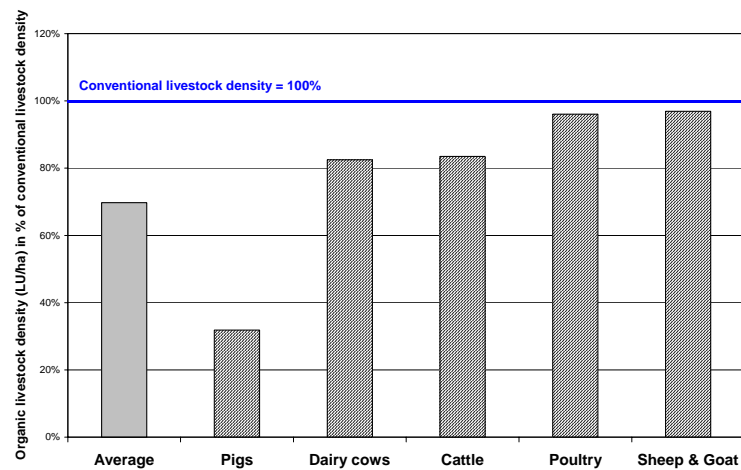


Figure 3: Livestock density in organic farming in the EU relative to livestock density in conventional farming (Source: Own calculations based on Eurostat 2003)

Regional differences in the composition of total livestock are observed (Figure 4). On average (EU 15), the contribution of cattle, dairy, sheep and goat, and poultry to total livestock density is higher in organic farming than in conventional farming, while the contribution of pigs to total livestock density is lower in organic farming.

The share of cattle, sheep and goats is higher in organic than in conventional farming in all European regions, while the share of dairy cows is only higher in Northern Europe. The share of poultry is higher in organic than in conventional farming in Central Europe and the same in Northern Europe, while in Southern Europe the share of poultry is lower in organic farming.

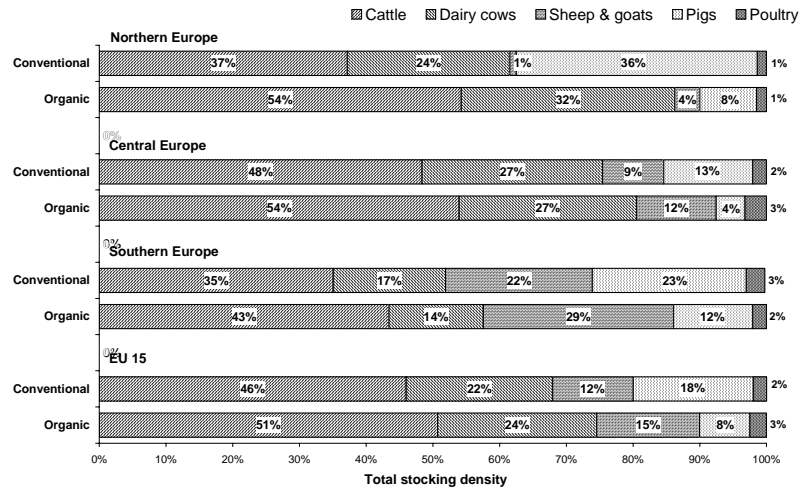


Figure 4: Change in livestock density due to organic farming for different livestock categories and regions (Source: Own calculations based on Eurostat 2003)

Lower livestock density in organic farming results in lower nutrient outputs due to animal rearing. However, this may differ due to regional characteristics. In some regions organic farming results in a higher nutrient output from livestock husbandry (Figure 4). In these regions conventional livestock density is significantly lower than the national or EU average and organic farming is characterised by a higher than average nutrient output per hectare, e.g. in Eastern England.

In contrast, in regions with a high livestock density in conventional farming, organic farming is characterised by a lower nutrient output, e.g. Northwest Germany.



