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On-farm effects and farmer attitudes towards Agri-environmental Programmes

A Case Study in Baden-Württemberg

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Abstract

Political strategies to reduce negative environmental effects of agriculture can be divided into injunctions such as inhibitions and precepts, and into voluntary approaches. These two substantially different approaches are studied in the German Federal state of Baden-Württemberg, using as examples the Market Release and Landscape Conservation Programme (*MEKA*, voluntary), and the regional Regulation for Water Protection Areas (*SchALVO*, compulsory) respectively. In order to evaluate the on-farm effects of these two approaches, the differences between the programmes, and any significant differences between participating and non-participating farms, a survey has been carried out involving 150 farmers in different parts of the state. As a second step, the attitudes of farmers towards *MEKA* and towards a range of other voluntary approaches have been analysed. The most significant results would indicate that the acceptance of voluntary programmes is based on an appropriate financial compensation for the required adjustments. If this is the case, this kind of programme would appear to have the same acceptance as injunctions. In general, the farmers have positive attitudes towards voluntary approaches, but their provisos are also growing as a function of the loss of influence felt to exist within these approaches.

Keywords: on-farm effects, agri-environmental programmes, Baden-Württemberg, empirical research, environmental protection, water protection, *MEKA*, Regulation EEC 2078/92

Résumé

Les programmes agri-environnementaux : impacts sur les exploitations et attitudes des agriculteurs en Bade-Württemberg. Les politiques agri-environnementales se répartissent en deux catégories : celles qui se traduisent par des contraintes imposées - interdictions et obligations - et celles qui impliquent une démarche d'adhésion volontaire à un programme agri-environnemental. Ces deux types d'approche ont été étudiées dans le Land de Bade-Württemberg (RFA), à partir de deux situations : le Programme « Marktentlastungs- und Kulturlandschaftsausgleich » (*MEKA*, volontaire) et la réglementation régionale pour la protection des zones de captage (*SchALVO*, imposé). Les effets de ces programmes au niveau des exploitations, leurs différences ainsi que les différences entre participants et non participants ont été analysés après enquête réalisée auprès de 150 agriculteurs dans différents sites du Land. L'étude a également pris en compte les attitudes des agriculteurs vis-à-vis du *MEKA* et d'autres démarches d'adhésion volontaire. Les résultats montrent qu'une mesure agri-environnementale n'est acceptée que si elle s'accompagne d'une compensation financière adéquate. Dans ces conditions, les agriculteurs répondent de façon positive. Mais ils se montrent de plus en plus réservés à mesure que les restrictions imposées limitent de façon croissante leur droit de co-décision.

Mots-clés : programme agri-environnemental, exploitation agricole, Land de Bade-Württemberg, recherche empirique, protection de l'environnement, protection des eaux, programme *MEKA*, Réglementation CEE 2078/92

Introduction

Modern agriculture as a cause of environmental damage has become increasingly the object of criticism in recent times. As early as 1985 the Expert Council for Environmental Issues (*Rat von Sachverständigen für Umweltfragen*; SRU) pointed out environmental impacts of agriculture and the change of agro-ecological systems in a special analysis (SRU, 1985). Problems of particular importance arise from the large-scale application of pesticides and fertilisers, the use of heavy machinery, crop rotations which are not site-adapted, as well as from the increasing removal of structural elements in the landscape, as e.g., hedges, single trees or moist biotopes. Nutrient input into groundwater and surface water, soil compaction and erosion, reduction or destruction of biotopes and thus a decrease of species variety are the consequences.

Strategies of environmental policy to solve these problems can basically be classified into regulative legislation approaches and voluntary approaches (cf. Nellinger, 1996; see also Lowe and Whitby, 1997). In the case of regulative legislation approaches a solution is achieved by a direct restriction of or the obligation for intervention respectively in the form of injunctions, prescriptions or prohibitions. These restrictions may be recompensed if necessary. Voluntary approaches, however, attempt to reduce or to eliminate environmental damage indirectly via costs in the form of taxes or through premium payments.

On the basis of a survey carried out in Baden-Württemberg, the present study investigates the on-farm effects and the attitudes of farmers towards environmental programmes which are relevant or available to their farms. Special consideration is given to the Market Release and Landscape Conservation Programme (*Marktentlastungs- und Kulturlandschaftsausgleich*, MEKA) which offers compensation payments to farmers for special actions, and the Regional Regulation for Water Protection Areas (*Schutzgebiets- und Ausgleichsverord-*

nung, SchALVO) for water protection areas in Baden-Württemberg, which imposes strict injunctions commanding compensation payments to farmers. Moreover, the inquiry will cover whether there are further alternative solutions for existing environmental problems besides the programmes in operation, for which sufficient acceptance by farmers can be assumed.

1. Data base

1.1. Study areas: Kraichgau and Swabian Alb showing different site qualities

The conditions of agricultural productivity in Baden-Württemberg vary distinctly between parts of the state. Besides the favourable sites with annual average temperatures around 9°C and favourable soil and climate conditions (cf. State Ministry for Rural Areas (*Ministerium Ländlicher Raum Baden-Württemberg*, MLR) 1996), there are marginal sites for agricultural use in Baden-Württemberg. Above all, the high altitudes of the Black Forest and of the Swabian Alb are among these marginal sites. The average annual temperature there is below 6°C and the soils are poor. Due to this high degree of heterogeneity, a research programme covering all Baden-Württemberg requires an adequate consideration of differences within the state. With this in mind, the Kraichgau and the Swabian Alb were selected as study areas (see Figure 1).

The Kraichgau is an area of high natural productivity. The soils are deep and fertile, the average annual temperature 9°C. The largest part of the agriculturally used area is arable land (84 %), on which cereals and sugar beet are predominantly cultivated. The large share of row crop cultures like sugar beet, maize, potatoes and even sunflowers together with mostly silty soils leads to considerable soil erosion risk in this hilly landscape. The share of forage crops and grassland is very low in the Kraichgau. Livestock production plays an insignificant role, a fact which is also

