Zeitschrift: Yearbook of socioeconomics in agriculture : Agrarwirtschaft und Agrarsoziologie = économie et sociologie rurales

Herausgeber: Schweizerische Gesellschaft für Agrarwirtschaft und Agrarsoziologie

Band: - (2013)

Artikel: Assessment of the Swiss Farm Accountancy Data Network target populations

Autor: Roesch, Andreas

DOI: https://doi.org/10.5169/seals-966687

Assessment of the Swiss Farm Accountancy Data Network target populations

Andreas Roesch, Agroscope Research Station, Ettenhausen, Switzerland

Abstract

This study assesses a new standard-output-based approach for the target population of the Swiss Farm Accountancy Data Network. The analysis depicts that the standard output per farm is an appropriate measure for delimiting the target population. It is shown that a major fraction of the summed census livestock and crop area is covered by the target populations. It is demonstrated that the threshold value significantly impacts on statistical measures of structural variables.

Furthermore, the new scheme was compared to three other concepts for the target population. The investigation reveals substantial differences among the four different concepts for the target population, regarding both the coverage of structural variables and the number of farms per farm type.

Keywords: *Sampling design, target population, standard output, sensitivity*

JEL classification: *Q 16, Q 18 and Q 19*

1. Introduction

There is a broad literature about the sample design of the Farm Accountancy Data Network (FADN) (Skinner et al. 1994; Vrolijk et al. 2006; Kokic et al. 2010; Roesch and Lips 2013). However, despite being of utmost importance, little emphasis is put on the definition of the target population (TP) from which the sample is drawn. The TP is formed by all those farms that have a non-zero probability of joining the FADN sample and is a (strict) subset of the census.

In the EU member states, the TP is defined as the set of farms which exceeds a certain country-specific economic size, with the aim of eliminating small farms run strictly as a hobby or sideline (EU, 2008). Up to 2009, the concept of Standard Gross Margins (SGM) was used in order to determine the farm's economic size which can be expressed as European Size Units (ESU) by dividing the total SGM by 1200 (EU, 1985). The SGM of a crop or livestock item is defined as the value of output from one hectare or from one animal less the cost of variable inputs required to produce that output (EU, 2013a). For Switzerland, Schmid (2005) suggested to limit the TP by a SGM of 16 ESU (corresponding to € 19'200 or CHF 31'500).[1] Note that the TP does not represent the entire census population, however, as we are deliberately excluding farms below a certain economic (or physical) threshold.

Since 2010, the Standard Output (SO) is used to measure the production or business size of an agricultural holding (EU 2013b).[2]The change from SGM to SO became necessary when agricultural policy moved from coupled to decoupled payments in 2005. By eliminating the previously coupled payments from the output side of the SGM calculation, it is possible to obtain negative results which cannot be used for the classification of farms. Assuming the same economic size for Switzerland as for Germany yields to a threshold for Swiss farms of € 30'000 (approximately CHF 49'200 in 2007).

Since the beginning of this millennium, the TP applied to the Swiss FADN is based on a non-financial criterion using 11 physical thresholds. In order to be part of the TP, a farm must reach a minimum physical threshold, e.g. 10 ha of

[1] Exchange rate in 2007: 1 € = 1.6426 CHF

[2] The system for classification of farms into particular types has been also revised: Farms are now classified in terms of Standard Output (SO) compared to Standard Gross Margin (SGM) previously.

utilised agricultural area or farming activities involving at least six cows (Meier 2005). These physical thresholds suffer from different drawbacks, the major ones being (i) average holdings become larger due to structural change, implying an increasing percentage of the census farms to be part of the TP, and (ii) they rely on assumptions with no underlying statistical considerations.
This paper suggests a novel approach for defining the TP based on the SO. The new approach (hereinafter called *TP_SO*) will be compared with (i) the delimitation currently used in Switzerland (hereinafter called *TP_FADN*), (ii) the minimum size threshold based on the SGM (*TP_SGM*), and (iii) the SO enhanced by direct payments (*TP_SO_DZ*).
The three main goals of this paper are (i) to give a detailed description of the new approach for the specification of the TP, (ii) to investigate the sensitivity of the SO threshold on statistical measures of structural quantities, and (iii) to assess the differences of the analysed concepts for delimiting the TP.
The paper is organized as follows: The data used are specified in Section 2. Section 3 describes the new approach for the specification of the SO threshold. A detailed sensitivity study of the new approach is presented in Section 4.1 and 4.2. Section 4.3 deals with the intercomparison of the four analysed methods. The findings are summarised in Section 5.

