

ECONOMICAL ASPECTS OF ORGANIC FARMING

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The agricultural practice has changed quite a lot in recent decades. The production has been intensified due to a grown investment of production. Simultaneously there arose problems like the increasing pollution of natural resources.

A growing mind-expansion towards the protection of environment and health can be noticed. There are opinions against the excessive application of pesticides and drugs as well as against the overdressing. These opinions and the unsatisfactory income complicate the farm management.

The organic farming tries to correspond to objectives of the grassroots. By the renunciation of certain means of production and by the reorganization of the technique the environment is relieved, and a foodstuff of less harmful substances can be produced. In return the biologically cropping farmers attend higher prices for their products.

The following article is going to treat at first some economic aspects of the organic farming. On the base of two existing farms the profitability will be discussed. In the second half of the article the fulfillment of aims concerning the protection of water by the organic farming will be scrutinized.

Another point to discuss will be the question, whether organic farming is an apt land use system for regions like protected water collection areas.

Development and significance of organic farming

There are six organically farming organisations that are forming the study group of organic farming called AGÖL (Arbeitsgemeinschaft ökologischer Landbau):

— ANOG- AG für naturnahen Obst-, Gemüse- u. Feldfruchtbaue.V.

— Bundesverband ökologischer Weinbau e.V.

— Bioland - Verband für organisch-biologischen Landbau e.V.

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Abstract

The organic farming has gained importance in recent times, even though all these farms together are exploiting not more than 0,7% of the whole agricultural area.

By means of two existing organic farms the author is trying to find economic parameters and is trying to scrutinize the financial situation. The reorganization of the farm is the most crucial period. During this time the profitability and mainly the liquidity may be endangered. With the product prices existing for the time being of organically grown products the biological farms are able to make a profit comparable to that of the corresponding traditional farms. A comparison between these two types of farms is not that simple because of the differences between the range of products, processing stages and marketing channels. Moreover the farm managers of organic farms have to be higher qualified to reach a comparable income.

By means of a calculation model, on the base of an existing farm, a comparison will be made between traditional cropping and organic farming for a period of ten years. Regarding the capital formation there are initial advantages to be noticed for the traditional farms. For the last years some competition advantages can be observed in favour of the organic variant, because of the restrictive price policy (mainly for coarse grains) that diminishes the capacity to compete. Following these correlations more organic farms will arise in future times, that will supply the market with a higher amount of organically based products. It depends on the further increase of the demand for organically based products, whether the existing and constant high price level will be maintained. The trend to be expected could head for a harder competition connected to a decrease of prices.

Résumé

Ces dernières années, l'agriculture biologique a gagné beaucoup d'importance, bien que la surface biologiquement cultivée ne soit que 0,7% de la surface agricole totale.

A travers deux exploitations de ce genre, l'auteur cherche à trouver les paramètres économiques et à analyser la situation financière. Il s'en suit que la réorganisation de l'exploitation est la phase la plus délicate, puisque c'est à ce moment-là que la capacité de tirer profits et la liquidité peuvent être entravées. Toutefois, grâce aux prix de ces produits, les exploitations biologiques peuvent avoir un profit pareil à celui des exploitations traditionnelles. Il faut souligner qu'il n'est pas facile de comparer ces deux types d'exploitations, à cause des différences existantes parmi les produits, les phases de transformation et les canaux de commercialisation. Enfin, les exploitants «biologiques» doivent être plus qualifiés que leurs collègues traditionnels, afin d'obtenir un revenu comparable. A travers un modèle de calcul, créé sur la base des exploitations existantes, une comparaison entre cultivation traditionnelle et biologique sera menée, pendant dix ans. En ce qui concerne la formation de capital, les exploitations traditionnelles ont quelques avantages. Au contraire, pendant ces dernières années, on a remarqué des avantages en terme de concurrence, concernant la variante biologique, grâce à une politique des prix restrictive (notamment pour les céréales secondaires), qui réduit la capacité de concurrencer. D'après ces corrélations, on aura à l'avenir, plus d'exploitations biologiques, fournissant aux marchés leurs produits organiques. Naturellement, le maintien des prix élevés dépend de la hausse de la demande pour ces produits, mais on prévoit une concurrence accrue, grâce à la réduction des prix.

— Demeter - Forschungsring für biologisch-dynamische Wirtschaftsweise e.V.

— Naturland - Verband für naturgemässen Landbau e.V.

3400 farms cultivating 75000 ha belong to the AGÖL in 1991. Furthermore there are 400 farms with 10000 ha cultivating in the first year of reorganization. All these farms together come to 0.6% of all farms in the old lands of the federal Republic of Germany, cultivating 0.7% of the agricultural area. Demeter and Bioland are the most important organisations. In 1978 there were 432 farms, cultivating 9000 ha, that belonged to these two organisations. In 1991 their number of members went up to 2721 farms with 60000 ha (see figure 1). The reasons for this huge increase probably were economic ones. Mainly small farms expected higher prices for organically based products that

some consumers are willing to pay. It was also the restrictive price policy of the «Common Market» that made these farmers change their minds.

