Farm level yield, price and cost variations

O.A. Kobzar[1,2,*]
M.A.P.M. van Asseldonk[1]
R.B.M. Huirne[1,2]

In this study farm revenue variability is analysed within and between farms. Within-farm analysis is conducted by examination the variance-covariance structure of revenue components (i.e. yields and prices). Between-farm analysis refers to farm revenue variability that is affected by differences in business and financial characteristics. The method is applied to a panel data set of 109 Dutch arable farms based on the period 1990–1999 including nine major crops.

The within-farm results show that the coefficients of variation (CV) of prices exceeded CV values of yields. A high number of the within-farm correlation coefficients were significant (75 out of 144) for both price-price and yield-yield correlations. Positive yield correlations were most frequently observed. Negative price correlations were found only between cereal crops and root crops. Negative correlation values were observed only between yield and price of the same crops. Cereals have lower yield-price correlation compared to the root crops. In overall the variance-covariance structure differed substantially between farms. The results have considerable impact on farm portfolio analysis, where usually within-farm variability of crops is ignored. Between-farm analysis indicated that the geographical location, farmer's age, farmer's education level and variable cost had significant impact on revenue variability. The leverage ratio, off-farm income and land area were also significant and had inverse relations with the total farm revenue variability.

Keywords

Revenue variability, farm business and financial characteristics, portfolio analysis, panel data, risk management.

---

1 Institute for Risk Management in Agriculture, Hollandseweg 1, 6706 KN, Wageningen University, The Netherlands

2 Business Economics, Wageningen University, The Netherlands

* Corresponding author. Contact information: Business Economics Group, Hollandseweg 1, 6706 KN Wageningen; tel: +31 317 48 34 88, fax: +31 317 48 27 45; e-mail: oxana.kobzar@wur.nl

Introduction

Risk management involves the selection of methods for countering all types of risks in order to meet the decision-maker's goal taking into account his or her risk-attitude. The portfolio modelling approach is often used to indicate the consequences of alternative risk management strategies. Markowitz (1952), in his classical work, defined of portfolio analysis as "security selection". At the same time he footnoted that a good portfolio is more than a long list of good stocks and bonds. The word portfolio refers to a mix, or combination, of assets enterprises or investments (Brealey and Myers, 2000). In application to risk analysis for agricultural businesses, the concept of assets is usually broadened to include crop and livestock enterprises, acquisition of machinery, buildings, and land, hiring labour, financing alternatives, consumption and tax activities, and investments in financial assets. A portfolio analysis starts with information concerning individual farming activities. Then the consequences of integrating the activities in different ways are analysed using portfolio analysis in terms of expect income and variability of income. The actual variability can be associated with farm specific business and financial characteristics. Although the farms in the same area operate under similar market and weather conditions, due to the specific farm and farmer characteristics, all farmers need to manage their risks differently.

The aim of this study is to conduct an individual farm revenue analysis (i.e. within-farm analysis) and to examine difference between farms based on the farm managerial effect and farm structural effect. This paper analysis the relationship between revenue coefficient of variation and business structural variables (such as: cultivated area size, regional location, farmer's age and education, company type, relationship between owners, variable costs and off-farm income) and a financial structural variable (leverage ratio). The study consists of four main parts. First, revenue components (crop yields and prices) of historical data are de-trended. In the second part the coefficients of variation are calculated as an indicator of relative risks for yields and prices. The third part estimates the within-farm correlations of yields and prices. In the last part, the regression analysis is performed to estimate the relation of farm revenue and farm characteristics (business and financial).

Method

Because the variables of interest tend to change over time in a more or less consistent and predictable way, yield and price variables were de-trended to account for technical progress and inflation (Barry et al, 2000: 315-318). Price has been de-trended by Paasche equation (Mas-Colell, 1995), using the consumer price index as deflator.

Yields are de-trended by using two main models: linear and multiplicative (equations 1-2). The multiplicative has been used only when heteroskedasticity was found to be present in the linear model (Verbeek, 2002: 80). Both the linear and multiplicative models consist of three different functional forms: linear, second and third degree polynomial (equations 1.a–1.c and 2.a–2.c). This method allows for differences in the systematic changes during the period (Oskam, 1991) and provides the best data fit into the model.