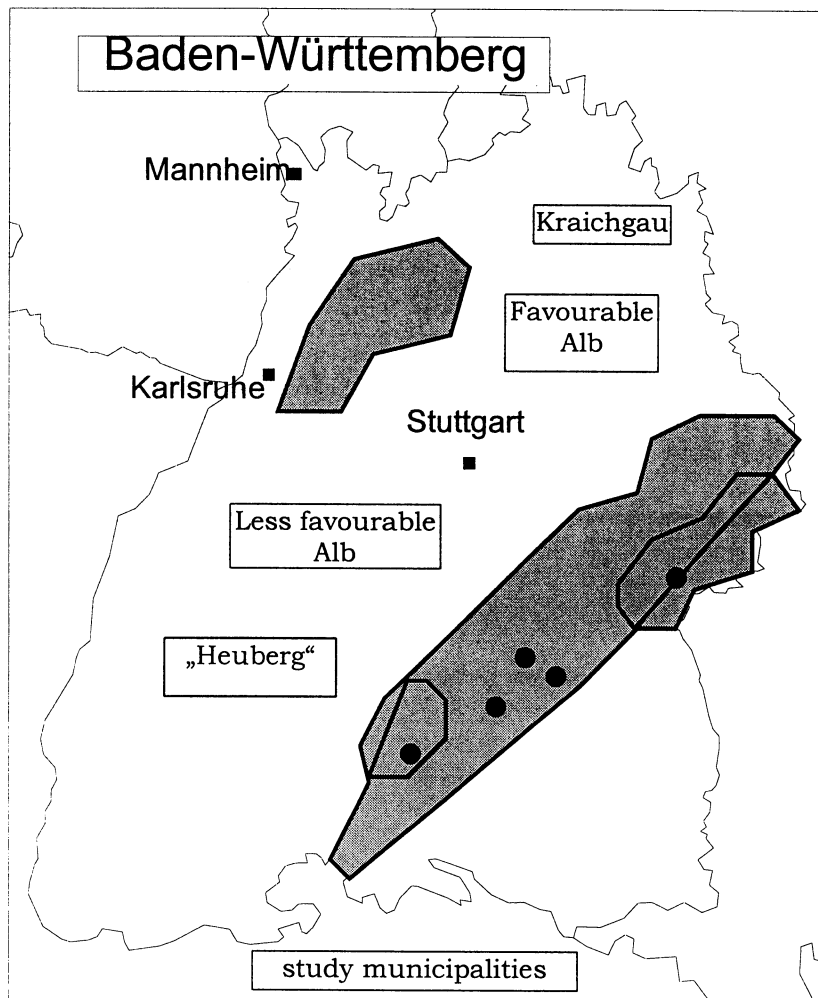


Figure 1: Study areas in Baden-Württemberg

reflected by the share of farm types with livestock production and the average stocking rate of 62 livestock units per 100 ha of farmland. On the other hand, there is a high share of permanent crop farms in the Kraichgau producing either fruits or wine. Farm size is not particularly high as is the case in most areas of Baden-Württemberg (60 % of the farmland is managed by farms with 50 ha and less). However, the share of farms operated by part-time management (67 % of all farms in the area) is high.

The Swabian Alb is a less homogeneous area. Therefore three different production sites are differentiated. The eastern part of the Alb is among the more favourable sites with altitudes of 550-800 m, rich soils and an annual mean temperature of 7°C. The high-altitude sites

of 800-1000 m of the West Alb (« Heuberg ») have very poor site conditions, which render agricultural production very difficult. In some areas agriculture is receding in favour of afforestation to a similar extent as is well known for the Black Forest. The largest part of the Swabian Alb is situated between these two extremes and is called « less favourable Alb ». With increasing altitude the share of grassland and of forage crop cultivation surface increases. The reverse proportion exists for the share of full-time farm enterprises and stocking density. Both diminish with increasing altitude. On the Heuberg, an area of about 15,400 ha farmland, hardly 8.6 % of the 854 agricultural enterprises count among the full-time enterprises. The farms on the

Swabian Alb are predominantly dairy farms which show a low degree of specialisation. Suckling cow farms have increased in the past years but on the whole are still of little importance.

the sites. The choice of these areas allows the range of production conditions prevailing in Baden-Württemberg to be covered.

Table 1 represents a comprehensive illustration of the structural diversity of

		Favourable Alb	Less favourable Alb	Heuberg	Swabian Alb (total)	Kraichgau
Municipalities	number	27	79	19	125	63
Agricultural enterprises	number	2,500	7,344	854	10,698	4,411
Percentage of FL in the totalsurface	%	59	42	33	44	42
Farmland (FL)	ha	50,486	146,784	15,393	212,663	73,140
Arable land (AL)	%	74	56	23	58	84
Grassland (GL)	%	26	45	77	43	13
Of which meadow	%	90	84	84	85	81
Arable land (AL)	ha	37,295	81,722	3,471	122,488	61,286
Oilseeds	%	11	10	6	10	8
Forage crops	%	18	20	15	19	10
Of which maize silage	%	66	32	3	41	72
Fallow land	%	1	3	6	2	4
Erosion-exposed AL (acc. to crops)*	%	16	8	4	11	29
Full-time farms <10 ha	%	5	3	2	3	5
Full-time farms 10-20 ha	%	11	5	1	6	5
Full-time farms >20 ha	%	34	22	5	23	23
Part-time farms <10 ha	%	30	45	68	45	56
Part-time farms 10-20 ha	%	15	16	17	16	7
Part-time farms >20 ha	%	5	9	7	8	4
Livestock units	LsU	61,977	135,906	8,154	206,037	45,884
Stocking rate	LsU/100 ha	120	89	53	97	62
Dairy and beef farms	%	51	54	54	54	16
Arable farms	%	27	34	37	33	46
Pig and poultry farms	%	11	4	2	5	3
Mixed farms	%	9	7	6	7	5
Permanent crop farms	%	2	1	1	1	30

Cultivation proportion of crops with low soil covering rate in spring (maize, sugar beet, sunflower, potatoes)

Table 1: Structural parameters of agriculture in the Kraichgau and on the Swabian Alb (Source: STALA 1991)

1.2. Survey: Realisation and Evaluation

In the context of a project supported by the State Ministry for Rural Areas (MLR) and by the EU, 150 farm managers in Baden-Württemberg were interviewed in winter and spring 1996 on their attitudes towards environmental issues and environmental programmes on the basis of a standardised questionnaire. In the Kraichgau, 25 representative farms were selected at random. On the Swabian Alb, interviews were attempted with all the farmers of selected municipalities. The municipalities reflect the agricultural and natural conditions of this area. The response rate of the oral interviews was 73 %.

The survey itself referred among other things to the attitudes of farmers towards agricultural and environmental policy schemes. Consequently, one major point of emphasis was on open questions, which served to ensure an undistorted evaluation of the farmers' attitudes. In addition to these open questions, some ordinally scaled questions were included. This was done primarily in those cases where farmers were to be induced to make judging statements. For the purpose of classifying the random sample and for the analysis of possible differences the survey was complemented by demographic and agro-structural data.

Firstly, the on-farm effects of the two agri-environmental programmes *MEKA* and *SchALVO* are evaluated. Special attention is paid to the effects on income, management, farm structure, and production. The differences between farms on different sites are tested statistically. Since no standard distribution can be assumed for the survey data, the non-parametric *Mann-Whitney U Test* is used for metric and ordinally scaled variables and the *Pearson Chi-Square Test* is used for qualitative variables (Sachs, 1988).

Secondly, the differences between participants and non-participants of the voluntary *MEKA* scheme and also the different motivations of participants are analysed. Here, the study follows the assumption that there are various

reasons for farmers to participate in agri-environmental programmes. Participation itself therefore represents the dependent variable. Independent variables are parameters of agrarian structure, individual farm conditions, the attitudes and patterns of farmer behaviour and site conditions. The subject is the question of to what extent these independent variables restrain or stimulate participation of farmers in agri-environmental programmes. For this section the non-parametric *Mann-Whitney U Test* and the *Pearson Chi-Square Test* are used as well.

It is frequently demanded that farmers participate in the development of local nature and environment-protection measures, in order to safeguard a maximum degree of effectiveness. Therefore, in a last step the attitudes of farmers towards other possible approaches to integrate environmental features in agricultural production are examined.

2. Agri-environmental programmes in Baden-Württemberg

Table 2 gives an overview of the most important environmental programmes in Baden-Württemberg and a comparison with other significant transfer payments to agriculture which partly aim at environmental protection or have indirect effects on the environment. For an estimation of the relevance of particular programmes for agriculture in general it should be noted that in 1996 little more than 84,000 agricultural enterprises existed in Baden-Württemberg with more than 1 ha farmland. Two thirds of them were operated as part-time farms and only one third as full-time farms (STALA, 1997).

