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PACIOLI 11
New roads for farm accounting and FADN

Krijn J. Poppe (ed.)

Project code 63492

January 2004

Report 8.04.01

Agricultural Economics Research Institute (LEI), The Hague

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- ☐ Chains
- ☐ Policy
- ☐ Institutions, people and perceptions
- ☑ Models and data

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The Pacioli network explores the needs for and feasibility of innovation in farm accounting and its consequences for data gathering for policy analysis in Farm Accountancy Data Networks (FADNs). PACIOLI-11 was held in Przysick (Poland), in October 2003. This workshop report presents the papers. In the 11th Pacioli workshop special attention was given to a number household income issues, using micro data. Other topics include the CAP-Mid Term Review, farm specialisation, software development, and productivity analysis. In addition results of the workgroup sessions are reported.

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Contents

		Page
Preface		9
1.	**Introduction**	11
1.1	The Pacioli network	11
1.2	Theme of PACIOLI-11	11
1.3	Programme PACIOLI-11	12
2.	**OECD information needs and indicators on farm income and household income**	16
Workgroup Session 1: 'Concepts of farm and household'		33
3.	**Value Added, work choices, and the measurement of income for U.S. farm households**	42
4.	**A review of the collection of Farm Household Income Data in Ireland**	53
4.1	Background	53
4.2	What is Farm Household Income?	54
4.3	Current farm household data sources in Ireland	55
4.4	Summary	60
5.	**Gathering data on household income in Norway**	64
5.1	The farm business Survey (FBS)	64
5.2	Household income presented from NILF	64
5.3	Data sources	65
5.3.1	Data from tax accounts	65
5.3.2	Administrative data	65
5.3.3	Data from farmers	66
5.4	Composition and development household income in Norway during the last 20 years	66
5.4.1	Composition of household income in Norway	66
5.4.2	Resultas total net income in Norway 1992-2001	67
5.4.3	Collecting data on household income in FBS in the future	67
Workgroup Session 2: 'How to collect household income data'		69

Page

6. Impacts of the Mid-Term Review on German agriculture requirements for experience with farm modelling based on FADN 74
6.1 Introduction 74
6.2 Modulation of direct payments 75
6.3 Impacts of the final decisions of MTR 77
6.3.1 Impacts on land use and crop production 78
6.3.2 Livestock production 80
6.3.3 Impacts on direct payments and income 81
6.4 National arrangements of direct payments 83
6.4.1 Partial de-coupling of headage premiums 83
6.4.2 Regional implementation of de-coupling 85
6.5 Summary and conclusions 87

Workgroup Session 3: 'Who gets the support?' 89

7. Implementation of the Farm Monitoring System in Macedonia 96
7.1 Introduction 96
7.2 Implementation of the FMS 98
7.3 Importance of the network information system 98
7.4 Organization 99
7.5 Methods of collecting and processing data 100
7.5.1 Advantages of the implemented Information system 101
7.5.2 Disadvantages of the implemtend Information system 102
7.6 Results 102
7.7 Conclusions from implementation of the FMS 103

8. Product concentration and farm specialisation in Spain after implementation of the CAP and its Reform 105
8.1 Introduction 105
8.2 Data Description 107
8.2.1 The Data Set 107
8.2.2 Crop Concentration by Large Agrarian Regions 108
8.2.3 Farm Concentration by Large Agrarian Regions 110
8.2.4 Crop Specialisation by Large Agrarian Regions 111
8.3 The decomposition of farm specialisation into regional and within regional specialisation 112
8.4 Concluding remarks 114

9. Farm Income and Income From Farming: Towards an Integration of Datasources 122
9.1 Introduction and problem statement 122
9.1.1 Objective 122
9.1.2 Structure of the paper 123

Page

9.2 The FADN date 123
9.2.1 History 123
9.2.2 Contents 123
9.2.3 Limitations of FADN 123
9.3 Luxemburg income studies 124
9.3.1 History 124
9.3.2 Content of the database 125
9.3.3 Organisational framework and management structure 125
9.3.4 Who collects and stores the data? 125
9.3.5 Who manages the central database? 125
9.3.6 What kind of research is done on this database 126
9.4 Case of Hungary - TARKI Household Monitor Survey 126
9.4.1 Income data 126
9.4.2 The variables of the HMS 127
9.4.3 Weighting 128
9.5 Comparison of datasources 128
9.6 Opportunities for cooperation and integration 128
9.6.1 Connecting databases 129
9.6.2 Ratio estimation 129
9.6.3 Datafusion and data integration 130
9.7 Summary and discussion 130

Workgroup Session 4: 'Wealth Issues and Organisational aspects' 133

10. Efficiency and Productivity of Finnish FADN Farms for 1989-2000 138
10.1 Introduction 138
10.2 Data 139
10.3 Method 140
10.4 Efficiency, productivity and profitability and their relation to farm size 142
10.4.1 Dairy farms 142
10.4.2 Cereal farms 145
10.4.3 Economies of size and managerial ability 148
10.5 Conclusions 148

11. The role of non-farm Income and cash flows in the analysis of structural change in agriculture 150
11.1 Can family farm income explain structural change? 150
11.2 Cash flow on household level give an answer 151

12. STARS: Statistics for Regional Studies 154
12.1 Introduction and problem statement 154
12.2 Description of data imputation 154
12.3 Estimating regional results of dairy farmers: an example 158

Page

12.4 Validation of the procedure 160
12.5 Summary and discussion 162

How to arrange the follow-up 165

Appendix
1. List of participants 167

Preface

Recent developments in agricultural policy have effects on tools to monitor income development at the micro level. This not only relates to farm income but also to household income. FADNs have attractive characteristics to fulfil this domain. To exchange experiences in this domain the Pacioli-group organised a workshop on this topic. This small and open network has become a breeding place for ideas and innovations and projects.

This report is one of the more lasting results of the 11th workshop, held in October 2003 in Przysiek (near Torun), Poland. It was the second time the workshop was organised in one of the EU's new member states.

We are indebted to Lech Goraj, our Polish colleague, for the local organisation. We also thank the staff of the local extension centre. Colinda Vogelaar-Teeuwen and Karlijn Krijgsman helped to prepare the workshop from the Netherlands.

We are also thankful for the input in this workshop by the OECD and their invitation to follow this up with a policy seminar in 2004 in Paris, connected to a PACIOLI-12 meeting. Since our Norwegian colleagues also invited us for a future meeting, the Pacioli-network looks to be alive and kicking.

The managing director

Prof. Dr. L.C. Zachariasse
Director General LEI B.V.

1. Introduction

1.1 The Pacioli-network

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 that 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, feed back is fostered.

It is with this background that the Pacioli-network organises every year a workshop. 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.

1.2 Theme of PACIOLI-11

FADNs are excellent tools to monitor income development at the micro level. With the reform of the Common Agriculture Policy (CAP) in the enlarged European Union, FADNs face an important task to make the agricultural policy more efficient and relevant. Next years many farmers will receive direct payments, decoupled from production. This will lead to more freedom in production decisions, probably more heterogeneity in farm systems and sources of household income, and to decisions to cap payments for the largest farms. It is also likely that policy makers and the society at large will more often question the efficiency of this policy: why should large farms get large amounts of money, why do they benefit from an extra safety net? It is most likely that FADN data will play a vital role in such discussions. We expect that these discussions will quickly raise questions on household and personal income (and even wealth), and in comparison to other persons in the economy. That will lead to a request for new data (on non-farm and household income for example) and new indicators.

This is not only a challenge for the FADNs in the EU, including the new established FADNs in central and eastern Europe. It is an issue that is also important in other OECD countries. Workshops and meetings organised by the USDA-ERS, Penn State University and Wye College in Wye College (April 2002) and by the OECD in Paris (Spring 2003) made this clear. More information on this topic is given in the introduction paper by Catherine Morredu (chapter 2).

