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Agnieszka Bezat[1]
Chair of Agricultural Economics and International Economic Relations
Warsaw University of Life Sciences
Warsaw

Polish farms in the light of quality requirements

Abstract. After the accession of Poland to the European Union farmers have to fulfil high food quality requirements. In accordance with the requirement 172/2002 of the European Commission, they should keep documentation regarding their part in the product's flow in the food chain. This paper focuses particularly on the analysis to what degree requirements are satisfied by the analysed farms. A cluster analysis and a point assessment technique were used.
Key words: farms, quality requirements, traceability

Introduction

The need for high product quality[2] and food safety is acknowledged by European Union and at first of all by consumers. After the accession of Poland to the European Union Polish farmers have to fulfil more legal and market requirements than before. In the past few years, newer or stricter product liability laws, enacted in the European Union (EU) and in other major markets of the developed world, have prompted large global retail chains (e. g. Carrefour, Metro, Tesco etc.) to formulate their own supplier standards for product and process quality [Krieger et al. 2007].

A responsibility for fulfilment of requirements regarding to product safety (e.g. HACCP[3], ISO 9000[4], EUREPGAP[5], GMP 13[6], Q&S[7]), marking of GMOs (genetically modified organisms) and T&T[8] (tracking and tracing) lay upon all participants of various steps of the food supply chain [Jarzębowski 2005]. The full range of quality requirements is too extensive a subject to be discussed fully in a brief paper. Therefore it is focused only on an examination of the fulfilment of requirement 172/2002, which defines that each step of supply chain should keep a documentation regarding the product's flow. This requirement was a reaction to a number of food scandals which lowered the consumer protection and the

[1] MSc, e-mail: agnieszka_bezat@sggw.pl
[2] Product quality – increased shelf-life and improved texture, flavour and colour [Voort et al. 2007].
[3] HACCP – Hazard Analysis Critical Control Points is a food safety methodology that relies on the identification of Critical Control Points (CCP's) in food production and preparation processes [Eurogran… 2008].
[4] ISO – International Organization for Standardization [ISO… 2008]. ISO 9000 is a series of standards that define, establish and maintain an effective quality assurance system for manufacturing and service industries [Searchdatacenter… 2008].
[5] EurepGAP – Euro Retailer Produce Good Agricultural Practices is a private sector body that sets voluntary standards for the certification of agricultural products around the globe [Eurocert… 2008].
[6] GMP 13 is to the feed industry what HACCP is to the food industry. The animal feed certification is a European rule that is expanding all over the European Community as a tool of quality guarantee for agricultural supplies [KMC… 2008].
[7] Q&S – Quality and Safety is a German quality system which sets requirements for the meat, fruit and vegetables supply chains [Krieger et al. 2007].
[8] T&T (Tracking and Tracing): Tracking means the inquiry of the current status of a delivery of a good etc.; Tracing means ex post reconstructable history of delivery [Klaus i Krieger 2002].

trust of the consumer in the food quality. It can be assumed that the market demands traceable products and traceability have compulsory character [Parlińska & Bezat 2007].

Vertically-oriented quality requirements, like the requirement 172/2002, are set at several or all stages of the supply chain. These vertically-oriented approaches aim to ensure a guarantee of chain's wide quality. In accordance with the requirement 172/2002 farmers, as the first step of food supply chain, should warrant the traceability of their products, as well as withhold unsafe products. It is significant that farms make up the first step of food supply chain and they have a big influence on the product's quality in the whole chain. Besides, farmers wishing to become suppliers in the more demanding retail markets, either locally or globally, need to customise for the market requirements.

Methods

The aim of the article is to determine if the Polish farmers meet the quality requirements. The traceability of food products is particularly examined.

The first step of supply chain, namely farmers, is analysed. It is assumed that farms, due to their position in the food supply chain, have a big influence on the quality of final products which are bought by consumers.

The data were collected by interviewing farmers with help of a standard questionnaire in March 2008. The surveyed sample include 30 farms from Łódzkie and Mazowieckie voivodeships. The interview was conducted personally with each farmer.

