Less favoured area measure in the Netherlands: a welcome or negligible addition?

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Abstract: The Less Favoured Areas (LFAs) Directive (75/268) which was introduced in 1975, was the first common European instrument of regional agricultural structural policy. LFAs are areas where agriculture is hampered by permanent natural handicaps. The major objectives were to ensure the continuation of farming, thereby maintaining a minimum population level and preserving scenic landscapes and environmentally valuable habitats. In the Netherlands, the LFA measure is used as an additional payment, to compensate farmers for negative economic effects due to the conservation of these natural handicaps. It was not implemented as a stand alone policy, but is linked to measures aiming at active nature and landscape conservation management. In this paper, the effects will be examined of the regulations aiming at the conservation of natural handicaps on farm businesses within LFAs, when comparing them to farm businesses outside LFAs, where these regulations and handicaps do not exist. The main data source that was used is the Farm Accountancy Data Network. Reference groups of farms were compiled with the use of the simple and multiple imputation approach in Stars (Statistics for Regional Studies). Both analyses were tested with the use of a parametric and a nonparametric test. When comparing the results of both analyses, it can be concluded that there is no evidence that there is a statistical difference in family farm income corrected for and not corrected for LFA payment between the LFA farm businesses and the reference groups.

Based on these findings it can be concluded that the size of the compensatory allowances is small and there is no evidence that it has a significant effect on the family farm income of LFA farm businesses. The main purpose of the Dutch LFA policy is to compensate farm businesses for negative economic effects due to the conservation of natural handicaps. Although this may be true for some individual farms, based on the methods used in this paper, it appears not to be the case for the collectivity of LFA premium beneficiaries as a whole.

Key words: Less Favoured Areas, family farm income, regional development

1. Introduction

Nowadays, more than half of the agricultural area in the European Union is classified as a 'Less Favoured Area' (LFA). The LFA policy was introduced in 1975 as part of the Common Agricultural Structural Policy. The major objectives were to ensure the continuation of farming, thereby maintaining a minimum population level and preserving scenic landscapes and environmentally valuable habitats (*IEEP,* 2006; *Tamminga et al.,* 1991).

In 2000, the LFA measure was integrated into the Common Agricultural Policy (CAP). In the Rural Development Program for the period 2007-2013 a major shift was perceived as the social need had lessened, and the measure no longer addressed depopulation. At the same time, the concern for the maintenance of certain types of agricultural land use and environmental protection increased. Member states have been offered increased flexibility in the implementation of the measure. They are now responsible for fixing the levels of compensation, defining the types of production to be covered by a scheme, and modifying the geographical LFA boundaries. The shift of emphasis of the LFA policy to an environmental focus, provoked the question of whether this measure should be subject to review (*Dax,* 2005).

In 2003, the European Court of Auditors expressed its concerns in a Special Report. It drew attention to the existence of considerable disparities between member states for its effectiveness and efficiency. It is now foreseen that the European Commission will present a new proposal for the designation of the so-called 'intermediate LFAs' in 2009, which are planned to come into force in 2010 (*IEEP,* 2006).

In the European regulations four different categories of LFAs are distinguished. In the Netherlands only LFAs affected by specific handicaps are implemented into national policy. Less than 10% of the area is considered to be Less Favoured. In the Netherlands, the LFA measure is used as an additional payment, to compensate the farmers for negative economic effects due to the conservation of natural handicaps. It is not implemented as a stand alone measure, but is linked to measures aiming at active nature and landscape conservation management. The compensatory

allowances are €94 per hectare. This income support is financed by the member states and partly reimbursed by the EU. Farmers only receive an LFA payment if they apply a number of nature management packages on their land (*Terluin et al.,* 2007). Since January 2007, part of the Dutch LFA policy has been decoupled from these management contracts (*LNV,* 2007).

This paper examines the effect of the regulations aiming at the conservation of natural handicaps on the family farm income of farm businesses within LFAs, when comparing them to farm businesses outside LFAs, where these regulations and handicaps do not exist.

