The mission of Wageningen University and Research is “To explore the potential of nature to improve the quality of life”. Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 10,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.

Proceedings of 24th Pacioli Workshop: FADN in a changing environment

Pristina, Kosovo, 25 September - 28 September 2016

Hans C.J. Vrolijk (ed.)

The international Pacioli network shares best-practices and innovations on the collection, management and use of micro-economic databases in agriculture (such as the Farm Accountancy Data Network in Europe). Each year, Wageningen Economic Research organises the Pacioli Workshop in close cooperation with a local organiser. The 24th Pacioli workshop took place in Pristina, Kosovo in September 2016.

Key words: Pacioli, FADN, farm-level data, policy analysis

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Wageningen Economic Research Report 2017-009

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Cover photo: Hans Vrolijk
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>Introduction</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Objectives of 24th Pacioli Workshop</td>
<td>6</td>
</tr>
<tr>
<td>1.2</td>
<td>Programme of the 24th Pacioli Workshop</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Paper session 1: Agriculture in Kosovo</td>
<td>9</td>
</tr>
<tr>
<td>2.1</td>
<td>Overview of agriculture in Kosovo</td>
<td>9</td>
</tr>
<tr>
<td>2.2</td>
<td>Development of FADN in Kosovo</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Paper session II: Use of FADN data</td>
<td>21</td>
</tr>
<tr>
<td>3.1</td>
<td>Impacts of agro-environmental policy on the nutrient use efficiency of Estonian farms</td>
<td>21</td>
</tr>
<tr>
<td>3.2</td>
<td>Analysing yields of organic and non-organic Farms in Austria</td>
<td>27</td>
</tr>
<tr>
<td>3.3</td>
<td>Milking robots in Norwegian Dairy industry</td>
<td>34</td>
</tr>
<tr>
<td>4</td>
<td>Paper session III: Data collection issues</td>
<td>38</td>
</tr>
<tr>
<td>4.1</td>
<td>Reducing response burden by new data collection methods</td>
<td>38</td>
</tr>
<tr>
<td>4.2</td>
<td>Use of administrative data from the view of the European code of practise regarding statistics</td>
<td>45</td>
</tr>
<tr>
<td>4.3</td>
<td>Polish experiences in collecting FLINT data from FADN farms</td>
<td>53</td>
</tr>
<tr>
<td>5</td>
<td>Workgroup session 1: Sustainability data collection in FADN</td>
<td>60</td>
</tr>
<tr>
<td>5.1</td>
<td>Description of session</td>
<td>60</td>
</tr>
<tr>
<td>5.2</td>
<td>Group formation</td>
<td>61</td>
</tr>
<tr>
<td>5.3</td>
<td>Group I</td>
<td>61</td>
</tr>
<tr>
<td>5.4</td>
<td>Group II</td>
<td>61</td>
</tr>
<tr>
<td>5.5</td>
<td>Group III</td>
<td>62</td>
</tr>
<tr>
<td>5.6</td>
<td>Group IV</td>
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</tr>
<tr>
<td>5.7</td>
<td>Group IV</td>
<td>63</td>
</tr>
<tr>
<td>6</td>
<td>Paper session IV: Methods for farm results</td>
<td>64</td>
</tr>
<tr>
<td>6.1</td>
<td>Multi-criteria evaluation of farms based on Czech FADN</td>
<td>64</td>
</tr>
<tr>
<td>6.2</td>
<td>A review and improvement of the income determination and forecast system for the Bavarian Agricultural Report</td>
<td>68</td>
</tr>
<tr>
<td>6.3</td>
<td>Dutch FADN: income estimations with FES model</td>
<td>75</td>
</tr>
<tr>
<td>6.4</td>
<td>Experience with publication of early farm results in Denmark</td>
<td>80</td>
</tr>
<tr>
<td>7</td>
<td>Paper session V: Methodological aspects</td>
<td>84</td>
</tr>
<tr>
<td>7.1</td>
<td>Change in agricultural income estimate due to the introduction of the Swiss random sample</td>
<td>84</td>
</tr>
<tr>
<td>7.2</td>
<td>Problems of using Standard Output for farm benchmarking among EU Member States</td>
<td>93</td>
</tr>
<tr>
<td>7.3</td>
<td>Design issues in Scottish FADN</td>
<td>97</td>
</tr>
</tbody>
</table>
8  Paper session VI: Data exchange and delivery  101
  8.1  Greenhouse gas emissions in Economy Doctor  101
  8.2  User Friendly FBS data delivery  107
  8.3  FADN IT infrastructure  114

9  Paper session VII: Economic Analysis:  119
  9.1  Implications of a Brexit for British Agriculture  119
  9.2  Quality analysis of the FADN results for Slovenia  125
  9.3  US farm household income volatility  133
Preface

For the 24th time, Wageningen Economic Research organised the yearly Pacioli workshop. This year it took place in Pristina, Kosovo, from 25 September to 28 September 2016.

The Pacioli workshop brought together 30 experts on collecting, managing and using farm-level data for policy analysis and research. The participants discussed innovations and developments in the collection and use of farm-level data. Important topics were the developments in data collection, IT developments for data exchange and dissemination of information and a range of innovative ideas and applications in using data for policy analysis and research.

The Ministry of Agriculture in Kosovo hosted the meeting and took care of the local organisation. Wageningen Economic Research was responsible for organising the content of the programme and chairing the meeting. We thank Edona Mekuli, Adelina Maksuti and Hakile Xhaferi for their kind offer to host the workshop and their work in preparing the workshop.

Prof. J.A.G.J. van der Vorst
General director Social Sciences Group
Wageningen University & Research
1 Introduction

1.1 Objectives of 24th Pacioli Workshop

Innovative ideas face many hurdles to become successful implementations. This is also true in farm accounting and in Farm Accountancy Data Networks (FADNs). Therefore it makes sense to bring together the ‘change agents’, the persons who have a personal drive to change the content of their work and their organisations. For farm accounting and policy supporting FADNs it is appropriate to do this in an international context: this creates possibilities to learn from each other. By bringing FADN managers and data users in micro-economic research together, learning and innovation is fostered.

It is with this background that the PACIOLI network organises a workshop every year. This year the 24th edition already took place. This small but open network has become a breeding place for ideas on innovations and projects. PACIOLI was originally a Concerted Action in the EU’s Third Framework Programme for Research and Technical Development (AIR3-CT94-2456). After completion of the contract with the PACIOLI-4 workshop, the partners decided to keep the network alive at their own costs. See www.pacioli.org for the presentations and papers of all the workshops.

Topic of the workshop: FADN in a changing environment

The European Farm Accountancy Data Network (FADN) collects detailed financial economic information on a sample of farms in Europe. These data are intensively used for the evaluation of the Common Agricultural Policy. Countries outside the EU have similar data collection systems at farm level to monitor the developments in the agricultural sector and to evaluate agricultural policies.

The environment in which FADN is operating is however changing. The information needs have changed due to changes in the Common Agricultural Policy; developments in IT solutions have created new opportunities to collect, store and manage data; and the developments around big data and the increasing information flows in the sector have created new ways of collecting data.

Owing to changes in the agricultural policies and the increasing societal demands with respect to the sustainability of agricultural production, the information needs change. There is a stronger need for data on the sustainability performance of farms in addition to the economic performance of farms.

The information technologies for data exchange support the re-use of data. EDI standards have been developed that facilitate the exchange of information between companies. SDMX is a standard for the exchange of statistical data. Standard Business Reporting defines XBRL standards to exchange information between banks, businesses and the government. These initiatives facilitate the efficient exchange of information and thus allow the re-use of information.

In the 24th edition of the Pacioli Workshop these topics have been discussed. The impact of new data needs and the possibilities to collect these data have been presented and discussed in a working group session. Data collection issues such as the use of administrative data, the use of big data and the feasibility of collecting sustainability data have been presented. The impact of IT developments on the possibilities to disseminate and manage data have been presented and discussed. Like in other Pacioli workshops, a range of new innovative ideas and applications of using FADN data in policy analysis and research have been discussed. See the next section for the full programme.
1.2 Programme of the 24th Pacioli Workshop

Sunday, 25th of September 2016
20.30 Get together for informal drink

Monday, 26th of September 2016
09.00 OPENING
  Opening of workshop by Ministry of Agriculture, Pristina by Ekrem Gjokaj
  Introduction Workshop by Hans Vrolijk
  Introduction participants
10.00 Paper Session I: Agriculture in Kosovo
  Ekrem Gjokaj - Overview of agriculture in Kosovo
  Edona Mekuli and Adelina Maksuti - Development of FADN in Kosovo
10.45 BREAK
11.15 Paper Session II: Use of FADN data
  Eduard Matveev - Impacts of agro-environmental policy on the nutrient use efficiency of
  Estonian farms
  Thomas Resl - Analysing yields of organic and non-organic Farms in Austria
  Jostein Vasseljen - Milking robots in Norwegian Dairy industry
12.30 LUNCH
13.30 Paper Session III: Data collection issues
  Martin Beaulieu - Reducing response burden by new data collection methods
  Ann-Marie Karlsson - Use of administrative data from the view of the European code of
  practise regarding statistics
  Piotr Czarnota - Polish experiences in collecting FLINT data from FADN farms
14.30 Workgroup session 1
14.30 Group discussion
15.30 BREAK
15.45 Plenary feedback of group discussions
16.15 Paper Session IV: Methods for farm results
  Zuzana Hlousková - Multi-criteria evaluation of farms based on Czech FADN
  Lucian Emanuel Stanca - A review and improvement of the income determination and forecast
  system for the Bavarian Agricultural Report
  Harold van der Meulen - Dutch FADN: income estimations with FES model
  Henrik Bolding Pedersen - Experience with publication of early farm results in Denmark
18.15 WRAP UP
20.00 DINNER
Tuesday, 27th of September 2016
9.00  Paper Session V: Methodological aspects
  Daniel Hoop - Change in agricultural income estimate due to the introduction of the Swiss random sample
  Szilárd Keszthelyi - Problems of using Standard Output for farm benchmarking among EU Member States
  Neil White - Design issues in Scottish FADN

10.15  BREAK
10.45  Workgroup session 2
10.45  Group discussion
11.45  Plenary feedback of group discussions

12.15  LUNCH
13.15  Agri-cultural Excursion with dinner

Wednesday, 28th September 2016
9.00  Paper Session VI: Data exchange and delivery
  Mika Sulkava - Greenhouse gas emissions in Economy Doctor
  Ben Lang - User Friendly FBS data delivery
  Eugene Westerhof and Derek Verwey- FADN IT infrastructure.

10.15  BREAK
10.45  Paper session VII: Economic Analysis
  Hans Vrolijk - Implications of a Brexit for British Agriculture
  Maja Kožar - Quality analysis of the FADN results for Slovenia
  Christopher Burns - US farm household income volatility

12.00  Closing
12.30  Lunch
13.15  DEPARTURE
2 Paper session 1: Agriculture in Kosovo

2.1 Overview of agriculture in Kosovo

Ekrem Gjokaj

- Kosovo is located in the centre of the Balkan Peninsula
- The total surface of Kosovo is 10,900 km² with a continental and some Mediterranean climate influence in the lower areas
- The population of Kosovo is around 1.8 million, 63% lives in rural areas and 37% in urban areas
- Kosovo has the youngest population in Europe with 52% of the population being under 25 years old.
- GDP per capita 3,093 €
- Agriculture contributes with 12% in Kosovo's GDP
- The Agriculture Census was conducted in 2014 in the Republic of Kosovo after more than 50 years
- Number of agricultural holdings - 130,775
- Average area cultivated by agricultural holding is 3.2 ha
- The average Livestock Unit per livestock holding is 3 LSU
- No. of persons working in agriculture is 362,700 with contribution in farm work 86,620 AWU
- Average value of AWU - 0.7 AWU/agricultural holding
Livestock Units

- Organic farming key indicators 2015:
  - Organic agricultural area – 160 ha
  - Share in UAA – 0.04%
  - Organic producers – 100 farms
  - Organic processors – 5 companies
  - Since 2016 organic farming supported through direct payments (area cultivated) and RD measures where farmers earn additional point during evaluation
Objectives of the Agriculture and Rural Development Program:

- Additional income for farmers and rural residents by improving conditions and living standards in rural areas;
- Improving the processing and marketing of agricultural products;
- Sustainable rural development and improvement of the quality of life through promotion of agriculture;
- Alignment of Kosovo agriculture with the EU standards;

ARDP is oriented in two types of support for agriculture producers: DP and RDM

In 2015 the implemented DP and RDM were:

**Direct payments** - Wheat, Wheat seed, Maize, Sunflower; Existing orchards, Vineyards, vegetables on open field, Dairy cows, sheep and goats, Beehives, Chicken, pigs, milk, seedlings, slaughtered animals

**Rural Development measures**
- Measure 101 - Investments in physical assets in agricultural economies;
- Measure 103 - Investments in physical assets for processing and marketing of agricultural products;
- Measure 302 - Diversification of farms and business development;
- Measure 303 - Preparation and implementation of Local Development Strategies - LEADER
- Measure on irrigation of agricultural lands (IAL)

![Graph showing share in total budget for DP and RDM from 2010 to 2015.]

![Bar chart showing DP and RDM budget from 2010 to 2015.]

Wageningen Economic Research Report 2017-009
Direct payments 2015

- Wheat
- Dairy cows
- Hogs
- Vineyards
- Sheep and goats
- Vegetables in open field
- Bees
- Milk
- Existing orchard
- Chickens
- Others

*ashes: sunflower, wheat, corn, seedlings, new andlaughtered animals.

Rural Development Measures 2014

- Measure 101
- Measure 102
- Measure 302
- IAL
- Measure 305

*101 Investments in physical assets in agricultural economics
102 Investments in physical assets in the processing and marketing of agricultural products
303 Diversification of farms and business development
302 Preparation and implementation of Local Development Strategies - LEADER
IAL Assistance in the operation of agricultural farms

Thank you for your attention!

ekrem.gokal@rks-gov.net
2.2 Development of FADN in Kosovo

Edona Mekuli and Adelina Maksuti

Development of FADN in Kosovo

24th Pacioli workshop, Prishtina
Edona Mekuli, Adelina Maksuti
Ministry of Agriculture, Forestry, and Rural Development

Development of FADN in Kosovo

- Funded by the European Agency for Reconstruction - EU, in 2005 an FADN pilot project started including 50 farms. This network was expanded to 159 farms in 2006, continuing with an increase in the number of holdings to 300 in 2008.
- FADN sample 2013 and 2014 includes 394 farms.
- Legal Framework - Administrative Instruction no. 06/2011 determines the criteria for the farms to be included in the system of farm accountancy, for the establishment of the data collection network, agriculture household accountancy and for the identification of the annual income.

Data Collection:

- Until 2012, data collected by advisory services;
- Since 2013, MAFRD contracted a company.
  - 10 data collectors trained in data collection and recording by FADN experts;
  - Collection of data in different regions of Kosovo
- Farms in most cases do not keep records of farm activities
- Participation of farms – voluntary;
- There is limited number of specialized and commercial farms in Kosovo.
- Agricultural holdings are very small and mostly semi-subsistent.
- Holdings usually rely on a range of enterprises
- Economic Size threshold – 2,000 €
- Standard Output per farm – 9,175 €
- 70% of farms with economic size less than 2,000 €
- 40% of farms are mixed crop and livestock

Until FADN 2014, data used from the Agricultural Household Survey
Latest CENSUS data for 2014 published in November 2015

Land use by type of farming, FADN 2014

<table>
<thead>
<tr>
<th>Type of Farming</th>
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<th>10.0</th>
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<tr>
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<td></td>
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<tr>
<td>Specialist permanent crops</td>
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</tr>
<tr>
<td>Specialist grazing livestock</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed cropping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed livestock holding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed crops-livestock</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

- UAA in owner-occupation
- Rented UAA
FNVA per AWU by type of farming, 2014

FADN 2016

- New sample designed based on results from Agriculture Census 2014
- Number of agriculture holdings 130,775
- Average UAA 3.2 ha
- 63% of farms have less than 2 ha
- Average livestock unit per agriculture holding is 2.1 LSU
- 75% of farms have less than 1 LSU

... 

