Evaluation of Land Fragmentation in Agricultural Areas: Farmers Perspective

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Key words: Land Fragmentation, Property Structure, Land Consolidation

SUMMARY

In Finland, the number of active farms has declined constantly since the beginning of 21st century. Simultaneously, the combined area of farmland has remained on its initial level and the average farm size has grown. This study examines how the change in average farm size has affected the average farm structure.

In this study, farms are divided into nine subgroups according to their respective sizes. This study measures the degree of land fragmentation with four instruments: the average number of parcels held by a farm, the average size of the parcels, the average distance to farm buildings from the parcels, and Simmons fragmentation index. Data used in this study consists of the field plot information of Finland from the years 2000 and 2012.

This study shows that larger farms occupy, on average, larger parcels but the average size of the parcels has declined in all nine farm size groups. Moreover, the number of parcels held by a farm has increased in every group. Also the Simmons fragmentation index, which expresses the relationship between number of parcels and the relative size of the parcels, indicates that farm structure in Finland has become weaker. The average overall distance from the farm to the parcels has increased between years 2000 and 2012, due to the increasing farm size. Within different farm size groups the average distance from one parcel to the farm has not changed significantly during the same period. Noteworthy, the average distance from parcel to farm becomes higher as the farm size increases. This indicates that expanding farms are required to acquire new arable land from further distances.

Land fragmentation causes a lot of problems, with the most obvious ones being the increasing production costs and greenhouse gas emissions. Due to land fragmentation the farm industry is not increasing its profitability, even though the industry is going through a major rationalization phase. The problems caused by land fragmentation could be mitigated through land management activities, especially through farmland consolidation.

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1 INTRODUCTION

Surveyors deal with land management that is the implementation of land policy by a wide range of land policy instruments (e.g. land consolidation). Land fragmentation lies in the heart of land consolidations since it is a tool which main goal is to reduce fragmentation. In Finland, land consolidations and land reforms have been carried out since the Middle Ages. These land management activities have been conducted due to changes in the social structure. Wars, population and economic growth, changes in economic structure, changes in the objects and procedures of taxation, and development in agriculture and cultivation techniques have led to the need to re-organize land parcels and/or their ownership structures. (Vitikainen, 2003, p. 37; Hiironen, 2012, p. 224-225.) Since 1960s the structural change of agriculture has been the largest factor contributing to the need for land management activities in agricultural areas.

The number of farms has been decreasing for 50 years, starting from the beginning of the 1960s. At that time there were over 300 000 farms in Finland, whereas now there are less than 60 000. At the same time, the average farm size has increased, because nearly all arable land is still cultivated. By measuring the field area, the average farm size was 38 ha in 2011 (CSOF, 2012). It is estimated that the number of farms will drop to 45 000 and the average field area of farms increase to 50 ha by 2020. Especially very specialized cattle and vegetable production will be in the hands of even fewer professionals and frequently concentrated geographically in areas with an already strong basis of production. This change where the production is concentrated in the hands of fewer and more specialized farmers is called structural development. Structural development is an international trend that seems to be continuing. The increase in productivity and the decrease in costs will be courted with the help of benefits gained from specialization and large scale (Pyykkönen et al., 2010, p. 6–13).

Despite the fact that the agricultural structure is changing at a rapid rate along with technological development, there has been no change in the profitability of Finnish farms (CSOF, 2012). From the farmers perspective the situation is difficult. The farmers are trying to improve their livelihood by relying on the economies of scale. We know that renting farmland has increased rapidly (Luke 2013). We also know that the prices paid for cultivated land have increased constantly (NLS 2014). But we do not know if this development is leading to the desired results. It is possible that the profitability of Finnish farms would have actually decreased without this development. Therefore, from the farmers' perspective, the development is most probably necessary and wished for. It shall be highlighted as well, that farmers gets their income mainly from subsidies. Their loans from purchasing land are practically free because of national interest subsidies. So even though acquiring arable land

far away does not make farms more profitable, it increases the farmers' absolute incomes. (Hiironen & Niukkanen, 2014.)