To organise data into meaningful structures an econometric method, namely cluster analysis, was used. This research was made by using the Statistica 8.0 Software. The analysis helps to group objects of similar kind into respective categories by using a measure of association or a similarity distance, so that the objects in a group are similar and the objects in different groups are not similar. In other words, cluster analysis is an exploratory data analysis tool which aims at sorting different objects into groups, in a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise. The most straightforward way of computing distances between objects in a multi-dimensional space is to compute Euclidean distances between them, which is probably the most commonly chosen type of distance [Luszniewicz & Słaby 2001].

The analysis was carried out with regard to four points, namely age of farmers, their level of education, acreage of farms and labour resources. Before starting the cluster analysis, the data were normalised by using the following equation:

$$X_j' = \frac{X_j - Min(X_j)}{Max(X_j) - Min(X_j)}$$

Normalisation of data was performed for age of farmers, level of education, acreage of farms and labour. The cluster analysis's results are shown in the next part of the article.

Because in the literature author couldn't find any formula for estimation of traceability's fulfilment, the point assessment method was used and following equation was proposed. Each farm was assessed in 2 categories, namely stock and crop production, with regard to the state of documentation of the products' flow. Farmer's family own consumption of the products was included. For each type of production three most important from author's point of view control points were chosen. For each farm the results

of calculation could be more than -3 and less than 3. This scale results from the used calculation formula (see following equation).

$$T\&T = P_{plant}\left[(1-C_p)*(Q_{p1}+Q_{p2})+Q_{p3})\right]+P_{stock}\left[(1-C_s)*(Q_{s1}+Q_{s2})+Q_{s3})\right]$$

where:
T&T is a level of traceability's fulfilment
P_{plant} is a share of crop production in the total farm's revenue
P_{stock} is a share of stock production in the total farm's revenue
C_p is a share of plant products' own consumption in the total crop production
Cs is a share of stock products' own consumption in the total stock production
Qp1 is an answer to the first question referring to crop production: 'Do you keep a documentation of sales of plant products? (write YES or NO)' (1. control point)
Qp2 is an answer to the second question referring to crop production: 'Do you use codes for identification of plant products' lots you are going to sell? (write YES or NO)' (2. control point)
Qp3 is an answer to the third question referring to crop production: 'Do you keep a documentation of purchases of crop production inputs, e.g. nitrogen fertilizer? (write YES or NO)' (3. control point)
Qs1 is an answer to the first question referring to stock production: 'Do you keep a documentation of sales of animals? (write YES or NO)' (1. control point)
Qs2 is an answer to the second question referring to stock production: '„Do you use codes for identification of animals you are going to sell? (write YES or NO)' (2.control point)
Qs3 is an answer to the third question referring to stock production: 'Do you keep a documentation of purchases of stock production inputs, e.g. animal feed? (write YES or NO)' (3. control point)

Answer 'yes' gives 1 point, answer 'no' gives 1 point, no answer gives 0 points. The results of the calculation are shown in the next part of the article.

Results

A cluster analysis was performed on the 30 observations (30 farms). For calculating dissimilarities the raw Euclidean distance was used. The results are shown in Figure 1. (dendrogram).

One of the alternative ways of interpreting the results is a visual analysis of observations. The visual analysis of the dendrogram (Figure 1) suggests clustering observations (farms) into 3 groups.

Using the visual interpretation one can say that cluster 1 is formed by farms numbers 30, 28, 27, 29, 18, 17, 4, cluster 2 by farms nos. 14, 24, 9, 7, 26, 25, 22, 15, 13, 21, 12, 11, 6, 2 and cluster 3 by farms nos. 20, 19, 23, 5, 16, 8, 10, 3, 1.