2. The LFA designation

The Dutch LFAs are scattered over the country. The Netherlands distinguishes five types of natural handicaps:

1. Deep peat meadows
2. Small-scale sand landscapes
3. River forelands
4. Brook valleys and inundation areas
5. Slopes

Figure 1 shows the designated LFAs in the Netherlands.

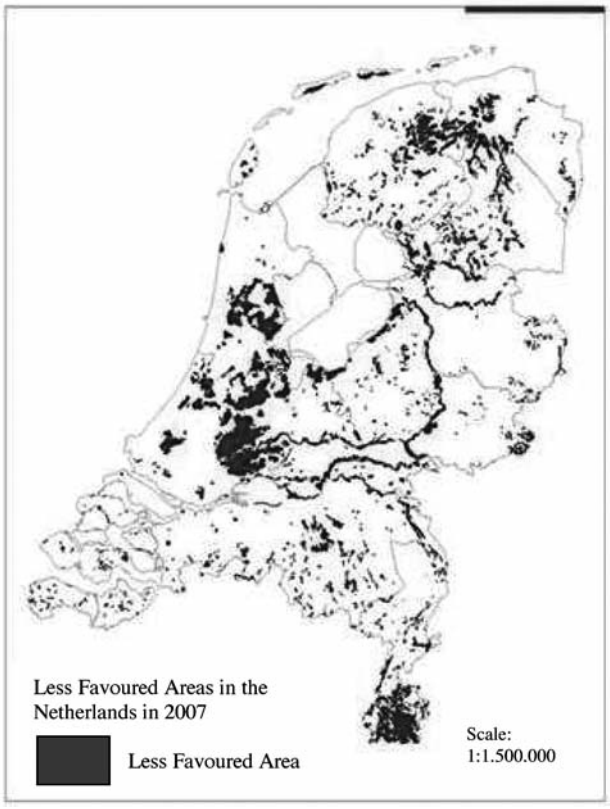

Figure 1: Less Favoured Areas in the Netherlands in 2007 (*LNV,* 2007)

In table 1 the designation of Less Favoured Area hectares over the different provinces is shown.

Table 1: Designation of Less Favoured Areas over the 12 Dutch provinces, according to regulation (EG) 1257/1999[1]

Province	ha LFA	As% total LFA in the Netherlands
Zuid-Holland	46991	21
Noord-Holland	29739	13
Gelderland	28087	12
Utrecht	23740	11
Friesland	22614	10
Groningen	16182	7
Drenthe	15274	7
Noord-Brabant	14519	6
Overijssel	12748	6
Limburg (NL)	12374	5
Zeeland	2733	1
Flevoland	0	0
The Netherlands	225001	100

[1] Including areas designated under Regulation (EG) 950/97 or older regulations (75/268/EEG and 2328/91/EEG) (IEEP, 2006).

3. Family farm income of LFA farm businesses in the Netherlands

In general, Farm Accountancy Data Networks (FADNs) are appropriate tools to monitor income development at a micro level. The advantage of FADN is that it is a harmonized data source with micro-economic data on both the structure and the economic performance of farms (*Vrolijk et al.,* 2005). With the use of FADN, detailed information is available on individual farm businesses, which provide the opportunity to conduct analyses at the farm level and gives an insight into the distribution and differences in incomes between groups of farms. In this study, data for the year 2006 are used. An average over two or three years would be preferable, but due to major policy adjustments in 2004 and 2005 these data were not reliable for analysis. Data for 2007 are not yet available.

In this study, attention is focused on the comparison of the family farm income of farm businesses that are situated in LFAs with farm businesses that are situated outside LFAs. The definition of family farm income is the following:

'Income for the farm family arising from the farm business; this is a remuneration for the labour of all family members as well as the private capital and land'(Berkhout and Bruchem, 2007).