From the land management perspective, it can be assumed that the structural development of agriculture is scattering property structure as a whole. Based on previous studies the size of the parcel and the distance between the parcel and the farm compound are the main elements that define the quality of the property structure of arable land (Hiironen, 2012, p. 114; Klemola et al., 2002; Peltola et al., 2006; Najafi, 2000; Lerman, 2002; Bentley, 1987). From the perspective of property structure, these two elements define how much time it will take to cultivate a certain land parcel. From the farmer's perspective, these two elements define how much the property structure effects to their cultivation costs. From both perspectives, the situation would be the best possible if all of the holdings would be in a single parcel, just beside farm compound.

This study is set up to evaluate the changes in property structure from the farmer's perspective between 2000 and 2012. The main questions are: how many land parcels does each farm have; how big are the land parcels; and how far away are they from farm compound? Additionally, the study observes how these properties that define the goodness of the property structure have changed between 2000 and 2012.

King and Burton (1982) stated that the goodness of property structure from the farmer's perspective can be defined based on six parameters: size (ha) of the farm (1), number of land holdings (2), average size (ha) of the land holdings (3), shape of the land holdings (4), distribution of the location of the land holdings (5), and distribution of the size of the land holdings (6). It seems that the goodness of property structure is a complex phenomenon. Bentley (1987, p. 32) claimed that there is no single definition for the scattered structure and therefore a variety of measures can be used to analyze it. There are, however, plenty of evidence of suitable methods to evaluate the goodness of property structure. The most typical properties that are used to analyze the property structure from the farmer's point of view are: number of land holdings, average size (ha) of the land holdings, and average distance between farm compound and land holdings. (e.g. Blarel et al., 1992; Hung et al., 2007; Hiironen & Niukkanen, 2014; Hiironen & Ettanen, 2013.) These are also the statistics for which the evaluation in this article is based on.

There are also numerous examples of different indexes that combine different property structure variables to a single index number (e.g. the Simmons Index (Simmons, 1964), the Schmook Index (1976), the Januszewski Index (Januszewski, 1968), the Igbozurike Index (Igbozurike, 1974), and the Simpson Index of Blarel et al. (1992)). Demetriou et al. (2013) have analyzed these different property structure indexes. After a thorough analysis they concluded that practically every index number is imperfect in some way. Most of the index numbers disregard at least the shape of the parcels, the type of the ownership rights and road connections. Based on their analyses, Demetriou et al. (2013) developed a global land fragmentation index, which combines a large number of variables into a single index number. In this article the Simmons Index was chosen since it combines the same three variables which are statistically analyzed independently as well.

As a result, the study that is based on statistical analyses and indexing, presents a generalization of the development of the property structure from the farmers' point of view. As a conclusion, the study analyses what kinds of changes can be expected in the near future. In the discussion, the study considers how land surveyors could enhance the positive changes and mitigate the negative ones. The contribution of this paper is to show how the structural change of agriculture affects the property structure.

Section 1 is an introduction part, which describes the background and objectives of the study. Section 2 focuses on the materials and methodology of the study. Section 3 presents the results of the calculations. The discussion and conclusions are presented in Section 4.

2 MATERIALS AND METHODS

2.1 Materials and data collection

The material for this study was gathered from the Land Information System (LIS) and Finnish Land Parcel Identification System (LPIS) (NLS, 2012a, 2012b; ICMAF, 2013). Detailed information of size, distance to compound and line of production (cattle farm/vegetable farm/grain farm) was collected for each field parcel. The data covers all field parcels that were cultivated in Finland in 2000 and 2012. Number of investigated parcels is 910 752 for year 2000 and 939 053 for year 2012. Farms are subdivided into nine field area groups according to classification used in many agricultural statistics in Finland (see Luke 2013).

In the data collected, a field parcel is the basic unit that includes the following attribute information: the size of the parcel, the coordinates of the parcel, and a farm identifier for each parcel. The location of each farm was identified by using the farm identifier and the farm register. By using this location and the location of each parcel, the distance between the farm compound and each land holding could be calculated. The geographical distance was calculated by using the Pythagorean Theorem. The number of land holdings per farm was calculated as the sum of land parcels for each farm identifier. The size of the farm was calculated as the sum of the area of all land parcels. Therefore, the final data included around two million observations, which each included the following information for each Finnish farm:

1.) size (ha) of the farm,
2.) number of land holdings per farm,
3.) average size (ha) of the land holdings in each farm,
4.) average distance between farm compounds and land holdings, and
5.) location (province) of each farm.