2. Data

In order to identify and better understand the key difference in the four concepts for defining the TP, the 2007 Swiss agricultural census data is used. This dataset, also known as the Farm Structure Survey (FSS), includes all farms in Switzerland, and has enabled the assessment and monitoring of Swiss agriculture (BfS/FSO, 2007). FSS provides detailed insight into the structural, technical and socio-demographic situation of all Swiss farms on an annual basis but contains no economic data. The study is based on 2007 data since for this year, direct payment data were provided for all holdings by the Federal Office for Agriculture (FOAG).

The SO of a farm can be interpreted as a measure of its potential income capacity or the «economic size of the farm». It does, however, since ignoring costs, not provide any indication of the actual profitability of a holding. For the calculation of the SO, the standardized SO coefficients are multiplied by the number of hectares (for crops) or heads (for animals) present on the farm to arrive at the farm SO. SO coefficients simply represent the monetary value of the output from one hectare or one animal at farm-gate prices. They are established for different crop and livestock items as five-year averages on a regional basis. The SO values are compiled per farm by the Federal Statistical Office (FSO).
The current investigation is based on the FSS from 2007 covering a total population of 61'763 farms.

3. New concept for the target population

The new approach *TP_SO* is based on the SO of the farm. SO was selected for two reasons: (i) it is the key monetary measure equal to the gross agricultural output at the farm-gate price, and (ii) the EU determines the economic size of agricultural holdings by using SO (EU, 2013b).
The *TP_SO* will be generated as follows: Based on the farms ranked according to their SO, we now include all farms, starting with the farm with the highest SO, until the summed SO reaches 95% of the total SO in the census, hence ignoring the farms on the lower tail of the SO density curve, which are small holdings run more for pin money or as a hobby than as a career or occupation. This means that the target population covers 95% of the summed SO generated by all census farms. Technically speaking the threshold is the inverse of the Lorenz curve of SO at the value 5%. For the 2007 census data, this leads to a threshold value of approximately CHF 50'500. (Economically) small farms are thus excluded from the sampling frame, since their SO lies below the predefined threshold. Note that this calculated threshold is close to the value that is currently suggested for Germany of CHF 49'200 (using the exchange rate in year 2007). The threshold will only be adjusted at multi-year intervals, and will therefore not vary on a single-year basis. This minimizes the number of sampled farms which is not in the *TP_SO* in the following year. Furthermore, in order

to avoid strong impacts of extreme events such as the rapid decline in the (Swiss) milk price in 2009, the SO will be calculated on the basis of SO coefficients averaged over a five-year period.
As in the European Union (EU), an upper threshold will not be applied to exclude very large farms from the TP. However, experience from previous years has shown that it is difficult to obtain data from (economically) large farms.
As some of the statistics estimated from the TP and from the census data differ quite substantially, it is essential to analyse the coverage of different key variables as outlined in Section 4.1.

4. Results

4.1 Coverage

The coverage of a variable is equal to the ratio of the TP total to the census total of this variable, i.e. the extent to which the census is represented in the target population. Given that it is only farms in the target population that have a non-zero probability of joining the FADN sample, this is clearly an important issue. The coverage of some activities and technical data is presented in Table 1. It indicates the extent to which the *TP_SO* covers the entire census population. It shows that 69% of all census farms (corresponding to 43'700 farms) are included in the *TP_SO*. This means that a substantial percentage of the census farms (31%) is excluded from the sampling framework. Nevertheless, Table 1 demonstrates that the *TP_SO* largely covers the census with respect to most key variables. By design, 95% of production (measured as SO) is covered by the *TP_SO*. Further, it covers almost 87% of the utilized agricultural area (UAA), with a distinctly higher coverage for arable land (92.2%) than for grassland (84.7%), which predominates in the hill and mountain regions of Switzerland. Livestock is also well represented, with an almost full coverage of pigs (99.1%). Since sheep and goat farms typically have a low SO, sheep and goats are poorly covered in the TP_SO (44.0% and 66.7%, respectively). Arable farms are well represented. 92.2% of the 0.275 million hectares of Swiss arable farmland (26% of total UAA) is covered by the target population. *TP_SO* covers almost all potato (98.7%), sugar beet (95.7%) and vegetable cultivation (98.9%).