The Dutch FADN covered 1133 farms in 2006. Of these farms, 79 received a Less Favoured Area payment. These farms were selected from the database with the use of a list of LFA receivers in 2006 that was made available by the Dutch Ministry of Agriculture, Nature and Food Quality. This means that 1054 farms in the FADN did not receive an LFA payment. An overview of the farms situated in LFAs, arranged by farm type is shown in table 2. The specialized dairy farms are represented in the sample with 60 farms.

Together, these farms got LFA payments for 1233 hectares in 2006. This means a total amount of approximately €116,000. These 1233 hectares represent roughly 88% of the total amount of subsidized Less Favoured Area hectares in the Netherlands (1398 hectares is 100%).

Table 2: Division of farms situated in Less Favoured Areas by farm type in 2006

Farm types	No. farms	No. LFA hectares
Arable farms	3	28.77
Pasture animal farms:	69	1328.97
– Specialized dairy farms	60	1233.28
Other	8	39.83
Total	79	1397.57

(Source: FADN and own calculations)

Because specialized dairy farms represent 88% of the total FADN sample, only these dairy farms will be analyzed. From now on, only the specialized dairy farms will be compared to other specialized dairy farms in the Netherlands. The definition of a specialized dairy farmer is the following:

'Grazing animals and pasture contribute more than two thirds of the share of the DSU[1]*of the involved farms. The dairy- and cow in calf also contribute to more than two thirds of the share of DSU of the involved farms' (Poppe, 2004).*

4. Definition of the reference groups

4.1 Reference group compilation

In agriculture, data from the FADN are often used to estimate population characteristics. The use of FADN data in regional studies is often problematic due to the low number of observations. A tool for statistics for regional studies (Stars) was developed to make estimates of small areas using the FADN more reliable (*Vrolijk et al.,* 2005).

Reference groups will be compiled that are similar to the LFA farm businesses on certain characteristics, but are not situated in LFAs. In this study attention is focused only on specialized dairy farms. This group is called the population of interest. For each farm in the population, a farm in the FADN sample is selected that resembles the farm as closely as possible. There are several variables that are used to decide whether a farm resembles the sample farm. These variables are called the imputation variables. The choice for the imputation variables is based on Berentsen and Giesen (1994). In this study the following imputation variables are used:

1. Farm type (only specialized dairy farms)
2. NGE (farm size)
3. Number of dairy cows
4. Hectares of grass land
5. Hectares of fodder crops

The condition is that the imputation variables should be known for all farms in the sample and in the population. This is true for these variables. Now, based on these variables the mean difference is calculated. The sample farm with the smallest dissimilarity is regarded as the farm that resembles the population farm as closely as possible. For each farm in the population, the most similar farm is selected from the sample. This best fit is recorded together with measures expressing the dissimilarity. Based on this best fit, estimates can be made for a set of goal variables, which are known in the sample but unknown for all population farms. The goal variables are family farm income, total revenue, total costs and total farm profit. A separate analysis will be done for farm businesses in the deep peat meadows, because they are represented in large numbers in the population of interest.

4.2 Distance restriction

The FADN farms that are used for the reference group selection have to satisfy a few conditions. First of all, the farms should be specialized dairy farms, like the population. This means, 274 FADN farms are eligible for selection for the reference group. Second, the farms must not be situated in an LFA area. There are, however, farm businesses with part or all of their parcels of land inside an LFA, who do not apply for LFA payment. These farms have to be excluded from the reference group selection. Since the location of the parcels is not available for each farm individually, a minimum distance to the nearest LFA is chosen to minimize this chance. A minimum distance of 1000 meters from the nearest LFA was considered as a reasonable interval. Taking a larger distance would result in too little available farm businesses left for the reference group selection, taking a smaller distance results in a larger chance that the farmer has parcels in LFAs. The farms are located using a GIS-application. When applying the minimum distance to the FADN sample, 177 farms can be selected.