The average farm size was 22.9 ha in 2000 and 37.8 ha in 2012. From the development and distribution of different farm sizes (see Fig. 1.) it can be observed that the number of farms has increased only among farms with a size larger than 50 ha. For example, the number of farms larger than 100 ha has tripled. The total area of cultivated land has remained

unchanged, which means that small farms have gone out of business and either sold or leased their land holdings to larger farms.

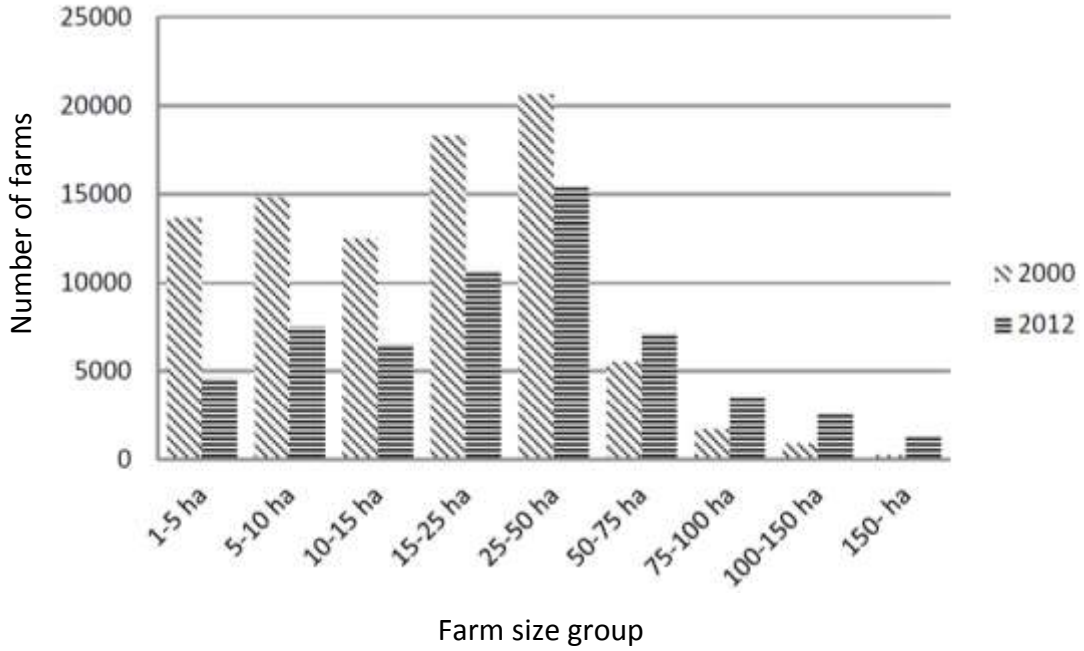

Fig. 1. *The number of farms in 2000 and 2012 divided into nine subgroups according to their respective sizes.*

2.2 Methodology

In this study the goodness of property structure is analyzed based on the following statistics:

1.) number of land holdings,
2.) average size (ha) of the land holdings, and
3.) average distance (km) between farm compound and land holdings.

The concept of land holding is used here. It means that regardless of the type of ownership (direct ownership or leasehold), every land parcel is linked to the farm that cultivates it. The number, the average size and the average distance of the land holdings are divided into nine subgroups based on the total size of the farm. The purpose of the division is to evaluate how the property structure is evolving in different types of farms. The purpose of the division is to analyze if the farms that increase their size are also improving their property structure at the same time, or vice versa.

As the data of this study included every cultivated land parcel in the whole country in 1 January 2000 and 1 January 2012, the collection of data had to be largely automated. Therefore, the Simmons index was chosen to describe the goodness of property structure despite its obvious flaws. The Simmons index takes into account three of the parameters

mentioned: the number of parcels, the size of parcels, and the total farm size. The formula implies that the values of the index can range from zero to one. A number one in the Simmons index describes a farm which land holdings are all in one parcel. A value close to zero, on the other hand, will indicate extreme levels of fragmentation, since the index number approaches zero as the number of parcels cultivated by each farm grows. The Simmons index was calculated for every farm based on the following formula:

$$SI_j = \frac{\sum_{i=1}^{m} A_{ij}^2}{A_j^2} \qquad [1]$$

A_{ij} is the area of the i^{th} parcel of the farm j; $A_j = \sum_{i=1}^{m} A_{ij}$ is the total farm size for farm j, where $j = 1,2,...,k$, and $i = 1, 2, \dots, m$ and where k stands for the number of farms in the data and m represents the number of parcels belonging to farm j. The index m varies between farms as the number of parcels is different between different farms. The index is calculated separately for each farm and as the formula implies, it expresses the relationship between the number of parcels comprising a farm and the relative sizes of these parcels.