- Agriculture holdings have been classified based on type of farming and economic size
- The determination of these elements is based on the standard output coefficients and on structural data of holding.
- Data used to calculate SO
  - Yield (average yield in a country)
  - Quantities produced
  - Prices
  - Cultivated area
  - Number of animals present and slaughtered
  - Technical information as length of production cycle,
  - Productivity of animal mortality of new born, etc.
Farms based on Agriculture Census 2014

<table>
<thead>
<tr>
<th>Economic size classes</th>
<th>Number of holdings</th>
<th>% in total number of holdings</th>
<th>$m. million €</th>
<th>% of total SO</th>
<th>UAA, thousand ha</th>
<th>% of total UAA</th>
<th>LSU, thousand</th>
<th>% of total number of LSU</th>
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<td>791</td>
<td>100</td>
<td>413</td>
<td>100</td>
<td>282</td>
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</table>

Representativity of FADN sample 2016

- Farms in the field of observation covers:
  - 54% of total number of agriculture holdings
  - 91.6% of total standard output
  - 86.6% of total UAA
  - 89.3% of total LSU

Field of observation 2014

<table>
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<tr>
<th>Economic size class</th>
<th>2,000-4,000</th>
<th>4,000-8,000</th>
<th>8,000-25,000</th>
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<td>3,095</td>
<td>983</td>
<td>414</td>
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<td>2 Specialist horticulture</td>
<td>76</td>
<td>105</td>
<td>139</td>
<td>117</td>
<td>93</td>
<td>51</td>
<td>3</td>
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<tr>
<td>3 Specialist permanent crops</td>
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<td>948</td>
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<td>294</td>
<td>68</td>
<td>20</td>
<td>20</td>
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<td>4 Specialist grazing/ livestock</td>
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<td>2,631</td>
<td>2,145</td>
<td>467</td>
<td>95</td>
<td>14</td>
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<td>1,551</td>
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<td>81</td>
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<td>857</td>
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Selection plan 2016

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<th>V</th>
<th>VI</th>
<th>VII</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialist field crops</td>
<td>122</td>
<td>67</td>
<td>54</td>
<td>17</td>
<td>7</td>
<td>2</td>
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<td>22</td>
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<tr>
<td>Specialist horticulture</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<td>1</td>
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<tr>
<td>Specialist permanent crops</td>
<td>15</td>
<td>17</td>
<td>18</td>
<td>3</td>
<td>1</td>
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<td>Specialist grazing livestock</td>
<td>87</td>
<td>46</td>
<td>38</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>181</td>
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<td>Specialist grainsure</td>
<td>18</td>
<td>14</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Mixed cropping</td>
<td>27</td>
<td>26</td>
<td>22</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>82</td>
<td>6</td>
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<td>Mixed livestock holding</td>
<td>66</td>
<td>44</td>
<td>22</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>132</td>
<td>11</td>
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<tr>
<td>Mixed crops-livestock</td>
<td>202</td>
<td>154</td>
<td>105</td>
<td>14</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>474</td>
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<td>Total</td>
<td>532</td>
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<td>%</td>
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<td>2</td>
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</tr>
</tbody>
</table>

Future developments

- Drafting the law for FADN
- Creating a new software for FADN
- Switching from face to face to electronic survey
- Create an FADN unit within the MAFRD

THANK YOU!

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Edona.Mekuli@rks-gov.net
3 Paper session II: Use of FADN data

3.1 Impacts of agro-environmental policy on the nutrient use efficiency of Estonian farms

Eduard Matveev
**INTRODUCTION**

- The objective of the study is to assess the impact of the Rural Development Plan agri-environmental measures on the nutrient use efficiency of Estonian farms based on the FADN data for year 2015.
- At the moment, there is no legal obligation for farmers to calculate nutrient balances in Estonia.
- Registration of input of fertilizers (both manure and mineral fertilizers) is mandatory on field level in the field record book.
- Holdings over 300 livestock unit with liquid manure are obliged to prepare three year fertilization plans.

**IMPORTANCE OF NUTRIENT BALANCE**

As the economic conditions improve, the negative impact on the environment increases. For example, the use of plant protection products and mineral fertilizers is growing, and this may bring about water pollution and decrease in biological diversity, unless modern environmentally friendly technologies are used.

The decrease of soil organic matter and nutrients, caused by the lack of classical crop rotation, nutrient balance data and fertilization plans

Much attention should be given to the maintenance of the soil organic matter content, in order to avoid the exhaustion of soil. With underfertilization (impoverishment of soils) more organic matter will be taken out from field while growing of crops than being applied to.

**MINERAL FERTILISERS CONSUMPTION IN HOLDINGS OF FIELD CROPS TYPE OF FARMING**

![Chart showing mineral fertilisers consumption in different years and types of farms](chart.png)

**Legend:**
- EFM – Environmentally friendly management farms
- SAPS – Single area payment scheme farms

**Source:** Own calculation based on FADN data
LEGAL BACKGROUND

The main legal act in Estonia which implements the Nitrates Directive is Water Act, which sets down rules concerning the use of fertilizers and requirement for nutrient bookkeeping in the field record book.

The Estonian Rural Development Plan (RDP) provides that soil and manure sampling at least once within the 5-year commitment period is compulsory for all producers.

Being aware of analyse results, it is possible to reduce underfertilization (impoverishment of soils) and overfertilization and environmental pollution caused by overfertilization. Therefore, rising of farmers’ awareness regarding the following of the results of soil analyses in the agricultural practices is the key factor.

ENVIRONMENTALLY FRIENDLY MANAGEMENT

Farmers, who applying for the environmentally friendly management scheme under the Rural Development Plan, should make a fertilization plan, in which will include information about the planned fertilization in each year of commitment.

Requirements for environmentally friendly management concerning the use of fertilizers

- maximum amounts of usage for manure nitrogen (170 kg/N/ha) and phosphorus (25 kg/P/ha)
- within nitrate-vulnerable area 170 kg/N/ha manure & mineral totally

Farmer must record in the field book

- date; work type; area (ha); type and name of fertilizer; amount and unit of fertilizer; nutrients N kg/ha; P kg/ha; K kg/ha)

AGRI-ENVIRONMENTAL PAYMENTS

The following agri-environment support (AES) measures are being implemented under Axis II of the Estonian RDP 2007-2013 (10 measures):

- support for less-favoured areas (2.1)
- Natura 2000 support for agricultural land (2.2)
- support for environmentally friendly management (2.3.1)
- support for organic production (2.3.2)
- support for keeping animals of local endangered breeds (2.3.3)
- support for growing plants of local varieties (2.3.4)
- support for the maintenance of semi-natural habitats (2.3.5)
- support for grazing animals (2.4)
- support for the establishment and restoration of stonewalls (2.5.1)
- Natura 2000 support for private forest land (2.7)
NUTRIENT BALANCE CALCULATION

- Balances are calculated for Nitrogen (N), Phosphorus (P) and Potassium (K) using the Farm Gate Balance methodology.
- Nutrient balances equal: bought or brought NPK minus sold or removed NPK.
- Nutrient balances provide information about environmental pressures. A nutrient deficit (negative value) indicates declining soil fertility. A nutrient surplus (positive data) indicates a risk of polluting soil, water and air.
- Input: mineral fertilisers, animal feeding stuffs (compound feed, coarse fodder), livestock, manure, biological nitrogen fixation by leguminous crops, atmospheric deposition of nitrogen, other inputs (seeds and planting material).
- Output: crop and livestock production, animals, manure, animal feeding stuffs.

DATA SOURCES

Rural Economy Research Centre (RERC)
- Farm Accountancy Data Network (FADN) data
Agricultural Registers and Information Board (ARIB)
- Register of agricultural supports
- Register of agricultural animals
- Field Register
Agricultural Board (AB)
- Register of organic farming
Gross margin calculations
Expert estimations

FARM GATE NITROGEN USE EFFICIENCY OF SPECIALIZED CROP FARMS, 2015

[Graph showing nitrogen use efficiency percentages for different farm types]
MAIN PROBLEMS

- Insufficient data coverage regarding the share of different species of legumes for correct application of N fixation coefficients, which have great impact for specific agricultural systems e.g. for organic farming
- Insufficient data coverage regarding the proportion of legumes in the biomass of the collected and sold grass fodder (e.g. hay, silage)
- Quantities of purchased concentrated feedstuffs and coarse fodder as well as the composition of the different kinds of feed
- Amounts and type of manure supplied from other farms and the amounts transported to other farms
3.2 Analysing yields of organic and non-organic Farms in Austria

**Organic farming in Austria**

<table>
<thead>
<tr>
<th>Number of organic holdings</th>
<th>Areas under organic farming*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>200,000</td>
</tr>
<tr>
<td>1,000</td>
<td>500,000</td>
</tr>
<tr>
<td>2,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>3,000</td>
<td>1,500,000</td>
</tr>
<tr>
<td>4,000</td>
<td>2,000,000</td>
</tr>
<tr>
<td>5,000</td>
<td>2,500,000</td>
</tr>
</tbody>
</table>

Organic holdings account for 18% of agricultural holdings in Austria

Source: AWI (2016)

<table>
<thead>
<tr>
<th>Share of utilised agricultural area under organic farming (in 2015, EU 28)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
</tr>
<tr>
<td>0%</td>
</tr>
</tbody>
</table>

Source: Eurostat (2016)
Organic arable land

- There was a vast expansion of organic arable land, which almost tripled since the year 2000
- Increased attention is laid on the productivity of organic crop production

Crop yields of organic farming

Organic agriculture (may) have lower crop yields
→ Demand for more land to produce the same amount of food

What is the relative yield performance?

- International research (meta-analysis)
  - Seufert et al. (2012): organic crop yields ~25% lower
  - De ponti et al. (2012): organic crop yields ~20% lower

Why to know organic crop yields?

- Politicians/ecologists/economists/extension service
  - Calculation of support provided for organic farms
  - Economic calculations (gross margin organic vs. conventional)
  - Calculation of ecological impacts per produced quantity
  - Self sufficiency rates of primary production (dependency on imports)
- Farmers need empiric evidence for their individual economic decisions
Crop yield data – present sources

Representative crop yield data is estimated on an annual basis.

- Statistics Austria (Federal Institute for Statistics Austria)
  - Annual crop yield estimations (harvest declarations) based on voluntary observers
- AMA (Austrian Market Organisation)
  - Annual crop yield data based on weighted crop yields (Agricultural chambers)
  - There will be annual organic crop yield statistics from 2016 on!

Data is not collected separately (organic and conventional crop yields)
Organic farming statistics are limited to area under organic farming and number of holdings

FADN data base

- In the framework of the FADN survey, crop yield data of conventional and organic farming systems is collected
- So far no regular use of this crop yield source
- Sporadic use for extrapolations

FADN data – arable organic and conv. farms

<table>
<thead>
<tr>
<th>Year</th>
<th>Year with arable land</th>
<th>Year with arable and livestock</th>
<th>Year with arable land without livestock</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>265</td>
<td>328</td>
<td>37</td>
</tr>
<tr>
<td>2004</td>
<td>281</td>
<td>237</td>
<td>44</td>
</tr>
<tr>
<td>2005</td>
<td>299</td>
<td>238</td>
<td>61</td>
</tr>
<tr>
<td>2006</td>
<td>296</td>
<td>241</td>
<td>55</td>
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<tr>
<td>2007</td>
<td>287</td>
<td>233</td>
<td>54</td>
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<td>2008</td>
<td>286</td>
<td>233</td>
<td>52</td>
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<td>2009</td>
<td>293</td>
<td>240</td>
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<tr>
<td>2010</td>
<td>297</td>
<td>235</td>
<td>62</td>
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<tr>
<td>2011</td>
<td>309</td>
<td>241</td>
<td>68</td>
</tr>
<tr>
<td>2012</td>
<td>319</td>
<td>238</td>
<td>81</td>
</tr>
<tr>
<td>2013</td>
<td>322</td>
<td>235</td>
<td>87</td>
</tr>
<tr>
<td>2014</td>
<td>320</td>
<td>234</td>
<td>86</td>
</tr>
<tr>
<td>2015</td>
<td>304</td>
<td>216</td>
<td>88</td>
</tr>
</tbody>
</table>

Source: AWM, 2016
Method (1)

- Crop yield averages are weighted on the level of:
  - major agricultural production areas and
  - dry/humid agricultural areas.
- Organic holdings are slightly overrepresented in the FADN survey.
- IACS data (acreage) was used to extrapolate the weighted averages of organic crop yields per crop type on a regional level.*

\[
CY_W = \frac{\sum_{i,cp} cy_i \times ha_i}{\sum_{i,cp} ha_i}
\]

\( cy \ldots \text{crop yield} \)
\( cp \ldots \text{crop type} \)
\( ha \ldots \text{hectares} \)

\( Cyw = \text{Weighted average crop yield per crop type and region}\)

---

Method (2)

Two independent analysis

Major agricultural production areas  Dry/ humid agricultural areas

Major agricultural production areas

8 major agricultural production areas
Agricultural production areas are characterized by different elevations, slope gradients as well as key characteristics of agricultural holdings e.g. size and production activity.
Relative organic crop yields per hectare compared to conventional crop yields

<table>
<thead>
<tr>
<th>Crop</th>
<th>Relative yield (%)</th>
<th>Standard deviation (%)</th>
<th>n'</th>
<th>n''</th>
<th>Area* (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Wheat</td>
<td>64.7</td>
<td>33.8</td>
<td>1,333</td>
<td>10,271</td>
<td>26,278</td>
</tr>
<tr>
<td>Rye</td>
<td>61.3</td>
<td>47.0</td>
<td>1,315</td>
<td>2,722</td>
<td>12,530</td>
</tr>
<tr>
<td>Winter barley</td>
<td>63.2</td>
<td>28.2</td>
<td>496</td>
<td>7,434</td>
<td>4,317</td>
</tr>
<tr>
<td>Summer barley</td>
<td>66.1</td>
<td>46.2</td>
<td>750</td>
<td>5,952</td>
<td>5,693</td>
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<tr>
<td>Oat</td>
<td>66.6</td>
<td>48.7</td>
<td>983</td>
<td>2,665</td>
<td>6,732</td>
</tr>
<tr>
<td>Triticale</td>
<td>69.2</td>
<td>36.0</td>
<td>1,309</td>
<td>4,564</td>
<td>9,819</td>
</tr>
<tr>
<td>Corn</td>
<td>64.7</td>
<td>41.3</td>
<td>511</td>
<td>6,695</td>
<td>8,796</td>
</tr>
<tr>
<td>Spelt</td>
<td>63.2</td>
<td>41.6</td>
<td>826</td>
<td>225</td>
<td>0,577</td>
</tr>
<tr>
<td>Root crops</td>
<td></td>
<td></td>
<td>52.2</td>
<td>50.9</td>
<td>1,555</td>
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<tr>
<td>Potatoes</td>
<td></td>
<td></td>
<td>71.0</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Sugar beets**</td>
<td></td>
<td></td>
<td>80.5</td>
<td>76.0</td>
<td>348</td>
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<tr>
<td>Oilseed and protein crops</td>
<td></td>
<td></td>
<td>58.1</td>
<td>57.5</td>
<td>493</td>
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<tr>
<td>Soybean</td>
<td></td>
<td></td>
<td>81.5</td>
<td>42.9</td>
<td>215</td>
</tr>
</tbody>
</table>

n' = number of observations on organic farms; n'' = number of observations on conventional farms; *mean annual crop area under organic farming 2003-2015; **yield data of sugar beets only available from 2008-2015

Relative organic crop yields – Common Wheat

Number of documented crop yields

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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<tbody>
<tr>
<td>Org</td>
<td>856</td>
<td>883</td>
<td>883</td>
<td>835</td>
<td>813</td>
<td>813</td>
<td>784</td>
<td>763</td>
<td>748</td>
<td>721</td>
<td>714</td>
<td>719</td>
<td>740</td>
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<tr>
<td>Conv</td>
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<td>784</td>
<td>763</td>
<td>748</td>
<td>721</td>
<td>714</td>
<td>719</td>
<td>740</td>
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</tbody>
</table>