Guidelines of organic farming

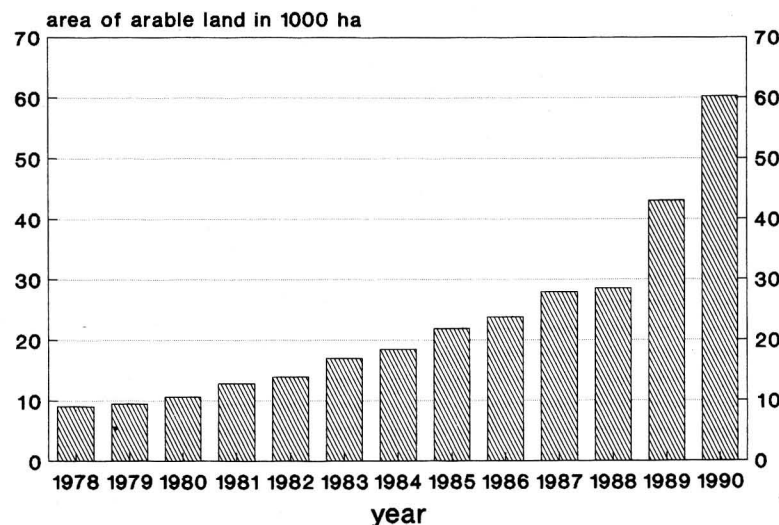
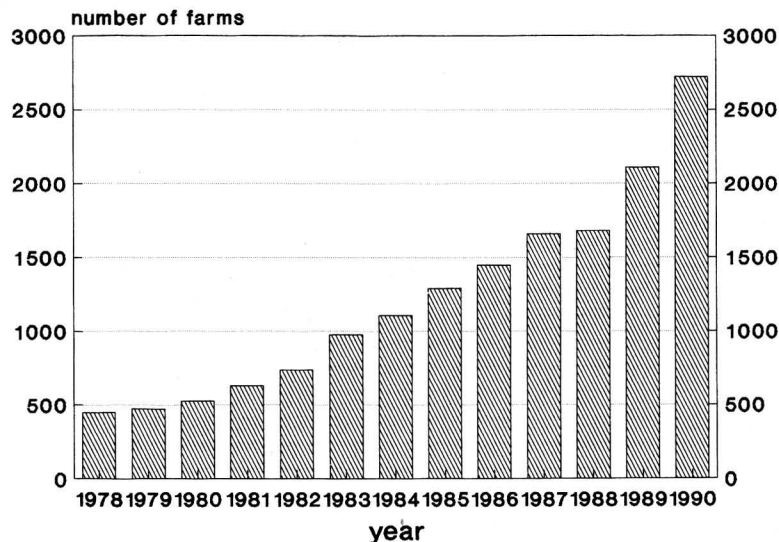
When reorganizing these farms the farmers are obliged to follow the guidelines of the organic farming organisations. Have a look at the table 1 showing the frame-guidelines of the AGÖL.

The main differences between traditional and organic farming consists of the renunciation of mineral fertilizer and of chemical pesticides (see table 1). The principle of organic farming plays the crucial role for organic farming. An important aim is to organize the nutrient circulation as self-containedly as possible.

Table 1 Selected features of the organic farming.

Variety choice:	* maintenance of the genetic variety * seeds and plants deriving from organic farming
Rotation of crops:	* sufficient share of green manuring, leguminosae as main crop and as catch crop
Fertilization:	* basis: organic material deriving from the farm * mineral fertilization as supply, not as substitution * no application of chemical nitrogenous fertilizer, readily soluble phosphates, and higher chlorinated potash salts
Plant protection:	* no application of synthetic plant protection products * prophylactic controlling of diseases and pests by rotation of crops, soil management, variety choice, ... * promotion of the settlement of beneficial insects by hedge rows, humid biotops, ...
Livestock management:	* system of stalling that corresponds to the dignity of the animals
Stocking rate:	* 1,4 manure units/ha
Livestock nutrition:	* maximum share of bought animal feedstuffs referring to the feeded dry matter: 10% for cattle, 15% for pigs

Source: AGÖL, 1990 a.

**Figure 1: Development of the organic farming i.e. «Bioland» and «Demeter».**
Source: Steinkobi et. al., 1990; Bioland, 1990; AGÖL, 1991.

Adjustment to organic farming

The adjustment to organic farming brings difficulties to most of the farms. Farms run in a traditional manner may gain high levels of output by the use of fertilizer and plant protection products. Against that, the biological farm faces more or less high losses of yield. **Figure 2** gives an idea of a possible development of yield.

In the practice it can be seen that in the first years, after complying with the farming guidelines, there arise clear losses of yield that may come up to 80 % of the original yield. Connected to this arise high fluctuations of yield which means risks of production. Their reason is the lack of experience of the head of the farm, handling the new techniques of production. Another reason worth discussing is the change of soil properties or rather change of general soil and nutrient dynamics, that needs a certain time for adjustment.

The longer the organic farming lasts, the more the yields rise again, although there remains a larger fluctuation of yield because weather influence grows more important. Different publications (Rottmann and Freitag, 1989, Dabbert 1990) tell us that the yield of organic farms after the time of adjustment is about 65% to 70% of the original yield, that is reached by conventional cultivation (see **figure 3**). There can be stated lower losses of yield of the «more extensive» crops such as rye or oats so that their competitive power rises, whereas root crops (common beets or potatoes) show higher losses of yield (50% to 60%).

It seems important, because of the high decrease of yield during the adjustment, to gain higher prices quickly in order to guarantee the profit and the rentability of the farm. Liquidity as well plays an important role in this period.

The formation of prices, previewed by BIOLAND is explained in **figure 4**.

If a farm manager makes up his mind to adjust to biological cropping he agrees for the first harvest on a so called «0-years» treaty. The products are to be commercialised either conventionally or can be sold to other organic farms as food at a higher price. (50-60 DM/dt).

Depending on the fulfillment of the guidelines (i.e. husbandry, stocking rate) at the earliest in the second year, there can be agreed on a «adjustment treaty». The harvest products, that are to be signed as adjustment ware can be sold at the usual price. The time of adjustment, that should not last longer than 5 years, is ended by the acknowledgement treaty. After gaining the acknowledgement treaty, products can be sold under the trade mark. The way in which the farm changes its organisation (land use and livestock husbandry) is authoritative for its acknowledgement. The judgement is made by the cultivation organisation.