3 RESULTS

3.1 The number of cultivated field parcels

The number of cultivated field parcels has increased among all farms, by over 60 percent on average (see Table 1). In 2000, a typical farm had 10 parcels to cultivate when in 2012 the number was around 16. Finnish farms, no matter what their size is, have either gone out of business or acquired new parcels during the twelve year period. Most concerning is the fact that the biggest farms have increased their number of cultivated field parcels the most, both in absolute and in relative terms. In this context the property structure has significantly worsened among Finnish farms.

Results on development of mean values on regional[1] level are available in Appendix 1. Regional disparities are apparent, especially in the upper end of farm size groups. One should note, however, that for some regions the number of large farms is very low (<5) and, consequently, the mean values are sensitive to development of individual farms.

[1] See regional classification by Statistics Finland, available at http://www.stat.fi/meta/luokitukset/maakunta/001-2015/index_en.html.

Table 1. *The number of cultivated field parcels in different subgroups in 2000 and 2012.*

Size of the farm, ha	***2000***		***2012***		***Change, %***	
	Mean	***Std.***	***Mean***	***Std.***	***Mean***	***Std.***
0–4.99	2.52	1.76	3.33	2.17	31.9	22.92
5–9.99	5.26	2.76	5.43	2.95	3.26	6.71
10–14.99	7.20	3.55	7.48	3.71	3.81	4.38
15–24.99	9.89	4.62	10.25	4.93	3.69	6.77
25–49.99	14.72	6.77	16.09	7.51	9.31	10.92
50–74.99	21.54	9.46	24.52	10.48	13.84	10.87
75–99.99	28.01	12.18	31.85	13.24	13.71	8.75
100–149.99	33.38	14.63	41.08	17.37	23.07	18.68
150-	49.48	26.21	61.84	32.98	24.99	25.85
All farms	***9.73***	***8.60***	***15.73***	***14.80***	***61.66***	***72.09***

3.2 The size of cultivated field parcels

The size of cultivated field parcels has increased by 8 % on average (see Table 2). However, when the situation is observed from the farmer's perspective, the size of cultivated field parcels has actually decreased among all farm sizes except among the smallest ones (1-4 ha). What is most concerning is the fact that the size of cultivated field parcels has decreased the most among the largest farms. The development is however logical. Small farms have small parcels and as the larger farms acquire new parcels from those, the average parcel size from the farmer's perspective decreases.

Table 2. *The average size (ha) of cultivated field parcels in different subgroups in 2000 and 2012.*

Size of the farm, ha	***2000 Mean***	***2012 Mean***	***Change, %***
0—4.99	0.91	1.00	9.89
5—9.99	1.41	1.37	-2.84
10—14.99	1.73	1.66	-4.05
15—24.99	1.99	1.92	-3.52
25—49.99	2.34	2.23	-4.70
50—74.99	2.79	2.48	-11.11
75—99.99	3.04	2.70	-11.18
100—149.99	3.51	2.91	-17.09
150-	4.17	3.48	-16.55
All parcels	***2.22***	***2.39***	***7.66***

3.3 The distance of cultivated field parcels

The distance of cultivated field parcels has increased by 46 % on average (see Table 3). The sum of distances of cultivated field parcels among all farms has increased by 137 % on average (see Table 4). This means that farmers nowadays travel twice as much as they did in

year 2000 to get to their parcels. The average distances between field parcels and farm compound have, however, not increased as much when they are observer from the farmer's perspective. For the largest farms (150 ha and above) the increase is about 12 %, and among the second largest group of farms (100-150 ha) the average distance has actually decreased. Nonetheless, the sum of distances has increased remarkably as the number of parcels has increased (see Table 1) and as the parcels have become smaller (see Table 2).