The most important agri-environmental programmes are the Regional Regulation for Water Protection Areas (*Schutzgebiets- und Ausgleichs-Verordnung, SchALVO*), which is in operation since 1988, and the Market Release and Landscape Conservation Programme (*Marktentlastungs- und Kulturland*

Programme	Institution	Acceptance of farmers 1996	Funds allocated 1996 in million. DM
Market Release and Landscape Conservation Programme (<i>MEKA</i>)	EU 50 % state (BW) 50 %	58,829	166.5
Compensation payments for use-restrictions in water protection areas (<i>SchALVO</i>)	state 100 %	28,275 (nearly 100 % of eligible persons)	95.4
Landscape Preservation Guideline (<i>Landschaftspflege</i> richtlinie) (part E only)*	state EU	2,413	4.8
Subsidies for less favoured areas (LFA)	EU 25 %, Fed. Govt. 60 %, state 15 % (single parts of programmes: state up to 100 %)	39,178 (60 % of the farmland)	140.5
Initial afforestation premium payment	state 50 % EU 50 %	1,229	0.5
Investment programme for individual farms and agricultural credit programme	Fed. Govt. 60 %, state 40 % EU-refunding 25 %**	1,589	85.4
CAP reform payments (crops)	EU 100 %	~ 50,000	425
CAP reform payments (animals)	EU 100 %	~ 24,000	59

* Communal subsidies are not considered. EU refunds only 5-year contracts. Short-term contracts were also concluded. In the case of old contracts (efficiency support) the EU takes over 25 % of a maximum of 354 DM/ha. In the case of new contracts acc. to Reg. 2078 EU takes over 50 % of a maximum of 824 DM/ha.

** EU-refunding 50 % for junior farmers support, deviating regulations for isolated parts of programme

Table 2: Environmental programmes and other selected transfer payments in Baden-Württemberg - financing structure and participation rate 1996 (Source: MLR Baden-Württemberg (1995, 1997, 1998); (comm. pers.))

schaftsausgleich, *MEKA*) introduced in 1992. Another state-wide programme is the Landscape Preservation Guideline (*Landschaftspflege*richtlinie, *LPR*), which is increasingly gaining importance but disposes only of limited financial resources. *MEKA* and *LPR* are environmental programmes which are co-financed by the EU as accompanying measures of the agricultural reform in application of the Regulation EEC 2078/92. In addition, there are several other - essentially communal - environmental programmes, which are diminishing, however, due to the tight budget situation of the municipalities and overlaps with programmes of the state, above all *MEKA*.

The table shows that for Baden-Württemberg farmers and the state budget the agri-environmental programmes play an important role compared to other schemes like e.g. the CAP reform. This is the case for the payments and the acceptance rate. The

number of farms taking part in *MEKA* is higher than the number of farms receiving arable CAP payments.

The present analysis exclusively concentrates on the *MEKA* and *SCHALVO* programmes as objects of investigation. An attempt to include *LPR* in the study failed because the number of programme participants is comparatively low and farmers are often not able to identify unequivocally local programmes of *LPR*.

2.1. Regional Regulation for Water Protection Areas: *SchALVO*

As a result of the *SchALVO* being effective since 1988, fertilisation, application of pesticides and agricultural management in water protection areas have been considerably restricted in order to avoid in particular the pollution of groundwater by nitrates and pesticides.

For concomitant economic losses the land users receive compensation payments. According to its definition, *SchALVO* is an injunction which imposes a direct restriction of intervention on farmers farming land within water protection areas, a restriction of use which is considered as eligible for compensation. In this context reference is made to Sütterlin (1989) who discusses in detail legal conflicts concerning agriculture in water protection areas. The obligation for compensation arises from the fact that the farmer has to comply with injunctions exceeding regular management. Upon application farmers whose fields are situated in water protection areas receive a global compensation payment of 310 DM/ha of farmland if they cannot prove greater losses. In 1994 17.4 % of the state surface formed part of water protection areas. The declared target figure of the state government for the protection of all water catchments is 28 % of the surface (LFU, 1995). Payments to agriculture amounted to 93 million DM in 1994. The programme is financed by the water users of Baden-Württemberg who pay a

tax of 0.10 DM per m³ on the purchase of water. Within the protection areas the prohibitions listed in Table 3 are in force. Moreover, there is an obligation of reduced fertilisation, and intercropping is required if the soil is to remain bare over a longer time.

In the appendix to the regulation the manner of restriction for farmers is specified regarding nitrogen fertilisation. The permissible nitrogen fertilisation rate is calculated as follows:

- fertilisation according to approved practice
- less 20 % risk reduction for precautionary reasons
- = permissible fertilisation in water protection areas

However, one problem continues to be the exact definition of regular agricultural management. The fertilisation regulation, the draft of the soil protection law and the new version of the nature protection law point, however, in the direction of concrete specifications in this area.

	Protection areas		
	Central catchment area (zone I)	Narrow protection zone (zone II)	Wider protection zone (zone III and IV)*
Prohibition on ploughing of permanent grassland	in all protection zones		
Prohibition on application of liquid manure, silage seepage water, waste water, sewage sludge, faeces and similar material	year-round		On permanent grassland from 15th Oct. to 1st Feb. on other surfaces from 1st Oct. to 15 th Feb.
Prohibition on ploughing in of solid manure and similar material on arable land	year-round		From 15th Nov. to 1st Feb.
Prohibition on application of nitrogen-containing commercial fertiliser	year-round		On permanent grassland from 15th Oct. to 1st Feb., on other surfaces from 1st Oct. to 15th Feb.
Prohibition on application of pesticides	year-round		According to list of allowed products

* Zone IV in water catchment areas

Source: modified according to Ministry of Environment Baden-Württemberg (1991)

Table 3: Protective measures in water protection areas according to *SchALVO*

The compliance with all regulations is monitored by the agricultural authorities. The most important element of monitoring is nitrate measuring which takes place annually in autumn and which included about 84,000 sampled sites in 1994 (Audit Office Baden-Württemberg (*Rechnungshof*), 1995). If the measured nitrate content persistently exceeds the concentration of 45 kg NO₃-N per ha in a soil depth between 0 and 90 cm, the compensation payments have to be re-paid, since it is to be assumed that the management interventions of the farmer cannot be considered as being in accordance with the regulation. An evaluation of measured results shows that during the period from 1991 to 1994 « there is a clear decreasing tendency concerning the nitrate leaching potential » (MLR, 1995, p. 48). This statement retains validity even if the influence of the annual weather conditions on the measuring results is taken into account. Thus the average nitrate content of the sampled surfaces could be lowered from 42 kg NO₃-N per ha in 1991 to 22 kg in 1994 and to 24 kg in 1995. As far as reduction of nitrate content in seepage and surface water of farmland is concerned, *SchALVO* is therefore generally considered to be efficient. No incontestable analysis has hitherto been carried out, however, of the exact correlation between the residual nitrogen content of the farmland in autumn and the nitrate content in headwaters and running waters (cf. Steiner *et al.*, 1996; Henze, 1996).