Source: SEV, 2016

Relative organic crop yields - Corn

Number of documented crop yields

<table>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Org</td>
<td>33</td>
<td>29</td>
<td>33</td>
<td>33</td>
<td>45</td>
<td>40</td>
<td>44</td>
<td>44</td>
<td>50</td>
<td>46</td>
<td>52</td>
<td>47</td>
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<tr>
<td>Conv</td>
<td>560</td>
<td>541</td>
<td>520</td>
<td>464</td>
<td>522</td>
<td>543</td>
<td>483</td>
<td>477</td>
<td>533</td>
<td>567</td>
<td>495</td>
<td>530</td>
<td>501</td>
</tr>
</tbody>
</table>
Relative organic crop yields - potatoes

Dry and humid agricultural areas

- The climatic water balance is calculated by the difference of precipitation and evapotranspiration
- The climate data is based on records between 2003-2015

Cereals - Crop yields per hectare

Dry/humid agricultural areas

<table>
<thead>
<tr>
<th>Crop</th>
<th>Common Wheat</th>
<th>Rye</th>
<th>Winter barley</th>
<th>Summer barley</th>
<th>Oat</th>
<th>Triticale</th>
<th>Corn</th>
<th>Millet</th>
<th>Spelt</th>
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</thead>
<tbody>
<tr>
<td>dt/ha</td>
<td>Org</td>
<td>Conv</td>
<td>Org</td>
<td>Conv</td>
<td>Org</td>
<td>Conv</td>
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<tr>
<td></td>
<td>35.8</td>
<td>64.7</td>
<td>22.7</td>
<td>45.7</td>
<td>34</td>
<td>57.3</td>
<td>44.5</td>
<td>57.3</td>
<td>35.8</td>
</tr>
<tr>
<td>n</td>
<td>170</td>
<td>345</td>
<td>919</td>
<td>1830</td>
<td>786</td>
<td>1306</td>
<td>786</td>
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<td>117</td>
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<td></td>
<td>421</td>
<td>368</td>
<td>346</td>
<td>354</td>
<td>331</td>
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<td>318</td>
<td>305</td>
<td>285</td>
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<td></td>
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<tr>
<td></td>
<td>35.8</td>
<td>64.7</td>
<td>22.7</td>
<td>45.7</td>
<td>34</td>
<td>57.3</td>
<td>44.5</td>
<td>57.3</td>
<td>35.8</td>
</tr>
<tr>
<td></td>
<td>170</td>
<td>345</td>
<td>919</td>
<td>1830</td>
<td>786</td>
<td>1306</td>
<td>786</td>
<td>1306</td>
<td>786</td>
</tr>
</tbody>
</table>

dt/ha = weighted average yield in decitollers per hectare; n = number of documented yield data between 2003-2015; *Relative yields organic to conventional
Oilseed and protein crops - Crop yields per hectare dry/humid agricultural areas

<table>
<thead>
<tr>
<th></th>
<th>Humid</th>
<th>Occasionally dry</th>
<th>Dry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Org</td>
<td>Conv. Relative*</td>
<td>Org</td>
</tr>
<tr>
<td>Field pea</td>
<td>26.2</td>
<td>14.3</td>
<td>274</td>
</tr>
<tr>
<td>n</td>
<td>227</td>
<td></td>
<td>274</td>
</tr>
<tr>
<td>Fava beans</td>
<td>31.0</td>
<td>25.3</td>
<td>19.1</td>
</tr>
<tr>
<td>n</td>
<td>30</td>
<td></td>
<td>19.1</td>
</tr>
<tr>
<td>Soybeans</td>
<td>24.0</td>
<td>19.9</td>
<td>26.7</td>
</tr>
<tr>
<td>n</td>
<td>361</td>
<td></td>
<td>26.7</td>
</tr>
<tr>
<td>Rapeseed</td>
<td>33.6</td>
<td>30.5</td>
<td>17.1</td>
</tr>
<tr>
<td>n</td>
<td>43</td>
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<td>30.5</td>
</tr>
<tr>
<td>Sunflower</td>
<td>20.8</td>
<td>14.1</td>
<td>24.5</td>
</tr>
<tr>
<td>n</td>
<td>36</td>
<td></td>
<td>24.5</td>
</tr>
<tr>
<td>Oil pumkin</td>
<td>4.3</td>
<td>4.5</td>
<td>5.5</td>
</tr>
<tr>
<td>n</td>
<td>194</td>
<td></td>
<td>5.5</td>
</tr>
</tbody>
</table>

dt/ha = weighted average yield in decitnes per hectare; n = number of documented yield data between 2005-2015; *Relative yields organic to conventional

Further work packages

WP - Survey
Use of clover and alfalfa (just mulching or additional use) of farms without livestock. Correction of results if there is no utilization.

WP – Matching procedure
The purpose of this work package is to find comparable farms (organic to conventional) with similar production conditions (eg. size, area, produced crops, crop rotation)

Conclusion

- Strong demand to have empiric data of yields (different stakeholders)
- Organic farming at arable land produces in average lower yields than conventional farming (average app. 66%). Extend of yield gaps depend on:
  - Crops (cereals, oil crops, root crops, protein crops)
  - Region in dry areas less disparity than in humid areas for main crops like wheat and corn (use of water capacity)
  - Disparity between organic and conv. crop yield is rising (advanced breeds)
  - Remain the utilizations (food, feed, energy) the same - decreases the self-sufficiency rate
3.3 Milking robots in Norwegian Dairy industry

Jostein Vasseljen

Robot milking in Norway

- Highest density of milking robots among the Nordic countries
- 200 - 250 new robots per year
- About 1 500 robots in Norwegian dairy farms (2015)
- More than 1/3 of produced milk runs thorough a robot
- Most of new farm buildings on dairy farms are equipped with robots
- Most important arguments for robots are welfare aspects
- High investments
- Uncertain economy

Why robot?

- «Large» Norwegian dairy farms fit for one robot
- The robot can be more ergonomical than other milking systems
- Wages in Norway are high, the robot can replace hired labour
- Second hand robots are popular among smaller dairy farms
- The robot gives a lot of information about animal health (and other things)
- Let the farmer have a «normal» family life
- The robot is a highly esteemed member of the staff
Methodology

- 2013 first year of identifying robot milking in the Farm Business Survey
- 48 holdings identified with robots in 2013
- 61 holdings in 2014, 7 are organic holdings
- About 320 dairy holdings in the database
- Selected benchmarking group consisting of the same number of cows and other milking systems. Note that the organic holdings are taken out of the groups
- Compared top third and lowest third of robotic farms

Comparison milking systems 2014

<table>
<thead>
<tr>
<th></th>
<th>Robot</th>
<th>Other system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holdings</td>
<td>54</td>
<td>37</td>
</tr>
<tr>
<td>Number of cows</td>
<td>40.4</td>
<td>40.1</td>
</tr>
<tr>
<td>Hectares</td>
<td>48</td>
<td>56</td>
</tr>
<tr>
<td>Rented land, hectares</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>Milk sold litres</td>
<td>298 100</td>
<td>271 400</td>
</tr>
<tr>
<td>Quota litres</td>
<td>331 000</td>
<td>298 500</td>
</tr>
<tr>
<td>Kilogram milk per cow</td>
<td>8 100</td>
<td>7 400</td>
</tr>
<tr>
<td>Kilogram meat per cow</td>
<td>195</td>
<td>262</td>
</tr>
<tr>
<td>Capital assets 1 000 NOK</td>
<td>8 080</td>
<td>5 676</td>
</tr>
<tr>
<td>Working hours per cow</td>
<td>97</td>
<td>107</td>
</tr>
</tbody>
</table>

Financial Results 2014

<table>
<thead>
<tr>
<th>1 000 NOK</th>
<th>Robot</th>
<th>Other system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output per holding</td>
<td>2 771</td>
<td>2 724</td>
</tr>
<tr>
<td>Variable cost</td>
<td>1 056</td>
<td>977</td>
</tr>
<tr>
<td>Gross margin</td>
<td>1 714</td>
<td>1 747</td>
</tr>
<tr>
<td>Fixed cost</td>
<td>831</td>
<td>802</td>
</tr>
<tr>
<td>Depreciations</td>
<td>365</td>
<td>278</td>
</tr>
<tr>
<td>Net income</td>
<td>519</td>
<td>866</td>
</tr>
<tr>
<td>Interest paid</td>
<td>274</td>
<td>173</td>
</tr>
<tr>
<td>Return on labour and own capital</td>
<td>431</td>
<td>738</td>
</tr>
<tr>
<td>Return on labour and own capital per man year</td>
<td>204</td>
<td>316</td>
</tr>
<tr>
<td>Earning capacity NOK per hour</td>
<td>108</td>
<td>160</td>
</tr>
</tbody>
</table>
Results robotic farms

- More milk and less meat produced caused a higher output
- Higher variable costs
- Lower gross margin
- Higher fixed costs
- Higher assets value and depreciations
- 58 per cent more interests paid
- 35 per cent less profitability

Best and lowest third among robot holdings, characteristics

<table>
<thead>
<tr>
<th></th>
<th>Top third</th>
<th>Lowest third</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holdings</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Number of cows</td>
<td>40.0</td>
<td>37.9</td>
</tr>
<tr>
<td>Hectares</td>
<td>50</td>
<td>42</td>
</tr>
<tr>
<td>Rented land, hectares</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>Milk sold litres</td>
<td>395 600</td>
<td>273 400</td>
</tr>
<tr>
<td>Quota litres</td>
<td>321 300</td>
<td>318 200</td>
</tr>
<tr>
<td>Kilogram milk per cow</td>
<td>8 500</td>
<td>7 800</td>
</tr>
<tr>
<td>Kilogram meat per cow</td>
<td>191</td>
<td>194</td>
</tr>
<tr>
<td>Capital assets 1 000 NOK</td>
<td>7 001</td>
<td>8 413</td>
</tr>
<tr>
<td>Working hours per cow</td>
<td>83</td>
<td>89</td>
</tr>
</tbody>
</table>

Best and lowest third, financial results

<table>
<thead>
<tr>
<th>1 000 NOK</th>
<th>Top third</th>
<th>Lower third</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output per holding</td>
<td>2 871</td>
<td>2 517</td>
</tr>
<tr>
<td>Variable costs</td>
<td>930</td>
<td>1 095</td>
</tr>
<tr>
<td>Gross margin</td>
<td>1 040</td>
<td>1 422</td>
</tr>
<tr>
<td>Fixed costs</td>
<td>794</td>
<td>855</td>
</tr>
<tr>
<td>Depreciations</td>
<td>342</td>
<td>378</td>
</tr>
<tr>
<td>Net income</td>
<td>804</td>
<td>169</td>
</tr>
<tr>
<td>Interest paid</td>
<td>125</td>
<td>353</td>
</tr>
<tr>
<td>Return on labor and own capital</td>
<td>874</td>
<td>-10</td>
</tr>
<tr>
<td>Return on labor and own capital per man year</td>
<td>433</td>
<td>5</td>
</tr>
<tr>
<td>Earning capacity per hour</td>
<td>207</td>
<td>10</td>
</tr>
</tbody>
</table>
Characteristics top third

- Higher number of cows
- More land hectares
- More rented land
- Higher quota and milk sold
- Higher percentage of quota filling (95/86)
- More milk per cow
- More produced meat (16 per cent)
- Lower asset value (17 per cent)
- Less labour input (3 per cent)

Financial results top third

- Higher output caused by more produced meat and better milk quality (better paid)
- Less costs (all over)
- Less depreciations and interests paid
- Top third got profitability, lowest third have no profitability

-- Paper in Norwegian only, web-side:
  - https://brage.bibsys.no/xmlui/bitstream/handle/11250/2395869/NIBIO_POP_2016_2_22.pdf?sequence=3\&isAllowed=y

- Thank you for your attention!
4 Paper session III: Data collection issues

4.1 Reducing response burden by new data collection methods

Martin Beaulieu

Outline

- Purpose
- Background
- New data ecosystem
- Ongoing projects and potential development in
  - Data
  - Analysis
  - Collection methods
- Challenges
- Conclusion
Purpose

- We have made significant progress in replacing survey data with administrative and remote sensing data
- What else can be done to fill data gaps in agriculture statistics?
- What are the challenges to overcome?

Background

- Several data gaps identified during the 2016 Census of Agriculture Content Consultation
  - Users want more detailed related to existing content
  - Users want new content on such as:
    - Agri-tourism
    - Animal welfare
    - Value chain and marketing channels
    - GMO
    - Grain storage on farm

Background

- Statistics Canada Agricultural Statistics Program
  - Census of Agriculture every 5 years
  - 17 surveys directly to farmers
  - Remote Sensing and Geospatial Analysis
  - Agricultural Taxation Data (more than 25 years)
  - Over 200 administrative data sources
  - New administrative data (crop insurance, income stabilisation program...
A new data ecosystem

- A wave of technological changes:
  - New ways of generating and sharing data: new technological platforms
  - New data sources: Big Data and alternative data sources
  - New actors producing and consuming data: local, national, international, public, and private
  - New data governance models: Open Data

- More data at lower cost, accessible to more people, on common platforms/standards, from anywhere in the world

Alternative data in agriculture

- Data sources we should keep an eye on:
  - Internet of Things (IoT) — "Things" are sensors and devices that capture data and flow data to other devices: e.g., biochip transponders on farm animals, steer and control equipment, manage inputs at very precise levels across fields, detect crop stress
  - Precision agriculture
  - Track food along supply chain — sensor-based technology
  - Smartphones: The pioneer species of the IoT is the smartphones. Every time we take a smartphone with us in a car, it beams information on our location and speed to Google. The result is real-time traffic information that can be used by everyone. Source: http://ag.com/156076/internet-of-things-will-replace-the-web/
  - Smart meters
  - Social media — food consumption behaviours, trends and attitudes

Earth observation & remote sensing

- Very high resolution remote sensing
  - E.g.: Sentinel-2, 20-60m resolution, global coverage, every 5 days; this is now Open Data
- Derived data products
  - Model-based Principal Field Crop Estimates
  - Developed and tested on the crops that are typically published within the September Farm Survey
  - Accounts for approximately 85% of the agricultural land in Canada
  - Alberta, Saskatchewan, Manitoba, Ontario and Quebec
  - 3 weeks in advance of the September Farm Survey, and
  - 11 weeks in advance of the November Farm Survey

- CANSIM Table 001-0075:
  http://www5.statcan.gc.ca/cansim/home-accueil?lang=eng&pa=5645405A
Alternative analytical methods

- Record linkage implies combining two or more micro-records to form a composite record combining information about the same entity (e.g. a business or an individual)
- Linkages are potentially important sources of valuable statistical information. But there are privacy concerns
- Canada has developed a policy framework permitting data linkage

Examples with farm taxation data

- 2015 Farm Financial Survey
  - Replacement selected revenues and farm expenses
- Agriculture Taxation Data
  - Uses the Census of taxation records of farm operations (unincorporated and incorporated)
- Longitudinal Census – taxation data
  - Productivity study

Business microdata linkage using the LFE: potentials and challenges

- For business data (including farm businesses), the Agency has developed a Linkable File Environment (LFE) facilitating the linkage of pre-approved databases
- The LFE brings together microdata holdings of Statistics Canada from both administrative and survey sources
- At the core of the LFE there is the Business Register (BR), which is used to identify the Business Number and implement all linkages
- Currently, LFE is intended to link records and to extract databases for analytical purposes
Crowdsourcing

- Much of the work on crowdsourcing agricultural data conducted in developing countries where there is lack of data
- Can we use crowdsourcing to reduce response burden and fill data gaps?
- Recently, Statistics Canada initiated a pilot project aimed at understanding the potential of crowdsourcing for statistical purposes – to describe characteristics of buildings

Crowdsourcing

- Collection will officially launch on October 2016
- The project is making use of OpenStreetMap as a platform for inviting contributors to crowdsource information on buildings
- Contributor will be able to input the location, physical attributes and other features of buildings
- A customized OSM editor will be used for this purpose
- The pilot will focus on the Ottawa-Gatineau region for now

Crowdsourcing in agriculture – an Australian example

Ground truthing - Crowd sourcing

A crowdsourced hub for collecting and recording 'Ground Truthing' data
Utilized to calculate total crop area planted and total crop volume.
By contributing information, users can win an iPad Plus!
Takes 30-45 minutes, depending on the number of fields the user wants to record.