In collaboration with the OECD we therefore decided to choose this issue as a central theme in PACIOLI-11. Some of the participants have been asked in advance to write a contribution on this topic. Others send in papers on this topic on their own initiative.

Being a workshop, we have the good tradition in Pacioli to have a number of interactive sessions in which we exchange ideas, learn more of each other interests and look for joint work. Around the theme of income support and household income we have designed four workgroup sessions:

- concepts for farms and households;
- how to collect household data?;
- who gets the income support?;
- wealth issues.

We hope that in the end this leads to four scientific papers, to be written after PACIOLI-11. At the end of the workshop we will discuss the feasibility of this. In case papers will be written, the OECD will consider to organise a meeting in Paris with the authors and an international forum to discuss the papers.

1.3 Programme PACIOLI-11

Location:

Sunday, 5 October 2003

18:00 Departure from Warsaw Airport to Przysiek

21:30 Arrival and registration at Daglezja Hotel

22:00 Dinner

23:00 Departure from Bydgoszcz Airport to Przysiek

Monday, 6 October 2003

08:00 Breakfast

09:00 Welcome and Introduction

Plenary Session I
09:45 *'FADN Poland'*
Lech Goraj, Institute for Agricultural and Food Economics

10:15	*'OECD information needs and indicators on farm income and household income'* Catherine Moreddu, OECD
10:45	Break
11:15	Workgroup Session 1 Concepts for farm and household
12:30	Lunch
	Plenary Session II
13:30	*'Value Added, Work Choices and the Measurement of Income for U.S. Farm Households'* Ashok Mishra, Economic Research Service (USDA)
14:00	*'Datacollection household income Ireland'* Anne Kinsella, Teagasc
14:30	*'Gathering data on household income in Norway'* Torbjorn Haukås, Norwegian Agricultural Economics Research Institute
15:00	Break
15:30	Workgroup Session 2 How to collect household income data
	Plenary Session III
16:30	*'Impacts of the Mid-Term Review on German agriculture requirements for experience with farm modelling'* Werner Kleinhanss, Federal Agricultural Research Centre
17:00	*'Income trends in the EU'* Hans Vrolijk, LEI
18:00	Dinner
19:30	Excursion to Planetarium, Torun

Tuesday, 7 October 2003

07:30 Breakfast

08:30 Excursion
Visit to the Farm STABROL in Stablewice and a tour on the Rural area near Torum

14:00 Workgroup Session 3
Who gets the support

Plenary Session IV
15:00 *'Implementation of the Farm Monitoring System in Macedonia'*
Kostov Mitko, Macedonian National Extension Agency

15:30 *Product concentration and farm specialisation in Spain after implementation of the CAP and its reform'*
Carlos San Juan , Universidad Carlos III de Madrid

16:00 *'Farm income and income from farming: Towards an Integration of Datasources'*
Ildiko Nagy, Social Research Informatic Centre

16:30 Snack

17:00 Workgroup Session 4
Wealth Issues

Plenary Session V
18:00 *'Efficiency and Productivity of Finnish FADN farms for 1989-2000'*
Timo Sipiläinen, MTT Economic Research

18:30 *'The role of non-farm income and cash flows in the analysis of structural change in agriculture'*
Beat Meier, FAT

20:00 Dinner with special reception, folk band with dancers performance, video movie 'Poland Invites you'

Wednesday, 8 October 2003

07:30	Breakfast
08:30	Plenary Session VI *'STARS'* Hans Vrolijk, LEI
09:00	*'The next steps in income studies and the role of OECD'* Ken Ash, OECD
09:30	Break
10:00	How to arrange the follow-up
11.15	Questions and answers session
11:45	Information on PACIOLI-12/Closing
12:00	Lunch
13:00	Travel to the airport

2. OECD information needs and indicators on farm income and household income

Catherine Moreddu, OECD-France

ORGANISATION DE COOPÉRATION ET DE DEVELOPMENT ÉCONOMIQUES

OECD OCDE

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Information needs in policy analysis: the OECD analysis of farm household income

Catherine Moreddu

Directorate for food, agriculture and fisheries

Pacioli Workshop XI, 6-8 October 2003

Directorate for Food, Agriculture, and Fisheries 1

The OECD analysis on farm household income issues:

- Describes income objectives in OECD countries
- Reviews the income situation of farm households in OECD countries for which data is available
- Evaluates the impact of policies on farm household income
- Assesses the effectiveness and cost-efficiency of current policies in meeting income objectives
- Suggests more effective and equitable solutions

In most OECD countries, income objectives are still prominent, but almost never clearly stated or quantified

It is important to be able to measure progress

- Need for measurable criteria in income objectives
- Need for flexible data collection

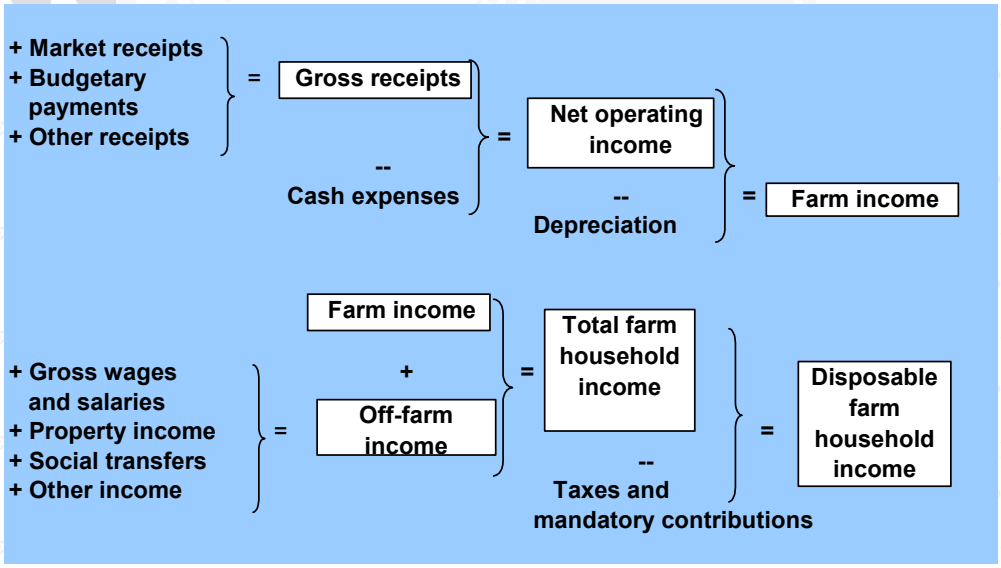
Information needs

- Indicators of the income situation of farm households:
- Impact of policies on farm household income

Choice of indicators to measure progress towards the objectives

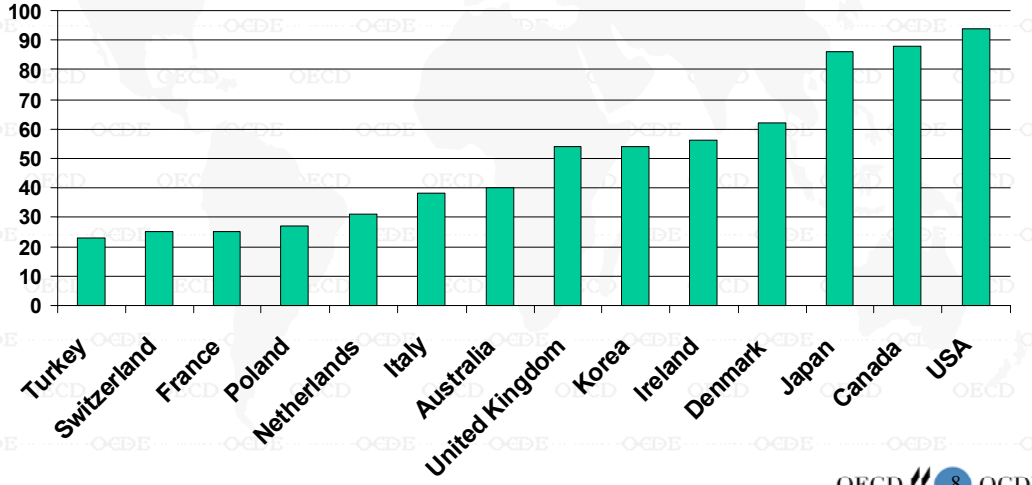
- Financial situation: income and wealth
- Income indicator: farm household income
- Sources of data
- Definition of farm households
- Timeliness