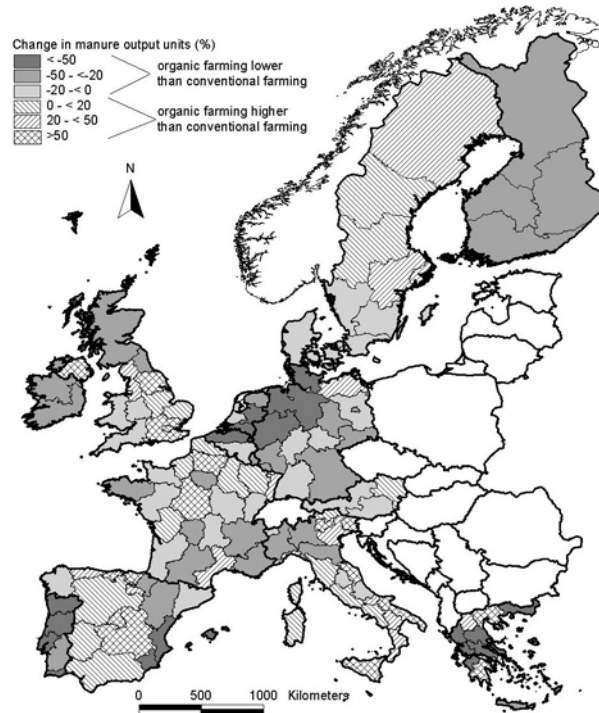


Figure 5: Manure output in organic farming compared to conventional farming – a regional perspective (manure unit per ha) (Source: Own calculations based on Eurostat 2003)

### Labour and farm diversification

The outlined changes in production methods in organic farming systems are expected to influence the labour intensity in organic compared to conventional farming (Offermann & Nieberg 2000). Higher labour input may be due to changed pest and weed management strategies, e.g. mechanical or hand weeding and a higher share of labour-intensive crops, e.g. vegetables (Schulze Pals 1993). Additionally, intensive livestock activities such as pigs and poultry tend to be more labour intensive in organic than in conventional systems due to standards on housing, e.g. ban of cages or bedding is required. However, this may be compensated by lower livestock densities.

Furthermore, in nearly all EU Member states farms are larger in organic than in conventional farming (on average 58%, UWA 2003) which may reduce the required labour per land area. This contrasts with the popular perception of organic farms as small, but again hides significant differences in farm size distribution within each country – most countries have a significant organic horticulture sector, typically characterised by smaller holdings, but also a more traditional agricultural sector, often characterised by larger, more extensive grassland-based farms. This is particularly marked in regions like Scotland, where large areas of rough grazing have been converted on a limited number of holdings, significantly affecting the UK average farm size figure. Furthermore, the average age of organic farmers tends to be lower, a higher share of full-time farms is observed, and area requirements are higher because forage must be produced largely on-farm (Wippel 1997).

This is also reflected in data on labour density on organic and conventional farms. Not in all countries average labour density is higher on organic farms than on their conventional counterparts. In some countries the opposite is observed.

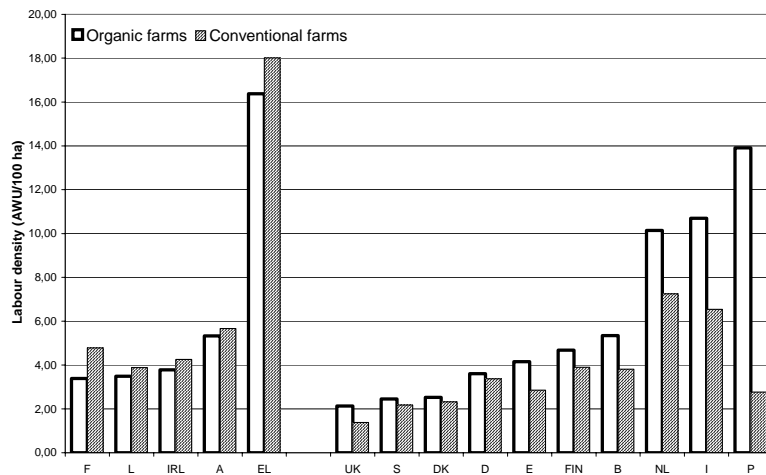


Figure 6: Average density of agricultural labour on organic and conventional farms in the EU (Source: Own calculations based on Eurostat 2003)

Apart from the arguments directly related to agricultural production, other factors might influence labour density on farms. For example, in organic farming standards and control are mandatory and provide for labelling of organic products and marketing in a separate market. Thus, organic farms tend to involve more in direct marketing activities than conventional farms. This might be additionally supported by the fact that organic products have only recently been taken up by large retailers.

Furthermore, standards also apply to the processing of organic products. Therefore, organic products must be processed separately from conventional products and organic farms tend to involve more in processing activities (Figure 6). A similar trend is observed for other gainful non-farming activities than conventional farms, e.g. tourism, contractual work or other activities.