		Linear model		*Multiplicative model*[3]
Linear function	(1.a)	$y_{qit} = \alpha_{qi} + \beta_{qi1}t + \varepsilon^{*}$	(2.a)	$\log(y_{qit}) = \alpha_{qi} + \beta_{q1}t + \varepsilon$
Second degree polynomial function	(1.b)	$y_{qit} = \alpha_{qi} + \beta_{qi1}t + \beta_{qi2}t^2 + \varepsilon$	(2.b)	$\log(y_{qit}) = \alpha_{qi} + \beta_{qi1}t + \beta_{qi3}tr2 + \varepsilon$
Third degree polynomial function	(1.c)	$y_{qit} = \alpha_{qi} + \beta_{qi1}t + \beta_{qi2}t^2 + \beta_{qi3}t^3 + \varepsilon$	(2.c)	$\log(y_{qit}) = \alpha_{qi} + \beta_{qi1}t + \beta_{qi2}t^2 + \beta_{qi3}tr3 + \varepsilon$

$^{*}\varepsilon \approx N(0,\sigma^2)$

where y_{qit} is yield unit of activity q on farm i in year t, α_{qi} is the regression constant for activity q on farm i, t is time ($t=1,...T$), β_{qi} is the systematic change in yield of crop q on farm i over the period (it is assumed that the trend caused by technological change among other things will continue in future), ε is a random error and *tr1*, *tr2* and *tr3* are the transformed functions of t, which equal (Murdoch, 1966):

$$trN = t^N - \frac{t^N * t^{N-1}}{t^{N-1} * t^{N-1}} * t^{N-1} - \frac{t^N * t^{N-2}}{t^{N-2} * t^{N-2}} * t^{N-2} \qquad (3)$$

where N can be 1, 2 or 3.

To evaluate the variability yields and prices within a farm, the coefficients of variation (CVs) are calculated. CV is an indicator of the amount of variability relative to the amount of expected yield or price.

$$CV_{qi} = \frac{\sqrt{s_{qi}^2}}{\bar{b}_{qi}} \qquad (4)$$

where CV_{qi} is a q crop yield or price coefficient of variation of farm i; $\bar{b}_{qi}$ is the mean value of crop q yield or price, respectively, on farm i; and s_{qi}^2 is the variance of crop q yield or price for farm i.

---

[3] If the multiplicative method is used, the orthogonal function can be inverted as: $y_{qit} = e^{\ln(y_{qit})}$

The variances (s^2), covariance's (Q) and correlations (ρ) of yields and prices are calculated as (Lien, 2002):

$$s_{qi}^2 = \frac{\sum_{i=1}^{n}\sum_{t=c_i}^{d_i}\left(b_{qit} - \hat{b}_{qit}\right)^2}{n-1} \quad (5)$$

$$Q_i(q,p) = \frac{\sum_{i=1}^{n}\sum_{t=c_i}^{d_i}\left(b_{qit} - \hat{b}_{qit}\right)\left(b_{pit} - \hat{b}_{pit}\right)}{n-1} \quad (6)$$

$$\rho_{qpi} = \frac{Q_i(q,p)}{s_{qi} \times s_{pi}} \quad (7)$$

where $\hat{b}_{qit}$ is predicted regression value for mean output per unit of activity q on farm i in year t; n is number of observations per farm; c_i is the first year with an observation on farm i; d_i is the last year with an observation on farm i; s_{qi}^2 is activity q variance of output per unit; $Q_i(q,p)$ and ρ_{qp} are covariance and correlation between crops q and p, respectively on farm i. Degrees of freedom in equations (5) and (6) are (n-1), where n is the number of observations and 1 is the degree of freedom lost in estimating the time trend.

In addition, farm total revenue is calculated by multiplying the deflated yield and price values for each crop, each then multiplied by the corresponding proportion of cultivated area and summed across crops. Afterwards coefficient of variation of the revenue *(CV(R$_i$))* were calculated. Differences in revenue variability between-farm were explained by the following input variables: leverage ratio (*Lev*), variable costs (*VarCost*), farm planted area (*Land*), farm location (*Loc*), farmer's age (*Age*), education level (*Edu*), company type (*ComTy*), relationship between owners (*Rel*), off-farm income (*OffInc*), as presented in equation 8:

$$Var(R_i) = f(Lev_i, VarCost_i, Land_i, Loc_i, Edu_i, ComTy_i, Rel_i, Age_i, OffInc_i) \quad (8)$$