To conclude, as far as the adjustment time is concerned, during the first year there are only «mixed prices» possible, losses of yield are probable and thus financial problems

Table 2 *Biological full-time farms in comparison - 1989/90.*

Structuring	Unit	Organic Farming (1)	Traditional Comparison Group (2)(3)	Farms (1) Altogether
Farms	Number	96	193	8882
Size of the farm	ha AA (4)	32	29	31
Workers	Labour/farm	1,7	1,5	1,6
Arable area	% AA	56	72	61
Grassland	% AA	44	28	39
Cereals	% AL (5)	53	66	63
Maize for silage	% AL	3	13	13
Other arable				
Fodder cropping	% AL	24	9	6
Stocking rate	LU/100 ha AL	102	129	173
Yield of the farm therefrom	DM/ha AA	4733	4829	6448
Vegetable production	DM/ha AA	1114	854	1155
Animal products	DM/ha AA	2365	2992	4104
Running costs therefrom	DM/ha AA	3277	3604	4750
Fertilizer	DM/ha AA	46	249	255
Plant protection	DM/ha AA	9	128	143
Fodder ware	DM/ha AA	235	396	810
Wages	DM/ha AA	234	76	188
Profit rate	%	30,8	25,4	26,3
Profit	DM/ha AA	1456	1225	1698
Profit	DM/family worker	32967	24252	37257
Profit	DM/enterprise	46260	35362	52915

1) full-time farm
2) averages, not calculated up
3) results of commercial farms, extensive commercial farms, commercial-forage growing farm and forage growing-commercial farms between 30 000 and 40 000 DM standart farm income on comparable locations (compared value below 2200 DM/ha AA)
4) AA: agricultural area
5) AL: arable land

Source: BUNDESMINISTERIUM FÜR E.L.u.F., 1991 a.

For good reasons farmers interested in an adjustment are asking about the income to be gained in organic farming. Due to the clear influence of different marketing and different prices, a comparison between organic and traditional farms is very difficult. Since 1983 the governmental report on agriculture compares biological and traditional farms. **Table 2** shows some important economic parameters. The small number of biological farms shown in the report and the various types of farms make a comparison more difficult, so that the author is not able but to point out the basic differences.

At similar farm sizes organic farms show a larger share of grassland of the total farm surface. The shares of grain are reduced. From the reasons given above, the share of maize for silage of the crop rotation is very low (about 3%), where as the compared traditional farms are cultivating 13% of maize. The resulting lack of fodder is leveled out in the biological farm by other arable fodder, mostly consisting of leguminosae meslins. The profit per ha of both forms of cropping is equalized because with biological cropping there are given lower sums not only as far as net income is concerned, but also as far as running costs are concerned. In the year 1989/90 the biological farms subject to investigation were able to gain higher profits (1400 DM/ha) than the traditional farms (1200 DM/ha). Due to the problems of comparability mentioned above the results should neither be generalized nor projected.

The income of organically based farms deriving from the soil cultivation is generally higher than that of the traditional farm. Despite the fact that there is a lower share of grain surface area and a lower profit per ha, the marketing of grain brings a much higher contribution to the income (Hamm, 1986). An important reason for this is the higher price to be gained by selling the grain amounting to about 80-130 DM/dt, depending on the kind of grain and the way of marketing (Hamm, 1986; Bioland, 1990; Stocker, 1990).

Animal production has a lower share of the profit, on the one hand because of lower livestock numbers and on the other hand because of the less intensively produced products commercialized for the most part in the traditional way.

An information about selected producer prices is given in **table 3**.

may arise. In the second year after the adjustment at the earliest, the farmer can reckon upon the usual prices in organic farming.

Comparison of chosen farm parameters

Like in the traditionally managed farm the input-output-relations are rising, therefore the profit is of great importance for the rentability and stability of the organic farm. Concerning the structure of production there are clear differences to be seen. Existing mostly specialized crop rotation systems in traditional cropping, there can be watched a more varied crop rotation in the organic farming. These are systems that show a higher share of leguminosae for grain using (mostly field beans) or for arable fodder cropping (clover ley, lucerne) for several years. Competitive cultures such as sugar-beet or maize for silage are largely reduced or ruled out due to the lack of management of pesticides for weed control. Organically based farmers grow as root crops potatoes, common beets or vegetables in small amounts. Special crops such as field vegetable are in most cases market

ed in a direct way and are not to be neglected especially in smaller farms with regional contact to the consumers.

The animal production, i.e. cattle keeping plays an important role in organic farming (Hamm, 1986) because manure is the only controllable source of nitrogen apart from leguminosae. But it is important to point out that the demand for animal products from organic farming is far lower than the demand for vegetable products. The animal products, for the most part commercialised in a traditional way, are burdened with higher costs of production (higher costs of food at a lower level of productivity).

Table 3 *Producer Price Organic Farming and Traditional Farming.*

Crop		Producer Price	
		Organic Farming	Traditional Farming
Wheat	DM/dt	85	38
Rye	DM/dt	103	42
Potato	DM/dt	59	29
Milk	DM/kg	0,74	0,68

Source: AID, 1991.

Table 4 *Organisation of the biological farms investigated.*

	"Farm I"		"Farm II"	
	1988/89	1989/90	1989/90	
Surface				
Agricultural area ha	39	39	49	
Arable area ha	24	24	42	
Grassland ha	15	15	7	
Crop rotation				
	ha	%	ha	%
Meslins	6,7	27,9	8,0	27,6
Winter wheat	2,8	11,7	3,5	14,5
Spring barley	9,8	40,8	2,3	9,6
Field beans	4,2	17,5	1,4	5,9
Winter rye			4,4	18,3
Oats			4,4	18,3
			ha	%
Clover grass			7	14,3
Winter wheat			7	14,3
Dinkel			7	14,3
Field beans			7	14,3
Winter rye			7	14,3
Oats			7	14,3
Livestock				
Dairy cows	22	22	Suckling cow	24
Breeding bulls	1	1	Breeding bulls	1
Calves	5	5	Calves	24
Heifers to 1 y.	2	2	Heifers to 1 y.	15
Heifers 1-2 y.	2	2	Heifers 1-2 y.	15
Livestock unit	26,7	26,7		47,4
Livestock unit/ha	0,68	0,68		0,97
Family workers	1,6	1,6		1,6

Source: own survey basing on existing farms.

Economical aspects of organic farming presented by the example of two existing farms

In the following the economical situation of two organic farms shall be explained and possible developments shall be derived.

Organisation of the investigated farms

The two investigated farms have an above average total cultivated area of the farms registered in the report on agriculture (see **tables 2,4**).