Income composition



Farm households derive a significant share of their income from non-farm sources

% share of non-farm income in total farm household income



Information on the income situation of farm households

- average level and composition of farm household income
- comparison with other households (e.g. IAHS)
- Individual level data to evaluate the incidence of low income (LIS)
- time series to measure income variability
- information by farm size, type and region to measure disparities and distribution

Impact of policies on farm household income

- Estimation of support: PSE
- Share of support: PSE as a % of farm receipts
- Share of social transfers in total income
- Share of taxes in disposable income

What are we looking for?

- Aggregated data (composition and comparison)
- Individual farm account data +
- Additional structural information +
- Information on wealth +
- Similar information for the off-farm component of the household

Income comparison

- Income of the agricultural households sector (EUROSTAT)
  - Aggregate picture of the total and disposable income of farm households
  - Narrow definition
  - Comparable information

Structural Indicators Project

- Farm account data + household component
- Quartiles based on gross sales
- National surveys and definitions
- Definition as broad as possible

Data quality and availability

- Incomplete coverage of the sector
- Incomplete and more or less detailed variables
- Different definitions of farm types
- Different sources of information
- Problems with accessibility

→ Data not comparable across countries

As a result

- Country comparison is very difficult
- Data and results have to be documented
- Interpretation has to be careful
- Improvements can and should be made

Lessons

- Countries' agricultural structures and structural data are not comparable
- With aggregated data, limited type of analysis and no flexibility -- careful interpretation
- It is easier to obtain data when they are requested for a specific analysis
- When collecting data, think about their use

Challenges

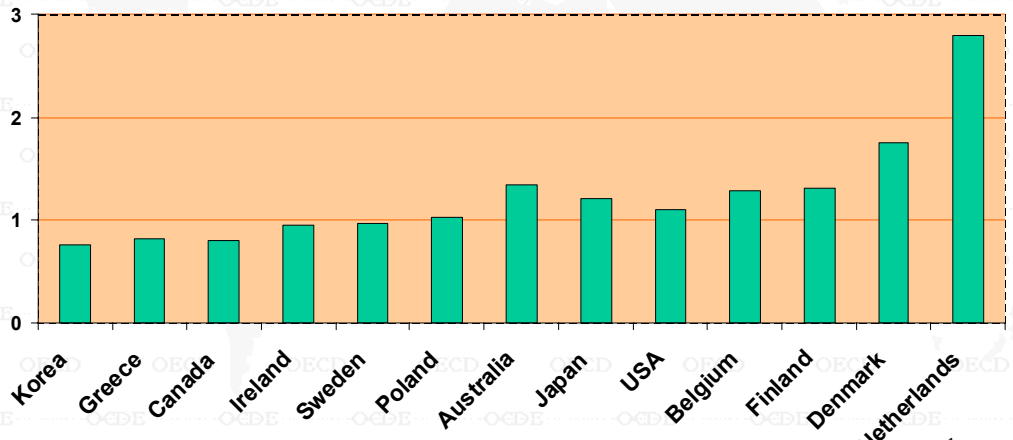
- Improving access to individual data (legal and practical problems)
- Building detailed and flexible systems
- Recognising their importance for policy evaluation
- Increasing political support for building such systems

Results of the OECD analysis

- What is the income situation of farm households?
- What is the impact of agricultural, fiscal and social policies on farm household income?

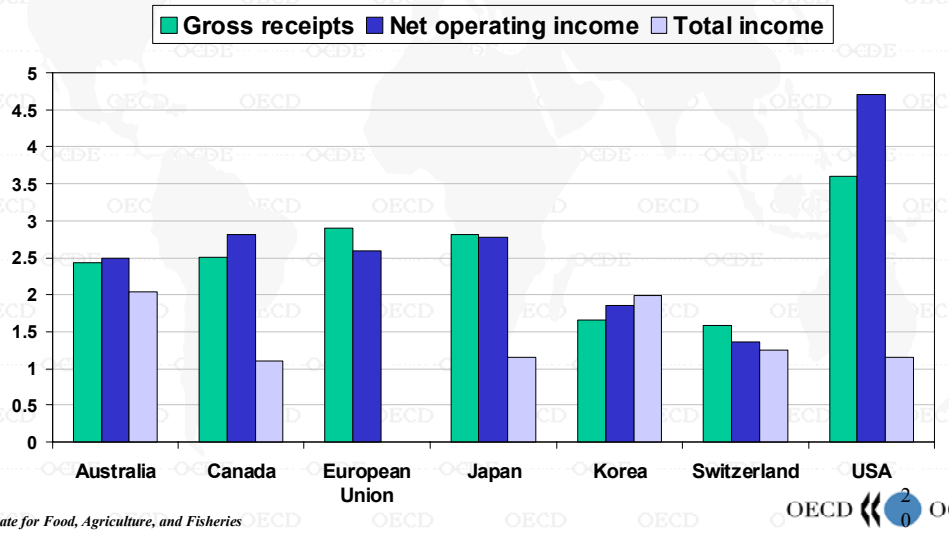
Farm household incomes are, on average, comparable to those in the rest of the economy

Total income of farm households as a ratio of that of all households



Large income disparities by farm size

Average for the 25% largest farms as a % of the average for all farms



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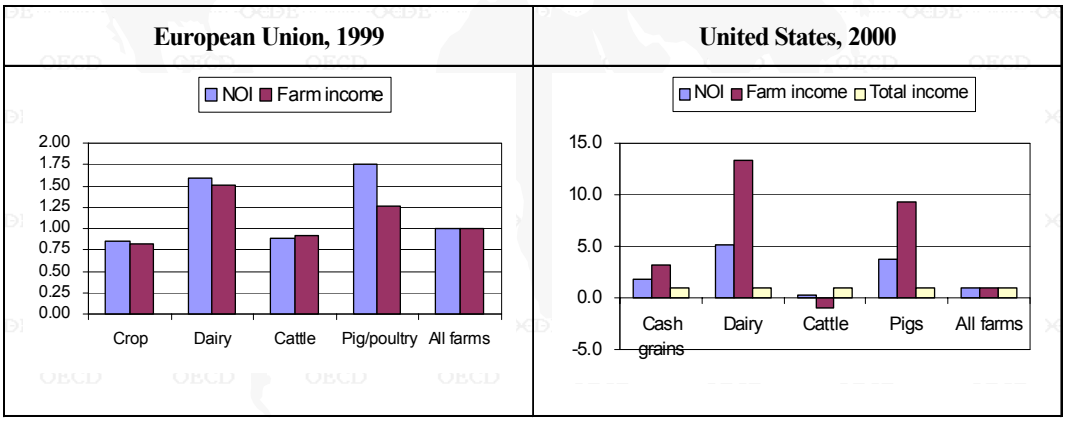
and by farm type