Materials

The input data concerning farm business and financial structure were obtained from the Farm Accounting Data Network (FADN) data set. The FADN data are a unique panel data set, which includes crop-level information per farm The Netherlands. For the analysis 109 arable farms were selected from 718 available farms with at least seven years of observations in the period 1990-1999. The used land area of these farms did not change over the observed period. The farms had grown at least four crops every year during the observed period from the following eight most extensively grown crops in The Netherlands: winter wheat, spring barley, sugar beet, onion seed, carrots, table potatoes, potatoes for processing, seed potatoes and grass seed. Therefore, farms could had different sizes, cropping sets and management strategies. The data set included detailed information for these arable crops over time. Prices for the crops were derived at the individual farm level.

The measured components of the farm revenue per crop were yield [kg/ha] and price [€/kg]. The numbers of yield and price observations, their uncorrected means and standard deviations are presented in Table 1. In addition, medians are presented because this measure of central tendency is more robust to errors of extreme data points than means (Pindyck, 2000).
INSERT Table 1

The independent variables of the regression analysis (equation 8) are divided into two parts: the variables describing the business structure of the farm and the variables describing the financial structure of the farm. The variables describing business structure are the following: variable costs, farm regional location, company type, relationship between owners, farmer age and off-farm income. The variable costs (*VarCost*) are measured as the sum of the variable costs of all the produced crops on the farm. These costs include storage, transport, energy, pesticides, fertilisers, manure and seeding materials, but not the costs of contract work. Land area (*Land*) is a total cultivated land area of the farm. Location (*Loc*) is measured by dummy variables. Eight main agricultural regions in The Netherlands are included. They are partly based on the soil type and partly on the traditional aspects of farming in that particular area (CBS, 1991). The majority of the farms are from the following areas: *LocA* (29%), *LocB* (27%) and *LocC* (24%). The rest of the farms are distributed as follows: 11% of the farms are from *LocD*, 10% from *LocE*, 4% from *LocF*, 3% from *LocG* and 1% from LocH (Figure 1). Farmer's age (*Age*) is measured as farmer's year-of-birth. One third of the farmers (30%) was born before 1940, 67% of the farmers were born between 1941 and 1960; the rest (3%) was born after 1961. However, to account for a possible non-linearity effect, this variable is included as a quadratic function of age ($Age+Age^2$). Farmer education level (*Edu*) is a dummy variable based on the level of farmer's agricultural education. The majority of the farmers (66%) had a high or secondary level of the agricultural education, some of them (28%) have a lower-level agricultural education, and others (6%) do not have special agricultural education. Company type (*ComTy*) is a dummy variable that indicates three main types of the Dutch farming: family farming, association (partnership firm), incorporated firms or limited liability firms. Most of the farms (63%) are family farms, 25% are partnership farms and only 1% are Incorporated or limited firms (Inc. or Ltd.). The relationship between owners (*Rel*) is a dummy variable that indicates types of family relationships within the farm. In the current data set the following family relations are presented: independent manager (58%), father with son or son-in-law (28%), brothers or brothers-in-law (6%) and other family relationships (8%). Off-farm income (*OffInc*) depicts farm income earned from other sources than farming. Leverage (*Lev*) is included as a financial variable measuring farm solvency (Barry, 2001). It is the ratio of total farm debt to farm equity and it measures the farm's total obligations to creditors as a percentage of the farm total equity capital. Since financial information of the beginning and end of the year is available in the data set, the values of farm debts and equities have been calculated as the average of begin-and-end balance of each year (Barry, 2000; pp. 98-114).

Results

Price and yield de-trending

Prices have been de-trended and applied to further analysis using the price indexes that were calculated based on the data of the Dutch Central Bureau of Statistics (CBS, 1990-2002). Yields de-trending was done by different models (see equations 1-2). Table 2 presents the best-fitting yield de-trending approach for each crop over all the farms. From the table it can be seen that the multiplicative method gives the best fit for winter wheat, sugar beet and onion seed. For the other crops the linear method gives a better fit. The third column of the table includes the number of observations and the goodness-of-fit (R_{adj}^2 and F-test) for each model. The significance of each parameter is evaluated by the t-test statistics. In the case of winter wheat, for example, 2140 observations are used for de-trending. The R_{adj}^2 measure indicates that the function explains 60% of the variation; the F-test value equals 5.00 and is significant at a level of 1%. The regression parameters are reflected by α and β coefficients. They have also been tested at the 1% significance level using the t-test. Since the multiplicative method has been used for de-trending of this crop the α-value should be inverted (footnote of equation 2) to reflect the real value. So, farmers have a de-trended production of winter wheat of 5540 kg/ha constantly.