5. Simple imputation approach

5.1 Simple and multiple imputation

In making estimations for the population of interest a choice can be made between *simple* and *multiple* imputations. Vrolijk *et al.* (2005) describe that simple imputation has the disadvantage that the variance of the estimator is underestimated. The estimated (or imputed) value is treated as the real value, although there is a degree of uncertainty about this value. To overcome this problem multiple imputation can be used. In this option it is possible to define how many of the best fit farms will be used to make estimates about the population. In this study, both approaches will be applied. To make estimates of the

[1] Dutch Size Units (DSU): A unit describing the economic size of agricultural holdings. The DSU is based on the standard gross margins (SGM), which are calculated by deducting related specific costs from the gross returns per hectare or per animal. The SGM is expressed in euro (current prices) (*Poppe,* 2004).

population of interest (LFA specialized dairy farmers) sample farms are matched to population farms based on the imputation variable. In this section, the best fitted sample farm will be matched to the population farms to make estimates of the goal variables.

5.2 Test procedure

In the simple imputation approach, each farm in the population is matched with the best fitting sample farm. The two samples are not independent. When designing the study, it was recognized that there are large differences in the family farm incomes between the farms, this would result in large variations among the 60 estimates of the reference group compared to the LFA farmers. By having both groups give an estimate of their incomes, the difference could be calculated between the estimates of the LFA and non-LFA farmers and hence the large variability between incomes could be reduced (*Ott and Longnecker,* 2001). In this situation, the two groups maintain important differences prior to their assignment to the group. The use of paired data in this paper reduces the variability in the standard error of the differences in the sample means in comparison to using independent samples. The actual analysis of paired data means computing the differences in the n pairs of measurements, $d_i = y_{1i} - y_{2i}$, and obtaining $\bar{d}$, s_d the mean and standard deviations in the d_i s. Also, the hypotheses of μ_1 and μ_2 must be formulated into hypotheses about the mean of the differences, $\mu_d = \mu_1 + \mu_2$. The conditions required to develop a *t* procedure for testing hypotheses and constructing confidence intervals for μ_d are:

1. The sampling distribution of the d_i s is a normal distribution
2. The d_i s are independent; that is, the pairs of observations are independent.

First, the paired *t* test will be applied to the total revenue, total costs and total farm profit. This gives an overview of the elements that make up the family farm income. Next, the paired *t* test is applied on the family farm income with and without LFA payment on both the LFA farm businesses and the reference group. The drawn conclusion will be based on $\alpha = 0.05$.

For these data, the parts of the 2-sided statistical tests are

$H_0: \mu_d = \mu_1 - \mu_2 = 0$

$H_1: \mu_d = \mu_1 - \mu_2 \neq 0$

Before computing *t*, first the $\bar{d}$ and s_d will be calculated. The mean, standard deviation and the test results of the total revenue, total costs and total farm profit of the 60 LFA farms and their reference group are given in tables 3, 4 and 5.

Table 3: Total revenue (€, rounded) on the LFA farm businesses and the reference group[1], 2006

	LFA farms	Reference group	test statistic ***t***	p-value (sig. 2-tailed)
Mean	261,100	258,500	0.284	0.777
Std Dev.	138,500	144,500		

[1] Total revenue for operational management, depending on the VAT

Table 4: Total costs (€, rounded) on the LFA farm businesses and the reference group[1], 2006

	LFA farms	Reference group	test statistic ***t***	p-value (sig. 2-tailed)
Mean	171,500	170,800	0.076	0.940
Std Dev.	92,000	76,000		

[1] Including depreciations and excluding interests

Table 5: Total farm profit (€, rounded) at operational management[1], 2006

	LFA farms	Reference group	test statistic ***t***	p-value (sig. 2-tailed)
Mean	63,300	58,500	0.614	0.541
Std Dev.	50,400	65,900		

[1] Depending on VAT

The *t*-test statistic is smaller than the tabulated -value (2.000) for df=59. Based on the results, there is no evidence that there is a difference in total revenue, total costs and total farm profit between the LFA farm businesses and the reference group.