Average of each farm type as a ratio of the average of all farms



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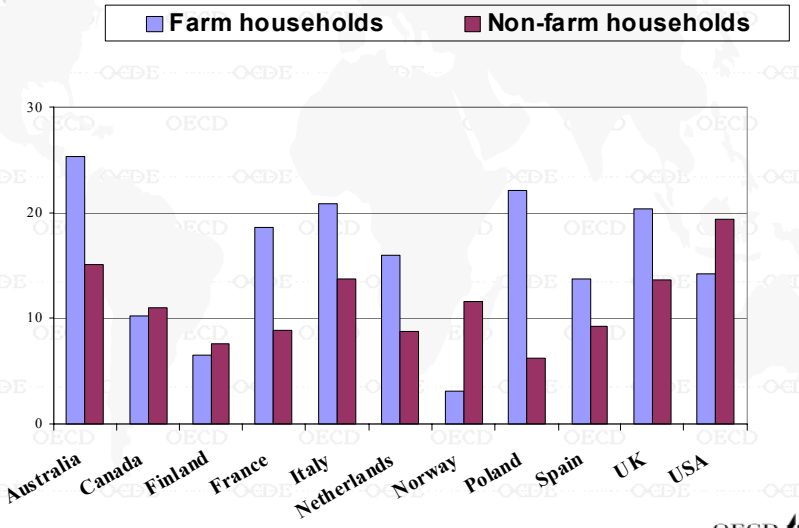
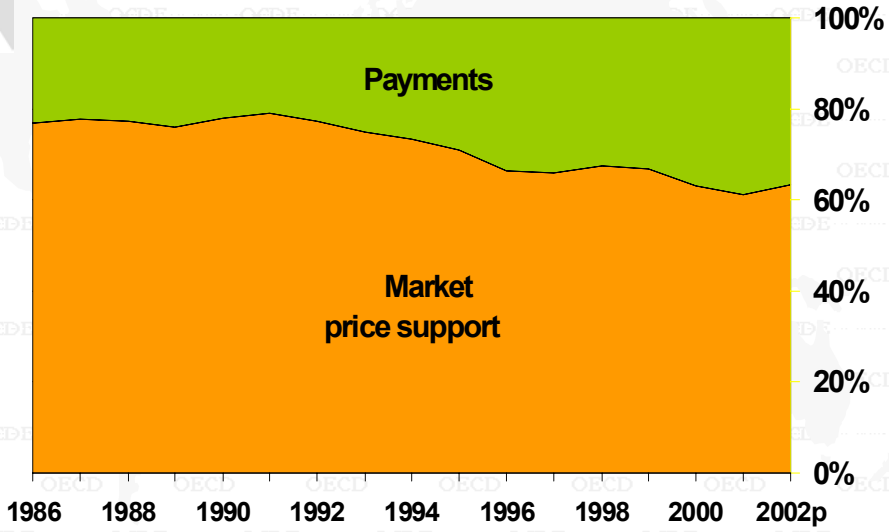
Higher incidence of low incomes among farm households in many countries



Off-farm income reduces variability, disparities and the incidence of low incomes

There are significant levels of support: 31% of farm receipts overall



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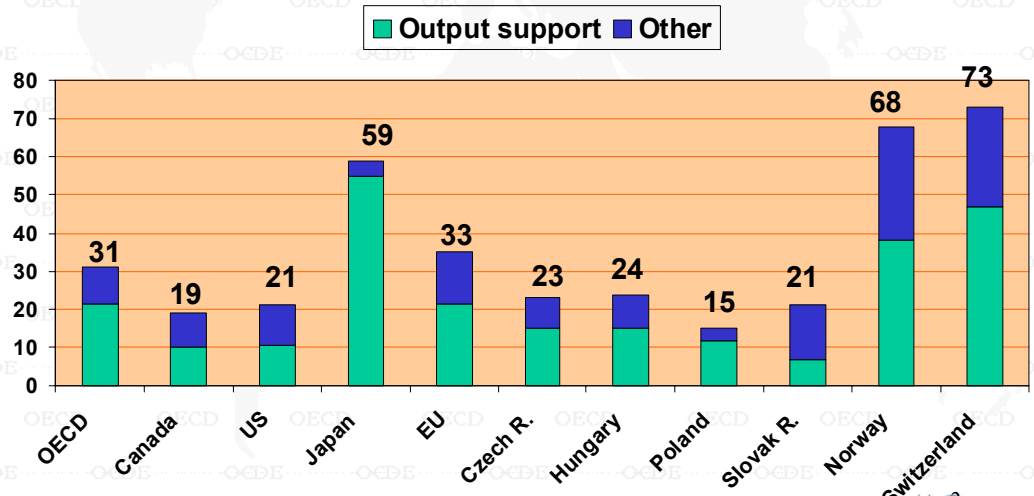
… but the share and composition of support varies by country

% share of the PSE in farm receipts in selected OECD countries, 2000-02



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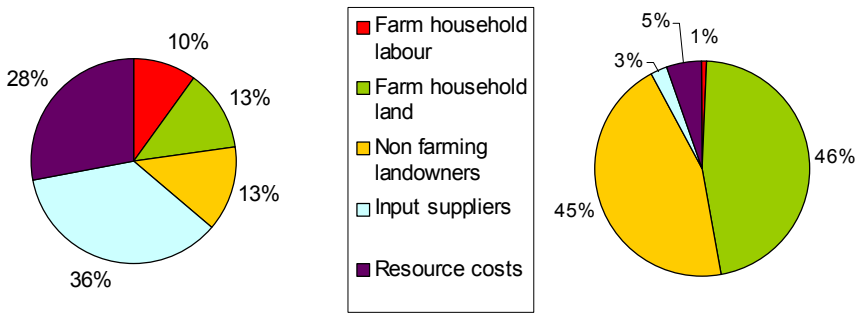
and support has a low transfer efficiency

Where does support go?

Market price support **Area payment**



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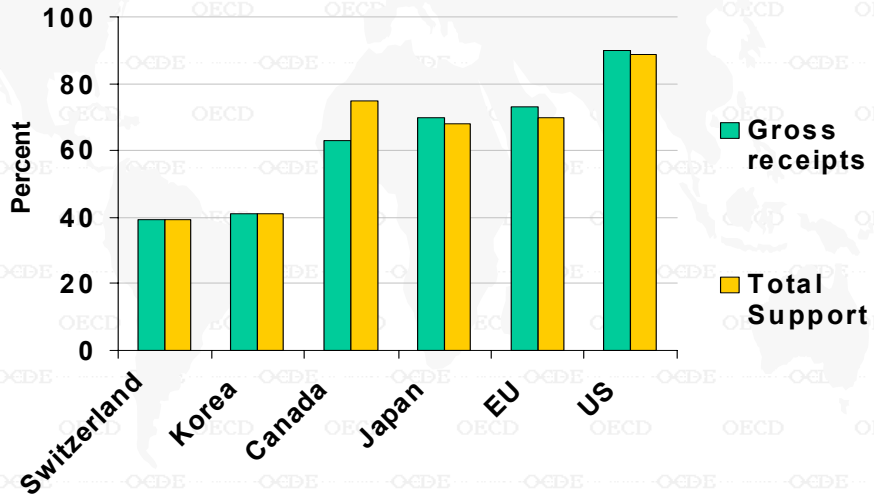
Support is unequally distributed and most goes to larger farms

Share of the 25% largest farms in



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Taxation is lighter on farm households and social transfers improve farm household income

In summary,

- support raises farm household income, and
- reduces revenue variability

but

- It is unequally distributed (most goes to larger farmers),
- has virtually no redistributive impact by farm size,
- often increases income disparities, and
- its efficiency in transferring income to farm households is low

Most support is linked to production levels or input use and does not take account of the income situation

- It is not targeted to low income households
- It is not equitable
- Large amounts are transferred to unintended beneficiaries (rich farmers, input suppliers, non-farming landlords, etc.)
- It has negative international spillover effects

In conclusion, if required, decoupled and targeted payments would be more efficient

To implement such payments, there is a need for clearer criteria and better information on the incidence and causes of financial problems among farm households to find the most efficient solution

The OECD suggests more effective and equitable solutions, to be applied sequentially

1. Develop market solutions for the provision of public goods and for risk management
2. Envisage payments for certain public goods, provide risk management instruments
3. Invest in general services to improve rural infrastructure and off-farm opportunities
4. Use the general tax and social security systems to address remaining income problems

Conclusions

- Without accurate information on the situation in agriculture, problems cannot be identified and efficient remedies cannot be applied
- It is important to collect precise and flexible data to be able to design, monitor and evaluate effective policies

Workgroup Session 1: 'Concepts of farm and household'

Theme

In the first workgroup session we focus on the terms 'farm' (or 'holding'), farmer and household. What do these concepts mean: is a farm with two locations also one farm? Also if they have different activities or are in two countries? What differentiates a farm from a hobby activity? What is a household - does it include the daughter that studies in the city and is only at home in summer (and harvest) time and the weekend? Does a farm has one household?