"Click on the Paddock Watch site and start entering your fields to go into the draw for a cool iPad!"
Challenges to crowdsourcing

- Accessibility
  - The Government of Canada has standards that may not be applied by third party providers
- Acceptability and willingness to participate
  - Voluntary
  - Incentives to participate?
- Privacy and confidentiality protection
  - Informed consent for research and statistical uses of shareable information
  - Not for collecting sensitive information (could be viewed by the crowd)

Challenges to crowdsourcing

- Security
  - Third service providers standards (before sent to NSOs)
  - Agreement under Section 12 Statistics Act
    - enter into an agreement with any ... or other corporation for the sharing of information collected from a respondent by either Statistics Canada or ... corporation on behalf of both of them and for the subsequent tabulation or publication based on that information
- Data quality and selection bias
  - Not every person with smart phone, mobile devices, GPS...
  - Crowdsourcing and potential false answer
  - Selected crowd (collection not fully outsourced)
- Building a business case for sharing
  - Proprietary value of privately held data

Conclusion

- Change in users expectations for timeliness, detail, frequency
- NSO's roles
  - Trusted party to certify alternative data quality
  - Promote the use of best practices
  - Partner and collaborate with other (private/public) data providers
- Explore, learn, adapt new technologies for data collection, processing, analysis and dissemination
Questions/contacts

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Remote Sensing and Geospatial Analysis, Agriculture Division
Gordon Reichert
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4.2 Use of administrative data from the view of the European code of practise regarding statistics

Ann-Marie Karlsson

Use of administrative data from the view of the European code of practice in FADN

FADN in Sweden

- 90% of farms collected at Statistics Sweden
- 10% of farms collected at Swedish Board of Agriculture

Official Statistics of Sweden in the agro-monetary area

EU Code of practice applies for official statistics of Sweden

Code of practice indicator 8.1

When European Statistics are based on administrative data, the definitions and concepts used for administrative purposes are a good approximation to those required for statistical purposes.

1. The statistical authority is responsible for the statistical processing of administrative data used for European Statistics.

2. Statistical processing is clearly distinguished from administrative data processing. When administrative data are used for statistical purposes, data are treated specifically for their statistical use. This might imply deriving new variables, applying different validation and imputation rules, creating new data files, calculating weights and new aggregates and specific quality checks.

3. Documentation exists describing the differences between administrative and statistical processes in terms of definitions, concepts, coverage, etc.

4. Studies about differences in concepts and measures are made.
Quality frameworks

**Quality framework Daas et al.**
- Hyper-dimensions of Dimensions
  - 1. Source
  - 2. Metadata
  - 3. Data
    - Quality indicators

**Quality framework Laitila et al.**
- 1. OK as it is for statistics
  - output data quality,
- 2. OK after processing
  - production process, input quality.
- 3. Improve the statistical system
  - Production process quality

**Sources of data for Swedish FADN**
- Statistical registers/surveys
  - Farm Register (FSS)
  - Crop survey
  - Horticulture survey
  - Price statistics
- Directly from farmers
  - Labour input
  - Yields (if not included elsewhere)
  - Inventories of buildings, equipment, machinery (only year 1)
  - Inventories of stocks
  - Investments
  - Basic information
- Other data sources
  - IACS data on (subsidies) (areas), (crops)
  - Central cattle data base (cattle)
  - Taxation registers (value of farm)
  - Organic control bodies (Organic production)
  - Accountancy data (sometimes extended with stocks etc.)
  - Swedish milk (milk deliveries)

**Quality frameworks**

<table>
<thead>
<tr>
<th>Source/dimensions</th>
<th>IACS type</th>
<th>Central cattle statistics</th>
<th>Taxation register value of farm</th>
<th>Control bodies for organic production</th>
<th>Accuracy data</th>
<th>Swedish milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Relevance</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Privacy &amp; security</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
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<tr>
<td>Delivery</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
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<tr>
<td>Procedures</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
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</table>

**Metadata dimensions**

<table>
<thead>
<tr>
<th>Metadata</th>
<th>Increment</th>
<th>Impact</th>
<th>Validity</th>
<th>Uniqueness</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Quality</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>2. Comparability</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>3. Uncisen keys</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>4. Data treatment</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
</tbody>
</table>
Quality frameworks

![Quality frameworks table]

Starting point - the users

EU: Administrative use
- Report according to (EG) nr 834/2007

EU: Statistical use
- FSS
- FADN (areas, crops, animals, animals slaughtered)

Additional Swedish use
- Swedish official statistics regarding areas, number of animals and production
- National environmental indicators

Supplier: Control-bodies

Control-bodies
- Kiwa Sverige AB
- Smuk AB
- HS certifiering

Labels
- KRAV 80% UAA
- 100% UAA
What the consumers see

Procedures
Legal prerequisites

Transmission of data
- Informal agreement
  - The "KRAV-software" has an added module with "EU-certification not KRAV".
  - The module fulfills the demands in the regulation
- The Swedish regulation
  - Specifies variables to send to the Swedish Board of Agriculture

Delivery: the reporting

Kiwa Sverige AB
Smak AB
HS certifiring

KRAV
Swedish Board of Agriculture
Plants Division • Statistics Division

Eurostat
FADN
Statistics
Sweden
Control body register

Clarity- comparability- unique keys - data treatment

Information about the holding unique identifiers

Crops
  • Organic crops and organic areas during the year

Animals
  • Average number of dairy cows and sows during the year
  • Highest number of ewes in this year’s production
  • Number of slaughtering pigs produced during the year
  • Born or bought calves during the year
  • Number of cows sold for breeding less than 4 months old

Quality frameworks

Source dimensions
  1. Supplier  ++++
  2. Relevance  +++++
  3. Privacy & security  ++++
  4. Delivery  ++
  5. Procedures  ++++

Metadata dimensions
  1. Clarity  +++
  2. Comparability  ++++
  3. Unique keys  ++++
  4. Data treatment  +++

Farm register

Information about the holding including keys from other registers

FSS-years (Reference day first Thursday in June)
  • Areas, animals
  • Information about the holding including keys from other registers

Other years (Reference day first Thursday in June)
  • Cattle is updated every year from Cattle database
  • Surveys on animals covering sheep, pigs and poultry
  • Last known value
FADN- all years

Organisational information
- All information from Farm register including organisational id of the holder, Production place numbers for the cattle register, FSS_id
- Information on linkage FADN-Farm register (FSS)

FADN-variables
- Number of animals in stock
- Number of animals sold
- Area of crops
- Crop yields

Linkability

Information of organic production in FADN
- Farm register (animals)
  - Type of animal
  - Number of animals
  - Area of crops
  - Crop production

How organic register is used for FADN

Animals
- Holdings
  - FADN (IACS) + Control reg.
- Variables
  - FADN (cattle, FADN-survey)

Animal production
- Holdings
  - FADN (IACS) + Control reg.
- Variables
  - FADN (swedish milk, survey)

Crop-areas
- Holdings
  - FADN (IACS) + Control reg.
- Variables
  - FADN (IACS) + control reg.

Crop production
- Holdings
  - FADN (Survey) Sometimes cropsurvey
  - Variables
    - FADN (Survey)
Technical checks

- Big differences of area of crops
- Not the same crop
- Duplicates between control-bodies
- Not the same type of animal

Quality frameworks

Control bodies for organic production

Data
1. Technical checks
2. Over-coverage
3. Under-coverage
4. Linkability
5. Unit non-response
6. Item non-response
7. Measurement
8. Processing
9. Precision
10. Sensitivity

Not relevant

Positives

- Benefit from the work for the organic statistics
- Benefit from the work with linking between administrative registers and the farm register
- Reduced response burden
- Better data quality
Thank you...

...for your attention...

...Questions?
4.3 Polish experiences in collecting FLINT data from FADN farms

Piotr Czarnota

Polish experiences in collecting FLINT data from FADN farms

Piotr Czarnota, IAFE-NRI, Poland

24th PACIoL Workshop, Prisztina (Kosovo), September 25th-28th, 2016

Content of the presentation

1. General info FLINT
2. Organization of survey in Poland
3. Experiences
4. Conclusions

General info FLINT

• Pilot project
• To establish a tested data infrastructure with up to date farm level indicators for the monitoring and evaluation of CAP and to contribute to a better targeting of CAP and other policy measures
• Use FADN to develop indicators that capture the different dimensions of the sustainability concept
  – Economic, social, environmental
  – Incl. innovation, risk management
Different types of FADN data collection

- **No standardised approach**
- **Countries with Type X**
  - Data provided by (fiscal) accountants
  - Re-use of accounting data for FADN purposes
  - Less expensive
  - More difficult to make changes
- **Countries with Type Y**
  - FADN Data collection by FADN liaison agency (or delegated to other)
  - Dedicated FADN data collection
  - Relatively expensive way to collect FADN data
  - More flexible to make changes in data collection

### Data collection in FLINT

<table>
<thead>
<tr>
<th>Country</th>
<th>Who collects FLINT data</th>
<th>Link to FADN data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>Agriculture students</td>
<td>Separate</td>
</tr>
<tr>
<td>Ireland</td>
<td>Researchers+NFIS data collectors</td>
<td>Yes</td>
</tr>
<tr>
<td>Spain</td>
<td>Farm advisors and accountancy offices</td>
<td>Separate</td>
</tr>
<tr>
<td>Poland</td>
<td>Agricultural advisors (same as for FADN)</td>
<td>Yes (but separate agreement)</td>
</tr>
<tr>
<td>Greece</td>
<td>2 agronomists—researchers data collectors</td>
<td>Separate (with FADN data collectors)</td>
</tr>
<tr>
<td>Hungary</td>
<td>Accounting offices a (same as for FADN)</td>
<td>Yes (but separate agreement)</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Advisors (same as for FADN)</td>
<td>Direct connection</td>
</tr>
<tr>
<td>Germany</td>
<td>2 researchers</td>
<td>Separate but in coop with FADN liaison agency</td>
</tr>
<tr>
<td>Finland</td>
<td>ProAgria-FADN data collectors</td>
<td>Separate (with FADN data collectors)</td>
</tr>
</tbody>
</table>
FLINT – organization of survey in Poland

- **146 farms**
  - 25 + 1 milk farms
  - 25 + 1 crop farms
  - 25 + 1 permanent crop farms
  - 25 + 1 pigs farms
  - 40 + 1 mixed
  - 1 small farm (below threshold of 4000 euro SO)

- **15 data collectors**
  - Data collectors selection
  - Kick-off meeting autumn 2014
  - Second meeting spring 2015
  - Third meeting - data collection training winter 2015

- **4 FADN regions**

FLINT – organization of survey in Poland

- **FLINT questionnaire (10 tables)**
  - Based on FLINT data definitions
  - Translated (in PL) and adjusted to Polish conditions
  - Skipped issues already present in Polish FADN (animals, crops, feed stuffs)

- **FLINT instructions**
- Separate methodology and software for pesticides
- **2 trial farms**
- **Contracts**
  - FLINT data by end of May (all 146 farms)
  - FADN data priority in FLINT farms
  - All FADN and FLINT data ready by August 2016
    - data available for specific case studies

General experience

- **Some data already in Polish FADN – no need for full FLINT data collection**
  - FADN data merged with FLINT data in a backoffice

- **Many FLINT variables partially available in FADN i.e. if some monetary value present in FADN, data collectors could ask for quantity**
  - reduces information collected from farmers and directs the interview
General experience

- Relationship with FADN data collector was crucial for participation in FLINT
  - low rate of refusal
  - bilateral advantages motivated farmers to participate
- Meticulous selection of data collectors – advisors well experienced in farm level data collection – knowledge/skill of data collectors important
  - knew how to approach the farmer to get participated in the project
  - explain the objectives of data collection, sustainability issues
  - ensure quality of data collected
  - keep the deadline for data collection
  - treat FADN farms taking part in FLINT with priority

General experience

- Minimum 5 farms per data collector in order to get experienced in FLINT data collection
  - collection of new data always causes some initial problems and need for adaptation
- Perceived importance and awareness of sustainability and farm impact on environment varies by farmer
  - Connection between questions and sustainability issues needed additional explanation
- Farmers were surprised by number of questions they were asked
  - even though they answered everything
  - FLINT partners aware that there are many questions – even consortium had doubts about certain criteria but this is a research pilot project which aims to test in practice data collection,

Data collection experience

External sources of information

- FADN (nearly all tables)
- SAPS application (e.g. greening)
- Insurance policy
- Contracts
- Invoices (e.g. energy), receipts
- Crop protection evidence
- Certificates (e.g. integrated production, organic farming)
- Land registry (land parcels)
Data collection experience – time required

- Average time needed varied by type of farming from 2.5 hour till 12 hour per farm
  - Field crops: 2.5 – 8h
  - Permanent crops: 2-9h
  - Milk farms: 2.5 - 12h
  - Pig farms: 2.5 - 12h
  - Mixed: 2.5 - 10h

- Includes FADN data analysis before the interview,
- Face to face interview
- Use of other external sources
- Final questionnaire fulfilment

Summary of data collectors experience

Social

- Straightforward questions, easy to give quick answer,
  - no external sources required,
- Some social variables needed broader explanation
  - at first farmers were hesitant to reveal information concerning their private aspect of life (social engagement),
  - FADN is oriented on economic performance of the holding,
- Advisory was a tricky question,
  - farmers hesitant to disclose other sources of advice in front of public advisor,
  - no record of the number of visits – just guessing,
- Some questions seemed to be sensitive to farmers,
  - financial involvement in other companies.
Environmental

- Some definitions used in the questionnaire were different from how farmer perceives it
  - i.e. soil erosion
- Farmers find water quantity estimation difficult
- As for energy, farmers reported only sources that were easy to measure (fuel, electricity)
- Land management
  - parcels – no need to use LPIS
- Pesticides
  - the biggest, but successful challenge – needed to work out purposful methodology
  - problematic data in small farms
  - in permanent crops farms was time-consuming – lots of pests were used

Economic

- Innovations were found difficult to explain
- Off-farm employment and contracts were perceived as sensitive issue
- Buildings
  - number of places, m², m³ needed estimation

Costs

- 100 euro for 1 completely fulfilled questionnaire free of errors.
  No differentiation between type of farming or economic size of the farm

  included: travel expenses, phone consultations, remuneration

  excluded: data entry
Conclusions

- Collection within FADN system provides advantages in terms of farmers participation and data quality assurance

- Data collectors do not find sustainability data collection too complicated – first year of FLINT data collection far less complicated than first year of FADN

- Data was collected thanks to good cooperation between advisor and farmer worked out during long-term FADN experience
  - Trust and confidentiality

Conclusions

- FLINT is a pilot project and reduction of variables is foreseen based on experience – due to difficulty to collect or sensitiveness for farmer

- Farmers answered all the questions required by FLINT data collection although some caused problems

- With some adaptations and clarifications it would be feasible to collect FLINT variables in Polish FADN in the future

Thank you for attention 😊

czarnota@fadn.pl
5 Workgroup session 1: Sustainability data collection in FADN

5.1 Description of session

Recent evaluations (for example the Court of auditors) have shown limitations in the possibilities to evaluate the common agricultural policy with the available data in FADN. The common agricultural policy has evolved since the early sixties of the previous century. In its inception phase, it was focused on providing food security for Europe and a fair standard of living for farmers in order to assure the continuity of agricultural production. Since then, a lot of things have changed. Societal expectations with respect to agricultural production have broadened. Society does not only expect a continuous availability of food, but also has a wide set of additional requirements with respect to food quality, food safety (for example use of pesticides, use of antibiotics), the environment (greenhouse gas emissions, acidification, eutrophication, pesticide use) and the role of agriculture in rural areas. Part of these concerns have also been included in the latest Common agricultural policy. However, the current monitoring systems lack the data for proper monitoring and evaluation of these topics.

The FLINT project addresses these issues. The FLINT project has defined a set of environmental and social indicators, and these indicators have been collected on FADN farms in addition to the normal FADN data collection. The FLINT project has come into phase that recommendations to the EU are formulated about the future data collection.

Collection of data

Earlier discussions have revealed that a major concern in extending the data collection is the increase of workload. There are a few options to reduce the workload, to compensate for the additional work to collect environmental and social data.

- Decrease of FADN sample, by 25 or 50%
- Collection of environmental or social data not in every year but in each Nth year.
- Re-Using data from other systems:
  - What are the possibilities and consequences of these options for your country?
  - Which is your preferred option and why?
  - Do you see other options to reduce the workload?