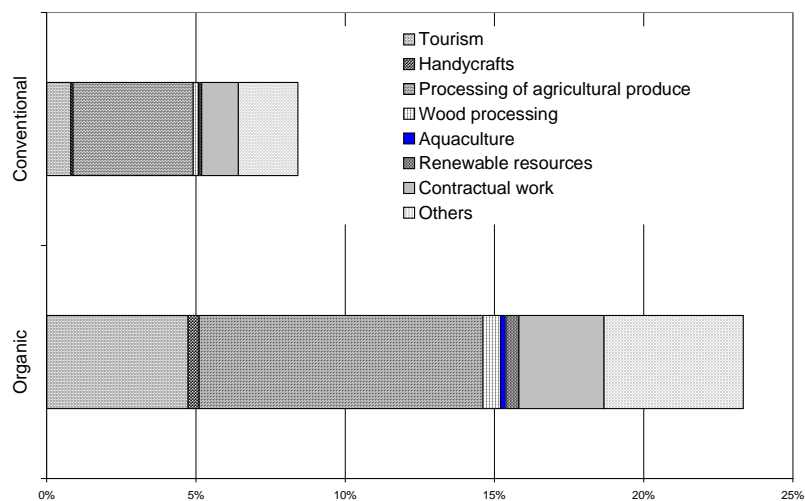


Figure 7: Non-agricultural gainful activities of organic and conventional farms in the EU in the year 2000 ((Source: Own calculations based on Eurostat 2003))

When interpreting this information it has to be kept in mind that this data only shows if a farm is involved in a certain activity or not (double entries possible). Thus, data neither gives an indication of the extent of involvement in a certain activity nor are different activities weighted in

any way. Renting one room to tourists would give the same result as running a saw mill – as long as farming is the main activity of the farming family.

### The regional distribution of organic farming

Another interesting question to ask is why organic farming is spread so unevenly throughout Europe (Figure 8). Three arguments which immediately come to mind are the policy environment, the quality of soils and climate and farm type.

The leading countries in the development of organic farming (in terms of the percentage of organic to total land area) have most certainly experienced strong policy support for organic farming. In most cases, this has included special support for the markets for organic foodstuffs. However, if the distribution of organic land within a country or a region with a uniform policy regime is uneven, other reasons must prevail.

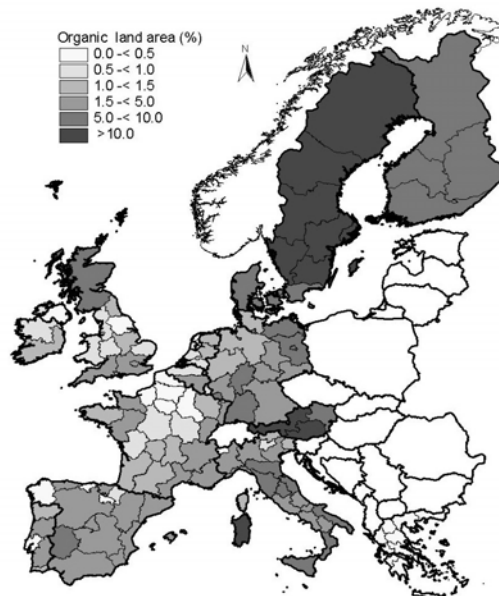


Figure 8: Regional distribution of organic and in-conversion land area in 2000  
(Source: Own calculations based on Eurostat 2003)

In some countries, i.e. Germany, Austria and Switzerland, organic farming is much more likely to be found in disadvantaged rural areas where extensive agriculture predominates (Dabbert and Braun 1993, Osterburg et al. 1997, Schneeberger et al. 1997, Hartnagel 1998, Köhne & Köhn 1998, Bachinger 2002). An attempt to test this argument on a European level has been made by Offermann (2003), who found that within countries or regional clusters with similar conditions, relatively high shares of organic farms are most likely to be found in regions unfavourable to agricultural production. In disadvantaged regions, conventional agriculture is usually organised quite differently from conventional agriculture in intensive regions. Grasslands tend to be more important than arable land, and less fertiliser is used on agricultural lands. Extensive (foraging) livestock husbandry such as beef/dairy cattle or sheep tend to play the major role in these regions, whereas intensive animal production systems such as poultry or pig production are rarely found.

If a conventional farmer relies heavily on feedstuffs, especially roughage, produced on his own farm to feed his animals, and low amounts of pesticides and synthetic fertilisers are used, the changes the farm has to undergo to convert to organic agriculture tend to be small (e.g. Schulze Pals 1993). If, on the other hand, a conventional farm relies on highly intensive animal rearing, such as poultry, a conversion to organic farming requires major changes in the organisation of the farm. In that case, the number of animals has to be drastically reduced because the organic production standards do not allow the purchase of large amounts of feedstuffs necessary to sustain the original level of production.

In a currently uniform policy environment the historical development of policies may have influenced the regional distribution of organic farming. For example, in Germany before support for organic farms was introduced organic farms were mainly found in regions beneficial to agriculture (Sick 1995, Jeap 1086, Hermanowski 1989, Rantzau et al. 1990). Therefore, in regions with a long tradition of organic farming, organic farms may be predominantly found in areas with favourable agricultural conditions.

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