In summary, it can be stated that although a substantial proportion of the farms have been excluded from the target population, the percentage of production value not covered is quite low. Only farms of small (economic) size are excluded from the sample. Such farms are predominantly found in the hill and mountain areas. This assumption is confirmed by the data: while 76% of all census farms in the plain region are members of the target population, this percentage decreases to 70% and 56% for the hill and mountain regions, respectively. This means that the *TP_SO* includes little more than every second mountain farm from the census data.

In addition to analysing coverage, it is essential to analyse the percentage coverage for the Swiss FADN stratification, distinguishing between 11 farm types and (the currently used) five size classes. The third classification variable, Region, has been ignored here for reasons of simplicity. Table 2 clearly shows that coverage for small-sized farms below 10 ha is low, while farms with UAAs above 30 ha are largely included for most farm types. This matches our specification, since small-sized farms tend – with some important exceptions – to be run as a hobby or sideline. Significant differences in coverage are found among the 11 Swiss FADN farm types. For Special crops (Fruit/vegetable/vines), Pigs/poultry, Combined dairy/arable and Combined pigs/poultry, the TP_SO comprises almost all census farms with a UAA of between 10 and 20 ha. This is in line with the findings from Table 1 depicting a high coverage for the production branches Pigs, Poultry, Vegetables, and Dairy. Conversely, the low coverage for Suckling cows, Horses/sheep/goats and Other cattle is in line with the low values in Table 1 for Suckling cows, sheep and goats.

It has to be pointed out here that the exclusion of economically weak farms might cause some problems regarding the representativity of the results primarily at national level. If required from Swiss authorities the design could be easily extended by considering a further stratum containing economically underdeveloped farms (here we suggest to not add a further stratum).

4.2 Sensitivity

In order to better assess further differences between the *TP_SO* and the census population, it is beneficial to analyse the impact of the value of the SO threshold on some key variables. Figure 1 displays the sensitivity curves for coverage for a number of important selected variables. The figure clearly reveals the extre-

mely high SOs generated by Swiss pig farms: even with a threshold of CHF 200'000, almost 80% of the pigs would be included in the *TP_SO*. By contrast, less than 15% of the sheep population are covered, assuming the same threshold for separating farms between the FADN and the census population. The figure reveals that approximately two-thirds of the 6,200 organic farms currently operating in Switzerland achieve a SO of less than CHF 100'000 from their products.

4.3 Intercomparison of TPs

We compare the new delimitation of the TP (*TP_SO*) as outlined in Section 3 with three other approaches as listed in Table 3. *TP_SO_DZ* is based on the same concept as *TP_SO* but with the SO augmented by direct payments (hereinafter called *SO_DZ*). The threshold becomes CHF 70,800. The target population *TP_EU_SGM* comprises all farms that exceed the economic size of € 19'200 (or CHF 31'500). This corresponds to the concept (previously) applied by the EU member states along with the threshold used in Germany. Fig. 2 shows that the percentage of census farms being part of the TP significantly varies both among the farm types and TPs. The figure demonstrates that for dairy farms, the farm type 51 (Combined dairy/arable) and 53 (Combined pigs/poultry), more than 90% of all census farms are included in all four analysed TPs. This is directly related to the generally high economic output of these farms. E.g., 25th quantile and mean SO for farm type 51 amount to CHF 145'700 and 228'100, respectively. In contrast, farm types 23 (Other cattle) and 31 (Horses/sheep/poultry) stand out with particulary low percentages. As to farm type 31, *TP_SO* includes only one tenth of the census farms (607 out of a 6'147 enterprises). This is little surprising as the mean and 75th quantile of the SO for farm type 31 amounts to less than CHF 27'900 and 26'100, respectively. Since *TP_FADN* is based solely on physical thresholds, the fraction of type 31 farms (45.8%) being member of *TP_FADN* is clearly higher than in the other three TPs confined by the economic variables SO, *SO_DZ*, and SGM. The variation of the percentage bars in Fig. 2 is largest for the farm type Suckling cows. While *TP_FADN* includes almost 90% of all census suckling cows farms, *TP_EU_SGM* comprises less than 30% of the census farms. The inclusion of the direct payments positively impacts on the farms considered for candidates in the random sample. The share of census farms increases from 41.8% (*TP_SO*) to 63.5% for the *TP_SO_*