Use of data

It is often claimed that the FADN sample is designed for economic use of the data. Please discuss the implications for the sample design in case environmental and social data are collected in FADN.

- Is the fadn sample designed for economic research, why yes? why not?
- Should changes be made to the sample design, when environmental and social data are collected? What are these changes?
- What are the consequences of these changes for the regular use of fadn data?

IT-infrastructure

Changing data collection also demands changes in the IT infrastructure. Collecting new data can affect different aspects of the IT system: data entry, database design, data checking, reporting etc.

- What are the overall possibilities to adapt your IT system to other data needs?
- What do you see as the main challenges in adapting your system to environmental and social data?
5.2 Group formation

<table>
<thead>
<tr>
<th>IT</th>
<th>Data collection</th>
<th>Data collection</th>
<th>Data Use</th>
<th>Data use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 1</strong></td>
<td>Daniel Hoop</td>
<td>Marju Aamisepp</td>
<td>Maja Kožar</td>
<td>Martin Beaulieu</td>
</tr>
<tr>
<td><strong>Group 2</strong></td>
<td>Edona Mekuli</td>
<td>Zuzana Hlousková</td>
<td>Henrik Bolding</td>
<td>Christopher Burns</td>
</tr>
<tr>
<td><strong>Group 3</strong></td>
<td>Mika Sulkava</td>
<td>Constanze Hofacker</td>
<td>Jasna Putar</td>
<td>Piotr Czarnota</td>
</tr>
<tr>
<td><strong>Group 4</strong></td>
<td>Jan Derk Verweij</td>
<td>Iva Hvízdalová</td>
<td>Christian Scheutz</td>
<td>Ann-Marie Karlsson</td>
</tr>
<tr>
<td><strong>Group 5</strong></td>
<td>Eugene Westerhof</td>
<td>Szilárd Keszthelyi</td>
<td>Hakile Xhaferi</td>
<td>Ben Lang</td>
</tr>
</tbody>
</table>

5.3 Group I

**IT-infrastructure**
- Switzerland has a ‘normal’ FADN system, plus a subsample for environmental data. It was a life cycle analysis in the past but now there are only some indicators left. Problem to bring together all indicators developed by different scientists in different software.
- Finland: Flexible system that is suitable for adding new variables, takes some time but can be done. Has to be done by IT specialist though.
- Kosovo: data collection in Excel, extraction via SQL. Can be easily extended new variables, but there is no system behind it so this will be difficult (no IT skills available).
- NL: FADN data system (15 years old), already antibiotics and pesticides etc was present. FADN system is flexible and procedural (no programming), adding FLINT took a lot of time because of huge amount of variables.

**One FADN system for all?**
- A lot of homebuilt systems for FADN data, some have no system.
- Would it be possible to have one system for all?
- Data collection process is different for diff countries.
- Level of detail is different.
- Combining economic and environmental data: quality control, but also harmonize the data collection process (combined surveys etc).
- Switzerland was planning to do a full, medium and light version for data collection, NL does the same
- Reasons: cost efficiency, better response rates
- Consequence for IT systems: modular design
- Overall possibilities to adapt IT systems: Finland & NL no problem, Switzerland has to go modular, Kosovo no problem because no software
- Go open source? Available systems too old, plus closed systems.
- So perhaps build a new system from scratch in cooperation?

5.4 Group II

**Decrease of FADN Sample**

**Contra**
- Against the representativity
- Less research possibilities
- Technical implementation

**Pro**
- Less budget
Collecting data not in every year

**Contra**
- Fixed cost (factor) of data collection is very high
- Organisational problems
- Data quality problems, since we cannot connect the data every year

**Pro**
- Less budget
- Some questions should not be asked every year

Re-using data

**Contra**
- Data confidentially
- Black and grey economy

**Pro**
- Decreasing the burden of the farmers
- Speed up data collection
- Less budget

Other issues concerning data collection

- No trained data collectors
- Legislation problems
- Representativity (sub-samples may needed)
- IT solution from Commission (harmonised IT development)
- FADN as an statistical tool?
- Convincing the farmers for data collection
- Payment for farmers (even on EU level),
- Changing the regulation (make it obligatory)

5.5 Group III

Decrease of FADN sample: strongly disagree

<table>
<thead>
<tr>
<th></th>
<th>Croatia</th>
<th>Denmark</th>
<th>Kosovo</th>
<th>Slovenia</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease FADN sample:</td>
<td>No</td>
<td>Possible</td>
<td>No</td>
<td>No</td>
<td>Possible</td>
</tr>
<tr>
<td><strong>Main reason:</strong></td>
<td>Losing too much valuable information (especially for small types of farming)</td>
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Collection every year or each n-th year: with each FSS

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<tr>
<th></th>
<th>Croatia</th>
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<th>Slovenia</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Each or n year:</strong></td>
<td>FSS sample bigger</td>
<td>Too much costs/respondent burden, limited space on FSS survey</td>
<td>No other alternative, because the sample was just increased</td>
<td>Too big increase in respondent burden and work load</td>
<td>FSS every year, but too big increase in work load</td>
</tr>
<tr>
<td><strong>The main reasons:</strong></td>
<td></td>
<td></td>
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</table>
Re-using data from other systems
- Strongly agree.
- **Increase the level of interoperability of databases, data exchange** (especially less experienced countries).
- **Co-ordination of samples** (FADN vs. FSS); Denmark – in 2017 (every FADN farm will be in FSS).
- **Preferred options, options to reduce the workload**: „Digital by default“, „once only“ (use multiple times).

5.6 Group IV

**Is FADN sample designed for economic research?**
Yes,
- but already there are many data that are regarded as social in FADN.

There was project in UK on environmental and social aspects that looked at FADN because there were some social data (AWU, education, age of farmer, whether there is tourism on the farm or not)
- or environmental data NPK, values of pesticides and so on.

**Should changes be made to the sample design when environmental and social data are collected**
- There are pros and cons.
- What research problems are the most interesting to us.
- Social aspects are more important in a small farms.
- If there were more social aspects, than FADN sample would have to be changed in a way that it captures small farms also.
- On the other hand including lot of small farms would cause many economic and production problems.
- Some policies are focused on issues such as carbon emissions, water, energy which much more concern big producers, so if we want to focus on environmental data, than we should design the sample in a way that it captures more big farms, as they impact environment more than small farms.
- There are some indirect environmental data in FADN (NPK, value of pesticides).
- Risk of non response or missing data (because there are many sensitive questions to farmers, we have to be careful as farmers can drop out the next year).

**Consequences**
- Increased interest in FADN data.
- Because of small amount of additional data on environmental and social aspects, there is huge amount of data for analyses because of the combination with FADN data.

5.7 Group IV

**Is the FADN sample designed for economic research, why yes? Why not?**
Yes
- mainly based on economic output of farms.
- Farm performance data.
- There is still more space for more economic analyses.

**Should changes be made to the sample design, when environmental and social data are collected? What are these changes?**
- Is the economic impact efficient enough?
- Not only revenues and costs, also the amount used could be an useful information (e.g. amount of fertilizer).
- New output - e.g. environmental results calculated with new weighting factors of sample (e.g. organic farming).
- Farm income versus household income (social data)
- Is there a possibility to use administrative data for environmental and social outputs?
- Additional information collected (project based?)
- Should we reduce economic indicators?

**What are the consequences of these changes for the regular use of fadn data?**
**Reducing economic data while increasing environmental and social data.**
- Increase the value of the FADN Data.
- More use of the data – self financing (data for additional research projects).
- Environmental indicators very important for politicians and public.
6 Paper session IV: Methods for farm results

6.1 Multi-criteria evaluation of farms based on Czech FADN

Zuzana Hlouskova

- To enrich outputs from FADN CZ database
- To attract attention of farmers to FADN survey
- To offer new approach of farm evaluation
- To look at farm results from another perspective
- To meet new requirements of policy makers
SCORING

Allocation of points based on FADN farm results
Maximum 10 points per indicator

(a) Groups 8-6
Results of indicator is divided by deciles
Each farm gets number of points according to the position on the scale

(b) Group A = yield
Average is calculated
Points according to the distance from the average

Example:
Average yield = 100% = 6 points

Below:
0% = 0 points
20% = 4 points
40% = 2 points
60% = 3 points
80% = 5 points
Above:
120% = 6 points
140% = 7 points
160% = 6 points
180% = 9 points
200% = 10 points

RELEVANCE

A. Production
Weight of group
Weighted given points

B. Economic
Weight of group
Weights of indicators
Weighted given points

C. Financial
Weight of group
Weights of indicators
Weighted given points

D. Environmental
Weight of group
Weights of indicators
Weighted given points

E. Other
Weight of group
Weights of indicators
Weighted given points

Sum of weighted points

DIFFICULTIES

The most sensitive parts are:

- Selection of indicators
- Problem of similar indicators (average of points)
- Set up of weights per group and each indicator
- Fair scoring for various production structures
- Missing values arrangements
Access to database for:
- Farmers
- Researcher
- Other registered users

Options:
- Predefined tables
- Dynamic table design
- Time row
- Comparison
- Flexible filter setting

Large scale of information:
- Complete information of questionnaire
- Standard results
- Yields & Prices of products
- Structure of land, labour, revenues
- Balance sheet
- Profit and loss statement
- Efficiency indicators
- Financial analysis
- Predicted results of selected variables

REPORTING

Evaluation of farm at farmer disposal – on-line access

Evaluation:
- Total
- By criteria group
- By indicator

Comparison:
- Own evaluation result with average of group of similar farms

Time series:
- Farm development since 2014 onwards

Thank you for your attention
6.2 A review and improvement of the income determination and forecast system for the Bavarian Agricultural Report

Lucian Stanca

Review and improvement of the current system to determine and forecast the income for the Bavarian Agricultural Report

24th Paschall Conference
September 25th to 28th
Prishtina, Kosovo

Lucian Stanca
Technical University of Munich
Agricultural Economics
Agricultural Production and Resource Economics

Outline

1. Introduction
2. Research questions
3. Current estimation system
4. Methodological approach
5. Next steps
6. Preliminary conclusions

1. Introduction

- The Agricultural Act in Germany was adopted in 1955
- Bavarian Agricultural Report was first published in 1973
  - A core issue is the presentation of the economic situation of the Bavarian agriculture.
- A weighted estimation was first introduced in 1978
- 33% of farms in Germany are located in Bavaria
- Information is needed at different levels: to better formulate and monitor regional policies, such as funds allocations (Rao & Molina, 2015)
1. Introduction

- Survey sampling is used for getting information about descriptive population parameters
- Easy and straightforward endeavour in presence of “ideal” statistical conditions
- Ideal conditions are given in absence of non-sampling errors such as:
  - Nonresponse (unit or/and item)
  - Measurement errors
  - Frame imperfection

2. Research questions

- Is the current estimation method still suitable?
- How to improve the current estimation method?
- What are the requirements for a new estimation method?
- Is the estimation significantly different/better when applying the new method?
3. Current estimation system

- Stratified random sampling (more than 3,000 farms)
- Stratification:
  - Farm type:
    - Full-time farms (>60,000 SO, at least one employee)
    - Part-time and Small farmers (25,000-60,000 SO)
  - Farm location
  - Type of farming
  - Farm size (in ha)
- Full-time farms are represented in the sample about 90%, part-time and small farms only about 60%.

3. Two main problems were identified:

1. Unit Nonresponse: part for the sample selected elements does not provide information.
   a. Major issue because parameter is considered biased until the opposite is confirmed
   b. The variance may increase as well

2. Design effect: standard error is not adjusted for disproportionate sampling or reweighting.

3. Current estimation system

- Nonresponse: according to the BMEL selection plan for 2013/2014 on average 27%
4. Methodological approach

- The information is expanded through the design weights \( w_i = \frac{d_i}{n_i} \), which correspond to the inverse sample inclusion probability, i.e. the proportion of the population each sample unit represents within each strata.
- Estimator for stratified sample is determined as follows:

\[
\hat{P} = \sum_{k=1}^{K} \frac{N_k}{N} \sum_{i=1}^{n_k} x_i
\]

- Due to nonresponse we can not assure unbiasedness
- Solution: adjust the weights to obtain a nearly unbiased estimation
- How: correlated auxiliary variables

4. Methodological approach

Calibration approach

- Minimise the distance function:

\[
\min_{w_i} D(w) = \sum_{i=1}^{n} d(w_i, d_i)
\]

- Subjected to the calibration function:

\[
\sum_{i=1}^{n} w_i X_i = X
\]

Why calibration? (Deville and Särndal, 1992; Särndal and Lundström, 2005)

- Reduction of bias when nonresponse
- Improvement of estimates’ precision
- Consistent estimation due to different sources

4. Methodological approach

- Disadvantages of the approach:
  - Presence of outliers
  - Weak correlation
  - Imposing to strict restriction on weights might cause no convergence
  - Too large or negative weights
4. Methodological approach

Auxiliary variables

- Integrated Administration and Control System (IACS): consists of a number of computerized and interconnected databases which are used to receive and process aid applications and respective
- Provides:
  - a unique identification system for farmers
  - an identification system covering all agricultural areas called Land Parcel Identification System (LPIS)
  - an identification system for payment entitlements
  - a system for identification and registration of animals

4. Methodological approach

- Särndal and Lundström (2006) suggest the selection of auxiliary variables is to some extent rather based on subjective assessments; nevertheless, it should be based on a structured approach to assure sound decisions.
- The constraints, for instance, that might be worth considering:
  - The number of farms in the population
  - The number of farms in the population by farm type
  - The number of farms in the population by farm size
  - Area of crop land in Bavaria
  - Number of dairy cows
  - Number of beef breed herd
  - Number of pigs
  - Number of meat birds

4. Methodological approach

Design effect

- Each strata should be represented proportionally in the sample
- Nevertheless, the composition of farm population is dynamic and so should be its representation in the sample
- But, the sample might not change as population changes
- If $\beta_1 = \frac{\beta_2}{\beta_3}$, the sample is disproportionate and tends to increase the standard error.
4. Methodological approach

- Reweighting due to nonresponse tends to affect also, even though the impacts are reduced.
- It can assessed through the design effect:
\[ \text{def} f^2 = 1 + CV^2(w_{np}) \]
- The most common approach employed for complex surveys is the Taylor linearization approach
- Is a design-based method, without any assumptions about the model that generated the data

5. Next steps

- Choose the most suitable distance function by testing different functions
- Determine the auxiliary variables
- Software for calibration
- Tuning parameters (e.g., convergence and iterations)
- Evaluation of calibrated weights
6. Preliminary conclusions

- It was detected that the current estimation system is only suitable without nonresponse.

- When estimating the variance, the design effect must be taken into account.

- The weights can be corrected through the calibration approach to produce nearly unbiased estimators.

- Software packages for complex surveys include methods for calculating the variance that take design effects into account.

Thank you for your attention.

Feedback: lucian.stanca@tum.de
6.3 Dutch FADN: income estimations with FES model

Harold van der Meulen

Dutch FADN: income estimations with FES model

Pacioli workshop Pristina - Kosovo
25th - 28th of September 2016
Harold van der Meulen, Wageningen Economic Research

Outline of the presentation

- Introduction
- The FES model
- Using FES for income estimations
- Presentation of the income estimations
- Quality of the income estimations
- Using FES for liquidity position
- Discussion

Introduction

- Income estimations at the end of calendar year
- Combination of:
  - Dutch FADN data: sample of 1,500 farms
  - Agricultural census data
  - Market information
- Since a few years the FES model in stead of Excel spreadsheets
The FES model

- Financial Economic Simulation model
- Based on accounting:
  - Profit and loss account
  - Balance sheet
- Micro-economic simulation model
- FADN-data
- Mid term
- Farm stays the same (size, crops, animals)

Using FES for income estimations

- Advantages:
  - More transparent compared to spreadsheets
  - Re-use of factors
  - Broadens applicability of FES-model
  - No separate maintenance for the spreadsheets.
  - Possible to report for non-standard groups.
  - The use of GAMS: very transparent and efficient.
  - The FES model is one of the main models of Wageningen Economic Research:
    - standard working procedures, audits and reviews.
    - maintenance of various versions can easily be organized (subversion).