«Farm I» is exploiting in the second year of the adjustment phase and is cultivating

about 40 ha. 24 ha are arable land, 15 ha permanent grassland. Regarding the crop rotation spring barley, leguminosae meslins (for fodder use) and field beans form the main share in the first year of adjustment (1988/89). Winter rye and oats were admitted in the first year of adjustment because of high losses of yield of the spring barley (28 dt/ha in the year 1989). Gaining further knowledge of handling the methods of production will surely change the crop area relation (see **table 4**). There are 22 dairy cows each with a second generation which makes the livestock unit of 0.68 LU/ha (see **table 4**). There is a labour density of 1.6 family workers on the farm.

«Farm II» had already been adjusted to organic farming in the year 1981/82; it has 49 ha of land, consisting of 42 ha cultivated area and 7 ha permanent grassland. The crop kinds clover grass, winter wheat, winter rye, field beans, dinkel and oats take 7 ha of the total arable area each, enabling a crop rotation of 6 sections. The stock consists of 24 mother cows and one breeding bull. Compared to farm I this makes a higher stocking rate of 0.97 LU/ha. The male calves produced in the farm are sold as baby beef at 300 kilos, the female calves are fattened as heifers and are not used before they weigh 500 kg. Same as «Farm I», «Farm II» has a labour density of 1.6 AK.

Economical situation of «Farm I»

Concerning «Farm I» calculations of rentability during three years have been made. Before the adjustment to organic farming the farm's profit was 43000 DM. Profit in this connection means gross income be-



cause lease and loan costs have been neglected.

In the first year of adjustment a drop of profit to 29000 DM is to be stated without demands for the EC-extensification programme. The losses are mainly located in the vegetable sector, because the yield of spring barley dropped heavily (28 dt/ha) and because of the big share of this crop of the total cultivated area. In the sector of dairy cow husbandry there was no visible drop in the milk performance (head of farm's statement, 1991) even though maize for silage as a basic high energy fodder was taken out of the ration and replaced by a leguminosae meslin. This meslin consists of field beans, peas, vetches and spring corn and is harvested as a «whole crop silage». The income of the animal production was largely constant compared to the original situation. As far as running costs are concerned the costs for fertilizing and for the protection of plants were reduced, however this reduction was caused by the higher running costs of grain seed and of corn for dairy cow husbandry (see **table 5**).

While in the first year of the adjustment the corn produced was sold as fodder to other organic farms, there were only mixed prices of 60 DM/dt (plus VAT) to be gained (as mentioned above); in the second year (1990) the prices to be gained in organic farming should be appropriated. These have a strong effect on the income of the land use. Additional to this, a high level of income has been gained, regarding organic farming; the profit of the farm rose to 58000 DM in the second year. If the profit can be kept on a similar level, the farm investigated has clear advantages compared to the traditional way of cropping, as practiced before. It remains uncertain, if this level is maintainable in the long run.

Due to this, additional model calculations have been made which represent the economic situation at a long term medium level of income (about 40 % loss of yield compared to the situation before the adjustment, at actual prices).

Those might be more important for the practice concerning the circumstances of organic farming.

Those calculations were based on the following areas and yields.

4 ha	winter wheat	with	40 dt/ha
4 ha	spring barley		40 dt/ha
4 ha	winter rye		45 dt/ha
4 ha	field beans		40 dt/ha
8 ha	leguminosae meslins		350 dt/ha

At the price level shown in **table 5** the sales of the land production amounts to 60000 DM and the total market proceeds amount to 156000 DM at a constant animal production. The thus resulting farm profit is 47000 DM in keeping with the 1990's running costs. This income might be possible on average during the following years at the given input-output relations. It is about 10000 DM lower than the income gained in the first

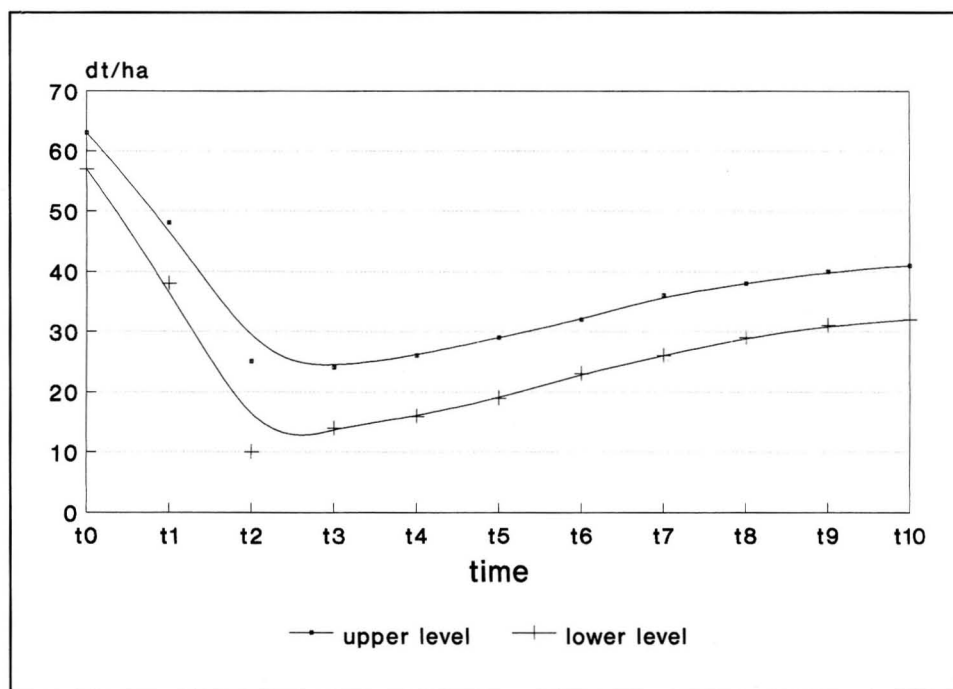


Figure 2: Development of yield after the adjustment to organic farming (schematic graph). Source: own survey.