2.2. Market Release and Landscape Conservation Programme *MEKA*

MEKA is part of the accompanying measures of the CAP reform which are implemented according to Regulation EEC 2078/92. In the context of this regulation regional programmes for environmentally sustainable agricultural production methods protecting natural habitats are supported. The object of these supporting measures is an improvement of environmental quality and a reduction of production. EU co-

financing in Baden-Württemberg amounts to 50 %

The following measures and conditions are supported by *MEKA* (MLR, 1993):

- 1- Support of grassland management in sensitive areas for the protection of soil against erosion and for the preservation and management of agricultural landscape.
- 2- Maintenance of landscape-preserving and particularly endangered uses, e.g., grassland with over 25 % incline, preservation of grassland which is mown once or at maximum twice a year, preservation of traditional orchards or use of grassland by livestock production of endangered regional agricultural breeds.
- 3- Low intensity and environment-friendly crop growing.
- 4- Management of specially protected biotopes according to the German nature protection law (cf. § 24).

As with all programmes co-financed by the EU under to Regulation 2078, farmers take up the obligation upon entering the contract to maintain the management of their farmland according to the programme's objectives for five years. The farmers may decide themselves whether and to what extent they participate in *MEKA*.

Table 4 shows the funds allocated for *MEKA*. It is evident that in this programme 'active' measures take priority, comprising the green covering of arable land, renunciation of growth regulators or extension of the drill row distance to 17 cm. They are complemented by three 'passive' measures aiming at the preservation of certain landscape elements. Taken as a package of measures, the support of grassland management amounting to 38 million DM ranks before all other *MEKA* measures. In 1995 a total of 63 % of farmers with enterprises sized from 1 ha farmland upwards received compensation payments through *MEKA*. An average *MEKA* premium payment of 1,700 DM per farm can be calculated.

	points per ha (1 point corresponds to 20 DM)	applications*	ha* or live- stock units (LsU)	total amount of support applied for [mil- lion DM]
GL below 1.2 LsU/ha**	5	10,050	103,707	10.4
GL 1.2-1.8 LsU/ha	3	5,385	74,730	4.5
GL above 1.8 LsU/ha	2	4,923	46,934	1.9
Low intensity GL	8	4,141	63,033	10.1
Inclined GL (more than 25 %)	5 or 9	16,752	61,200	6.6
GL under specific conditions	1 to 5	33,590	144,104	4.6
Traditional orchards	10	39,748	64,782	13.0
Steep slope viticulture	10	665	324	0.1
Endangered agricultural breeds	5-10	5,110	27,793	3.2
Renunciation of growth regulator in wheat, rye and triticale	6 or 10	31,754	117,911	22.6
17 cm drill row distance	6	9,801	141,866	17.0
Complete renunciation of mineral fertilisation and chemical plant protection	8	4,862	48,543	7.8
Ecological cultivation (incl. viticulture and fruit)	10 to 60	1,105	26,136	6.8
Green cover (incl. partial g.c. 40 or 70 %)	2,8 to 7	38,604	259,149	35.4
Mulch sowing	6	5,720	75,638	9.1
Renunciation of herbicides	5	9,749	27,556	2.8
Biotopes (moist, wet, dry or special b.)		900	3,061	0.9
Sum	-	-	-	156.6

* Situation 1996 in Baden-Württemberg: 840,000 ha arable land, 582,000 ha grassland and 49,000 ha permanent crops; 84,000 farms above 1 ha farmland, of which two thirds part-time farmers

** Density of cattle, sheep, goats and horses (LsU per ha main forage surface)

Source: modified according to LFL 1996

Table 4: MEKA in Baden-Württemberg in 1995 - conditions eligible for support, financial means and acceptance classified according to measures

3. Effects of MEKA and SchALVO on farmers and their business

Site differences, income structure and farm type are closely correlated with the effects of different agri-environmental programmes on agricultural enterprises. Therefore, it can be assumed that these factors have different influences on the farms and that there are differences between participating and non-participating farmers. In the following the on-farm effects of MEKA and SchALVO are described and evaluated. A differentiation between participants and non-participants is, however, only

made for MEKA, since SchALVO as indicated above is an injunction involving sanctions rather than a programme based on voluntary participation.

3.1. Effects of MEKA on production, management and farm income

As shown in Table 5, participation in MEKA affects large numbers of agricultural enterprises. Sometimes only a few farms are concerned by on-farm effects, frequently, however, one half of the farmers or more are concerned. It is significant that some parameters show considerable regional differences.

	Kraichgau 1	favoured Alb 2	less fa- voured Alb 3	Heuberg 4	total
Participants (in % of N)	23 (92 %)	18 (95 %)	69 (90 %)	28 (97 %)	138 (92 %)
Effects on farm income (positive in %) ²	70	83	72	64	72
Effects on scheduling of activities (positive in %) ²	57	61	38	39	45
Effects on labour input (positive in %) ¹	22	39	9	4	14
Effects on the use of agricultural machinery (positive in %) ¹	48	28	21	7	23
Decreasing production quantities (positive in %) ¹	36	17	40	70	42
Effects on other fields (positive in %) ¹	15	13	2	0	5
Effects on investments (positive in %) ¹	43	19	9	11	17
Premium share required to compensate use restriction (%) ³	44	70	55	73	58

¹ Significantly different ($\alpha=5\%$) among all areas

² Not different ($p>0,1$)

³ Significantly different between area 1 and 4 ($\alpha=5\%$)

Table 5: MEKA effects on the farm

		Kraichgau 1	favoured Alb 2	less fa- voured Alb 3	Heuberg 4	total
Participants (in % of N)		23 (92 %)	18 (95 %)	69 (90 %)	28 (97 %)	138 (92 %)
<i>Question: Which measures do you carry out within the programme, which you would not apply otherwise? (in % of the farms)</i>						
Number of measures not applied otherwise						
0 measures	5	12	27	4	17	
1 measure	46	47	34	30	37	
2 measures	27	29	27	33	29	
3 and more measures	23	12	12	33	18	
Total	100	100	100	100	100	

Significantly different between areas 1 and 3, 3 and 4 and 2 and 4 ($\alpha=5\%$)

Table 6: MEKA effects on certain management measures classified according to area

The strongest on-farm effect of *MEKA* is reflected by farm income. However, it is important to note that farmers mentioned decreasing or increasing farm income and that farmers were not aware of overlapping effects by other transfer payments and the lowered product price level.

The effects on the scheduling of activities within the farm mostly refer to the prescribed sowing and ploughing dates for intercropping measures, leading to periods of intensive labour, particularly on the less favoured Alb and on the Heuberg, due to the shortened vegetation period. Moreover, participation in *MEKA* resulted in a higher or lower total labour input in approximately an equal number of cases. The changes of quantity and timing of labour activities are accompanied by a further qualitative aspect. Protective measures for cereals, for example, require more intensive care and control of crop stands (e.g., renunciation of growth regulators or herbicides), due to the intensity restriction prescribed by *MEKA*.

The existing influence of *MEKA* on farm investments is higher in the Kraichgau and on the favoured Alb than on the two poorer sites. As a result of *MEKA*, in the Kraichgau and on the favoured Alb, investments frequently became necessary with respect to mulch sowing techniques. In the other two areas there were above all investments for curry combs and mulch appliances. If this result is correlated with the premium share required to compensate the use restriction, it becomes evident that parts of the premium can and must be used in order to finance the adjustment of machine equipment to environment-beneficial production methods.