Prognosis of income: input

- Based on profit and loss account individual firms year t-1 (= last year available): calculation on farm-level
  - Revenues: price and quantity factors
    - milk, tomatoes, wheat, potatoes, etc..
  - Costs: price and quantity factors
    - fertilizer, feed, petrol, capital, labour, etc..
  - Exclusion of individual farms possible
- Market information in year t (= recent year)
  - Index on price and quantity of all the revenues and costs from profit and loss account
- No changes in the structure of the firms. However, changes in the relative weighting ratios
Prognosis of income: output

- Calculate new revenues and costs in year t
- Forecast of farm income year t
- Data browser access to the results at farm level and sector level
- Report on aggregate level: per agricultural sector
- Report average income estimation and income distribution

Income estimations: average and distribution

- Every year great difference in farm income within farm types. See for example dairy farms

![Graph showing family farm income per unpaid worker average for dairy farms]

Presentation of income estimations

- Prognosis report of income in the Netherlands
  - All FADN data year t-1 available in October
  - Publication on [www.agrimatie.nl](http://www.agrimatie.nl) & [www.Agrofoodportal.com](http://www.Agrofoodportal.com)
  - Press conference: great interest
  - Important for policymakers
Results and quality of the income estimations (from business by farm x 1,000 euro’s)
Results and quality of the income estimations (from business by farm x 1,000 euro’s)

Using FES for liquidity distribution

- Cash flow 2015 based on FADN 2014

Thank you for your attention

Questions?
6.4 Experience with publication of early farm results in Denmark

Henrik Bolding Pedersen

Value of Statistical Information

Who wants yesterday’s news

Could we add value to our users?

Normal year:
- Prepare data collection: OCT-JAN
- Collect, validate (and validate again): FEB-AUG
- Publish: End of SEP
- Validate and send data to FADN: SEP-NOV

1st of July we normally have validated 50% of the final sample.
How would the precision be if we use these data?
Results with forecast data for 2013-2015

- **Farm Net Income**, FNI (FADN)
  Remuneration to fixed factors (work, land, capital)

- **Farm Net Profit** (Statistics Denmark's main indicator)
  $\approx$ FNI – costs of hired labor and financing
  Remuneration to farmer and his invested capital

**Net profit, All Danish full-time farms**

**Net profit, pig farms**
Net profit, dairy farms

Net profit: Fur farms

Net profit: Crop farms
Did we succeed?

At Statistics Denmark we measure our news on hits and citations in the medias weekly and monthly:

- Week: Nr. 2 on hits and Nr. 1 on citations.
- Month: Most cited News (92 citations) in July.
- Based on 2-3 years experience the precision is OK

Thank you for your attention!
7 Paper session V: Methodological aspects

7.1 Change in agricultural income estimate due to the introduction of the Swiss random sample

Daniel Hoop

Change in agricultural income estimate due to the introduction of the Swiss random sample

Daniel Hoop

24th Pacioli Workshop, Pristina, Kosovo, 27th September 2016

www.apossoc.org/about, healthy environment

Outline

- Start of new time series from the year 2015
- Quantification of and reasons for the break in the time series of...
  - farm income
  - work income (remuneration of family labour input)
- Conclusions
NEW TIME SERIES

- Start of new time series from 2015
  - Time series until 2014 based on the old system
  - From 2015 a new time series starts based on the new random based sample
  - Break in time series: Shift downwards
  - Quantification of break possible based on comparison of agricultural income in old and new system in the year 2014

- Two estimates in SpE 2014
  - Problem!
    - Sampling plan in 2014 was suboptimal.
    - Substantial change in sampling plan from 2014 to 2015
  - Two ways to estimate 2014
    - \textbf{A}: Average of full sample 2014.
      Comparing macroeconomic development with FADN shows: \textit{FADN estimate 2014 seems to be too low! (Should be higher)}
    - \textbf{B}: Calculate 2014 based on full sample in 2015 taking into account the relative change of the balanced sample 2014/15.
      \rightarrow Calculate “backwards” from 2015 to 2014.
Break in time series

Source: Agroscope, Swiss FADN

Change in agricultural income estimates due to the introduction of the Swiss-columne sampling in the FADN Workshop 2018.

Break in time series

Source: Agroscope, Swiss FADN

Change in agricultural income estimates due to the introduction of the Swiss-columne sampling in the FADN Workshop 2018.

QUANTIFICATION OF BREAK IN FARM INCOME
Farm income 2014

- Old 67'800
- New 63'700 – 65'100
- 4% to -6%

Source: Ref/Old FAaN system. SpE/RANDOM FAaN sample (2 estimates)
Change in agricultural income estimates due to the introduction of the Swiss random sample (FAaN) Process workshop.
Dennis/Danny

Reasons for break in farm income

1. Methodological changes in accountancies:
   - From analytical accounting to financial accounting (tax optimized)
   - Updated calculation of farm income

2. New definition of statistical population

3. Random sample

4. Other reasons:
   - New weighting method: Calibration instead of post-stratification
   - New farm typology

- Residential house: House belongs to farm. Family has to pay rent.
  - Old: Economic rent (est. real costs, higher rent -> higher farm income)
  - New: Imputed rental value (for taxes, lower rent -> lower farm income)

- Depreciation
  - Old: Linear
  - New: Optimized for taxes (higher yearly fluctuation)

- Social insurance and retirement provision of family labour
  - Old: 0% farm costs, 100% private costs
  - New: 50% farm costs

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm</td>
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<td>0</td>
</tr>
<tr>
<td>Family Private expenses</td>
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<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Change in agricultural income estimates due to the introduction of the Swiss random sample (FAaN) Process workshop.
Dennis/Danny
Definition of the population

- **Old system**: physical minimal sizes, e.g.:
  - 10 ha UAA (usable agricultural area)
  - 6 dairy cows
- **New system**: minimal standard output (95% criteria), e.g. in 2014:

<table>
<thead>
<tr>
<th>Plain region</th>
<th>Hilly region</th>
<th>Mountains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fr. 60'000</td>
<td>Fr. 54'900</td>
<td>Fr. 34'900</td>
</tr>
</tbody>
</table>

Sample also contains group/collective farms

Average farm size increases:

<table>
<thead>
<tr>
<th>UAA</th>
<th>LU</th>
<th>SGM</th>
</tr>
</thead>
<tbody>
<tr>
<td>+8%</td>
<td>+13%</td>
<td>+14%</td>
</tr>
</tbody>
</table>

UAA: usable agricultural area, LU: livestock units, SGM: standard gross margin

Farm income 2014

**Old 67'800**
-4% to -6%

**New 63'700 – 65'100**

Source: Raiffeisen-FADN system. Splitt Random FADN sample

Farm income 2014
(Old system adapted to new methodology)

**Old 58'900**

Correction FinAc / AnAc: -13%

**New 63'700 – 65'100**

+8% to +10%

AnAc: Analytical Accountancies, FinAc: Financial Accountancies
Source: Raiffeisen-FADN system. Splitt Random FADN sample
Farm income 2014
(Old system adapted to new methodology)

Old 62'000 – 65'000
New 63'700 – 65'100

Correction for Ag./An. & population -4 to -9% - 2% to +5%

Source: Ref/0ld FADN system, Spl/Rand FADN sample

Remuneration of family labour

• Calculation of work income (WI) per family annual working unit (FAWU):

\[ WI \text{ per FAWU} = \frac{\text{farm income} - \text{calc. costs equity}}{\text{FAWU}} \]

• where:

\[ \text{calc. costs equity} = \text{equity} \times \text{interest\ Swiss Conf. bonds} \]

Work income per family labour unit

Old 52'800
New 42'400 – 44'200
-16% to -20%

Source: Ref/0ld FADN system, Spl/Rand FADN sample
Reasons for the break in work income per family working unit

<table>
<thead>
<tr>
<th>Old (CHF)</th>
<th>New (CHF)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm income ( CHF)</td>
<td>67'000</td>
<td>65'100 to 66'000</td>
</tr>
<tr>
<td>- calc. costs eq. (CHF)</td>
<td>-3'600</td>
<td>-3'900 to -3'300</td>
</tr>
<tr>
<td>= Work Income (CHF)</td>
<td>64'200</td>
<td>61'200 to 61'800</td>
</tr>
<tr>
<td>/ annual working units</td>
<td>1.22</td>
<td>1.42 to 1.44</td>
</tr>
<tr>
<td>= WI / FAWU (CHF)</td>
<td>52'800</td>
<td>44'200 to 44'200</td>
</tr>
</tbody>
</table>

Lower farm income and higher family labour input cause dramatically lower work income per family labour unit.

Conclusions

- The introduction of the new random based sample led to break in the time series of farm income and work income per family labour unit.
- There are several reasons for the break. An exact quantification of all influencing factors is not possible.
- Despite larger farms in the new sample and the newly defined population, the estimate of farm income and work income decreases by 4 to 6% and 16 to 20%, respectively.
- The introduction of the new sample has shown that work income was massively overestimated with the old FADN system.

Thank you for your attention
Literatur

Methodik:

 Datenauswertungen 2014/2015:

Neues Rechnungslegungsrecht:

Farm income 2014 (distinguished by regions)

- Plain region: -1% to +2%
- Hilly region: -11% to -12%
- Mountain region: -5% to -6%

(Quelle: Rech/Referenzbetriebe bzw. SpE/Stichprobe Einkommenssituation, Gewichtung: Kalibrierung)

Work income 2014 (distinguished by regions)

- Plain region: -15% to -16%
- Hilly region: -23% to -26%
- Mountain region: -12% to -17%

(Quelle: Rech/Referenzbetriebe bzw. SpE/Stichprobe Einkommenssituation, Gewichtung: Kalibrierung)
7.2 Problems of using Standard Output for farm benchmarking among EU Member States

Szilard Keszthelyi

Problems of using Standard Output for farm benchmarking among the European Union Member States

Pacioli workshop, Pristina, 2016
Szilárd KESZTHELYI

Importance of farm benchmark

Support farmers to improve their income, productivity and sustainability performance

• Why are others better?
• How are others better?
• What can be learnt?
• How can the farm catch up?

Source: Based on EIP-AGRI farm benchmark focus group

Importance of benchmark based on farm size

• The farm size usually is a fixed condition;
• Size efficiency can be disregarded;
• Easier to recognize the differences;
## TF-8 Fieldcrops, Total Utilised Agricultural Area (SE025)

<table>
<thead>
<tr>
<th>Country</th>
<th>&lt; 100.0</th>
<th>100.0 - 250.0</th>
<th>250.0 - 500.0</th>
<th>500.0 - 1,000.0</th>
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<th>TOTAL</th>
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<td>661,10</td>
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<td>3,690,07</td>
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<tr>
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<td>2,15</td>
<td>25,71</td>
<td>45,36</td>
<td>93,43</td>
<td>263,86</td>
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Source: FACH Public Database

## TF8, Milk farms - Total Livestock Units (SE080)

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</table>

Source: FACH Public Database

## TF8, Granivores, Total Livestock Units (SE080)

<table>
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<th>100.0 - 250.0</th>
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<th>1,000.0 - 2,500.0</th>
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<tbody>
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</tbody>
</table>

Source: FACH Public Database
Walter van Everdingen (LEI) - New indicator: Standard Earning Capacity (Pacioli Dublin)

**SO: Need for new indicator**
- Compared to SGM, SO is less related to farm value added, farm result and labor input
- Farm size based on SO less comparable then based on SGM
- Many questions on farm labor input and whether a farm is big enough to provide a living for farmer
  - Important in tax and local regulations
  - Before these questions were answered based on SGM, SO not useful

**Problems of EU level farm comparison**

1. Standard Output makes bias among the EU member states;
   1. Not express the added value;
   2. Very big differences among the member states
   3. Quality problems;
2. Farms/researchers want to focus on the physical size class (in terms of hectare/livestock);

**Developing new perspectives**

**Establishment of EU wide SO:**
- EU level SOs instead of national -> same physical basis in all countries;
- New Eurostat publication;
- New FADN dataset for international benchmark;
- New on-line typology software for reference information;
Thank you for your attention!
7.3 Design issues in Scottish FADN

Neil White

Scottish Government statistics

Pacioli – September 2016

Neil White

Agriculture statistics

- Data collections using paper surveys + administrative databases + electronic data capture. This satisfies SG needs and EU regulations (CAP).
- Most of our work routes back to an EU regulation and most of our data is widely used.
- We survey over 35,000 individual farms every year (issuing 50,000+ survey forms).
- Returns go via UK lead or direct to EU. Crops, livestock, milk production, farm accounts (and so on). Some monthly returns.
- Member State requirements are with the UK, but Devolved Administrations are responsible/tiable for compliance.

FADN – Farm Accounts Survey (FAS)

- Survey/audit of 500 farm businesses.
- Farms are selected by ESU (economic size unit) >= €25,000 and Standard Labour Requirement of >0.5.
- Representative of ~12,000 larger “more economically active” farms in Scotland.
- Data collection and “data build” is conducted by a contractor. Similar for England and Wales, but Northern Ireland survey is in-house.
- Average cost per farm ~£2,000 – very high but data quality is very good, multiple validations and call-backs with farmers.
FADN – Farm Accounts Survey (FAS)

- Stratified simple random sample and is effectively designed as a panel survey.
- Sample is stratified by 8 farm types and 3 size groups.
- Most farms stay in the panel, drop out rate is around 10%.
- Currently there has been no assessment of non-response bias in the FAS for Scotland.
- Local and EU policy uses (CAP, land reform).
- Farm business advice + Economic Accounts for Agriculture
- Research community use FAS widely.

The Scottish Government

Challenges - 1

- (1) UK and Scottish budgets are under pressure.
- (2) Scotland’s new tax & welfare powers mean re-organisation
- UK EU referendum result
- (3) UK and Scotland’s position with regard to EU and therefore European Statistical System and FADN.
- (4) Another Scottish independence referendum?

The Scottish Government

Options for statistical systems.

- UK will need to agree what relationship it has with ESS. Do we/could we stay in the ESS?
- Do we follow the Norway model/Swiss model or some other variant?
- How much alignment with UN? Where does the UK want to position itself?
- There are other countries with good statistical systems.
- Where and how will statistics feature in the Brexit deal?
- Want to maintain international standards for the production of official statistics that allow valid inter-country comparisons
- In Scotland, ensure that our priorities to meet the needs of Ministers and wider stakeholders in Scotland are maintained.

The Scottish Government
Challenges - 2

- We may have to work very hard to sell the benefits of FAS if we are no longer aligned with the ESS.
- The overall cost of FAS is high compared with other countries
- Data sharing controls are prohibitive
- In the Brexit context, how do we keep response rates up?
- We will be "competing" for resources across government.
- How can we deliver the same quality for a reduced cost - is it possible?
- Will we accept lower quality for a lower average cost per farm?

Opportunities

- Is this a chance to (re) design statistics/evidence needs.
- Could we be more innovative? Can data science help?
- Change how we collect/produce statistics/maximise re-use.
- Work to collect/produce what SG & stakeholders really need.
- Expand our involvement with other countries?

Some examples/ideas - 1

*Change how we collect/produce statistics/maximise re-use.*
- We are building an electronic data capture function for the 2017 June census – could we expand this to FAS?
- Can we collect more data automatically from accounting packages? Will data sharing with HMRC help us?
- Could we bring elements of FAS in-house, using industry bodies to supply members’ accounts? Would that bias our sample?
- Do we still need “everything” we currently have in FAS? Could we allow electronic data submission to produce “10 key financial indicators” instead of a full farm account?
Some examples/ideas – 2

Work to collect/produce what SG & stakeholders really need.

- Full overhaul of our statistical outputs/products in 2017/18.

- Can we meet challenges on any evidence needed for new policies, for example, non-UK nationals working in agriculture?

- Review *how* we produce for users – can we move away from ‘glossy commentary’ publications to shorter ‘notices’ – what role does open data play here?

- We have an active statistics community but also want to maintain/increase collaboration with other countries.