In PACIOLI-8, organised in 2001 in Hungary, participants in the working sessions dreamed up 10 cases where the concepts are not so clear. To stimulate the discussion they are repeated below:

1. *Trading activities*
   A farm is buying products like ornamental plants, tree nursery products and wine from other farms, to sell them without further processing. Should such activities be included in the financial accounts?
   Attributes: commercial trading activity
2. *Legal partnership to share risks*
   Danish farms producing pigs form a legal partnership to share risks in pig crises. Does such legal partnership change the definition of a farm?
   Attributes: legal structure, partnership
3. *Forestry activities*
   Farms in several countries (Finland, Austria, Sweden, Czech Republic) have a mixed forestry/farming operation. Are farms still an agricultural holding if most of their income comes from forestry?
   Attributes: forestry
4. *One legal unit - 2 farms*
   Two farms, e.g. with arable production and pigs, merge on paper into one legal entity to comply with environmental regulations. In case this is only a legal construction, and desicion making is separated between the two farms, should we then have one or two farms in the FADN?
   Attributes: Legal structure, partnership, quota rights, production licences, allocation to entity, sampling frame
5. *Two legal units - 1 farm: Fiscal/CAP distortion*
   One family farm can be split for tax reasons or to receive quota or premiums into two or three legal units. An example is the Italian dairy farm split into a 'farm' with the cows in the hands of the farmer and a 'farm' owning the buildings and the land in the hands of the mother and son. Another example is the German pig and poultry farm split into two holdings in order to avoid to becoming so large that it is classified as

industrial, and thus loosing attractive options in VAT and income tax regulations. Are these one or two farms in the FADN?
Attributes: Legal structure, partnership, quota rights, production licences, allocation to entity, sampling frame, social security, taxation, subsidies, hygienic standards, rural development.

6. *Non-agricultural/non-food activities*
Some farms have important non-agricultural activities. An example is the Estonian pig farm selling fuel. Or the Hungarian farm making plastic and the construction activities of co-operatives (former Brigades) in the German Neue Bundeslander. Are these farms part of the FADN and how should costs be allocated to farming and non-farming?
7. *Para-agriculture*
Some farms carry out activities that are linked to the farm, by using the resources of the farm of providing services that need a farm a s a basis. Examples from Switzerland are snow ploughing, B&B (Bed and Breakfast), B2B (Back to Basics, programs with manual work for high level Novartis managers). Or the French Eco-museum. Should these activities be included in the FADN and if no, how should costs be separated (e.g. share of income outside, share of use of machinery, specifity of machinery - can it be used in agriculture, share of financing, is the machinery driver the farmer or a paid worker, share of assets non-farm use, share of work allocated to non-farm activities??
Attributes: separability of overheads, identification of para-agriculture
8. *Co-operatives*
Some co-operatives not only provide services to farmers, but have in addition also their own farm activities. Part of the profits of co-operatives is paid out to members, and are in their accounts recorded as income or costs. Is it consistent to include such farms in the FADN?
9. *Food-industry*
Several farms have food producing activities. Cheese is a classic example, but especially in candidate countries, many farms are integrated with slaughterhouses, processing plant etc. Should such activities be separated, and how?
10. *Production integration agreements*
In some production chains (like pigs) farms enter into formal agreements with other farms and/or industry. This raises questions on how to account for such partnerships and how to value internal trade (not always on farm gate prices)?

This was represented in a data model that could store the data in a database that could describe the situation in the farm (figure 1).

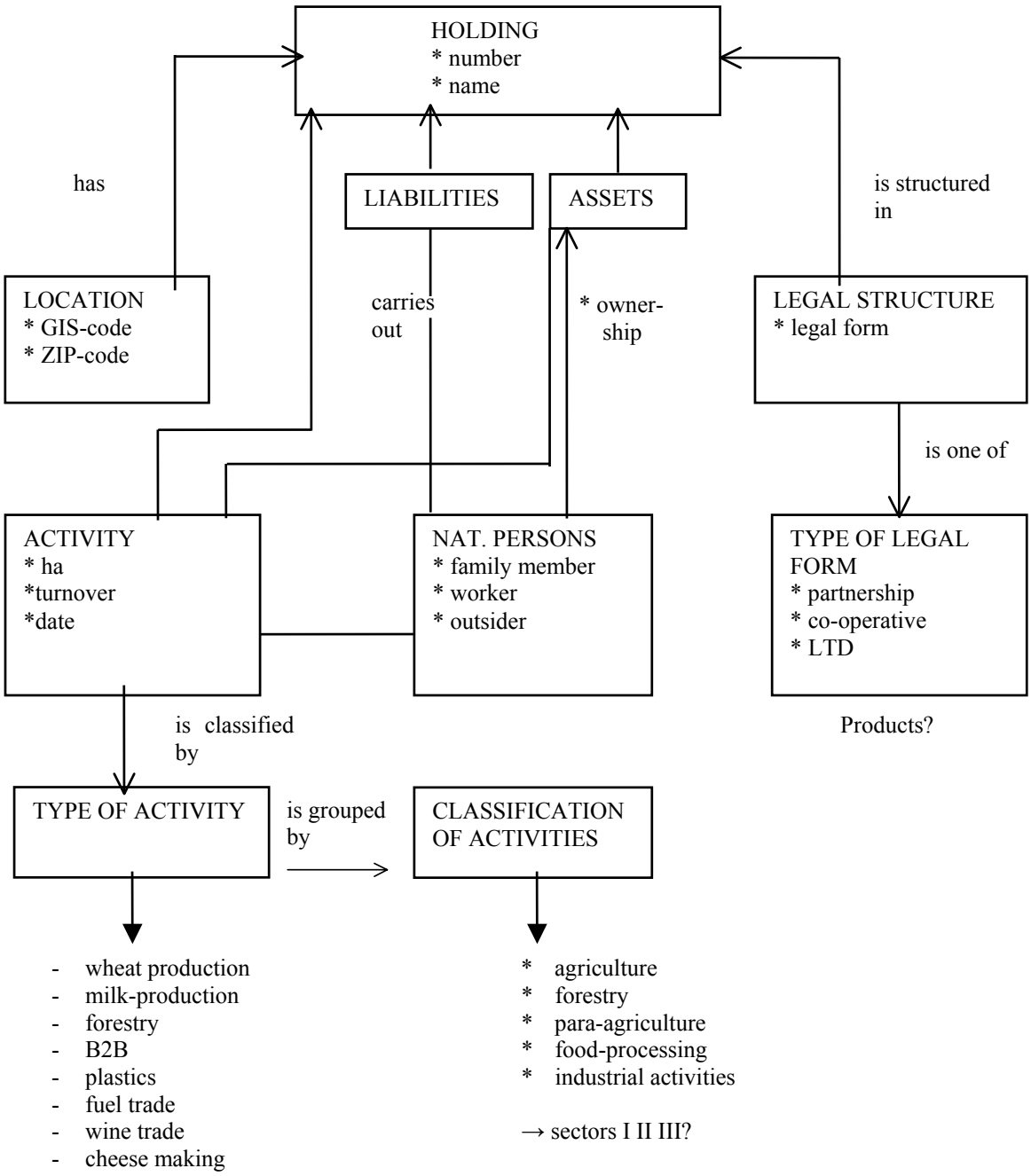


Figure 1 Example data model by Krijn Poppe, Hans-Hennig Sundermeier, Koen Boone and Beat Meier

In this first workgroup session of PACIOLI-11, we will have a closer look to three aspects of this discussion:

1. what are the most problematic issues in defining a farm?;
2. what is the relationship between a farm and household(s)?;
3. what really matters for policy evaluation?