The indication of the number of measures which would not be realised by farmers without *MEKA* (Table) is an indicator of the extent to which farmers have changed the agricultural management of their farmland in comparison to former times. On the whole 83 % of the farmers carry out measures today which they would not apply without *MEKA*. Examples are, above all, green cover after harvest, renunciation of growth regulators in wheat and rye cultivation,

extended drill row distance to reach at least 17 cm and - above all on the Swabian Alb - restricted use of grassland. In the Kraichgau and on the favoured Alb farmers would often dispense with mulch sowing procedures without *MEKA*. The number of measures falling into this category always depends, however, on the number of *MEKA* measures in which a farmer participates.

Area differences in Table 6 are significant as indicated. On the less favoured Alb 27 % of the farmers do not feel restricted in management by *MEKA*, in the other areas this percentage is lower. The assumption that farmers farming on poor sites undergo less restrictions than those on favourable sites, however, cannot be confirmed, since the results for the Kraichgau and the Heuberg contradict it. It should be considered, however, that in the context of this investigation no statement can be made about the extent of the necessary modifications.

3.2. Effects of *SchALVO* on production, management and farm income

Since the demarcation of water protection areas did not take place simultaneously in the different areas, some farmers have more experience with *SchALVO* effects than others. Part of the studied farms belong to areas declared as water protection areas back in 1989, while part of the water protection areas were only demarcated in 1992. Therefore, the presentation of results is confined to the area level. In total 93 % of the interviewed farmers are concerned by water protection measures. Frequently a large part of their total farmland lies within the water protection area. There are, however, considerable differences between the sites: in the studied farms of the Kraichgau only 35 % of farmland is within the water protection area, on the Swabian Alb the percentage varies between 72 and 97 %

In answer to the question, which percentage of the compensation payment (310 DM/ha farmland) is required as

	Kraichgau 1	favoured Alb 2	less favoured Alb 3	Heuberg 4	total
Farmers concerned (in % of N)	21 (84 %)	19 (100 %)	70 (91 %)	29 (100 %)	139 (93 %)
Effect on farm income (positive in %) ¹	58	89	68	54	67
Effect on scheduling of activities (positive in %) ¹	47	100	82	79	79
Effect on labour input (positive in %) ²	11	11	4	3	6
Effect on use of agric. Machines (positive in %) ²	26	5	13	7	13
Decreasing production quantities (positive in %) ¹	53	42	39	72	49
Effects on other farmland (positive in %) ¹	37	0	4	0	9
Effects on investments (positive in %) ²	29	37	31	14	28

¹ Significantly different ($\alpha=5\%$) among all areas

² Not different ($p>0,1$)

Table 7: SchALVO effects on the farm

	Kraichgau 1	favoured Alb 2	less favoured Alb 3	Heuberg 4	total
Farmers concerned (in % of N)	21 (84 %)	19 (100 %)	70 (91 %)	29 (100 %)	139 (93 %)
<i>Question: Which measures do you apply within the programme which you would otherwise not apply? (in % of the farms)</i>					
Number of measures not applied otherwise					
0 measures	0	0	5	3	3
1 measure	17	11	12	28	16
2 measures	33	39	27	28	30
3 and more measures	50	50	56	41	51
Total	100	100	100	100	100

Not different ($p>0,1$)

Table 8: SchALVO effects on certain management measures classified according to area

direct compensation for management injunctions, over 60 % were indicated (189 DM/ha farmland). No significant differences between various sites are ascertainable in this respect ($p > 0,1$), although it was to be expected that management injunctions would lead to higher income losses or expenses on the better sites than on the poorer ones. As to the demand for a reduction of the premium put forward in this context, it should be noted that, besides the change in direct yield and expense relations, further expenses arise for the participating farmers in the form of application work and management adjustments, e.g., investments for storing manure etc. A reduction of the premium to 189 DM/ha farmland is therefore not liable to provide sufficient compensation.

Table 7 shows that *SchALVO* has a particular influence on the scheduling of activities. This is a consequence of the obligation to stick to certain ploughing and fertilisation dates. One positive effect of *SchALVO* on farmland outside the water protection areas is worth mentioning. In the Kraichgau a large part of the 37 % farmers concerned reported that they increasingly applied pesticides, permitted in water protection areas, also on farmland situated outside the *SchALVO* areas.

Compulsory participation in the programme also had an effect on farm investments on some farms. A large proportion of the farmers indicated that *SchALVO* required an extension of storage capacities for solid or liquid manure.

Referring to Table 3 there are five most important measures to be fulfilled by farmers under the *SchALVO* regulation. The indication of the number of measures which would not be realised without *SchALVO* (Table 8), leads to the conclusion that the object of the injunction is met. Especially in the Kraichgau and the favoured Alb the reduction of fertilisation and the application of certain pesticides are considered as restrictions, in the other areas they cover fertilisation and ploughing date - due to a shorter vegetation period - and the obligation for green cover. In some cases

even the improvement of ground water quality is called into question. Area differences in Table 8 are not significant ($p > 0,1$).

Clear differences as to management adjustments appear if the farms are classified according to their income structure. Part-time farms are considerably less restricted by *SchALVO* than full-time farms. One reason for this might be that the necessity for optimal productivity plays a less important role for part-time farms than for full-time farms, since they are much less dependent on the income from agriculture, or it might be due to the fact that they farm with a low intensity anyhow because of different factor relations, e.g., they often have more difficulties in performing scheduled work by qualified personnel than full-time farms, or they are more specialised.

3.3. Socio-economic differences between *MEKA* participants and non-participants

The participation conditions for *MEKA* described in section 3.2 demonstrate that the demand of farmers for the introduction of environment-preserving production methods can be met in manifold ways and sometimes in a simple manner. Basically it can therefore be assumed that the percentage of participating farms is very high. Various studies (cf. ZEDDIES AND DOLUSCHITZ, 1996; LFL, 1996) corroborate this thesis. This effect was also noticeable in the present sample. Only 12 of the 150 interviewed farmers do not participate in *MEKA*. 96 % of the participants are considering renewed participation after expiration of the 5-year contract. Comparison with the statistical data base of Baden-Württemberg causes problems, because in the agricultural statistics enterprises are included which can hardly be considered as farms, e.g. enterprises with 1 ha farmland.