- Pacioli ☺
8 Paper session VI: Data exchange and delivery

8.1 Greenhouse gas emissions in Economy Doctor

Mika Sulkava

Contents

- Greenhouse gas (GHG) emissions of farms
- Data
- EconomyDoctor
- GHG calculation
- Emissions from manure management
- Emissions and sinks of forests
- Summary
Greenhouse gas (GHG) emissions of farms

- Agricultural GHG emissions 20% of Finland’s total emissions
- Until now, no farm-level emissions available
- New web service in construction to EconomyDoctor
- Emission categories to be calculated
  - CH₄ emissions from animals and manure
  - N₂O emissions from soil and manure
  - CO₂ emissions from liming
  - CO₂ emissions and sinks from biomass and soil
  - CO₂ emissions from energy use

Data

- Farm-level data currently available
  - Number of animals
  - Crop output
  - Area of organic and inorganic soil
  - Amount of fuels used
- Data to be collected
  - Cutting down trees
  - Manure management
  - Synthetic fertilizers

EconomyDoctor

- Web service providing lots of information about Finnish agriculture and horticulture
- Also other forms of primary production: e.g., fishing, reindeer farming and beekeeping
GHG calculation

- Calculations in EconomyDoctor are done on the fly in SAS
- New SAS routines for GHG emissions will be implemented according to IPCC 2008 guidelines
- Forest growth calculated in NettiMELA – another web service of Luke
- Emissions of enteric fermentation ready
- SAS routines ready for emissions of manure management
- Other emission components under construction


GHG calculation


Stress Protection © Natural Resources Institute Finland | www.luke.fi
## GHG calculation

### Economic sector: Greenhouse Gas calculation

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### Economic Sector: Greenhouse Gas calculation

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Emissions from manure management

- Manure management is the third largest GHG emission component of agriculture
- Emissions both CH₄ and N₂O
  - Much stronger than CO₂
- No accurate information about manure management in farms
  - Inaccurate total emissions without additional information about manure management

Emissions from manure management

- New data collection form

Emissions and sinks of forests

- Forest growth sequesters large amounts of carbon from atmosphere
- Cutting down the trees results in major loss of carbon stock
- We asked if the FADN farmers are willing to give permission to use their forest plan information
  - Only few interested farms turned up
  - Enough for prototyping, but not for reliable calculations
Summary

- Farms produce a significant amount of greenhouse gases
- Farm-level GHG calculations will be available in EconomyDoctor
- Links between economic performance and GHG emissions
- Manure management is an important source of emissions
- New data collection form
- Forests also important
- Data acquisition requires resources
- Better calculation accuracy in future
8.2 User Friendly FBS data delivery

Ben Lang

User Friendly FBS Data Delivery

24th Pacioli Workshop
Pristina, Kosovo

Ben Lang
27 September 2016

The Farm Business Survey

- In England, the Farm Accountancy Data Network forms the major part of the Farm Business Survey (FBS) and is partly funded by DEFRA
- The FBS includes 1800 farm businesses in England UK agricultural policy and PGS
- EU agricultural policy
- Decisions in the management of farms in the UK
- Data for use in education and training

Target Audience

- Farming professionals and researchers
- Farmers
- Policy makers
- Policy advisers and industry bodies e.g. NFU
Eight reports in combinations of print format and web version at ruralbusinessresearch.co.uk.

These cover arable, horticulture and several livestock farm types. One is a specialist organic report.

Selected Regional Results

The results that we are presenting today can be found at:

www.farmbusinesssurvey.co.uk

Report concepts

We have designed the reports with the following concepts in mind. The reports should:

- Be useful to many users; farmers to policy professionals
- Be consistent with published Defra data
- Be responsive to user feedback
- Take account of users’ varying numeracy
- Offer a range of data presentation methods (e.g. graphs and words) as appropriate
Four reports to meet the requirements of a wide range of users:

- Simple indexing vs relevant data
- A large dataset vs ‘drill down’ capability
- Confidentiality of data vs maximum access
- Changing policy demands vs consistency
- Accuracy vs timeliness of data

Region Reports

Since 2004/2005:
- farm profitability,
- balance sheets
- time series performance

FBI calculation splits: of:
- agriculture
- agri environment
- single payment
- diversification

Website Tools: Farm Benchmarking

www.farmbusinesssurvey.co.uk/benchmarking

→ Enterprise gross margins
→ Farm Profitability 1) Sector Specific
→ Performance ratios 2) Average and Top Quartile Data
→ Balance Sheets 3) Includes some Organic
→ EU benchmarking
FBS farm business benchmarking

Farm and gross margin comparisons by:
- organic and conventional
- farm size
- tenure
- farm performance

Projection Calculator

Projection calculator uses accurate Farm Business Data and the latest futures prices to indicate future gross margin and farm performance using transparent methodology.

It is popular with farmers wishing to plan farm activities.

The dynamic aspect of the report is especially useful in the context of volatile commodity prices.

FBS Databuilder

FBS data builder is a specialist interactive system for professionals and researchers. It allows direct interrogation of Farm Business Survey (FBS) data to construct user defined tables.

“FBS databuilder can carry out analysis in an afternoon that might once have been the subject of a PhD thesis”

Martin Seabrook,
Retired Professor, University of Nottingham
Some dimensions of FBS data builder:

- Largest standard table has 880 cells
- 157,000 tables using standard dimensions
- Nearly 7 million tables using size groups

FBS Databuilder

FBS databuilder generates custom tables to your design without compromising confidential farm data.

We have fitted a new engine to FBS databuilder, and it calculates each cell in 0.82 seconds.
It has since:
- calculated 8,300 tables
- with 21m data items

It can produce over 10m different tables.

Requesting data

To retrieve an earlier request enter the reference number below and click the 'Retrieve' button. To view data, select the 'Review' button.

Follow these steps to create your own results:

1. Select dimensions
2. Select variables
3. Enter your table and choose your variables
4. Click on 'Execute request' to view your results.
Our users: use through the day

FBS data at www.farmbusinesssurvey.co.uk

Databuilder, Regional and Benchmarking reports are available at: www.farmbusinesssurvey.co.uk

The reports were devised and developed by Richard Dexter, Ben Lang, Rachel Lawrence, Charles Mbakwe, Roger Price and Mark Reader

Thank you for your attention
Ben Lang
bgal2@cam.ac.uk
8.3 FADN IT infrastructure

Derek Verweij and Eugene Westerhof

Datamangement

With applications in
FLINT (partly)
and FADN (current and future)

Pacioli, Sept. 28
Pristina, Kosovo

Derek Verweij & Eugene Westerhof

Overview

Datawarehousing

- Congregate data from multiple sources into a single database so a single query engine can be used to present data.
- Integrate data from multiple source systems, enabling a central consistent view (classification)
- Maintain data history, even if the source transaction systems do not (performance, reproducability)
- Improve data quality, by providing consistent codes and descriptions, flagging (or even fixing) bad data and reducing manual processing
Data Dimensions: Classifications

Subject: Other Gainful Activity
Variable: Production
Unit: Quintals
Type: Processing of cow’s milk
Year: 2015
Country: Hungary
Holding: 768.7.75195

Current state of affairs

- First implementation of technical solution delivered
- Three pilots in three different domains:
  - Foodprofiler: Smart phone app ('gamified') to collect data on consumption patterns (daily)
  - KCB: dutch export data on agricultural products
  - BIN (Dutch FADN+ data on farm level). Data released for research updated daily
- Rule Component used for FLINT
Automatic validation feedback

Farmer feedback website

Validation Rules

RICA
If
then
L_CV_261:321_MD_V > 0
L_OV_261:321_MD_V > 0
or
L_PR_261:321_MD_Q > 0

FLINT
If
(Type = (Processing of cow's milk)
     (Processing of buffalo's milk)
     (Processing of sheep's milk)
     (Processing of goat's milk))
&
ClosingValuation > 0
then Production > 0
OpeningValuation > 0
FLINT

- 170 variables and 60 dimensions in 40 ‘subjects’ (tables) (51000 variables in RICA1)
- All (~200) FLINT coherence tests implemented
- 435 RICA test automatically generated from rule configuration XML provided by the Commission
- 63 tests not generated because of missing information and different processing of lookups (= dimensions).
- Runs all tests for 100 farms is less than half a minute (RICA1 test server takes 2.5 hours)
- Rule engine Software is free for use and we welcome an open source community effort

Future developments

- Wageningen Economic Research needs to find new funding: government funding will decrease, PPS will have to pick up as will contract research
- What is our market proposition?
  – Research, plus combination of various data
- So: Agro Economic Platform in the making
- Data Warehouse will accommodate multiple datasources, including third party sources
Things to be considered

- Classification is key!
- Usability: researchers will have to easily ‘construct’ their information, minimal dependency on Datalab department
- Open data: is a challenge in terms of marketing (what is our market proposition?)
- Virtual data – just in time (cost, actuality)
- Big data: being developed on university level

Thank you!

- Questions
9.1 Implications of a Brexit for British Agriculture

Hans Vrolijk

Background

- Referendum June 23 to leave or stay in EU
- Follows a promise made by Prime Minister Cameron in 2013 that if the Conservative party would be re-elected in May 2015
- Leaving the EU is likely to have significant implications for the agricultural sector in the UK.
- (1) conditions governing international trade in agricultural products and (2) public support payments for farmers are critical elements
- Research project commissioned by National Farmers Union (NFU)

Implications of EU exit for British Agriculture

Hans Vrolijk, Wageningen Economic Research
Pacioli 24, September 25-28, Pristina, Kosovo
Objective

Quantification of effects of:
- Possible trade and agricultural support scenarios on the
- UK agricultural production, trade, farm gate prices and
  farmers’ income levels
in case of the UK leaving the EU.

Scenarios (two dimensions):
- (1) a UK-EU Free Trade Arrangement (FTA); (2) a WTO default
  position; (3) a UK Trade Liberalisation (TL) scenario.
- (1) a continuation of all direct payments; (2) a 50% reduction
  of direct payments; (3) no direct payments

Approach

Results of trade scenarios

- Under the FTA and WTO scenarios, UK domestic prices
  increase, mainly driven by trade facilitation costs.
- Under the WTO scenario, increases are intensified
  because certain commodities no longer benefit from the
  EU’s TRQ import concessions
- The agricultural product prices are projected to increase
  - FTA scenario range of 2.3 to 5.5%,
  - WTO scenario range of 7.2 to 11.5%.
- A UK TL scenario implies a lowering of the UK’s external
  import tariffs by 50%.
  - significant impact on UK meat and dairy prices as
    current import rates are higher for these products.
Farm level approach

Based on UK data (2012/2013)

FARM level simulations to estimate impacts of:
- Price changes of outputs as estimated by AGMEMOD
- mapping between AGMEMOD and FADN product groups
- Price changes of selected inputs (e.g. feed) on farm results as estimated by AGMEMOD
- Change in direct payments to farmers

On farm incomes and farm viability

Farm level approach

Three types of results analysed
- **Average farm incomes** of groups of farms with and without Brexit
- Change in **farm income at farm level**: % of farms with a negative impact on farm income due to Brexit
- Change in **farm viability**: % of farms with an improved / deteriorated viability due to Brexit

Farm viability defined as the extent to which opportunity costs of own labour and assets can be covered by farm income

Farm level approach
Impact on average farm incomes (types)

Impact on field crop farms

Negative farm level income effect

Percentage of farms with negative income effect due to Brexit

Data sources: EU-AIDH - DG AGRI, calculations LI.
Impact of Brexit on farm viability

Conclusions

- In FTA and WTO scenarios farm-gate prices increase, supporting farm incomes (but reducing consumption)
- More liberalised trade: farm-gate prices fall, benefiting consumers through lower prices but hitting farm incomes in many sectors.
- For most sectors the biggest driver of UK farm income changes is the level of public support payments available.
- The positive price impacts on farm incomes seen in both the FTA and WTO default scenario are offset by the loss of direct support payments.
- A reduction of direct payments would further increase the negative impact seen in UK Trade Liberalisation scenario.
Impact

- Brexit supporters insist support to UK farmers would continue in the event of Britain voting to leave the EU. However, farmers have raised concerns about whether this financial support would be forthcoming, as the government has previously argued against direct payments through the CAP (the guardian, April 18)
- Resolution passed by the NFU council: “On the balance of existing evidence available to us at present, the interests of farmers are best served by our continuing membership of the European Union.”

Further information

9.2 Quality analysis of the FADN results for Slovenia

Maja Kozar

Quality analysis of the FADN results for Slovenia – first stage results

Maja Kožar (maja.kozar@kis.si)
Agricultural Institute of Slovenia

Outline of presentation

- Motivation for research
- Data quality assessment: theory
- FADN data quality management: EU, Slovenia
- Approach used
- Selected components of data quality – first stage results
- Conclusions
- Key mid-term recommendations
- Limitations and recommendations for further research

Motivation

- FADN data: data gold mine and invaluable data input for EU (50 years of FADN conference, June 2015), wide range and volume of different uses throughout EU (EC and EU member states)
- But not in Slovenia – (hints of) insufficient quality by several quality components (previous research), modest use
- Slovenian FADN: total quality management not systematically developed yet; comprehensive quality analysis of FADN for Slovenia not performed yet
- But growing awareness about data richness and potentials of FADN for Slovenia: Incentive for a national project

Source: EU Rural Economy Office based on 2013 FADN data. 2016 Figure 3.1, pg. 12
Motivation – Cont.

- Development of Holistic Model of Agricultural Holdings and Related Databases for Decision Making in Slovenian Agriculture; 100% state financed, 3-year project; partners: Agricultural Institute of Slovenia, University of Ljubljana, Agricultural Advisory Service (public)
- Key aim - from the perspective of FADN data quality: systematic, in-depth quality analysis of FADN data for Slovenia, recommendations to improve data quality & usability
- 2-stage project - from the perspective of FADN data quality:
  - First stage: quality analysis of Slovenian FADN from the organizational (operational) perspective
  - Second stage: more in-depth analysis of basic FADN data (cross-checking with other databases, model)
- Results presented today – first stage results (collected up to December 2015)

Data quality assessment: theory

- Quality of data, ‘fitness for use’ (Statistics Canada’s Quality ..., 2002)
- Not only accuracy (one component), but a mixture of several different components/dimensions
- Selection, range, hierarchy of components – user defined
- EU project (European Statistics Code of Practice, 2011) quality at 3 levels:
  - institutional environment (system)
  - statistical processes
  - statistical output
- Assessment and monitoring of data quality: part of total quality management (TQM), rigorous procedures in commercial companies and statistical offices; quality of EU statistics – legislative obligations

FADN data quality management (EU)

- No new ideas; proposals for a more comprehensive (total) quality management of FADN data following example of statistical offices in 90’s (first PACIU workshops);
- FADN not official statistics, but strongly connected, also some MS already have similar starting point/approach (recent efforts in Sweden, Denmark, FADN within statistics offices)
- Not to our knowledge not at the EU level; main reasons: different systems of data collecting, processing, quality assessment, time consuming procedures
- Growing awareness about multidimensional nature of quality of FADN data/systems (recently, Bradley and Hill, 2015, Ex. Court of Auditors, 2016)
- At EU level very detailed and harmonized activities regarding:
  - accuracy and reliability (data quality checks – raw data, aggregate data, sample)
  - timeliness and punctuality (determined by legislation)
  - accessibility, and clarity (more quick info, periodic publications)
- Problem: ‘aggregate’ approach (‘aggregate’ categories, important countries, regions, sectors, maintenance of averages/order of magnitude between years...)