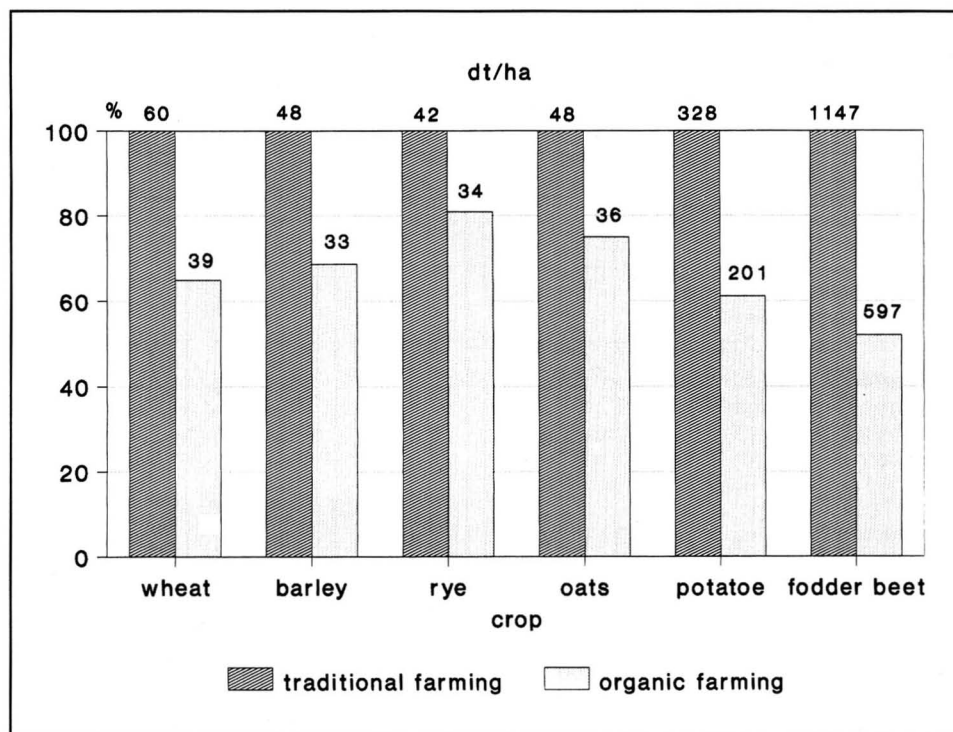


Figure 3: Comparison of yields from different land using systems of Bavaria. Source: Rottmann and Frettag, 1989.

year after the adjustment. Compared to the original situation (traditional farming) only small income improvement will be possible disregarding the possible changes of price. The annual fluctuations of yield will be higher in organic than in traditional farming. For these reasons there results a stronger income elasticity.

Due to the utilisation of the EC-extensification programme (variant «adjust-

ment to organic farming») one adjustment bonus of 425 DM/ha for market order products cropped before adjustment and another bonus of 300 DM/ha for other areas was paid at the time of adjustment.

The time of share or investment support is running for 5 years. By participating in this programme «Farm I» gets an investment support of 14175 DM that raises the profit in the first year of adjustment to the original level

Table 5 *Economic situation of "Farm I" during the time of adjustment to organic farming.*

Name	Before adjustment (1988)					First year of adjustment (1989)					Second year of adjustment (1990)									
	Crop	Surface ha	Yield dt/ha	Price (¹) DM/unit	Turnover DM	Crop	Surface ha	Yield dt/ha	Price (¹) DM/unit	Turnover DM	Crop	Surface ha	Yield dt/ha	Price (¹) DM/unit	Turnover DM					
Yield																				
* Crop production	W Wheat	8,9	71	41	25908	WW	3,3	58	67	12824	WW	3,5	38	99	13167					
	S Barley	3,0	66	45	8910	SB	9,8	28	67	18385	SB	2,3	43	99	9791					
	W Rape	5,0	25	93	11625	FBe	4,2	30	67	8442	WRa	4,4	58	99	25265					
	F Beans	2,9	45	59	7700						Oats	4,4	51	88	19747					
	Maize fS	4,2				Meslin	6,7				FBe	1,4	41	71	4075					
											Meslins	8,0								
Animal production																				
	Head of	Milk (²) kg	Price DM/unit			Head of	Milk (²) kg	Price DM/unit			Head of	Milk (²) kg	Price DM/unit							
Dairy cattle	22	85000	0,7		59500	22	85000	0,7		59500	22	85000	0,7		59500					
Animal sales					21000					21000					21000					
* Other turnover					14600					14600					14600					
SUM OF TURNOVER					149243						134751						167145			
Running costs																				
* General input					70870					70870					70870					
* General input crop production																				
Seed					3600					4000					4000					
Plant protection					3000					0					0					
Fertilizer					2220					1800 ^(³)					1800 ^(³)					
Machine hiring					5970					5640					5760					
Else					3750					3750					3750					
* Input animal production																				
General input					13320					13320					13320					
Concentrates (cereals)					3490					6080					9120					
SUM INPUT					106220						105460						108620			
PROFIT I					43023						29291						58525			
Extensification Programme					0					19,8 19,2					425 300					8415 5760
PROFIT II					43023						43466						72700			

(¹) including VAT (²) existing milk quota (³) stone flour
Source: own survey basing on existing farms.

(see **table 5**). So the statal farm development programme may equalize certain losses of yield rising in the time of adjustment or even raise the farm's profit over its original level as shown in the example's second year. Thus it may be an incentive to adjustment and reduce liquidity problems during this period.

Economical situation of «Farm II» (suckler cow herd)

As shown in **table 6** «Farm II» has a larger total cultivated area and higher stocking rate. The most significant farm activity is commercial cropping, in addition mother cows are kept. What is for the housing the farm has a loose housing stable. The fodder area has a slatted floor while the bedding is done in the laying area (deep loose housing stable). Thus as fertilizer there is solid dung that is composted and certain quantities of semi-liquid manure. As the farm has already been adjusted to organic farming in 1981/82 the income development can be followed exactly. **Figure 5** illustrates the yields for winter wheat before the adjust-

ment or the development after the adjustment in the farm investigated or the rural district's results (traditional variant). As explained in section 2.2., the longer organic

farming lasts, the greater the yields will rise (see Dabbert, 1990); in 1990 they were close to the rural district's results. This is mainly the head of the farm's merit; even during



traditional cultivation above average levels of income have been gained.