Table 3. *The average distance (km) to each cultivated field parcel in different subgroups in 2000 and 2012.*

Size of the farm, ha	***2000 Mean***	***2012 Mean***	***Change, %***
0—4.99	1.14	1.90	66.67
5—9.99	1.22	1.81	48.36
10—14.99	1.50	1.95	30.00
15—24.99	1.65	1.85	12.12
25—49.99	2.21	2.41	9.05
50—74.99	3.02	3.08	1.99
75—99.99	3.31	3.63	9.67
100—149.99	4.48	4.15	-7.36
150-	7.20	8.03	11.53
All parcels	***2.20***	***3.22***	***46.36***

Table 4. *The average sum of distances (km) to all cultivated field parcels in different subgroups in 2000 and 2012.*

Size of the farm, ha	***2000***		***2012***		***Change, %***	
	Mean	***Std.***	***Mean***	***Std.***	***Mean***	***Std.***
0–4.99	2.88	21.15	6.32	63.73	119.36	201.31
5–9.99	6.40	39.39	9.85	82.96	53.89	110.62
10–14.99	10.77	57.72	14.59	93.78	35.42	62.47
15–24.99	16.32	55.72	18.92	71.37	15.97	28.08
25–49.99	32.57	81.40	38.77	136.04	19.02	67.13
50–74.99	65.07	171.49	75.50	145.11	16.03	-15.38
75–99.99	92.75	109.48	115.77	226.23	24.81	106.64
100–149.99	149.54	252.62	170.58	250.11	14.07	-1.00
150-	356.28	1 287.40	496.70	3 049.52	39.41	136.87
All farms	***21.39***	***103.59***	***50.70***	***465.91***	***137.03***	***349.76***

3.4 The goodness of property structure (Simmons index)

The goodness of property structure has weakened among all sizes of farms (see Table 5). This undesirable development is the strongest among farms larger than 50 ha. Based on the Simmons index, the property structure has weakened by 28 % among the largest farms (150 ha and above) and 20 % among the second largest farms (100-149 ha).

Table 5. *The Simmons index of Finnish farms in 2000 and 2012.*

Size of the farm, ha	*2000*		*2012*		*Change, %*	
	Mean	*Std.*	*Mean*	*Std.*	*Mean*	*Std.*
0–4.99	0.580	0.276	0.557	0.282	-4.0	2.4
5–9.99	0.373	0.214	0.372	0.217	-0.2	1.8
10–14.99	0.288	0.178	0.283	0.172	-1.9	-3.3
15–24.99	0.223	0.144	0.212	0.138	-4.9	-4.2
25–49.99	0.153	0.096	0.145	0.092	-5.1	-3.6
50–74.99	0.111	0.069	0.097	0.059	-12.2	-14.2
75–99.99	0.089	0.060	0.078	0.049	-11.7	-18.1
100–149.99	0.079	0.063	0.063	0.044	-20.2	-29.1
150-	0.071	0.096	0.051	0.054	-28.0	-43.4
All farms	***0.267***	***0.230***	***0.203***	***0.195***	***-24.0***	***-15.2***

From Table 6, where the index numbers are divided into 11 subgroups based on the index number itself, it can be observed that both in absolute and relative terms the proportion of the weakest farms, in relation to their property structure, has increased dramatically. In 2000, only 16 % of farms had Simmons index lower than 0.1. By 2012, the relative share of farms in the same subgroup has almost doubled.

Table 6. *The number of farms by their Simmons index, and their relative share of all farms.*

Index number	*Number of farms in 2000*	*Relative share, %*	*Number of farms in 2012*	*Relative share, %*
0.0 < SI < 0.1	13,944	15.8	17,890	30.1
0.1 < SI < 0.2	28,885	32.7	19,391	32.6
0.2 < SI < 0.3	17,315	19.6	9,588	16.1
0.3 < SI < 0.4	9,836	11.2	4,657	7.8
0.4 < SI < 0.5	5,037	5.7	2,386	4.0
0.5 < SI < 0.6	4,829	5.5	2,088	3.5
0.6 < SI < 0.7	1,995	2.3	814	1.4
0.7 < SI < 0.8	1,233	1.4	536	0.9
0.8 < SI < 0.9	815	0.9	351	0.6
0.9 < SI < 1.0	402	0.5	186	0.3
SI=1	3,962	4.5	1,516	2.6
Total	***88,253***	***100.0***	***59,403***	***100.0***

4 DISCUSSION AND CONCLUSIONS

In 2012 there was 2 302 153 ha of arable land in Finland. The land was divided into 939 053 parcels. In 2012 a typical farmer had 16 different field parcels to cultivate. On average, the number of parcels per farmer has increased by over 60 percent in the 20th century. The average size of field parcels in Finland was 2.4 ha in 2012. During the past twelve years the average size of field parcels has decreased among all farm sizes. The average distance

between field parcel and farm compound in Finland was 3.2 km in 2012. As a total, farmers are travelling twice as much as they were twelve years ago.