DZ. This is related to the substantial difference of the mean SO and *SO_DZ* for farm type 22 (CHF 54'400 vs. 107'300).

Figure 3 displays the coverage of some key structural variables for all TPs under study. *TP_FADN* benefits from the highest coverage for most structural variables. The results demonstrate that all concepts capture the principal part of the total sector's livestock and crop area. Not unexpected from the results in Section 4.1, there are some exceptions. For sheep and goats, the coverage is quite low for all analysed TPs but the *TP_FADN*. This is in line with the low economic output of these farms that are generally very small (78% of sheep and goats farms are characterized by a UAA < 10 ha) and contribute very little to the sector's total economic output. Figure 3 also reveals that the inclusion of the direct payments significantly rises the number of sheep (and goats) in the target population: The coverage of sheep (goats) increases from 44% to 56% (67% to 74%) when using the enhanced SO. Generally, the coverage for the three TPs that are based on an economic threshold, exhibit quite a similar coverage for most structural variables. *TP_SO_DZ* tends to have slightly higher coverages than the other two economic-based TPs. What may be critical for the assessment of organic farms is the fact that 36% (*TP_SO*) and 41% (*TP_EU_SGM*) of the census farms will be excluded from the target population. Part of this problem consists of the fact that the SO does not account for generally higher realized prices in organic farming (e.g. Tsakiridou, 2008). The other two analysed TPs are more qualified to allow for statistical investigations of organic farms: *TP_FADN* and *TP_SO_DZ* cover 88% and 77% of the census farms. Labor (not shown in Figure 3) is well captured by all analysed TPs. They include more than 90% of the full-time labor of the agricultural sector. Total labor expressed in standard labor units (SLU) is also largely covered by all four analysed TPs (*TP_FADN*: 96%, *TP_SO*: 89%, *TP_EU_SGM*: 87%, *TP_SO_DZ*: 92%).

5. Conclusions

This study demonstrates that the SO is an appropriate measure for delimiting the target population from the census data. The advantage of defining the threshold by requiring 95% of the total census SO to be in the *TP_SO* is threefold: (i) the threshold is intuitively clear from both a statistical and economic point of view; (ii) the measure is easily customisable on an annual basis; and (iii) SO is used as a new measure for the EU farm-typology classification from 2010 onwards.

The evaluation shows that most key structural variables are well covered in all four analysed TPs. It is shown that the coverage for livestock and crop areas are generally lower for TPs that are based on the economic size of the farm. Low coverages below 0.6 are typically found for sheep and goats for the TPs based on economic thresholds. To a lesser extent, organic farms also belong to the group that is poorly represented, at least in *TP_SO* and *TP_EU_SGM*.

The investigation shows that the fraction of all census farms per farm type differs strongly, both between the different farm types and the analysed TPs. A high percentage of holdings in farm types 23 and 31 (and, to a lesser extent, in type 22) are deliberately excluded from *TP_SO* and *TP_EU_SGM*. This also applies, albeit less pronounced, to organic farms. To avoid these drawbacks, a possible modification might be – besides the approach applied for *TP_SO_DZ* – to apply the *TP_SO* concept separately for each of the 11 farm types. This procedure would guarantee that all farm types are well represented in the TP but it may result in serious problems when headlining 11 different SO-thresholds to the FADN community. Since the share of TP farms tends to decrease with rising altitude, a reasonable modification of *TP_SO* would be to treat the region separately by determining a separate SO threshold for the plain, hill and mountain regions, respectively. In fact, given that it increases the share of census farms in the mountain region from 56% to 75%, this modification could potentially be implemented in the future sampling design.