INSERT Table 2

Revenue components estimation

Because it is impossible to present all 109 variance-covariance matrixes (one for each farm), we choose to present the mean values of the correlation matrix and coefficients of variation (Table 3).

Coefficient of variation

On the diagonal of Table 3, the coefficients of variation (equation 4) are presented. It can be seen that the within farm CV of wheat yield, for example, over the period 1990-1999 equals 0.34. The CV values of winter wheat, carrot and consumption potato are lower. The corresponding values are

34%, 29% and 27%, respectively, while the CV values for most other yields are below 25%. The CVs of prices are more widely dispersed: with extremely low values for sugar beet (2%) and extremely high values for carrot (134%) and onion seed (70%). The rest of the CVs price values are around 20%.

Correlation values

Yield-price correlations: Above the diagonal of Table 3, the correlation coefficients are presented (equation 7). There are 41 significant correlation coefficients from the possible 64. The table shows that, for example, the correlation between yield and price of wheat is –0.05. Only negative correlations between yield and price of the same crop were found. These results illustrate an inversely relation between yield and price within crops: increases in the expected yields of these crops are associated with decreases in their respective prices. On the whole, cereals have lowest correlation values compared to the other crops. The yield-price correlation values of other crops vary from the lowest value of potato seed (-0.29) to the highest value of carrot (-0.44). The reason of the positive yield-price correlations between different crops (8 from significant 34) could be that yields and prices of these crops are affected by the same weather and market conditions. The rest of the significant correlations were negative.

Yield correlations: As it can be seen from the table, positive yield correlations between different crops are observed in most cases (18 from possible 19 significant). For example, yields of wheat and barley have a positive correlation of 0.33. The results indicate that crops are subjected to the same production and weather influences: a high yield of one of them is associated with a high yield of another one. Only one negative significant correlation value is observed between yields of table potato and seed potato.

Price correlations: There are 11 positive price correlation coefficients between different crops from possible 18 significant values. For example, winter wheat price is highly positive correlated with summer barley price (0.98). Negative correlations are found between all possible pairs of the prices of cereals and sugar beet, cereals and consumption potato and cereals and potato seed. There is also a negative correlation between the prices of onion seed and winter wheat. Other significant correlations were positive. Possible price correlations indicate that crop prices are subject to the same market conditions.

INSERT Table 3

Farm revenue variability estimation

A summary of the regression analysis (Equation 8) is provided in Table 4. The F-statistic of the model was significant at the 95% confidence level and the coefficient of determination R_{adj}^2

equalled 75%. The significance of the coefficients was estimated by the t-value at a significant level 5% level or less. A highly educated farmer with son (father-son family relation) managing an independent farm (as a company type) in the region G was chosen as the reference group. From the results of the farm revenue CV estimation it can be seen that the leverage ratio had an inverse relation to the total farm revenue variability: farms with greater solvency had lower revenue CV while farms with relatively greater obligations to creditors had a lower CV of revenue. The same held for the land area and off-farm income. Thus the higher the proportion of the land area and off-farm incomes, the lower the revenue variability could be expected to be. High variable costs were associated with higher farm revenue variability. Farmer's age had an inverse influence on revenue variability: older farmers had less variable revenues. As can be seen, the majority of farm location dummy-variables were significant in the model and had considerable influence on the revenue variability. Farmers with a higher education level had slightly lower CV of revenues than their less educated colleagues. Concerning the company type, family farms had more stable revenues than partnerships or farms with managers. The variable for relationships between owners indicated that brothers had higher revenue variability, while father-son and other types of family-based farms had less variable revenues.

INSERT Table 4

Conclusions

In this paper Dutch crop revenue variability is considered from two different points of view: within a farm and between farms. The within-farm analysis focussed on revenue components. The results indicate that it is important to estimate the correlation structure on the individual farm level, since there is there is a considerable difference between the farms. For instance, positive yield and price correlations were most common at the farm-level basis of the aggregated data set. However, in a number of the cases, on the farm-level negative correlation values were observed between yield and price of the same crops; this demonstrates the importance of knowing the farm specific situation in optimising risk management decisions.