FADN data quality management (Slovenian FADN network)

- At national level no official plan of quality management of FADN data
- Top priority: timeliness to fulfill EC obligations; regarding the data controls: the same system as EC – adopting the ‘aggregate’ approach can be a problem!
- With current staff at the ministry (LAO): more proactivity regarding the improvement of data quality and quality assessment by other components, coordinated efforts within the network, better communication:
  - Accuracy and reliability: interinstitutional co-operation regarding data quality checks and data validation
  - Commitment to quality: national FADN commission meeting 1x/year
  - Adequacy of resources: stability of resources – multianual contract with accounting office
  - Timeliness and punctuality, accessibility and clarity: feedback to farms somewhat upgraded and delivered faster
- Cost effectiveness: non-excessive burden on respondents: Agriculture act (low) now enables interoperability of FADN database with some admin. databases

Approach used

- First stage of project: selected components – most problematic for Slovenian FADN or the ones for which assessment was possible within the project capacity: commitment to quality, adequacy of resources, relevance, timeliness and punctuality, accessibility and clarity, non-excessive burden on respondents and cost effectiveness
- Second stage of project: accuracy and reliability sound methodology and appropriate statistical procedures; update of others if needed
- Analysis by selected components principle (description of component adapted to FADN SLO): indicators, current state of FADN in Slovenia, recommendations
- Data used: literature, interviews/talks, SR FADN 2007-13, best practices (other MS)

Interviews

- Semi-structured interviews: questionnaires; some questions closed (Likert scale): 2015
- Interviewees: farms, advisers, FADN coordinators (focus group), 2 accounting offices
- Farms mixture of ‘pure’ FADN sample farms and ‘RDP’ farms from two regions
- Advisers: one region
- Small sample, not representative – generalizations of findings not recommended!
- Nevertheless, very valuable insights
- Results presented as frequencies

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<th>Interviewees</th>
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<td>Agricultural holdings:</td>
<td>15</td>
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<tr>
<td>– Included in FADN sample (not necessarily all)</td>
<td>10</td>
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<tr>
<td>– Excluded from analysis</td>
<td>5</td>
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<tr>
<td>Agricultural holdings analyzed</td>
<td>15</td>
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<tr>
<td>Other interviewees (advisers, FADN coordinators, accounting offices):</td>
<td>13</td>
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<tr>
<td>– Excluded from analysis</td>
<td>1</td>
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<td>Other interviewees analyzed</td>
<td>12</td>
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<tr>
<td>Interviewees: total</td>
<td>26</td>
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<tr>
<td>Interviewees analyzed: total</td>
<td>33</td>
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Commitment to quality

"Slovenian FAOIN network is committed to quality of data and processes. Strengths and weaknesses are systematically and regularly identified to continuously improve the quality of FAOIN data for Slovenia."

(Adapted 4th principle of European Statistics Code of Practice, 2012)

Selected indicators:
- Quality policy is defined and made available to the public.
- Procedures for establishing, plan and monitor quality of thematic (output) production process.
- Data quality is regularly monitored, assessed with regard to possible trade-offs and reported.
- Key results (outputs) regularly and thoroughly reviewed.

Current state:
- No (total) data quality management regarding FAOIN
- Insufficient commitment of key stakeholders in network (conflicting purposes of FAOIN in practice, path dependency, avoiding responsibility, uncertain use of results)
- Almost entirely about fulfilling EU commitments, some improvements recently

Key recommendation:
- National consensus about data quality management (defining key principles to follow declaration, main stakeholders, divide responsibility)

Adequacy of resources

"The human, financial and IT resources available to the Slovenian FAOIN network are sufficient in volume and quality."

(Adapted 5th principle of European Statistics Code of Practice, 2012)

Selected indicators:
- Resources adequate in magnitude and in quality, are available to meet the key data needs.
- Scope, detail and costs of producing the data are commensurate with data needs.
- Procedures are established to assess the need for collecting new data or discontinuing collecting the existing data.

Current state:
- Problem of scatteredness of HR resources, esp. for extension service (200 advisors in FAOIN; most max. 15% time engaged in FAOIN related activities); negative consequences!
- Improvements: more productivity, co-operation

Key recommendation:
- Reorganization: increase specialization and HR stability (tasks reassignment, reorganization of institutions)

Adequacy of resources: survey results

Opinions of the focus group about evaluation of farm advisors for FAOIN-related activities (n=7)

Opinions about the progress of Slovenian FAOIN network in recent years

Wageningen Economic Research Report 2017-009

128
Relevance

"FAO data for Slovenia meet the needs of key users in the country."
(Adapted 15th principle of European Statistics Code of Practice, 2011)

Selected indicators:
- Processes are established to consult key users, e.g., about their priority or new data needs.
- Priority data needs are being met and reflected in the work programme.
- User satisfaction is regularly and systematically monitored.
- Main purposes of FADN declared in paper, but in practice unstructured and too modestly implemented.
- Conflicting purposes, path dependency – influences relevance and the range of use of the FADN results.
- Interview results: weak understanding of FADN database content, usability and potentials.

Key recommendation:
- To explicitly define key users and their main data needs; adapt the activities and organization of Slovenian FADN system to them (e.g., sampling, use system for pure FADN sample farms and RDP farms).

Relevance: survey results

Timeliness and punctuality

"FAO data for Slovenia are released timely and punctually."
(Adapted 15th principle of European Statistics Code of Practice, 2011)

Selected indicators:
- European and other international release standards are taken into account.
- Time for the dissemination of data is made public, divergence is published in advance & explained.
- User requirements are taken into account as much as possible (publication periodicity).
- Preliminary results can be released when considered useful.
- No time schedule for dissemination, but legislative deadlines respected.
- Punctuality can’t be determined (no time schedule, scarce periodic publications).
- Timeliness: data too late for decision-making (12-24 months after end of accounting year).
- Improvement: FADN feedback results to farms quicker.

Key recommendation:
- Further automaticization, digital by default, database pooling & exchange, speeding up or abolishing administrative procedures.

Knežek Iztirin Slovenia
Timeliness and punctuality: survey results

Accessibility and clarity

"FAOM data for Slovenians presented in a clear and understandable way and easily accessible to key users in the country" (Adapted 13th principle of European Statistics Code of Practice; 2011)

Selected indicators:
- (Data) data presented in form that enables appropriate interpretation and comparison
- Modern ICT used in dissemination, hard copy (paper) only if necessary
- Possibility of custom designed analyses of FAOM data
- Access to microdata allowed (privacy respected)
- Users are informed about methodology, uses, quality of FAOM data

Current state:
- Accessibility and clarity traditionally the most problematic quality components
- FAOM results, information: too scarce, weak public presence, not very interesting output

Key recommendation:
- Accessibility: "digital by default" for respondents and users of FAOM data
- Simplify access to FAOM data (privacy respected)
- Clarity: "simplification and personalization" (easy, quick, efficient, personalized)

Accessibility and clarity: survey results
Non-excessive burden on respondents

The reporting burden of Slovenian FAaN agricultural holdings is not excessive and is proportionate to the needs of the key users in the country. (Adapted 9th principle of EU Statistics Code of Practice, 2011)

Selected indicators:
- Use of administrative and other data, electronic means
- Data sharing among all parts of the FAaN network
- Specific measures, enabling linking of data sources in order to reduce reporting burden

Current state:
- Improvement in last years: option for electronic/online data entry
- Enabling better interoperability and data exchange of FAaN with other databases: still limited; data exchange still happens only at the last stage
- Data sharing happens, but weak

Key recommendations:
- ‘Once only’: some information can be collected only once from the respondents, but to be used many times
- ‘Digital by default’ for respondents

Cost effectiveness

Resources in the Slovenian FAaN are used effectively. (Adapted 10th principle of EU Statistics Code of Practice, 2011)

Selected indicators:
- Processes of data collection, processing and dissemination are optimized with the help of information and communications technology
- Proactive efforts are made to improve the usability of the data

Current state:
- Slovenian FAaN relatively cost effective (previous studies), but too little benefits from the data for both respondents and key data users
- Improvements in last years (both indicators/software FAaN evidence), proactive and frequently coordinated activities of ministry and advisory service (e.g. regarding the increasing usability/use of FAaN data)

Key recommendation:
- ‘Digital by default’ for data entry and dissemination of results
- Review necessity of paying fee to farms (pure FAaN sample farms) to participate in FAaN

Conclusions

- Main challenges of Slovenian FAaN system:
  - Path dependent scope and scatteredness of the resources, especially human
  - Key users and their data needs not explicitly defined
  - Accessibility and clarity too weak for (key) users
  - FAaN results too late for decision making
- Some improvement with current staff at ministry; co-operation in the network; planning and bigger proactivity at other quality components (not only timeliness and punctuality)
- Based on first stage results it is not possible to argue anymore, that quality management of FAaN data for Slovenia is limited only to fulfilling EC obligations
- National consensus of key stakeholders - catalyst for significant improvement of quality of FAaN data for Slovenia!
Key mid-term recommendations – first stage of study

- Forming national consensus about key users, their key data needs and uses
- Increase specialization of staff engaged in FADN: reorganization of tasks and institutions
- „Digital by default“: electronic and online ways to enter & control, process and disseminate the data, further automation
- Strengthen and improve quality of dissemination of FADN results and FADN related education (esp. for advisers), simplification and personalization (feedback for farmers: easy, quick, efficient, personalized)
- „Once only“: increase level of database interoperability and data exchange, shorten/eliminate the administrative procedures
- More efficient use of the existing resources and infrastructure in the Slovenian FADN network!

Limitations and recommendations for further research

- Key limitation of interviews: small, unrepresentative sample – problem of generalizing findings
- Questionnaires to be upgraded
- Nevertheless, results say a lot: interviewees from all parts of Slovenian FADN network especially valuable was the insight into thinking of FADN coordinators
- Second stage of the project – plan to analyze following quality components: accessibility and clarity (economic counseling to farmers)
  - accuracy and reliability, sound methodology and appropriate statistical procedures (cross-checking of FADN data with other databases, models)
  - relevance (support to policy making, identify data needs of advisers and farms)

Thank you for your attention!
maja.kozar@kis.si
9.3 US farm household income volatility

Daniel Prager

Farm Household Income Volatility: Assessing Risk in Farming using Panel Data from a National Survey

24th annual Pacioli Workshop
Pristina, Kosovo

Nigel Key, Daniel Prager, and Christopher Burns
Economic Research Service, USDA

The views expressed are those of the authors and should not be attributed to the Economic Research Service or USDA

Why Is Farm Household Income Volatile?

- Farm household income = farm income + off-farm income
  - Farm income is share of farm-related income that accrues to principal operator household (can be negative)
  - Off-farm income includes off-farm wages and salaries, other business income, capital gains, and transfers to the household

- Many farm households face greater income risk than non-farm households:
  - Fluctuations in yields, prices, land rents, Input prices (business risk)
  - Rare events such as disease, blight, droughts, flooding (production risk)
  - Changes in government policies
  - Changes in the non-farm economy (e.g. recessions, local labor market conditions)

Lack of Longitudinal Data on U.S. Farm Households

- There is panel data available to measure volatility of non-farm households
  - Panel Study on Income Dynamics (PSID)
  - Current Population Survey (CPS)

- But, a lack of consistent panel data on farm households
  - Agricultural Resource Management Survey is conducted each year (since 1996) and gives data on a variety of farm household characteristics
    - Jointly administered by NASS and ERS
    - Survey is nationally representative, but cross-sectional
Sampling ARMS respondents

- ARMS administered in three phases
  - Phase I: initial screen for eligible farms
  - Phase II: field-level (production practices, resource and input usage)
  - Phase III: farm-level (farm finances, operator/household demographics and finances)
- ARMS has a stratified random sampling design
  - Selection probabilities vary by region and commodity type
  - Larger farms are oversampled in each year
    - More likely to be sampled again over time
  - Population estimates generated with sampling weights

Linking farms through time in ARMS

- NASS identifies farms based on the principal operator
  - Person who makes the managerial decisions on farm
- Each principal operator is given an ID, which does not change over time
  - (POID) Person-operation identification
- For this study, we match on POID and link farm operators (and their operations) over time
  - Unbalanced panel with 27,515 year-pairs
    - No sampling weights used in analysis
    - Because larger farms appear more often in panel, our data is representative of U.S. commercial farms (i.e. Total sales > $350,000)

POIDs that are observed at least twice

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- 450 488 875 1,079 1,139 1,020 1,326 1,608 1,556 1,777 2,844 8,328 1,145 44 27,313
How to Measure Income Volatility?

- Measuring farm household income volatility is difficult because of negative income values.

One measure of income volatility:
- Absolute Coefficient of Variation (ACV)
  - lower limit of 0, unbounded above

\[
ACV_{it} = \frac{\sqrt{\sum (y_{it} - \bar{y}_t)^2}}{\bar{y}_t}
\]

Where \( \bar{y}_t = 0.5 \times (y_{it} + y_{it-1}) \)

Crop Farms Have Higher Household Income Volatility

<table>
<thead>
<tr>
<th>Farm Income</th>
<th>All farms</th>
<th>Livestock</th>
<th>Crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>$48,052</td>
<td>$35,588</td>
<td>$71,213</td>
</tr>
<tr>
<td>Median absolute change between years</td>
<td>$86,402</td>
<td>$63,765</td>
<td>$123,903</td>
</tr>
<tr>
<td>Share negative in at least one year</td>
<td>0.46</td>
<td>0.49</td>
<td>0.44</td>
</tr>
<tr>
<td>Share negative in both years</td>
<td>0.14</td>
<td>0.15</td>
<td>0.11</td>
</tr>
<tr>
<td>Mean ACV</td>
<td>1.35</td>
<td>1.37</td>
<td>1.95</td>
</tr>
</tbody>
</table>

Off-farm income

| Median                | $33,037   | $31,204   | $34,647 |
| Median absolute change between years | $16,293 | $15,149 | $18,341 |
| Mean ACV              | 0.67      | 0.67      | 0.67    |

Total household income

| Median                | $98,803   | $83,742   | $125,276 |
| Median absolute change between years | $102,935 | $71,470 | $138,021 |
| Share negative in at least one year | 0.26 | 0.25 | 0.28 |
| Share negative in both years | 0.04 | 0.03 | 0.04 |
| Mean ACV              | 1.00      | 1.03      | 1.10    |

Source: 1996-2014 ARMS panel

Farm household income, farm income, and off-farm income volatility have declined
Regression Analysis

What factors are associated with farm household income volatility?

- Estimation Equation:
  \[ y_{it} = a + X_1 \beta + X_2 \gamma + Year_t + State_t + \epsilon_{it} \]

- \( X_1 \) – farm, operator, and household characteristics
- \( X_2 \) – unbalanced panel data controls
  - E.g., the number of times a farm appears in the dataset and the distance between observations

### Regression results (selected variables)

<table>
<thead>
<tr>
<th></th>
<th>Total Household Income</th>
<th>Farm Income</th>
<th>Off-farm Income</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mid-year</strong></td>
<td>-0.086***</td>
<td>-0.009**</td>
<td>-0.016***</td>
</tr>
<tr>
<td><strong>Year span</strong></td>
<td>0.025***</td>
<td>0.003***</td>
<td>0.003***</td>
</tr>
<tr>
<td><strong>Assets $700k-1.5M</strong></td>
<td>0.213***</td>
<td>0.008***</td>
<td>0.007***</td>
</tr>
<tr>
<td><strong>Assets $1.5M-3.0M</strong></td>
<td>0.752***</td>
<td>0.116***</td>
<td>0.184***</td>
</tr>
<tr>
<td><strong>Assets $3.0M+</strong></td>
<td>0.466***</td>
<td>0.110***</td>
<td>0.322***</td>
</tr>
<tr>
<td><strong>Operator Education: High-school</strong></td>
<td>-0.122***</td>
<td>-0.029***</td>
<td>-0.116***</td>
</tr>
<tr>
<td><strong>Operator Education: Some-college</strong></td>
<td>-0.120***</td>
<td>-0.053</td>
<td>-0.200***</td>
</tr>
<tr>
<td><strong>Operator Education: College or more</strong></td>
<td>-0.213***</td>
<td>-0.314***</td>
<td>-0.317***</td>
</tr>
<tr>
<td><strong>Primary occupation: farmer</strong></td>
<td>0.496***</td>
<td>0.030</td>
<td>0.459***</td>
</tr>
<tr>
<td><strong>Operator Age: 65+</strong></td>
<td>0.040*</td>
<td>0.109***</td>
<td>0.200***</td>
</tr>
<tr>
<td><strong>Operator Married: Bothyears</strong></td>
<td>-0.269***</td>
<td>-0.055</td>
<td>-0.388***</td>
</tr>
<tr>
<td><strong>Unemployment Rate</strong></td>
<td>0.030**</td>
<td>0.002</td>
<td>0.002</td>
</tr>
</tbody>
</table>

*Note: State clustered standard errors (*** p<0.01, ** p<0.05, * p<0.1)*

### Findings

- **Farm households have volatile income**
  - Fluctuations in farm income is primary driver of volatility
  - Off-farm income less volatile
- **Regression results show a secular decrease in household, farm, and off-farm income volatility**
  - Larger farms (assets) and crop farms have more volatile income
  - More educated operators and older operators have lower income volatility (household, farm and off-farm)
  - Married operators have lower household and off-farm income volatility
  - Local labor market conditions affect ability to smooth household income volatility
Thank you!

Questions?

My contact info:
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+01 202 694 5329
The mission of Wageningen University and Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 10,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.
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Hans C.J. Vrolijk (ed.)