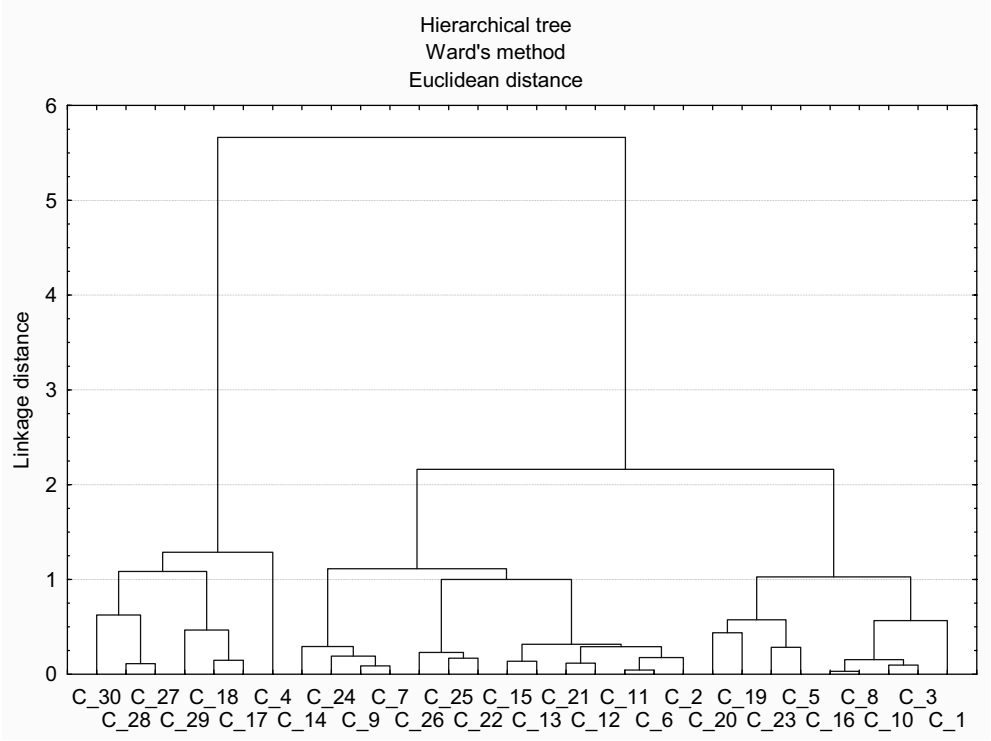

Fig. 1. Results of cluster analysis
Source: own research using STATISTICA 8.0 Software

All data which were used in the cluster analysis were normalised and are in the range of <0,1>. For the age of farmers the variable value 0 indicates the youngest farmer and 1 the oldest one. For the level of education the variable value 0 means a primary school, 0,3 a vocational education, 0,7 a secondary school and 1 a higher school. For the area of farms the variable value 0 indicates the smallest farm and 1 the biggest one. For the labour resources the varaible value 0 means the farm with the smallest labour potential and 1 the farm with the biggest labour resources.

The first cluster is built from farms which are run by the youngest farmers (see Fig.2). Their age averages 25 years. Those farmers have the highest level of education (secondary school and higher school). The second cluster is characterised by small farms (about 10 hectare) with poorly qualified labour. The farms in this group are managed by the oldest farmers. The farmers have primary or vocational education (see Fig. 3). In the third cluster, the small and the middle farms were grouped (about 17 hectare). The farmers in this group have a secondary school education (see Fig. 4).