Between-farm analysis quantified the relation between business and financial variables on the one hand and revenue variability on the other hand. A significant relationship between revenue coefficient of variation and farm structural characteristics existed in our research. The leverage ratio, off-farm income, and land area all tended to reduce farm total revenue variability: larger values of these variables were shown to be associated with lower values of revenue variability. Also farmer's age had an inversely relation with the revenue variability. This regression coefficient is quite low, but it has significant influence at the model. A slight positive relation of education level at the model is observed: better-educated farmers have less variable revenues.

References

Brealey, A.R., and Myers, C.S. (2000). *Principals of Corporate Finance* Quebecor, Printing Book Group. Hawkins. Sixth edition.

CBS (1990-2002). Agricultural Figures, several volumes (in Dutch). Agricultural Economic Research Institute and Central Bureau of Statistics. The Hague.

CBS (1991). The Division of Agricultural Areas (in Dutch). Agricultural Economic Research Institute and Central Bureau of Statistics. The Hague.

Lien, G. (2002). Non-parametric estimation of decision maker's risk aversion. *Agricultural Economics* **27**:75-83.

Markowitz, H.M. (1952). Portfolio Selection. *The Journal of Finance* **VII(1)**.

Markowitz, H.M. (2000). *Portfolio Selection* Blackwell, Cambridge MA & Oxford UK. Second Edition.

Mas-Colell, A., Whinston, M.D., and Green, J.R. (1995). *Microeconomic Theory* New York, Oxford, Oxford University Press. First Edition, p.27.

Murdoch, D.C. (1966). *Linear Algebra for Undergraduates* John Wiley & Sons, INC. Eighth printing, p.34.

Oskam, A.J. (1991). Weather indices of agricultural production in The Netherlands 1948-1989.1. General methodology and the arable sector. *Netherlands Journal of Agricultural Science* **39**:149-164.

Pindyck, R. S., and Rubinfeld, D.L. (2000). *Econometric models and economic forecasts* McGraw-Hill International Editon. Economics Series. Fourth edition.

Verbeek, M. (2002). *A guide to modern econometrics* John Wiley & Sons, LTD

Table 1: Description statistics of yield and price of crops

Product	*Revenue component*	*Number of farms*	*Mean*	*Std. Dev*	*Median*
Winter wheat	yield (kg/ha)	92	7461	2313	7957
	price (€/kg)	92	0.18	0.03	0.17
Summer barley	yield (kg/ha)	86	5945	1015	6104
	price (€/kg)	86	0.17	0.02	0.17
Sugar beet	yield (€/ha)	99	62179	8712	62483
	price (€/kg)	99	0.06	0.00	0.06
Carrot	yield (€/ha)	26	66829	15212	69452
	price (€/kg)	26	0.11	0.07	0.08
Potato consumption	yield (€/ha)	64	45623	12968	45254
	price (€/kg)	64	0.23	0.06	0.23
Potato for seed	yield (kg/ha)	44	36078	5255	36337
	price (€/kg)	44	0.23	0.06	0.23
Onion for seed	yield (kg/ha)	48	49066	9831	47698
	price (€/kg)	48	0.10	0.06	0.09
Grass seed	yield (kg/ha)	45	1407	300	1416
	price (€/kg)	45	1.22	0.20	1.22

Table 2: Results of yield de-trending

Product	*Type of function*	*Statistical estimations of model fit*	*Parameters* α	β_1	β_2	β_3
Winter wheat	third degree orthogonal polynomial	n=580 $R_{adj}^2=0.60$ F=5.00 p<0.01	8.62 p<0.01	0.13 p<0.01	-0.02 p<0.01	-0.001 p<0.01
Summer barley	linear	n=320 $R_{adj}^2=0.56$ F=4.70 p<0.01	7297.55 p<0.01	61.84 p<0.03		
Sugar beet	quadratic orthogonal polynomial	n=625 $R_{adj}^2=0.60$ F=5.70 p<0.01	11.2 p<0.01	-0.06 p<0.01	-0.004 p<0.01	
Carrot	third degree polynomial	n=96 $R_{adj}^2=0.45$ F=2.54 p<0.01	128826.61 p<0.01	-26379.67 p<0.01	4366.19 p<0.01	-246.07 p<0.01
Potato consumption	quadratic polynomial	n=375 $R_{adj}^2=0.49$ F=5.02 p<0.01	41194.83 p<0.01	3339.79 p<0.03	-399.90 p<0.03	
Potato for seed	quadratic polynomial	n=284 $R_{adj}^2=0.44$ F=4.20 p<0.01	26171.42 p<0.01	567.45 p<0.01	-43.83 p<0.01	
Onion seed	orthogonal linear	n=170 $R_{adj}^2=0.52$ F=3.92 p<0.0001	10.78 p<0.01	0.01 p<0.05		
Grass seed	third degree orthogonal polynomial	n=233 $R_{adj}^2=0.42$ F=3.09 p<0.01	6.84 p<0.01	-0.06 p<0.01	0.02 p<0.01	0.002 p<0.01