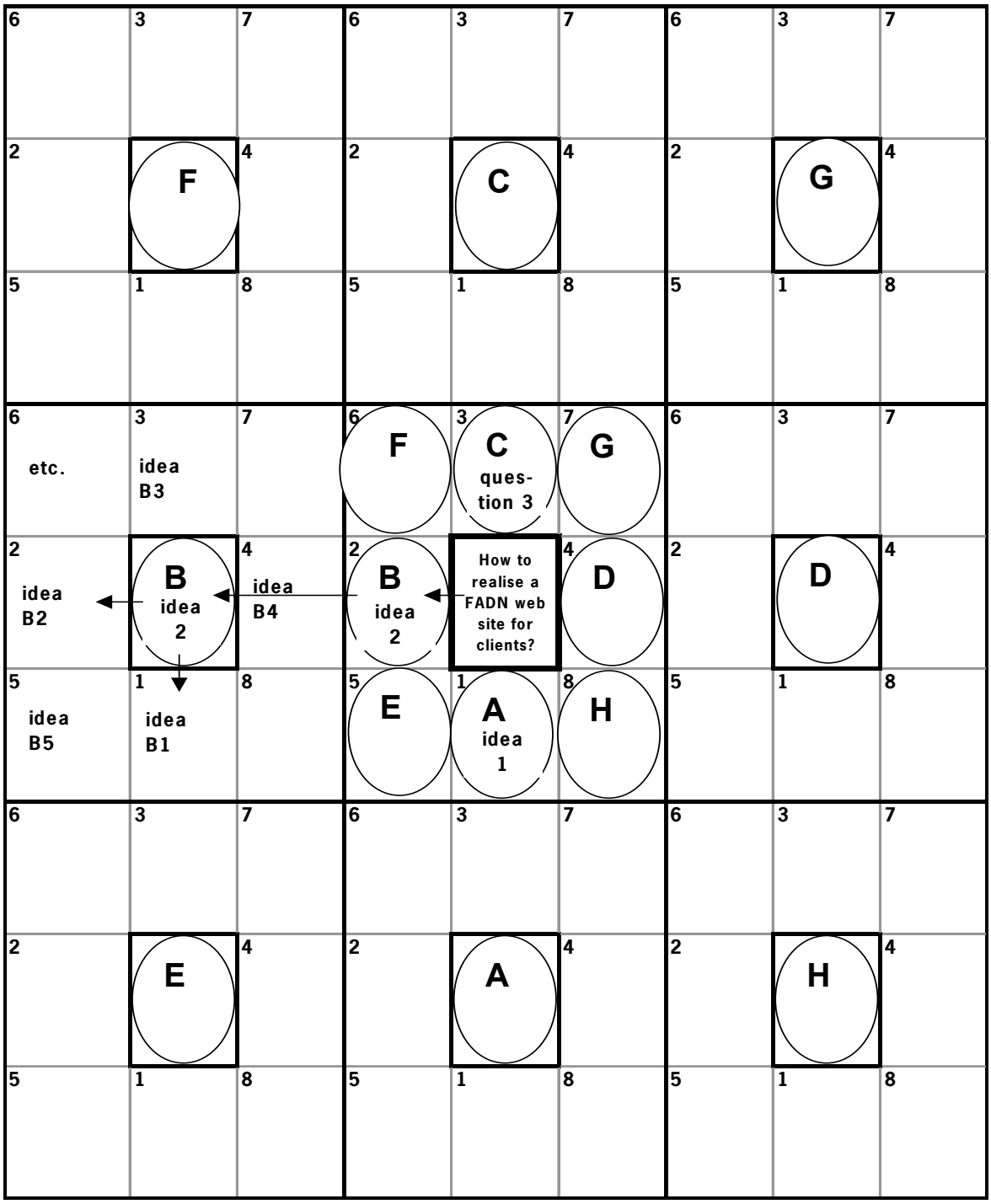
Method

These three aspects of the discussion will be discussed in the three working groups. We start with making a mind map. This is a kind of brainstorming method in which our ideas and feelings on the topic can quickly be exchanged and takes at most 10 to 20 minutes. Central on a flipchart the central issue is written:

1. group I: problems in definition of farm;
2. group II: relation farm - households;
3. group III: what for policy evaluation.

The group then brainstorms in a 'tour de table' on 5 to 10 important words. These are written around the central issue, like a 'flower'. We then take these 5 to 10 words and elaborate in the same way. We stop when most persons think that no really new ideas come up. We probably then have a mind map that looks like this:

LOTUS FLOWER METHOD
(example sheet)



Based on this mind map the group then discusses for about 30 minutes on the central question of the group and tries to come up with a conclusion on the aspect of the discussion:

1. what are the most problematic issues in defining a farm?
2. what is the relationship between a farm and household(s)?
3. what really matters for policy evaluation?

Write the conclusion on an overhead transparency and present this with the mind map in the plenary session.

Group composition

Group 1

Werner Kleinhanss (chairperson)
Anne Kinsella
Trajkovski Petar
Ann-Marie Karlsson
Damaris Melle
Ildiko Nagy

Group 2

Carlos San Juan (chairperson)
Catherine Moreddu
Lech Goraj
Benoir Jean Boup
Ilievska Vesna
Torbjørn Haukås
Marju Aamisepp

Group 3

Beat Meier (chairperson)
Kostov Mitko
Ashok Mishra
Finn Andersen
Timo Sipiläinen
Hans Vrolijk
Paola Doria