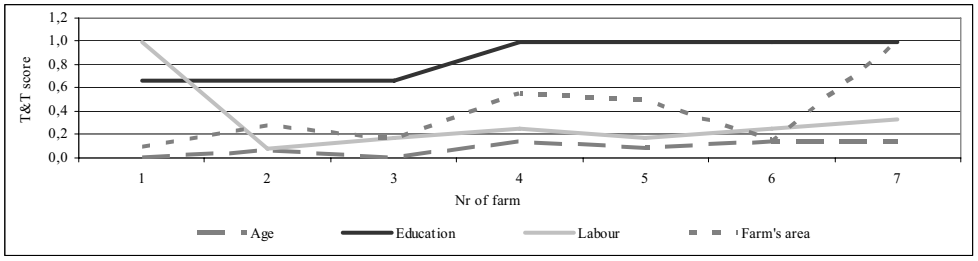

Fig. 2. Characteristics of farms in the first cluster
Source: own research

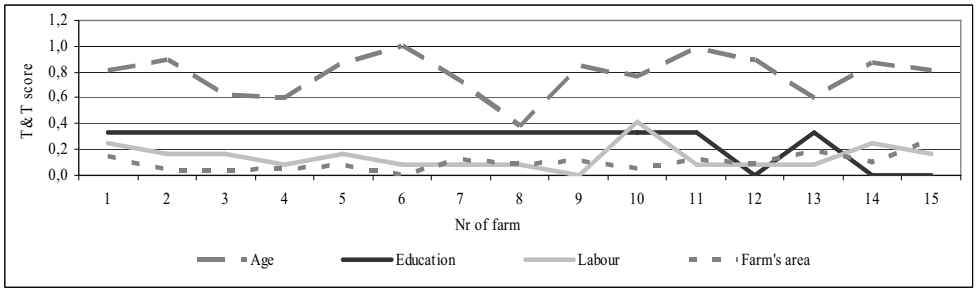

Fig. 3. Characteristics of farms in the second cluster
Source: own research

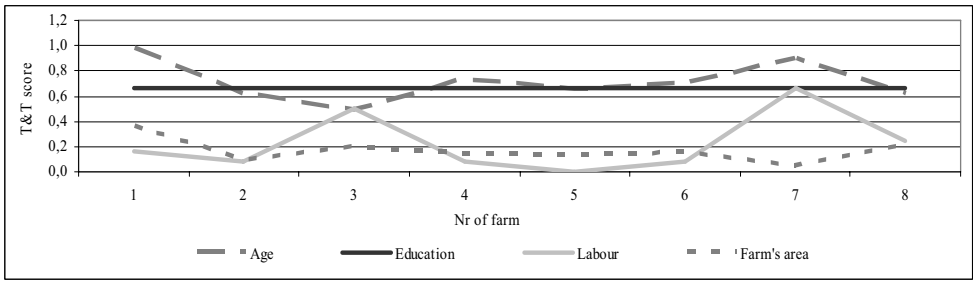

Fig. 4. Characteristics of farms in the third cluster
Source: own research

Using the survey's data it has been analysed, whether the traceability is guaranteed in each of the groups. The results of fulfilment of the traceability requirements are shown in Table 1. Using the point assessment technique for each farmer, the indicator of the fulfilment of traceability settlements has been calculated.

Table 1. Results of cluster analysis and point assessment of traceability

No of farm	No of cluster	Age of farmer	Education	Labour stock	Acreage of farm	Traceability score T&T
4		0,0	0,7	1,0	0,1	3,00
17		0,1	0,7	0,1	0,3	2,27
18		0,0	0,7	0,2	0,2	0,71
27	1	0,1	1,0	0,3	0,5	2,98
28		0,1	1,0	0,2	0,5	1,00
29		0,1	1,0	0,3	0,1	1,00
30		0,1	1,0	0,3	1,0	1,00
2		0,8	0,3	0,3	0,1	-1,10
6		0,9	0,3	0,2	0,0	-2,90
7		0,6	0,3	0,2	0,0	-0,02
9		0,6	0,3	0,1	0,0	-0,90
11		0,9	0,3	0,2	0,1	-1,95
12		1,0	0,3	0,1	0,0	-1,00
13		0,7	0,3	0,1	0,1	2,80
14	2	0,4	0,3	0,1	0,1	0,90
15		0,8	0,3	0,0	0,1	-0,43
20		0,8	0,3	0,4	0,0	0,10
21		1,0	0,3	0,1	0,1	1,76
22		0,9	0,0	0,1	0,1	0,98
24		0,6	0,3	0,1	0,2	0,96
25		0,9	0,0	0,3	0,1	0,90
26		0,8	0,0	0,2	0,3	0,92
1		1,0	0,7	0,2	0,4	-0,30
3		0,6	0,7	0,1	0,1	0,00
5		0,5	0,7	0,5	0,2	-0,53
8		0,7	0,7	0,1	0,1	1,98
10	3	0,6	0,7	0,0	0,1	-0,20
16		0,7	0,7	0,1	0,2	0,37
19		0,9	0,7	0,7	0,0	-1,00
23		0,6	0,7	0,3	0,2	0,98