Summarized, it can be stated that the *TP_SO* fulfills the basic requirements even though a substantial percentage of enterprises belonging to economically weak farm types are excluded from the target population.

1 List of abbreviations

ART	Agroscope Reckenholz-Tänikon Research Station
ESU	European Size Units
FADN	Farm Accountancy Data Network
FOAG	Federal Office for Agriculture
FSO	Federal Statistical Office
FSS	Farm Structure Survey
LU	Livestock Unit
SGM	Standard Gross Margin
SLU	Standard Labor Unit
SO	Standard Output
UAA	Utilised Agricultural Area

References

BfS/FSO, 2007. Swiss Federal Statistical Office, Agricultural Census from the Swiss Federal Office for Agriculture.

EU, 1985. Establishing a Community typology for agricultural holdings, Official Journal of the European Communities L 220, 17 August 1985, available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31985D0377:EN:NOT

EU, 2008. Establishing a Community typology for agricultural holdings, Official Journal of the European Union L 335, 13 December 2008, pp. 3–24, available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:335:0003:0024:EN:PDF

EU, 2013a. Glossary: Standardoutput (SO), available at http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Standard_output_(SO)

EU, 2013b. European Commission, Agriculture and rural development, Farm Accounting Data Network, Methodology, available at http://ec.europa.eu/agriculture/rica/methodology1_en.cfm

Kokic P. N., Che N., and Chambers R. L., 2010. Analysis of Economic Data Collected in Farm Surveys, in Agricultural Survey Methods (eds R. Benedetti, M. Bee, G. Espa and F. Piersimoni), John Wiley & Sons, Ltd, Chichester, UK. DOI: 10.1002/9780470665480.ch20.

Meier, B., 2005. Analyse der Repräsentativität im schweizerischen landwirtschaftlichen Buchhaltungsnetz. Messung und Verbesserung der Schätzqualität ökonomischer Kennzahlen in der Zentralen Auswertung von Buchhaltungsdaten. Dissertation ETH no. 15868, Zürich, Switzerland.

Roesch, A. and Lips, M., 2013. Sampling Design for Two Combined Samples of the Farm Accountancy Data Network (FADN). J. Agricultural, Biological, and Environmental Statistics; DOI: 10.1007/s13253-013-0130-5.

Schmid, D., 2005. Schweizer Landwirtschaftsbetriebe im EU Vergleich. FAT-Bericht Nr. 638. Forschungsanstalt Agroscope Reckenholz-Tänikon ART, Ettenhausen.

Skinner C.J., Holmes D.J., and Holt D., 1994. Multiple Frame Sampling for Multivariate Stratification, International Statistical Review/ Revue Internationale de Statistique, 62 (3), pp. 333–347.

Tsakiridou E., Boutsouki C., Zotos Y., and Mattas K., 2008. Attitudes and behaviour towards organic products: an exploratory study, International Journal of Retail & Distribution Management, 36 (2), pp.158 – 175.

Vrolijk H.C.J., van der Veen H.B., and van Dijk J.P.M., 2006. Sample of Dutch FADN. Design principles and quality of the sample of agricultural and horticultural holdings. Report 1.06.03.2006. LEI, The Hague, 2006.

Appendix A: Figures

Fig.1: Sensitivity curves. Relationship between the threshold for SO and coverage for some selected key variables. Abbreviations are as follows. UAA: utilised agricultural area; SLU: total labor; SGM: standard gross margin. Vertical dashed line: threshold value for TP_SO (50.5 kCHF). Data from year 2007.