On the basis of the interview results, the question regarding in which sectors participants and non-participants show basic differences or similarities was

Investigated agricultural enterprises in Baden-Württemberg, eligible for participation in MEKA					non-participants	participants	significance
					n=12	n=138	
Age of manager in years					52	47	n.s.
Annually applied labour unit hours (LUh)					1,249	3,100	*
Farmland (FL) in ha					12	32	*
Share of property FL in %					68	70	n.s.
Farm type in %							n.s.
Arable farms					33	30	
Dairy and beef farms					50	43	
Pig and poultry farms					0	7	
Mixed farms					8	11	
Others					8	8	
Farms with long-term liabilities in %					42	59	n.s.
Household income (ECU per year)							n.s.
<16 000					25	26	
16	to	<	32	000	33	46	
32	to	<	48	000	42	20	
48	to	<	72	000	0	5	
≥72 000					0	3	
Farms with larger farm investments (>10 000 ECU) since 1990 in %					33	74	*
Non-agricultural income sources in %					79	51	*
Judgement of current economic situation (%)							*
Very good					0	1	
Good					8	18	
Partly good, partly bad					25	45	
Bad					58	29	
Very bad					8	7	
Judgement of future economic situation (%)							n.s.
Very good					0	1	
Good					18	11	
Partly good, partly bad					9	35	
Bad					64	40	
Very bad					9	13	

n.s.: not significant

* : significant at $\alpha=5\%$

Table 9: Differences between MEKA participants and non-participants (averages of the two groups)

studied. The following Table 9 shows in a condensed way the most important investigated parameters. Characteristics differentiating both groups refer predominantly to factors related to the importance of the farm as a basis for subsistence. Thus farmers who do not participate in *MEKA* have smaller enterprises than participants (average 12 ha farmland), they invest less working hours in their farm (1249 hours) and gain a larger part of their income from sources outside agriculture (79 %). In addition, these farms have made considerably lower farm-investments during the past 10 years than participating farms (33 %). This may be taken as an indicator for the fact that non-participants are farmers for whom the importance of agriculture as an income source and as a long-term income basis is decreasing rather than increasing.

Both groups estimate the existing and future economic conditions as rather bad, with non-participants tending to give more negative opinions than participants. The hypothesis that older farm managers have more reservations about participation in *MEKA* than younger ones, however, does not stand the test of this investigation. There is no statistically proven correlation between age and participation in *MEKA*. Nor do the farm type and the level of total farm income play a significant role for participation in *MEKA*.

The results show that small farms and farms which are operated on a part-time basis more often refuse participation in *MEKA* than other farms. This is explicable by the fact that, for these farms, expenditure in case of participation is higher or estimated to be higher than the allocated compensation payments. In order to integrate these farms in the programme, the conditions for acceptance have to be improved. A general increase of the premium rates does not appear to be good policy for several reasons (e.g., because of the increase of the so-called allowance-seeking effects for all farms or the negative implications for the already tight budget situation). Rather the application modus should be further simplified and the consulting facilities for these farms should be improved.

4. Attitudes of farmers towards *MEKA* and selected other agri-environmental approaches

4.1. Comparison of differently motivated *MEKA*-participants: Ecological reasons versus income maintenance

The participating farmers were asked what the most important reason for them to participate was. Examination of the responses to this question showed that the answers can be classified according to several categories. A large proportion of the farmers justify participation by the allocated premium payment. Clearly distinct from this group are farmers who participate in *MEKA* for ecological reasons. Single responses falling into this category are for instance « the possibility to practice a less intensive agriculture », « the possibility to reduce nitrate levels » or « for landscape preservation ». A third group of farmers participate in *MEKA* because, in their own words, *MEKA* « fits well into the farm » or « because certain *MEKA* measures were already carried out before introduction of the programme », which means that farmers actually seek for additional allowances in certain areas.

Not all farmers could be classified in this way. On the one hand, these are farmers who gave several unprioritised reasons as most important, on the other hand they are farmers who gave certain hardly classifiable or rare reasons for participation. Among these are arguments like « because all the others do it » or « upon request of the father ». Due to the possibility of falsification of results it makes sense to exclude these farmers in this section despite the loss of data, because they are not unequivocally classifiable. In the following the three groups are investigated and compared with one another. Table 10 represents class size, percentage and group characteristics.

In order to corroborate the significance of the classification, a complex closed question was evaluated for groups 1-3.

Group no.	Category	Features	Class size (N=135)	in %
1	'financial reasons'	premium payment money financial reasons financial incentive	81	60.0
2	'fits well into the farm'	fits well into farm already applies measures allowance seeking effects	18	13.3
3	'ecological reasons'	less intensive agriculture possible helps against erosion landscape preservation	14	10.4
4	not classified	financial and ecological reasons financial and other reasons because everybody does it upon request of father	22	16.3

Table 10: Classification of MEKA participants in categories

Reason 1	Amount of premium payment per ha
Reason 2	Contribution to agricultural income
Reason 3	Presentation of programme by government agency
Reason 4	Fitted well into existing farming system
Reason 5	MEKA provides safe income source
Reason 6	MEKA allows to practice less intensive agriculture
Reason 7	MEKA helps to maintain low intensity
Reason 8	Realisation of nature protection measures
Reason 9	Extension of nature protection plans
Reason 10	Financial source for farm investments
Reason 11	Improvement of environmental quality of farm
Reason 12	Reduction of farm labour

Table 11: Possible reasons for participation in MEKA

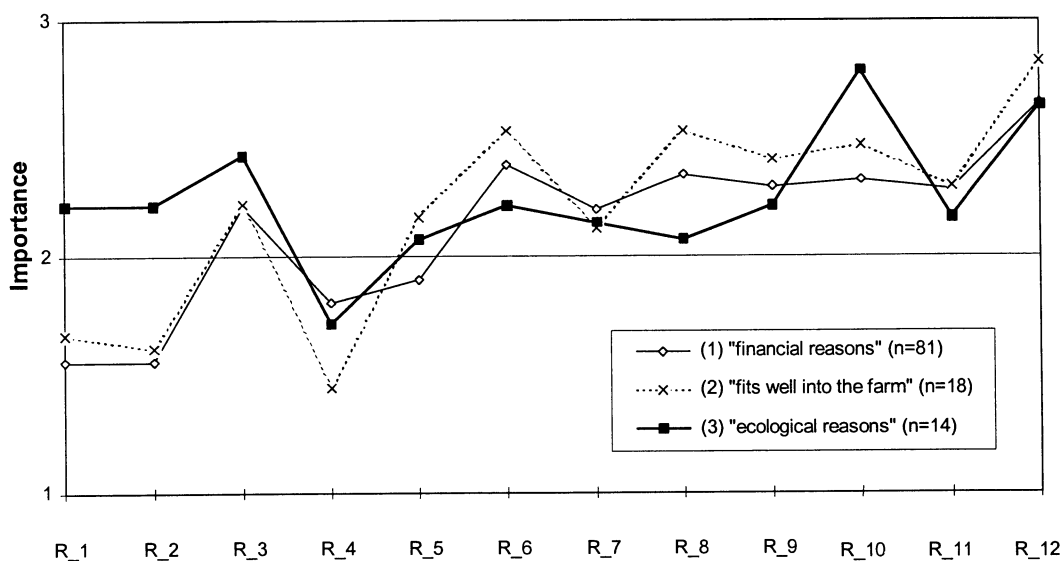


Figure 2: Varying priority of reasons for participation in MEKA (1=very important, 2=important, 3=insignificant)

The farmers were asked to rate 12 possible reasons for participation in *MEKA* according to significance for themselves (Table 11). For each of these reasons the farmers were asked to indicate whether the specified reason was of « very high » or « high » significance in their decision to participate in *MEKA* or whether it was « negligible ».

For illustrative purposes the answers on the subject of these 12 motives were scaled nominally from 1 to 3 (1=very important, 2=important and 3=unimportant) and represented graphically (Figure 2). Statistically proven differences (*Mann-Whitney U Test*) between the 3 groups are found for the following reasons ($\alpha=5\%$):

- differences between group 1 and 2: reason 4
- differences between group 1 and 3: reasons 1, 2 and 10
- differences between group 2 and 3: reasons 1, 2 and 8

Generally financial reasons and the fact that the chosen *MEKA* measures can be realised without excessive many costs, have a higher priority for all groups than environmentally relevant facts. In Figure 2 this is illustrated by the fact that environment-related reasons show a value higher than 2. By contrast, reasons 1 and 2 are frequently rated as very important and thus show values between 1 and 2.