The same paired *t* test will be performed on the family farm income with and without an LFA subsidy of the LFA farms and the corresponding reference group. The drawn conclusion will be based on $\alpha = 0.05$. The mean, standard deviation and the test results of the 60 LFA farms and their reference group are given in tables 6 and 7.

Table 6: Family farm income (€, rounded) minus Less Favoured Area payment, 2006

	LFA farms	Reference group	test statistic ***t***	p-value (sig. 2-tailed)
Mean	61,600	59,300	0.290	0.773
Std Dev.	50,100	67,200		

Table 7: Family farm income (€, rounded), 2006

	LFA farms	Reference group	test statistic ***t***	p-value (sig. 2-tailed)
Mean	63,500	59,300	0.538	0.592
Std Dev.	50,200	67,200		

The *t*-test statistic is smaller than the tabulated *t*-value (2.000) for df=59. This shows that there is no evidence that the family farm income with and without the LFA payment is different from the family farm income of the reference group. Also the nonparametric Wilcoxon signed-rank test is performed to test the various hypotheses and showed the same results.

6. Multiple imputation approach

As described in section 4, there are two ways in which estimations can be made for the population LFA farm businesses and the reference groups. In this section, the

multiple imputation approach will be used. By using the multiple imputation approach, it can be defined how many best fitting farms should be used for the sample to make estimates about the population (*Vrolijk et al.,* 2005). In this case, for each LFA farm business, the five best fitting farms will be matched to the population. The same imputation variables will be used as in the simple imputation approach. Now, Stars searched for the five best fitting farms to make estimations about the population. Stars simulates that at random one of the five reference farms is chosen to match the LFA farm business. Theoretically, all 5^{60} combinations of LFA farms and the reference farms would have to be analyzed to get to know the distribution of the mean. This is quite impracticable; therefore the combinations will be simulated 1000 times at random. To determine whether the hypotheses are significant, the mean and the sampling distribution are necessary. The dissimilarity is calculated for the goal variables, all farms and all simulations between the reference farm and the LFA farm. For each goal variable, the mean difference is calculated, as well as the corresponding standard deviation. From this point onward the same procedure is used as in the simple imputation approach. Having all the elements of the paired *t*-test, the *t*-test statistic is calculated. The drawn conclusion will be based on $\alpha = 0.05$. For these data, the parts of the 2-sided statistical tests are

$H_0: \mu_d = \mu_1 - \mu_2 = 0$

$H_1: \mu_d = \mu_1 - \mu_2 \neq 0$

The *t*-test statistic, the confidence interval of the family farm income for the 60 LFA farms, and their reference group are given in table 8.

Table 8: Paired -test for business indicators of LFA farmers and the reference group

Variables	Test s tatistic ***t***	Confidence interval Lower and upper bound	Rejection yes/no
Family farm income Family farm income	-0.625	- 19,700 and + 10,300	No
Family farm income minus Less Favoured Area payment	-0.368	- 17,700 and + 12,200	No
Farm business indicators Total costs (total paid costs included depreciations and excl. interest)	0.538	- 11,400 and + 19,700	No
Total revenue (for operational management, depending on VAT)	0.027	- 18,700 and + 19,300	No
Total farm profits (shown at operational management, depending on VAT)	-0.990	- 22,000 and + 7,400	No

No H_0 hypotheses are rejected, the t-test statistics are smaller than the tabulated *t*-value (2.000), and the p-values are $> \alpha = 0.05$ (2-tailed). Also when using the nonparametric Wilcoxon signed-rank test the same results were shown. Based on the results, it can be concluded that there is no evidence that there is a difference in total revenue, total costs and total farm profit between the LFA farm businesses and the reference group. There is also no evidence that there is a difference in family farm income, before and after subtraction of the LFA payment, of the LFA farm businesses and the reference group.