When the development is compared locally between provinces (Appendix 1a-b), remarkable differences can be found. For example, in Southern, Central and Northern Ostrobothnia (Etelä-, Keski- and Pohjois-Pohjanmaa) the number of cultivated field parcels among farms with a size of 50 ha or above, has increased only by 6 %. That is three times less than in other provinces on average. The observation is interesting, since the same area is the area where the majority of farmland consolidations have been implemented in the 20th century (Ettanen, 2013, p. 140). This may indicate that the implemented farmland consolidations have mitigated the undesirable development.

As the results show, the development towards smaller parcels among the growing farms is obvious. There is plenty of evidence from all around the world that small parcels increase production costs (eg. Najafi, 2000; Lerman, 2002; Bently, 1987). Previous Finnish studies (eg. Myyrä, 2002; Hiironen, 2012) have shown that the small parcel size is the biggest problem concerning the feasibility of Finnish farms. When the situation is observed locally between provinces, the smallest parcels are found in Ostrobothnia (Pohjanmaa). In this area, the average parcels size is less than 3 ha, even among the largest farms. This may be one of the main reasons why the farmers in this area are applying for land consolidation like nowhere else in Finland.

The Simmons index numbers support the findings of weakening property structure. The property structure has weakened dramatically during the twelve year period. One may criticize that the index number becomes automatically lower as the farms grows but this is not true. The property structure is not automatically the weakest in areas with a large relative share of big farms. The index number is actually the best in the Häme region and in Southern Finland (Uusimaa) where the average farm size is the largest (Appendix 2). Krigsholm (2014, p. 54) suggested that the reason behind the good property structure in these specific areas relates to the procedure called “rearrangement of basic land consolidation”. These farmland consolidations were implemented widely basically only in the Häme region and in Southern Finland in 1880-1919. These projects were very successful, but their implementation soon came to an end because of World War I, which changed the whole purpose of land reforms from improving the agriculture to the resettlement of refugees. (Hiironen, 2012, p. 37-42.) This indicates that successful land reforms may have long lasting effects.

The observations made in this study support previous assertions that structural development causes fragmentation. The main reason for this unfavorable development is the structural development of agriculture, which concerns not only Finland but the whole Europe. As the structural change will continue (e.g. Pyykkönen et al., 2010; Hiironen & Ettanen, 2013) the property structure will keep worsening. This will increase the production costs even further. Also, the amount of harmful greenhouse gas emissions will keep increasing due to the fact that the distance farmers travel to work is increasing rapidly (see Hiironen & Niukkanen, 2014).

The problems caused by land fragmentation could be mitigated through land management activities, especially through farmland consolidation. Surveyors, especially those who have the possibility to effect on the implementation of land consolidation, have the possibility to mitigate the problems caused by this development. Surveyors can reveal with studies like this that the structural development is scattering the property structure and therefore hindering the benefits gained from specialization and large scale. Surveyors can also promote land consolidation, as it is not always accepted among farmers and politicians as a tool to improve the profitability of agriculture. With the help of positive feedback and good results from ongoing land consolidation projects, surveyors could show the doubtful parties that land consolidation is not obsolete or something that belongs to the past. In our opinion land consolidation is a land management tool for the future. With the help of land consolidation, agricultural rationalization actions could be concentrated on correcting the basic defects in the rural areas and not on handling the consequences caused by them, year after year.