Concerning further studied characteristics, the following correlations could be established (cf. Table 12).

The average farm size of all 3 groups lies between 29 and 33 ha farmland and thus is hardly different between the groups. 85 % to 94 % of the farms have participated in *MEKA* since 1992. The affiliation of the farmers to one of the categories did not have any influence on initial participation. Percentage of property in the farmland (70-71 %), level of household income, non-agricultural income sources (48-59 %), average age of farm managers (42-47 years), larger investments and economic situation do not differ significantly either. Groups 1 and 3 differed only in the employment of family labour. While the farms of group

1 dispose of 1.7 labour units (LU), in group 3 on the average only 1.2 family LU work on each farm. There is however no statistically based difference to group 2 (1.5 LU), however.

An evaluation of the parameters referring to management changes during the past years (Table 13), and which can be taken as an indicator of environment-friendly behaviour on the part of participating farmers, illustrates the fact that in general parameters implying reduced intensity are stated more frequently than parameters implying increased intensity. It becomes evident that - apart from a distinctly lower degree of afforestation and non-adherence to an advanced harvesting date in group 3 - there are only minor differences among the groups.

If these differences and differences between other quantitatively measurable parameters from Table 13 (surface of intercrops, percentage of intercrops in the AL or in cereal surface, the number of grassland plots and average price for renting of arable land), are considered, an interpretation of the results is difficult. Significant differences are primarily found in areas with distinct site influences. This is due to the fact that the group members are not regularly distributed per area. (Figure 3). On poor sites farmers are more frequently found to participate in *MEKA* for financial reasons (group 1), and due to allowance seeking effects (group 2), than on better sites. As a consequence the share of farmers who participate for ecological reasons (group 3) is significantly higher on favourable sites.

4.2. Attitudes towards other approaches of agricultural and environmental policy

The two presented agri-environmental programmes of *MEKA* and *SchALVO* show differences concerning the mode of participation. Both, however, are examples of measures for the protection of the environment, which are offered or imposed to the farmers by representatives of the state government.

	'financial reasons' Gr.1 (n=81)	'fits well into the farm' Gr.2 (n=18)	'ecological reasons' Gr.3 (n=14)	all participants (n=138)
Farmland (FL) in ha	29.0	31.3	32.6	29.9
Share of property in FL (%)	71	70	71	70
Percentage of full-time farms	39.5	35.3	42.9	39.4
Income from non-agricultural sources	48.3	58.6	50.3	50.7
Age of farm managers	46.7	47.3	42.3	46.6
Family labour in labour units (LU)	1.7 ³	1.5	1.2 ¹	1.6
Initial participation in 1992 in %	85.2	94.4	85.7	85.9
Intercropping (IC) in ha	5.7 ³	9.7	11.8 ¹	7.1
Share of IC in % of FL	34 ³	40	53 ¹	37
Share of IC in the cereal surface in %	49 ³	63	85 ¹	55
Number of arable plots	22	18	15	20
Number of grassland plots	17 ³	16 ³	5 ^{1,2}	14
MEKA-surface in ha FL	18.8	23.2	16.5	19.4
MEKA-share in % of FL	71	75	64	70
SchALVO-surface in ha FL	21.7 ²	11.7 ¹	23.5	19.8
SchALVO-share in % of FL	77	68	76	74
Share of MEKA-premium required for compensation in %	60	65	59	63
Winter wheat yield in dt/ha	51.9 ³	51.1 ³	63.2 ^{1,2}	52.5
Costs of renting arable land	310	247 ³	421 ²	306

¹ Significantly different ($\alpha=5\%$) compared to group 1

² Significantly different ($\alpha=5\%$) compared to group 2

³ Significantly different ($\alpha=5\%$) compared to group 3

Table 12: Average values of quantitative features of groups 1, 2 and 3

	'financial reasons' Gr.1 (n=81)	'fits well into the farm' Gr.2 (n=18)	'ecological reasons' Gr.3 (n=14)	all participants (n=138)
Afforestation	33.3 ³	38.9 ³	7.1 ^{1,2}	28.9
Reduced fertiliser input level on GL	71.6	50.0	57.1	64.4
Reduced fertiliser input level on AL	55.6	38.9	42.9	53.3
Reduced input level of pesticides	61.7	50.0	64.3	59.3
Reduction of livestock density	28.4	61.1	35.7	36.3
Increased additional purchase of forage	33.3	16.7	21.4	31.1
Increase of mowing frequency on GL	11.1	5.6	14.3	
Change of management of surfaces not covered by MEKA	2.9 ³	0 ³	23.1 ^{1,2}	4.5

¹ Significantly different ($\alpha=5\%$) in comparison to group 1

² Significantly different ($\alpha=5\%$) in comparison to group 2

³ Significantly different ($\alpha=5\%$) in comparison to group 3

Table 13: Changes of farm management during the last 10 years regarding environment-related parameters of groups 1,2 and 3

For administrative reasons and for the purpose of comparability and practicality these programmes have to be formulated in such a way that they can be applied to many different farm types on various sites. The efficiency concerning the desired effects should, however, in any case be preserved. In this context it is frequently demanded that farmers, representatives of local government, and nature and environment-protection activists should participate in the development of local nature and environment protection measures, in order to safeguard a maximum degree of effectiveness. For this purpose the different attitudes of farmers towards various approaches were ascertained and it was examined whether the parameters of site, farm type and income structure or previous participation in *MEKA* have an influence on these attitudes.

An investigation of farmer attitudes towards the various conceivable approaches for nature and environment-protection, e.g., on the basis of cooperation, de-regulation and regionalisation, reveals that the interviewed farmers have various preferences towards the approaches (see Table 14). A large proportion of the farmers (79.6 %) would be prepared to participate in an agri-environmental programme under similar conditions to *MEKA*, even if this was not proposed by MLR as above but by a nature or environment-protection organisation. The reason they gave was that, if the conditions were in fact the same, they would not expect any differences to ensue from the difference in sponsors. Frequently they pointed out that, not so much the sponsor of a programme but the necessity of financial compensation for management changes, is the decisive factor for participation. To qualify this statement it should be noted, however, that non-participants of *MEKA* (as discussed small farms and part-time farms) are generally less positively inclined to take up such an offer than participants. Altogether the following reservations were mentioned as justification for a negative attitude (20.4 % of the farmers):

- less confidence in environment protection organisations concerning fur-

ther injunctions and requirements at a later date,

- own bad experience,
- doubts as to reliable long-term funding of such an approach.

As can be expected, the number of farmers with a positive attitude diminishes according to the degree of restriction of the farmer's freedom to decide. Approximately two thirds of the farmers would allow members of environment-protection organisations to carry out environment-protection measures on their farm fields. Non-participants of *MEKA* frequently even take a more positive stand on the issue of such a proposal than participants. A reason for this might be that these farmers are favourably disposed towards nature and environmental protection but prefer to leave the realisation of such measures to others rather than carry them out themselves, due to time scarcity or the insignificant financial remuneration.