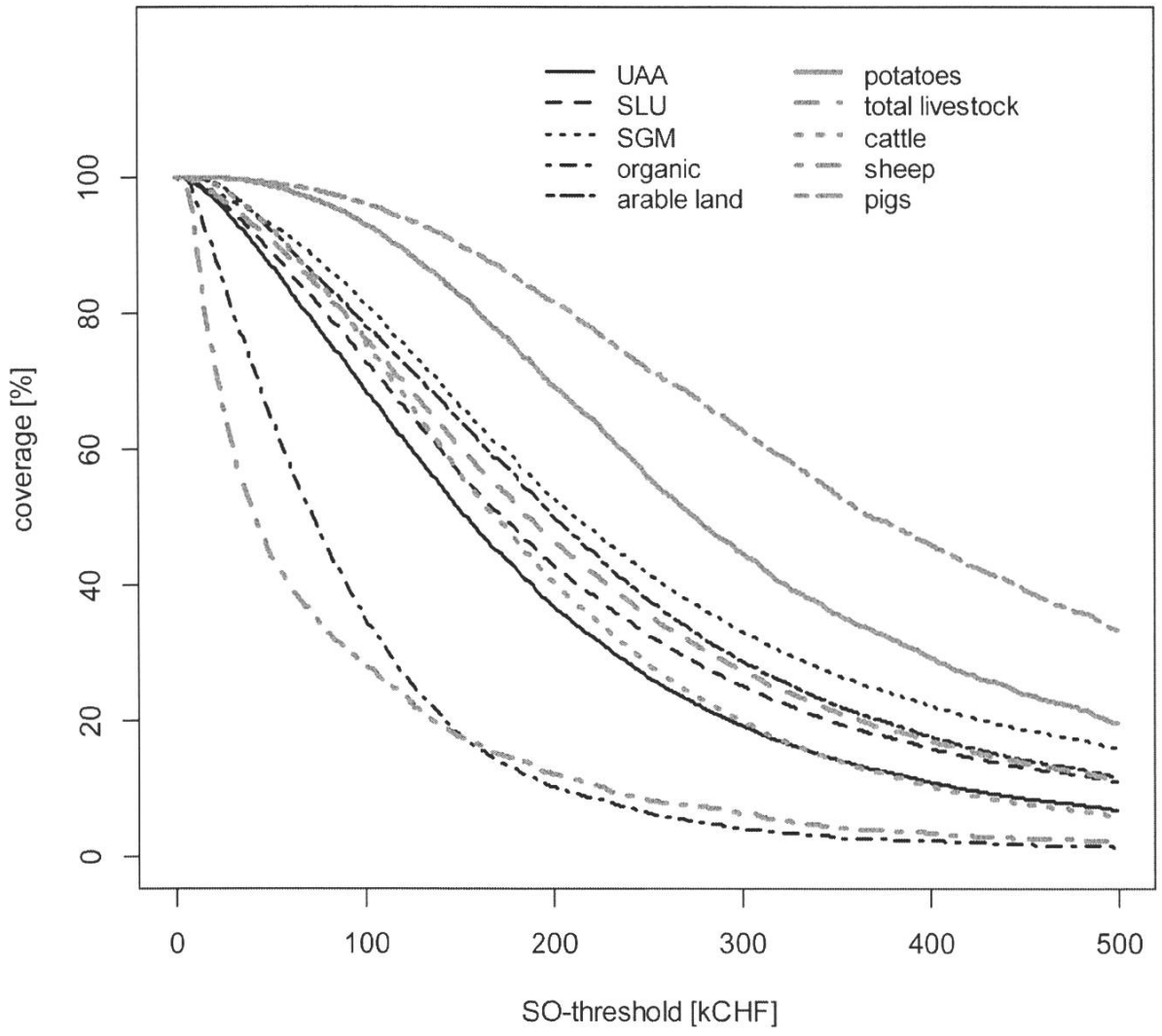


Fig.2: Percentage of census farms in the four TPs under study (for abbreviations see Table 3) for each farm type. Data from year 2007. Farm types: 11: Arable crops; 12: Special crops; 21: Dairy; 22: Suckling cows; 23: Other cattle; 31: Horses/sheep/goats; 41: Pigs/poultry; 51: Comb. dairy/arable; 52: Combined suckling cows; 53: Combined pigs/poultry; 54: Combined others.