As in «Farm I» the arable farming is the main source of profit. On the other hand the sales profit's share of mother cow husbandry is low. Although its role on the farm remains important (supply with nutrients).

Altogether the farm achieves a total variable margin of 130000 DM. Reduced by the fixed costs a profit of 62000 DM results (lease and loan costs neglected) referring to a profit per worker of 39000 DM and per ha of 1260 DM. Of the statal offered direct income transfers «Farm I» can demand for the social structural equalisation of income (90 DM/ha ls, this is referred to 4400 DM/farm) and for the suckler cow premium. In 1990 the investment support amounted to 152 DM/suckler cow or to 3600 DM/farm. The amount of investment support of the farm investigated was 8000 DM out of the two variants and thus raises the profit shown in picture 5 by about 13 %.

The comparative group of the bavarian farm accounting statistics (Bayer. Staatsministerium für E.L.u.F., 1991) a commercial cropping farm, tertiary hilly country, 20-50 ha shows a profit of 1331 DM/ha ls. Yet comparing the profit per family worker which is 33911 DM/family worker according to the statistics mentioned above to the amount specific of the «Farm II», «Farm II» reaches a much higher income (38750 DM/family worker). These differences can primarily be explained by the small livestock; this is why a labour density of 1.6 is sufficient for this farm.

Comparison of the economicalness of traditional and organic cultivation

Comparisons of income between traditional and organic cultivation mostly neglect the difficulties of the period of adjustment and the constantly stronger fluctuations of yield in organic farming. With the example of «Farm II» both aspects ought to be respected. For this farm the data of almost ten years of organic cultivation are available. The data important for the comparison are to be taken from similar farms with traditional cultivation. The question, whether the adjustment to biological cultivation was reasonable out of economical reasons, shall be answered by looking back. For the registration of the fluctuations in income it is previewed to subtract the withdrawal for living from the annually gained profit and to pay interest on a remaining positive amount with interest on credit and an eventual negative amount with interest owing.

The final value of the income surplus during the time of investigation shall therefore be measured (formation of owner's capital). The idea is that the head of the farm is investing his surplus (comparable to formation of owner's capital) at interest, which is similar to investment. If the profit should not be sufficient for the withdrawals (similar to a loss of owner's capital), borrowed capital must be taken if there are no capital reserves from earlier times. As there are often invest-

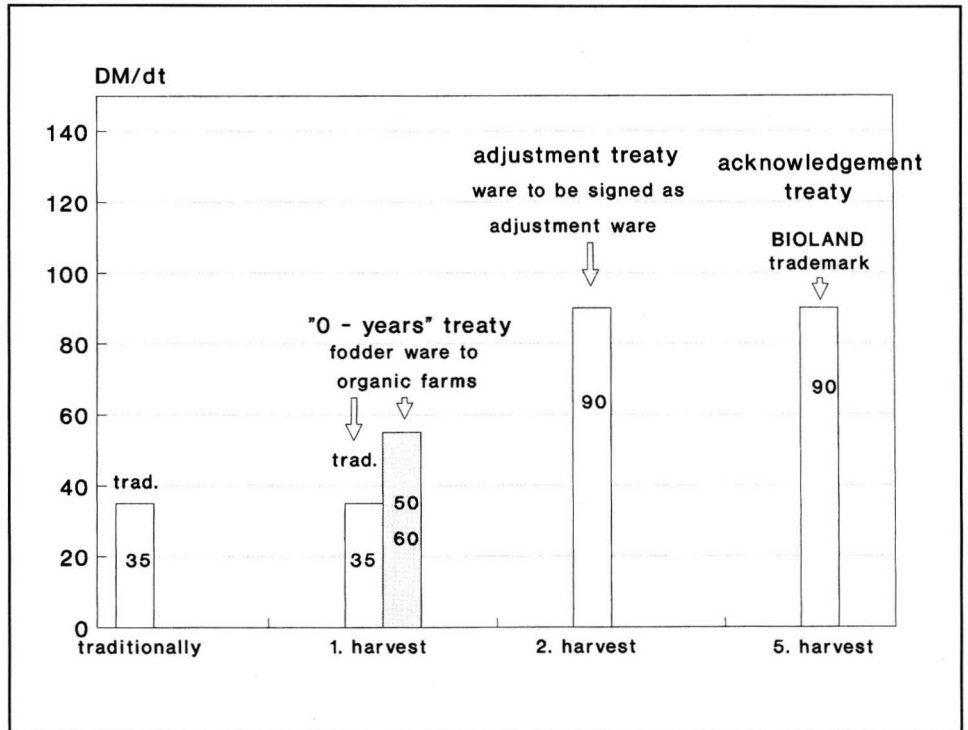


Figure 4: The adjustment to organic farming, example «Bioland». Source: Bioland, 1990.