Workgroup Session 1, Group 1

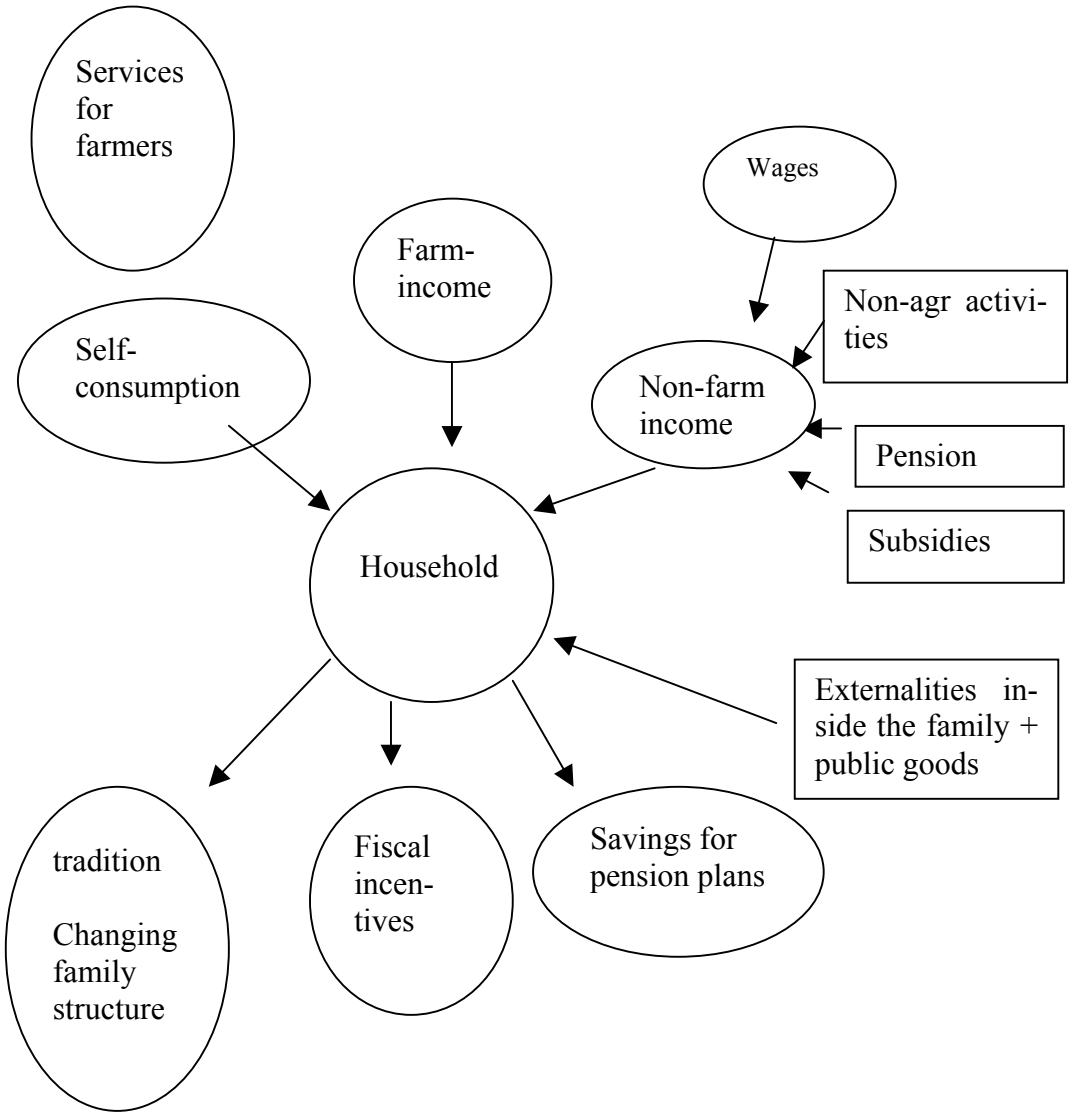
Resources:	Land	=> size, quality, location
	Labour	=> capacity, working hours.
	Capital	=> buildings, machines etc.
	Human capital	=> education, qualification, management, demographics
	Organization	
Farm-activities (output)	Crops	=> hectares, output
	Livestock	=> number, output
	Public Goods	

FARM

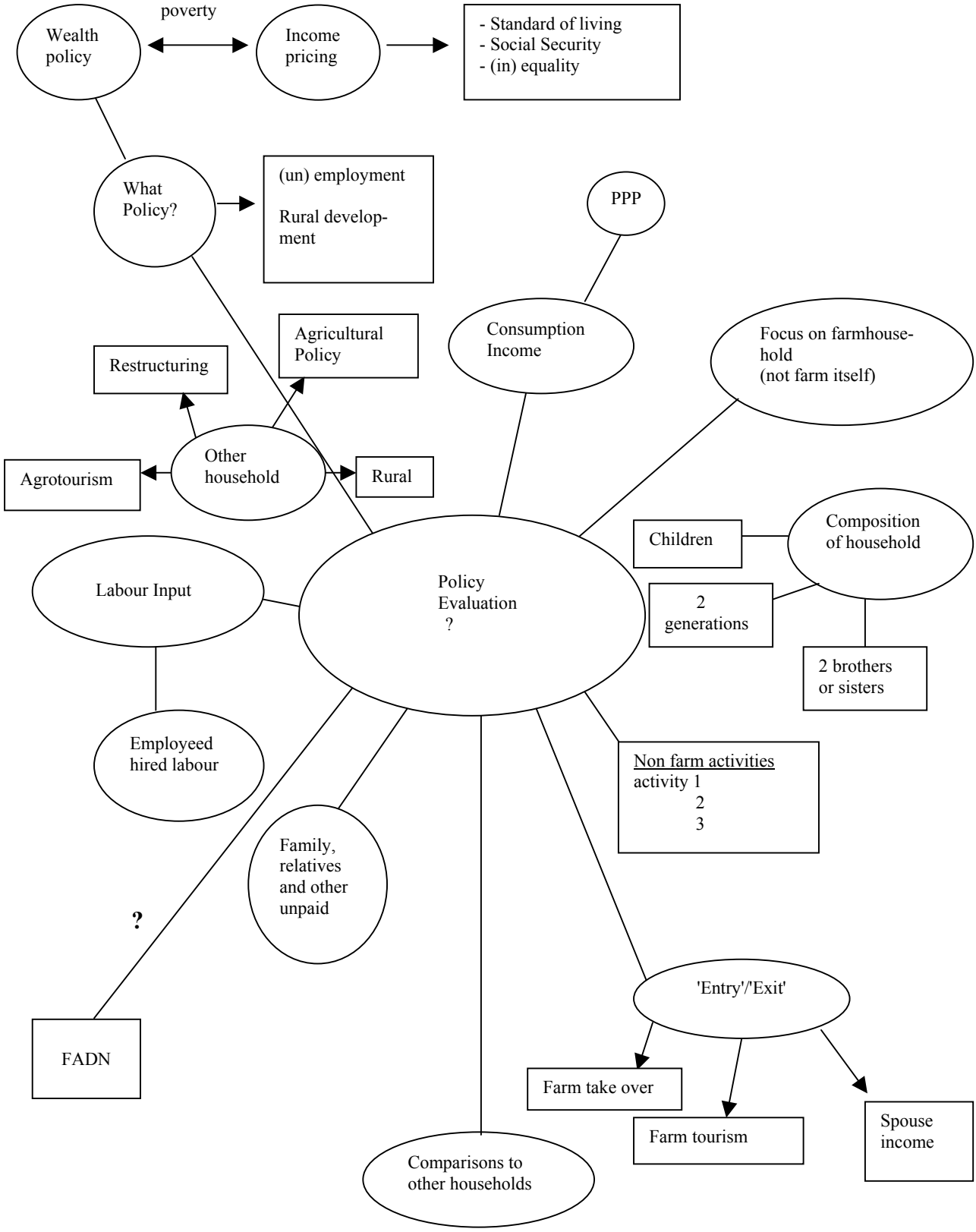
Criteria depends on society

Problems:
* hobby versus commercial farm
* comparability (between countries and type of farms)
* definition of farm activity