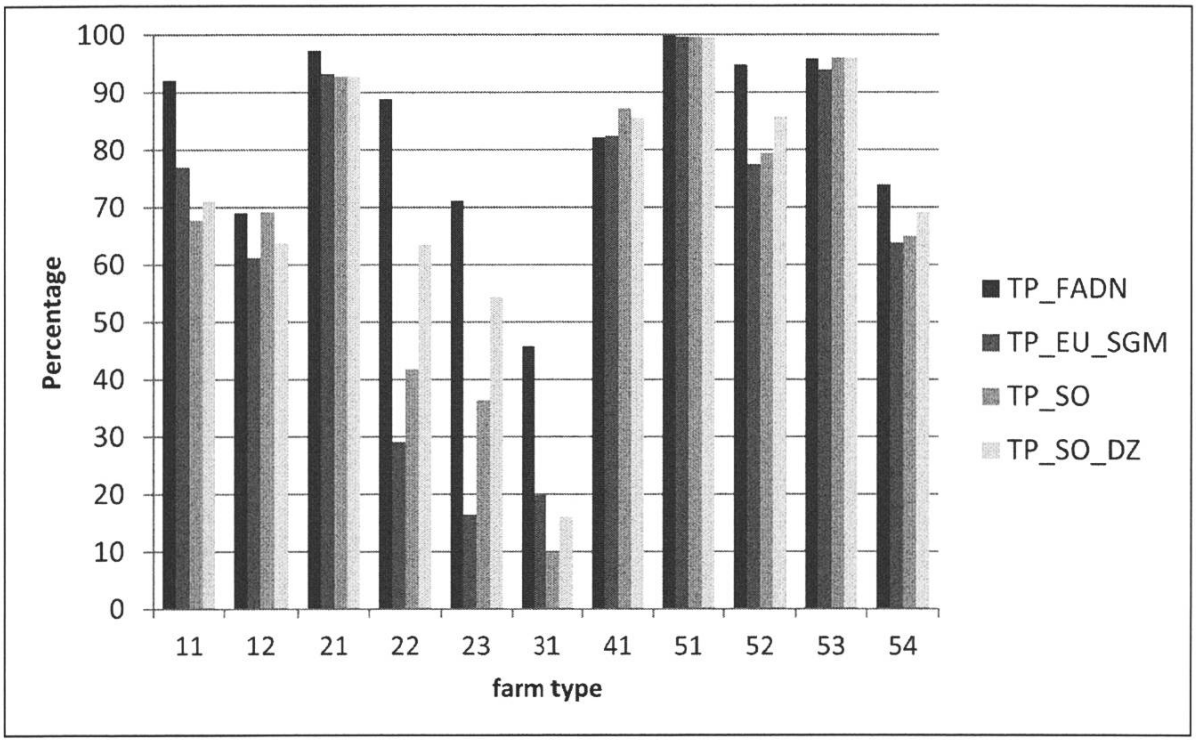
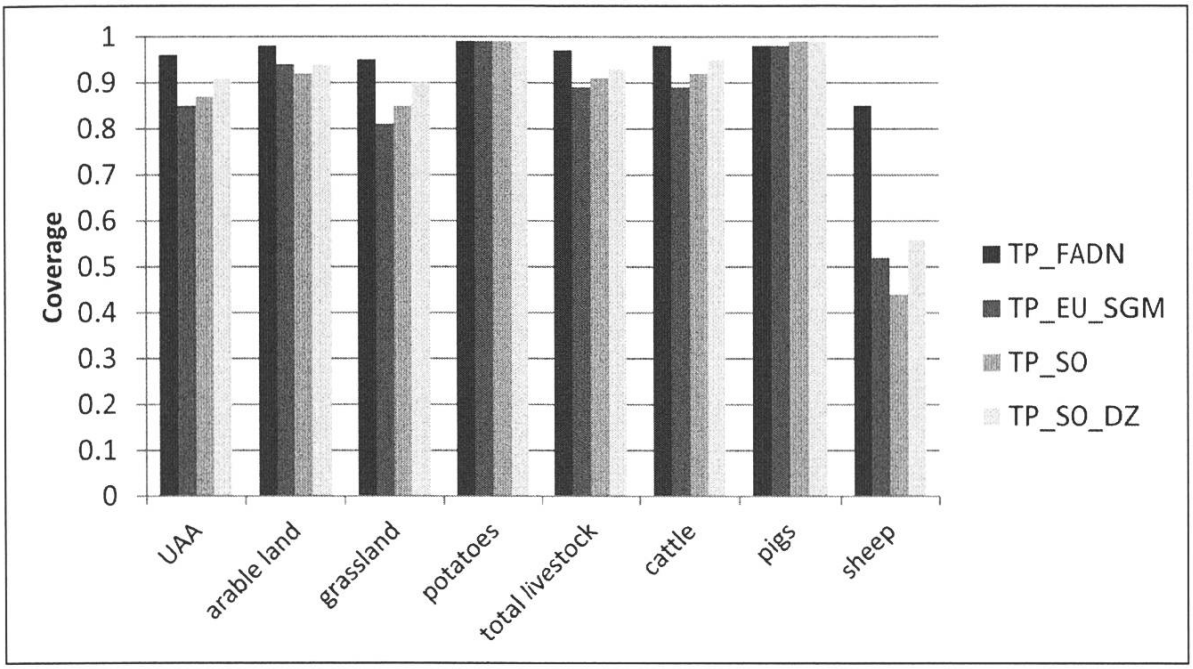