The question whether farmers could imagine setting up a local work team with members of a nature and environment-protection organisation and other interested groups for the joint development of environment-protection concepts, is still positively answered by more than half of the farmers. Reasons in favour of such a work group are, among others:

- the possibility of having an influence and exchanging information, leading to a better understanding of appropriate environment-protection measures by all participants concerned, in the opinion of farmers (n=30),
- a positive attitude towards nature and environmental protection (n=15),
- interest and the improvement of own information level (n=7).

Farmers having objections to such a work team gave the following reasons: time scarcity (n=30), the fact that they are too old for it (n=11) or bad experience with environment-protection organisations (n=5).

The renting or the selling of land does not represent an option for the improvement of nature and environmental

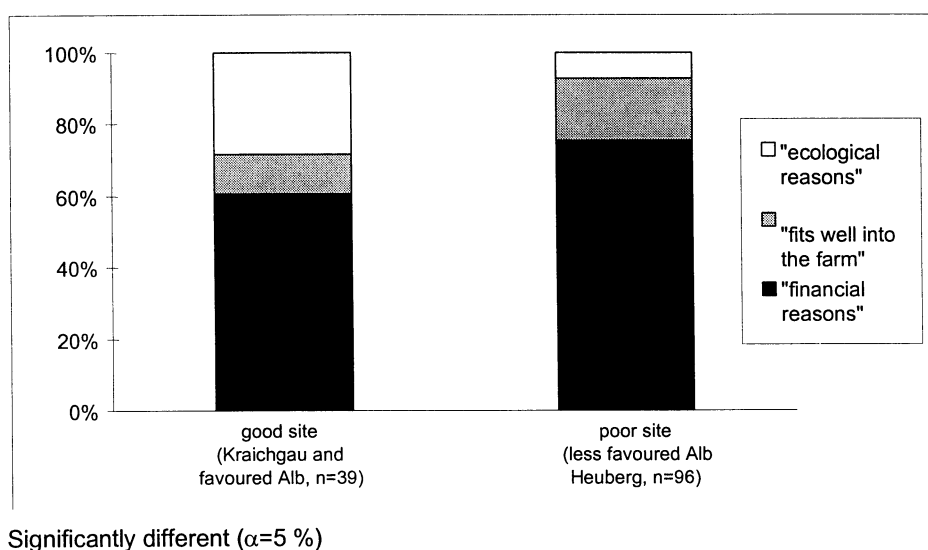


Figure 3: Area distribution of MEKA participants from groups 1,2 and 3

Approach	Percentage of farms with positive attitude towards indicated approach (positive answer)	Total of random sample n=
Would you consider participating in an agri-environmental programme which is offered by a nature and environment-protection organisation?	79.6 ¹	142
Would you allow members of a nature and environment-protection organisation to carry out measures on your farm which correspond to a proposition that has been agreed with you?	65.5 ²	139
Would you be prepared to join a local work group for the development of nature and environment-protection measures for farms ?	56.1	139
Would you consider renting out some of your fields to nature and environment-protection organisations?	35.7	143
Would you consider selling some of your fields to nature and environment-protection organisations?	9.0	144

¹ Non-participants significantly ($\alpha=5\%$) lower percentage (50 %) than participants (82 %)

² Non-participants significantly ($\alpha=5\%$) higher percentage (70 %) than participants (66 %)

Table 14: Conceivable approaches for the realisation of more nature and environmental protection in agriculture

protection in the eyes of farmers. Hardly one third of the farmers would rent out fields to environment-protection organisations and only 9 % would sell land. Selling of land is considered only for poor sites and in this case frequently linked to the demand for replacement with alternative land. The following conditions for renting of land were mentioned:

- payment of a locally customary or higher rent (n=30),
- only marginal land or land adjoining biotopes (n=7),
- right of co-determination and due return at the expiration of the renting contract (n=7).

An examination of the question whether certain groups of farmers in addition to participants and non-participants can be isolated with different attitudes towards these approaches, shows that neither the income structure nor the farm type or the site have an influence on the attitude. Only on the Heuberg the percentage of farmers prepared to tolerate the realisation of environment-protection measures on their farmland by others was smaller (45 %, $\alpha=5$ %).

5. Discussion

The investigation of different parameters influencing farmers' decisions to participate in agri-environmental programmes shows that variables of economic importance can be taken as explaining factors in most cases. The high percentage of farmers who participate in *MEKA* especially for financial reasons is evidence for this, as well as the fact that small farms and farmers having a high share of non-agricultural income sources participate more rarely in *MEKA* than others.

The attitudes of farmers towards *MEKA* have no influence on participation or non-participation. Rather the attitudes are overlapped by area identity, income structure and site quality.

Although the environmental effects of *SchALVO* are still the object of contro-

versy, the survey was able to show that the regulation is in itself an efficient instrument, since a large number of farmers have considerably changed their agricultural management. 97 % of the farmers comply with the requirements of *SchALVO* which they would not carry out without the regulation.

The comparison between the incentive programme of *MEKA* and the injunction of *SchALVO* shows that comparable participation rates can be obtained with both approaches. The high degree of farmer participation in *MEKA* measures involving a reduction of intensity moreover refutes the critical argument that incentive schemes generally do not attain positive environmental effects. It is, however, worth considering how overlapping effects can be dealt with in the future.

Approaches for the implementation of nature and environment-protection measures which hitherto have only rarely been pursued, such as the formation of work groups for the realisation of local environmental goals, generally meet with the approval of farmers, as long as these do not restrict their proprietary freedom too much and as long as they have a say in the elaboration of appropriate environment-protection measures. In this respect no significant differences could be found among the farmers correlating with site, farm type, income structure or past participation. In this context the continuous time pressure on farmers is to be considered as a problem factor.

6. Judgement and perspectives

It is evident that the attraction of *MEKA* is based on its financial structure. As a result of this, partly allowance-seeking effects arise. On poor sites, *MEKA* tends to be used for compensation of financial losses caused by the agricultural reform, whereas on favourable sites the payments usually do not suffice to cover income losses which exceed compensation and in these cases therefore the aim of environment protection takes

priority. Both are implicit goals of the Regulation (EEC) 2078/92.

As to the *SchALVO*, a state-wide standard premium payment offers the advantage of a comparatively simple administrative implementation; it has, however, different income effects, depending on farm type, site and percentage of land situated in the water protection area. Moreover, the high cost of monitoring the scheme can also be criticised.

On the whole the present study demonstrates that regulative legislation and voluntary approaches generally show less differences regarding their impacts than is frequently assumed (cf. Scheele *et al.*, 1992, S.33). More important is the fact that for voluntary measures leading to a restriction of regular agricultural management, premium payments have to be provided in sufficient amounts in order to motivate farmers to participate. Nevertheless, future agricultural policy should not rule out a system based on subsidiarity, since local approaches - provided there is appropriate possibility for control - may be more efficient than EU-wide or national ones, especially concerning the level of achievement.

For the aim of achieving a state-wide environment-beneficial agricultural production using agri-environmental programmes, it is of less importance how these schemes are formulated and implemented, but rather how on-farm efficiency of the premium as compensation for the incurred income loss is estimated by farmers. Voluntary programmes disposing of an appropriate funding therefore produce environmental effects which are comparable to those achieved by injunctions. Certainly the more positive attitude of farmers towards voluntary programmes is of advantage.

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