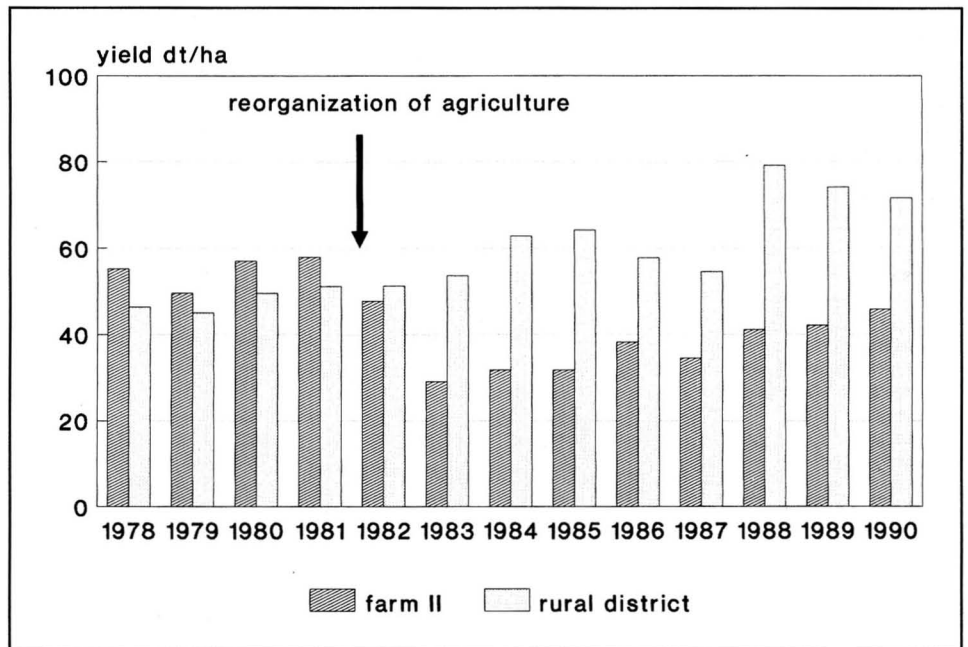


Figure 5: Development of the winter wheat yields after the adjustment to organic cultivation in «Farm II». Source: numbers of the head of farm, Statistisches Bundesamt 1991.

ments necessary during the time of adjustment, there is most of the time no way of using the deductions for covering the costs of living.

Figure 6 shows the annual formations of owners capital of «Farm II» at organic (real results) or traditional (calculated results) cultivation.

The withdrawals have been adjusted to the costs of living during the time of examination.

As expected, the profit made in the year of adjustment (1982) was not sufficient to cover the withdrawals necessary. In the second year (1983) the profit was already higher than the withdrawals. In the following years a positive formation of owners capital is to be noticed in direction. On the other hand, the fictitious development of profit of the traditional variant is marked by dropping producers prices, as in organic farming there were largely constant prices

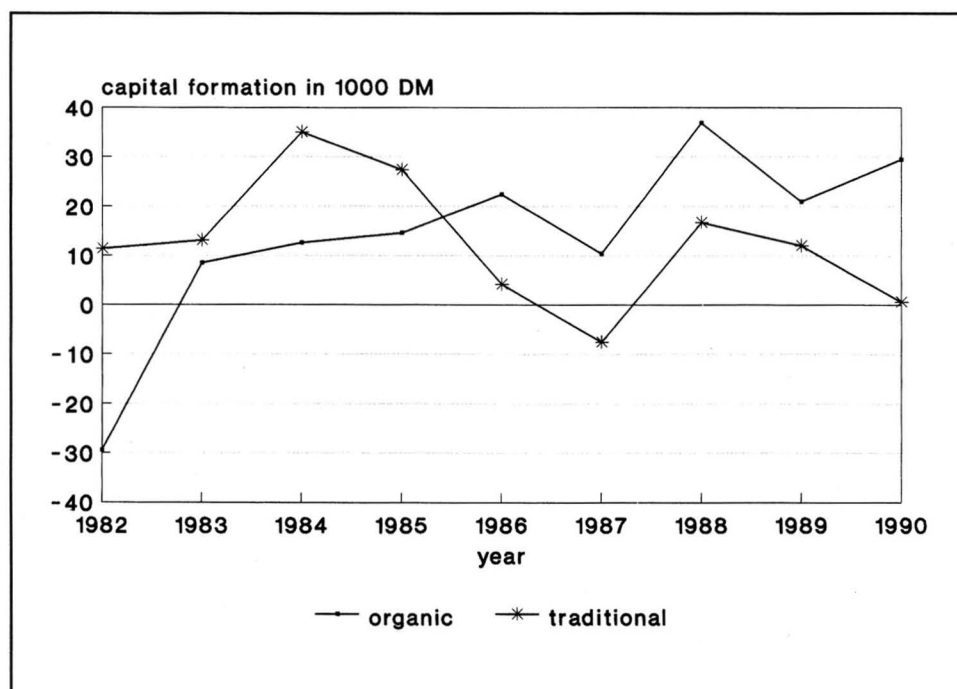


Figure 6: Annual formation of capital at organic and traditional cultivation during the time, shown for «Farm II». Source: own survey.

Crop	Yield dt/ha	Price (1) DM/unit	Unit	GM (7) DM/ha	Sum DM
Winter wheat	45	99	7	3554	24878
Dinkel	42	133	7	4662	32634
Winter rye	45	99	7	3575	25025
Oats	45	88	7	3146	22022
Field beans	30	67	7	2007	14049
Clover grass			7	-750	-5250
Grass land			7	-600	-4200
* Proportional special costs					
Suckling cow + heifer			12	-857	-10284
Suckling cow + baby-beef			12	-571	-6852
* Proportional volume of sales					
Sale of the old cow	550 (2)	2,95 (3)	4	1622	6488
Sale heifer	500 (2)	3,65 (3)	7 (4)	1825	12775
Sale baby-beef	165 (2)	10 (6)	11 (4)	1650	18150
Total gross margin					129435
./. Fixed costs				1383	67767
PROFIT					61668

(1) VAT included
(2) kg living weight
(3) DM/kg living weight
(4) one animal loss
(5) kg slaughter weight (300 kg living weight, 55 % carcass yield)
(6) DM/kg slaughter weight
(7) gross margin

Source: own calculations basing on an existing farm.

to be gained. Out of this it is obvious that by growing stabilisation of the yields of the biological variant the formation of capital rose clearly and was over the level of the traditional cultivation after the fourth year. For the comparison of the two forms of cultivation, interest on the surplus revealed during the time of investigation was paid.

Table 7 shows the methodical way of proceeding. By the help of the «heaviside function» it is assured in the calculation programme, that interest on credit on the surplus and interest owing on the deficit is to be paid.

Figure 7 shows the final values of capital for the following variants:

- traditional cultivation
- organic cultivation
- organic cultivation seeking the extensification support

In variant c it was suggested that the extensification support lasting 5 years had already existed at the time of adjustment. In the case presented this would refer, under the conditions of 1991 to a sum of 20000 DM. This would even in the second year allow a higher formation of owners capital than in variant a (traditional cultivation).