Fig.3: Coverage for the four TPs under study (cf. Table 3). For abbreviations see Table 3. Data from year 2007.



Appendix B: Tables

*Table 1: Coverage of the TP_SO compared to the agricultural census (2007). Areas are given in hectares, livestock numbers in livestock units. Monetary quantities are presented in millions of Swiss Francs (CHF). *The percentage for SO is 95%, as this is required from the procedure which forms the TP_SO.*

Agricultural Census Variable	**Unit**	**Number according to Census**	**Share of TP [%]**
Standard output (SO)	Millions of CHF	9'317	95.0*
Farms	-	61'764	69.1
Family labor (full time)	-	64'582	93.0
Organic farms	-	6'199	64.4
Standard gross margin (SGM)	Millions of CHF	491.1	93.0
Utilised agricultural area (UAA)	ha	106'0256	86.9
Arable land	ha	275'1091	92.2
Grassland	ha	745'629	84.7
Vegetables	ha	10'035	98.9
Fruit	ha	7'419	96.1
Vineyards	ha	14'544	93.1
Winter wheat	ha	76'281	91.5
Maize	ha	17'464	86.1
Potatoes	ha	11'745	98.7
Sugar beet	ha	20'660	95.7
Number of animals			
Total	LU	129'329'1	90.6
Cattle	LU	948'226	92.4
Suckling cows	LU	93'545	75.4
Dairy cows	LU	614'795	95.3
Pigs	LU	198'759	99.1
Poultry	LU	47'474	94.7
Sheep	LU	43'500	44.0
Goats	LU	10'369	66.7

Table 2: Percentage coverage of the TP_SO compared to the Agricultural Census (2007). For currently used farm type and size classification, see Meier (2005).

Farm type/ UAA	*<10ha*	*10-20ha*	*20-30ha*	*30-50ha*	*>50ha*
11 Arable crops	11.2	51.9	96.9	100	100
12 Fruit/ vegetable/ vines	57.8	100	100	100	100
21 Dairy farms	63.0	98.3	100	100	100
22 Suckling cows	2.1	35.2	76.7	96.9	100
23 Other cattle	4.1	45.9	88.1	98.3	100
31 Horses/sheep/goats	2.2	21.6	65.6	91.0	100
41 Pigs/poultry	82.0	95.5	98.2	100	100
51 Combined dairy/arable	82.4	99.7	100	100	100
52 Combined suckling cows	12.3	69.5	99.7	100	100
53 Combined pigs/poultry	78.5	98.0	99.6	100	100
54 Combined others	25.0	69.0	95.3	99.4	100

Table 3: Description of the four TP concepts under study. Acronyms used in this analysis are given in the 1st column. The latter three are based on economic thresholds.

Acronym	*Description*
TP_FADN	TP currently used in the Swiss FADN (based on physical thresholds)
TP_SO	TP covers 95% of the total census SO (cf. Section 3)
TP_SO_DZ	As *TP_SO* but the SO includes direct payments (SO_DZ)
TP_EU_SGM	includes farms with SGM > 16 ESU (€ 19'200 or CHF 31'500)[3]

[3] Exchange rate (2007): 1 € = 1.6426 CHF

Andreas Roesch
Agroscope
Tänikon 1
8356 Ettenhausen
Email: andreas.roesch@agroscope.admin.ch