Source: own research using STATISTICA 8.0 Software

The biggest value of the indicator of traceability fulfilment can be observed in the first group of farmers. Above the level of 0 it can be assumed that the traceability is at least partially satisfied. It is the case of 14 farms which belong to all three clusters. In the first group 100% of the analysed farms meet the requirements of traceability (at least partially). The features that determine a satisfactory level of traceability's fulfilment in the first cluster are age and education of farmers (see Fig. 2).

On the basis of data collected from the survey it can be observed that 60% of farms document activities that take place during the production processes (products' flow). Only 65% of farmers have a regular buyer. Furthermore, we can see that only 50% of them are able to keep a documentation enabling the traceability in order to get a better price for their products.

Conclusions

The quality and safety market requirements that farmers have to fulfil are still growing. To improve own competitiveness and to assure a stable position in the market farmers should be able to supply their buyer with whole information referring to products quality and to contribute to establishing the product traceability from a field to a buyer.

During the analysis it was determined that only a half of the farmers keep required documentation concerning the traceability. For the rest of them it can be difficult to sell their raw products, because in the near future the requirements of big food processing companies (their buyers) will grow. So if they want to have big and regular buyers they have to be prepared for keeping the documentation of all products and all production processes. Using this analysis results, it can be interpreted that these farmers who do not keep documentation of the products' flow do not have enough knowledge about the traceability. It was shown that the younger and better educated the farmers are, the higher level of traceability's fulfilment they achieve.

To fill the knowledge gap would be possible by carrying out of professional training or by giving farmers information about the relevance of traceability's fulfilment. Farmers that are not able to fulfil the traceability's requirements in the future can have difficulties with selling their products. This can lead to a shutdown of their production.

References

Eurocert – European Inspection and Certification Company. S.A. [2008]. Available at http://www.eurocert1.com/certificate_uk.asp?certificate_id=64&organization=6. Accessed May 2008.

Eurogran [2008]. Available at http://www.eurogran.com/en/quality/food_safety/haccp_quality_control_system/. Accessed May 2008.

ISO. [2008]. Available at http://www.iso.org/iso/about/discover-iso_isos-name.htm. Accessed May 2008.

Jarzębowski S. [2005]: Obligatoryjne systemy zarządzania jakością. *Food&Drinks.*

Klaus P., Krieger W. [2002]: Gabler Lexikon. Logistik. Management logistischer Netzwerke und Flüsse. 2 edition. Wiesbaden, pp. 475.

KMC. [2008]. Available at http://www.kmc.dk/News%20&%20events/060123gmp13.asp. Accessed May 2008.

Krieger S., Schiefer G., da Silva C. [2007]: Costs and benefits in food quality systems: concepts and a multi-criteria evaluation approach. Agricultural management, marketing and finance working document 22, Agricultural Management, Marketing and Finance Service (AGSF), Rural Infrastructure and Agro-Industries Division, Food and Agriculture Organization of the United Nations, Rome, pp. 2-39.

Luszniewicz A., Słaby T. [2001]: Statystyka z pakietem komputerowym STATISTICA PL. Teoria i zastosowania. Akademia Oeconomica. C.H. Beck, Warszawa.

Parlińska M., Bezat A. [2007]: EAN Code as a part of effective traceability on the example of wholesale markets. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu* vol. IX, no. 4, pp. 133-137.

Searchdatacenter. [2008]. Available at http://searchdatacenter.techtarget.com/sDefinition/0,,sid80_gci512546,00.html#. Accessed May 2008.

Voort van der M., Baricicova V., Dandar M., Grzegorzewska M., Schoorlemmer H., Szabo C., Zmarlick K. [2007]: EU Access report 06. Quality requirements for vegetable and fruit products in the European Union. Training Manual: Product Quality Standards including UN-ECE Quality standards for onions. Wageningen UR Library, Lelystad.