Table 3: Correlation matrix (off diagonal) and coefficient of variation (diagonal) including all farms

coefficient of variation		wheat		barley		beet		carrot		potato cons.		potato seed		onion seed		grass seed	
		yield	price	yield	price	yield	price	yield	price	yield	price	yield	price	yield	price	yield	price
wheat	yield	0.34	**-0.05**[1]	**0.33**	**0.11**	**0.31**	-0.02	0.15	-0.16	**0.27**	**-0.14**	**0.27**	**-0.26**	**0.15**	**-0.50**	0.35	**-0.19**
	price		0.15	**-0.07**	**0.98**	**0.34**	**-0.58**	**0.28**	-0.19	**0.19**	**-0.31**	-0.01	**-0.17**	0.05	**-0.18**	0.13	-0.07
barley	yield			0.17	**-0.03**	**0.37**	**-0.12**	0.18	**-0.33**	**0.22**	**-0.23**	**0.20**	**-0.26**	**0.26**	**-0.42**	0.08	0.06
	price				0.16	**0.27**	**-0.42**	0.19	0.01	0.12	**-0.30**	**-0.22**	**-0.28**	0.02	-0.12	**0.18**	0.08
beet	yield					0.15	**-0.32**	**0.25**	**-0.24**	**0.46**	**-0.31**	**0.26**	**-0.32**	**0.32**	**-0.14**	**0.16**	**0.14**
	price						0.04	-0.04	0.16	**-0.30**	**0.69**	-0.10	**0.41**	**-0.18**	**0.31**	0.02	-0.03
carrot	yield							0.29	**-0.44**	0.15	-0.24	0.09	-0.14	**0.30**	**-0.33**	**0.42**	-0.09
	price								1.34	-0.14	**0.28**	-0.12	**0.44**	**-0.31**	**0.33**	**-0.56**	**0.52**
potato con.	yield									0.27	**-0.38**	**-0.29**	**0.33**	**0.50**	**-0.36**	0.03	-0.01
	price										0.24	**-0.27**	**0.55**	**-0.35**	**0.37**	-0.15	0.01
potato seed	yield											0.13	**-0.29**	**0.25**	**-0.31**	0.11	0.04
	price												0.20	**-0.47**	**0.50**	0.02	-0.06
onion seed	yield													0.22	**-0.38**	0.14	-0.09
	price														0.70	-0.03	0.07
grass seed	yield															0.21	**-0.40**
	price																0.22

[1] The correlation coefficients that are differed from zero at a significance level of 5% or less are written in bold.
[2] Infeasible combination.

Table 4: Regression results of farm revenue variability estimation

Variables	*Coefficients*		*t-value*
Intercept	-628.94	**	3.57
Lev	-2.61	**	-2.06
OffInc	-0.14	**	8.88
VarCost	2.99	**	13.22
Land	-2.45	**	-3.39
Age	-0.02	**	-4.34
LocA	2.23	**	-3.37
LocB	4.26	*	1.65
LocC	-14.83	*	1.93
LocD	-19.21	**	-6.13
LocE	-4.78	**	-3.83
LocF	5.70		0.25
LocH	-6.37		-0.68
Edu			
Low-level education	0.22	**	2.60
ComTy			
Association	-7.17	**	-3.56
Inc or Ltd.	2.42	*	1.93
Rel			
No relation	2.05	**	4.62
Other family relation	2.04		0.95

* Statistical significance at 5% level

** Statistical significance at 1% level

Figure 1: Agricultural regions in The Netherlands