7. Deep peat meadows

Nineteen deep peat meadow farm businesses that are situated in the provinces of Zuid-Holland and Utrecht are present in the FADN sample. Because of the size of the group, and the share of the deep peat meadow LFA farmers in the Dutch LFA policy, this group was analyzed separately. Both the simple and multiple approaches were applied to the data. Both analyses were tested with the use of both a parametric and a nonparametric test. From the results of the analyses when applying the multiple imputation approach it can be concluded that there are no significant differences between the LFA farm businesses in the deep peat meadows and their reference group. Only when the simple imputation procedure is applied[2], there is a statistically significant difference in the family farm income before subtraction of LFA payment, between the deep peat meadow farm businesses and the reference group. Then the family farm income of LFA farm businesses in the deep peat meadows is significantly higher than the family farm income of the reference group. The results of the family farm income after subtraction of the LFA payment and the other farm business indicators showed no significant differences.

8. Conclusion

It is a challenge to support farming in regions with particularly unfavorable natural conditions for agricultural production. Farmers in Less Favoured Areas sometimes have a long tradition of farming, and farms are taken over generation after generation in the same place. Farmers create the landscape, use the landscape and adapt to the landscape.

This study tried to find out whether there are differences in family farm incomes of LFA farm businesses, due to the existence of natural handicaps in LFAs, when compared to farm businesses outside LFAs, where these handicaps do not exist. A reference group of farms was compiled with the use of the simple and multiple imputation approach in Stars. Because a large group of LFA farm businesses are located in the deep peat meadows, these farms were taken separately and a separate reference group was composed. Both analyses were tested with the use of a parametric and nonparametric

2 The simple imputation approach is tested with both a parametric and a non-parametric test. The outcome of the parametric test was significant with a 95% confidence interval for the variable family farm income, before subtraction of the LFA subsidy, in the deep peat meadows.

test. When comparing the outcomes of both analyses, using both tests, the overall conclusion is that there is no evidence that there is a difference in family farm income (excluding LFA payments) between the LFA farm businesses and the reference groups. When looking at the family farm income including the LFA payment, still no evidence was found that there is a significant difference in family farm income between the two groups. Based on these findings it can be concluded that the relative size of the compensatory allowance is small and there is no evidence that it has a significant effect on the family farm income of LFA farm businesses. A significant different family farm income is found in the deep peat meadows, however but only when applying the simple imputation approach. When applying the multiple imputation approach to the reference group, no significant difference between the groups could be found anymore. It can be concluded, based on the method used in this paper, that there is no evidence that the family farm income of Dutch LFA farm businesses is affected by the regulations aiming at the conservation of natural handicaps, when compared to farm businesses outside LFAs. The main purpose of the Dutch LFA policy is to compensate farm businesses for negative economic effects due to the conservation of natural handicaps. Although this may be true for some individual farms, based on the methods used in this paper, it appears not to be the case for the collectivity of LFA premium beneficiaries as a whole.

9. Discussion

In 2004 and 2005 major adjustments were made to the Dutch Less Favoured Area policy. This meant the datasets for these years were not reliable for analysis. The year 2006 was chosen as it was the first year in which all data were available, and therefore can be used for the quantitative part of this study.

Only 79 LFA farm businesses on the list of LFA payment receivers were present in the FADN for the year 2006. This is a low number of farms, and it would be better to have a larger dataset.

Another problem rose when locating the non-LFA farm businesses for the reference group composition: There is a possibility that there are farmers that do have land in a LFA, but did not apply for this subsidy for several reasons. This means that the conditions of farming are exactly the same as for the LFA farmers. It is difficult to locate these farm businesses by using the available statistical data. By setting up a minimum distance of the reference farms from the LFAs, this problem has been reduced, although it could not be removed with absolute certainty.

The regional differences in prices of land could affect the family farm income of LFA farm businesses and farm businesses outside LFAs. Sufficient data necessary for research on this topic are not available, so no conclusions can be drawn.

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