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Evaluation of Land Fragmentation in Agricultural Areas: Farmers Perspective (7939)
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FIG Working Week 2016
Recovery from Disaster
Christchurch, New Zealand, May 2–6, 2016

Appendix 1a. *The number of cultivated field parcels in different subgroups in 2000 and 2012 for Finnish regions. (Muutos=change)*

	1-5 ha			5-10 ha			10-15 ha			15-25 ha			25-50 ha		
	2000	**2012**	**Muutos**	**2000**	**2012**	**Muutos**	**2000**	**2012**	**Muutos**	**2000**	**2012**	**Muutos**	**2000**	**2012**	**Muutos**
Uusimaa (01)	2,59	3,09	0,51	4,21	4,45	0,25	5,56	5,98	0,41	7,67	8,09	0,42	11,70	12,36	0,66
Varsinais-Suomi (02)	2,81	3,19	0,39	4,44	4,94	0,50	5,91	6,35	0,43	8,25	8,80	0,54	12,06	13,27	1,22
Satakunta (04)	2,97	3,22	0,25	4,99	5,36	0,37	6,87	6,98	0,12	9,71	10,18	0,48	14,44	15,80	1,36
Kanta-Häme (05)	2,69	2,41	-0,27	4,35	4,29	-0,06	5,55	5,55	0,00	7,51	7,67	0,17	11,45	12,19	0,74
Pirkanmaa (06)	3,08	3,51	0,43	5,49	5,68	0,18	7,49	7,94	0,45	10,56	10,61	0,05	16,16	17,10	0,94
Päijät-Häme (07)	2,81	3,20	0,40	4,68	4,71	0,03	6,67	6,47	-0,21	8,54	8,53	-0,01	12,47	13,08	0,61
Kymenlaakso (08)	2,60	3,04	0,45	4,79	4,54	-0,25	6,72	6,58	-0,14	8,88	8,94	0,06	13,42	14,62	1,20
Etelä-Karjala (09)	3,02	3,22	0,19	5,84	5,83	-0,01	8,01	8,21	0,20	10,76	11,28	0,52	17,06	18,74	1,69
Etelä-Savo (010)	3,16	3,40	0,24	5,97	5,61	-0,35	8,29	8,30	0,01	11,38	11,56	0,18	16,65	18,63	1,98
Pohjois-Savo (011)	2,85	3,27	0,42	5,18	5,21	0,03	7,32	7,64	0,32	9,93	10,71	0,78	14,78	16,66	1,88
Pohjois-Karjala (012)	2,97	3,14	0,17	5,30	5,75	0,45	7,70	7,69	-0,01	10,21	10,41	0,19	14,60	16,45	1,85
Keski-Suomi (013)	3,22	3,54	0,32	5,66	5,56	-0,10	7,53	7,82	0,30	10,80	11,05	0,25	16,38	18,24	1,86
Etelä-Pohjanmaa (014)	2,65	2,96	0,32	5,00	5,11	0,11	6,89	6,74	-0,15	9,95	9,94	-0,01	15,72	16,43	0,71
Pohjanmaa (015)	3,09	3,43	0,34	5,42	5,29	-0,13	7,70	7,94	0,24	10,44	10,69	0,25	16,52	17,34	0,82
Keski-Pohjanmaa (016)	2,66	2,77	0,11	4,85	4,95	0,10	7,13	7,50	0,37	9,94	9,76	-0,18	15,13	16,12	0,99
Pohjois-Pohjanmaa (017)	2,78	3,09	0,31	4,86	4,94	0,08	7,01	7,34	0,32	9,94	10,38	0,43	14,82	15,62	0,80
Kainuu (018)	2,97	4,14	1,17	5,88	6,11	0,23	8,95	9,03	0,08	12,67	13,00	0,33	18,26	20,87	2,61
Lappi (019)	3,35	4,13	0,78	5,63	6,40	0,76	7,88	8,58	0,70	11,22	12,84	1,62	17,31	21,29	3,98
Ahvenanmaa (021)	3,54	4,58	1,04	7,41	7,69	0,28	8,70	10,51	1,81	12,08	14,39	2,31	18,84	22,90	4,06

Appendix 1b. *The number of cultivated field parcels in different subgroups in 2000 and 2012 for Finnish regions. (Muutos=change)*