As demonstrated in figure 7 the respective final values of capital of the variant a were higher than the referring sums of variant b, in spite of the comparatively disadvantageous development of profit. The heavy loss of owner's capital in the adjustment year is a great load continuing having an effect. As far as the head of the farm is able to reduce a little bit the withdrawals at this time, he may contribute to some extent to the bettering of liquidity and stability. Depending on the individual case (size of family, structure of age...) there is only a small leeway to be noticed.

The situation is completely different if a farm is able to seek for the extensification support. The ruling until today (1991) previewed, that there is a paid premium of 425 DM/ha will be paid for the cultivated field fruits with a market order (i.e. corn, rape, beet, sun flowers, peas, and broad-and field beans), and an extensification premium of 300 DM/ha for the rest of the farmland if the farm is adjusted to less intensive ways of production (Bayer. Staatsministerium für E.L.u.F., 1991 b). According to the actual legal position the sums of the premium are for the time being 500 DM/ha or 350 DM/ha. If this had been possible in 1982, regarding the final values of fortune, there would have been almost no difference to variant a, (traditional cultivation) even within the first four years. In the following five years variant c, shows a rising superiority (see figure 7). The arising consequence is that the extensification support has a tendency to diminish the liquidity and stability problems of the adjusting farm, maybe it is quite an attraction towards adjustment.

Result

The cultivation of a farm according to the guidelines of organic farming is characterized by liquidity problems during the time of adjustment and by a higher risk of yield caused by a renunciation of certain means of production.

One reason for the problems mentioned is the head of the farm's initial lack of experience with the changed method of production. It ought to be possible to diminish the risks by optimization. As there are often times techniques applied that are capable of improvement. In this connection further research activities might be an important contribution. For instance there was

Table 7 *Determination of the final value of the capital out of the difference between profit and withdrawals.*

Profit (G) - withdrawals (E) = formation of capital (K)
 Paying of interest on credit (h) on the surplus
 Paying of interest owing (s) on the deficit
 Transfer to the following year corresponding
 Extrapolation of the withdrawals by 3% p.a.

$$K_n = G_n - E_n + h \cdot K_{n-1} \cdot \Theta (K_{n-1}) - s \cdot K_{n-1} \cdot \Theta (-K_{n-1})$$

$$n = 1, 2, 3 \dots 8$$

Heavisidefunktion: $\Theta(x) = \begin{cases} 1 & x > 0 \\ 0 & x \leq 0 \end{cases}$
 Θ Theta

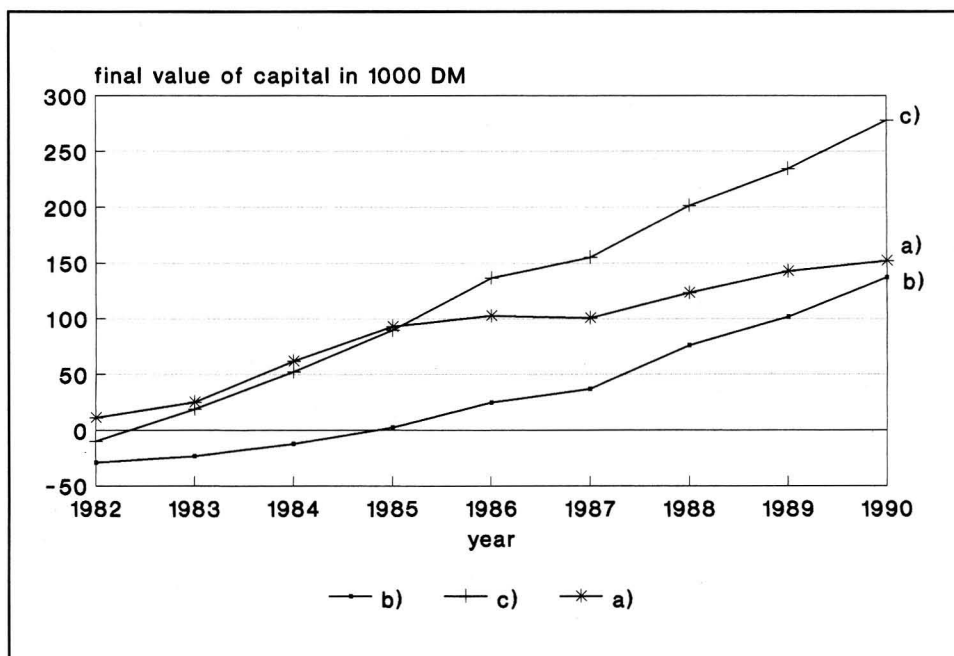


Figure 7: Final value of capital of biological and traditional cultivation of «Farm II». Source: own survey.

hardly no technical improvement of the weed control in corn by hoeing and currying since the introduction of the herbicides in traditional farming. Meanwhile it turned out that there are satisfying results to be reached at relatively low costs by using new implements without herbicides. It is remarkable that those improved techniques are entering to an increasing degree into traditionally cultivating farms mainly if they are affected by environmental conditions, i.e. in protected water collection areas. In this respect a improved method of production contributes to a stabilisation of yield in organic farming; under circumstances it also serves traditionally cultivating farms. Out of the reasons given the method of production in biological farming is not standardized as in traditional cropping. This is why the head of the farm's qualification might have a stronger impact on the level of income. This assumption is supported by a further aspect.

The organically based farmer has to take care especially about the marketing, because standardized ways of sales are usually not usable. In addition, those farms are totally exposed to the market's risk. Statal measures of intervention are of little use for these farms because of the clearly lower level of price. In future times a rising pressure on the producers prices of organic farms will be expected. On the one hand the supply of organically based products will grow, also because statal support programmes offer an incentive to the adjustment, and on the other hand farms, until now traditionally cultivating, might try to protect their existence by adjusting to organic farming because of the price pressure connected with the EC reform of agriculture and the opening up to the world market. The problem of structural change also affects organic farmers. To smaller farms, direct marketing offers a chance to gain a satisfying income.

Larger farms have to look for efficient ways of marketing and have to emphasize the regional relations. The initial stages towards this end are already existing. An important area of responsibility will generally be to improve the possibilities of marketing in order to diminish the inevitable pressure of price at the rising supply.

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