	50-75 ha			75-100 ha			100-150 ha			yli 150 ha		
	2000	2012	Muutos	2000	2012	Muutos	2000	2012	Muutos	2000	2012	Muutos
Uusimaa (01)	17,67	19,16	1,49	23,25	24,90	1,66	30,00	34,25	4,25	47,28	54,88	7,60
Varsinais-Suomi (02)	17,64	19,64	2,00	23,53	25,22	1,69	29,15	33,28	4,13	41,88	54,27	12,39
Satakunta (04)	21,46	24,26	2,80	30,31	32,04	1,72	34,21	42,98	8,77	67,73	65,01	-2,72
Kanta-Häme (05)	17,23	17,80	0,57	21,96	24,30	2,34	25,91	31,82	5,91	47,47	49,21	1,74
Pirkanmaa (06)	24,32	26,66	2,34	33,51	35,12	1,60	38,73	45,49	6,76	71,56	77,58	6,01
Päijät-Häme (07)	18,02	20,15	2,12	23,42	25,11	1,69	27,08	33,79	6,71	41,67	53,86	12,20
Kymenlaakso (08)	19,03	21,35	2,32	26,68	28,28	1,60	31,88	40,42	8,54	40,40	55,59	15,19
Etelä-Karjala (09)	25,30	27,93	2,63	34,81	37,82	3,00	37,63	47,14	9,51	27,00	55,92	28,92
Etelä-Savo (010)	24,92	29,16	4,24	25,71	38,51	12,80	24,00	50,88	26,88	27,00	58,50	31,50
Pohjois-Savo (011)	21,88	25,41	3,53	28,54	34,09	5,55	37,94	43,85	5,91	26,67	68,51	41,84
Pohjois-Karjala (012)	21,70	24,62	2,92	28,17	31,95	3,78	39,13	43,06	3,93	56,00	64,98	8,97
Keski-Suomi (013)	24,70	29,05	4,35	32,34	38,64	6,30	39,38	50,01	10,64	58,25	70,94	12,69
Etelä-Pohjanmaa (014)	25,31	26,19	0,89	33,99	36,02	2,03	45,83	47,49	1,66	65,46	73,71	8,25
Pohjanmaa (015)	27,83	28,18	0,34	36,59	40,14	3,55	47,45	51,83	4,38	56,50	75,32	18,82
Keski-Pohjanmaa (016)	24,64	24,04	-0,60	30,77	32,37	1,60	47,33	45,07	-2,27	45,33	51,57	6,24
Pohjois-Pohjanmaa (017)	21,70	24,12	2,43	27,41	30,76	3,36	34,31	39,03	4,72	44,50	55,27	10,77
Kainuu (018)	29,45	33,73	4,29	42,71	40,92	-1,80		48,43		78,00	64,22	-13,78
Lappi (019)	26,16	38,18	12,03	38,08	38,18	0,10	48,20	50,04	1,84	48,00	77,63	29,63
Ahvenanmaa (021)	25,30	38,07	12,77	29,70	41,11	11,41	33,21	51,14	17,93	50,27	62,54	12,27

Appendix 2. *Percentage of total cultivated field area hold by farms in size groups 75—100 ha, 100—150 ha and >150 ha (Column 1) and quarters of Simmons index values (Columns 2-4) for Finnish regions in 2012.*

	III	25 %	50 %	75 %
Uusimaa (01)	50,1 %	0,101	0,174	0,317
Varsinais-Suomi (02)	49,5 %	0,098	0,166	0,298
Satakunta (04)	38,5 %	0,094	0,167	0,296
Kanta-Häme (05)	42,6 %	0,113	0,195	0,346
Pirkanmaa (06)	37,2 %	0,092	0,163	0,287
Päijät-Häme (07)	42,9 %	0,102	0,174	0,320
Kymenlaakso (08)	38,6 %	0,094	0,162	0,283
Etelä-Karjala (09)	25,9 %	0,084	0,142	0,242
Etelä-Savo (010)	23,0 %	0,101	0,170	0,294
Pohjois-Savo (011)	30,4 %	0,090	0,148	0,261
Pohjois-Karjala (012)	36,3 %	0,089	0,160	0,284
Keski-Suomi (013)	27,0 %	0,095	0,171	0,299
Etelä-Pohjanmaa (014)	34,3 %	0,086	0,151	0,274
Pohjanmaa (015)	27,6 %	0,090	0,158	0,282
Keski-Pohjanmaa (016)	28,5 %	0,087	0,149	0,273
Pohjois-Pohjanmaa (017)	43,7 %	0,082	0,139	0,258
Kainuu (018)	32,9 %	0,083	0,139	0,268
Lappi (019)	31,1 %	0,093	0,171	0,303
Ahvenanmaa (021)	49,6 %	0,082	0,140	0,266