Workgroup Session 1, Group 2

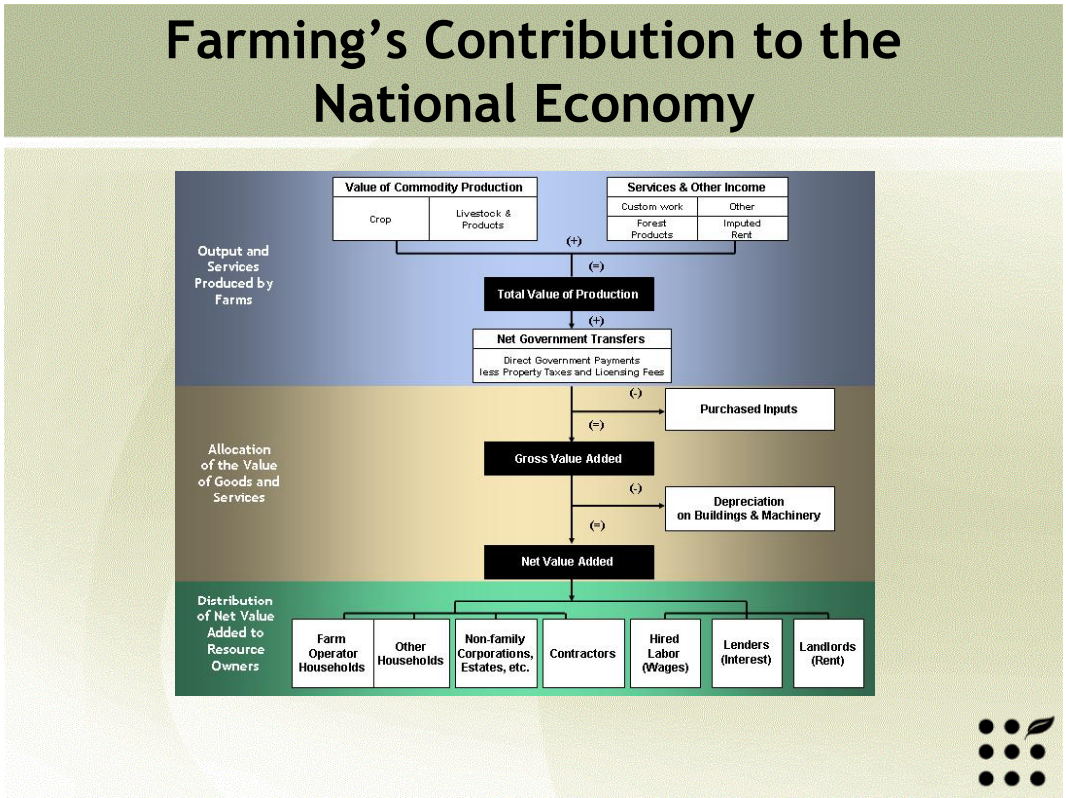


Workgroup Session 1, Group 3



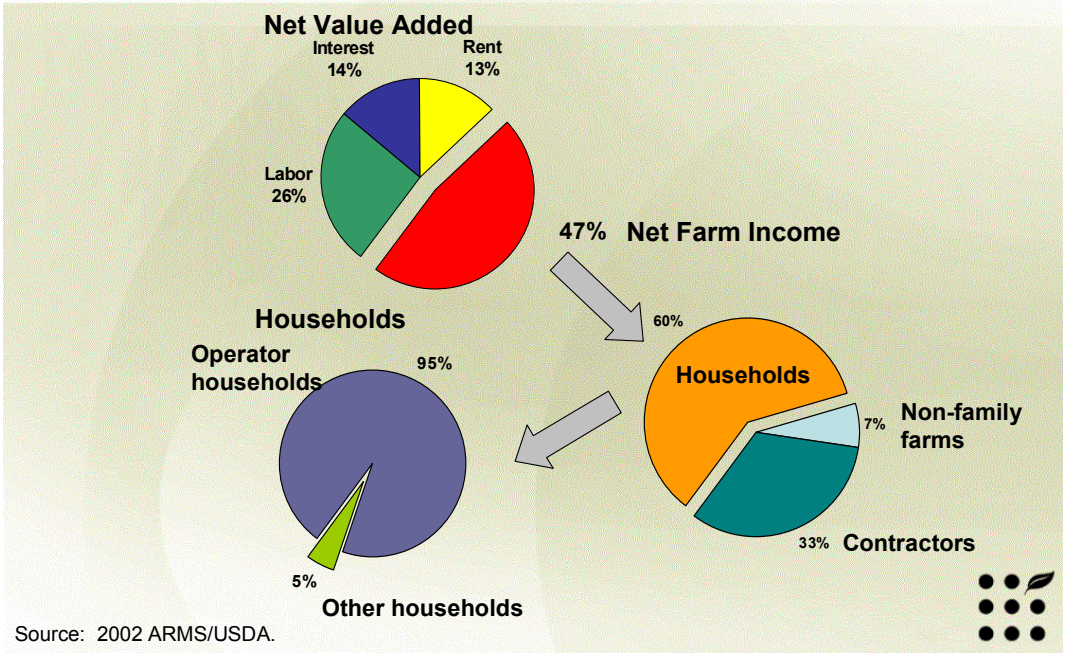
3. Value added, work choices, and the measurement of income for U.S. farm households

Ashok Mishra, Mitch Morehart and James Johnson [1]



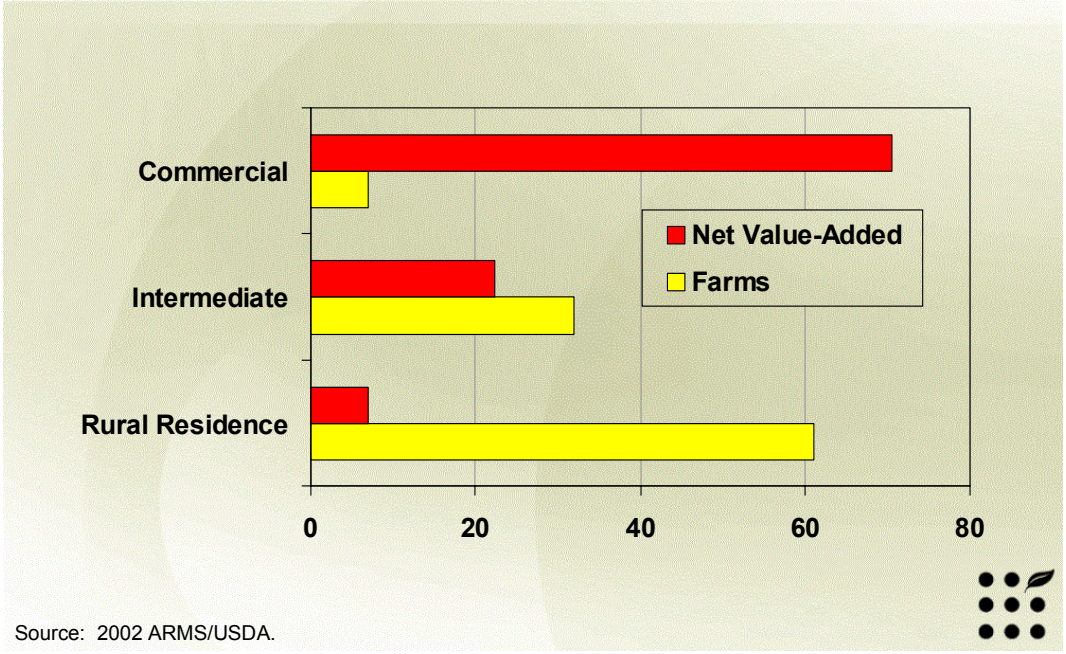
[1] Farm Sector Performance and Well-Being Branch Economic Research Service, USDA.

Farm operator households only receive a portion of value-added



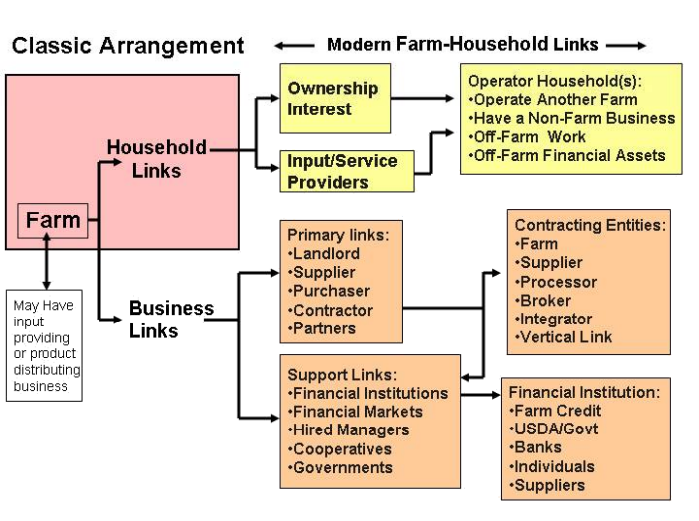
Source: 2002 ARMS/USDA.

Contribution to Net Value-Added by Farm Size



Source: 2002 ARMS/USDA.

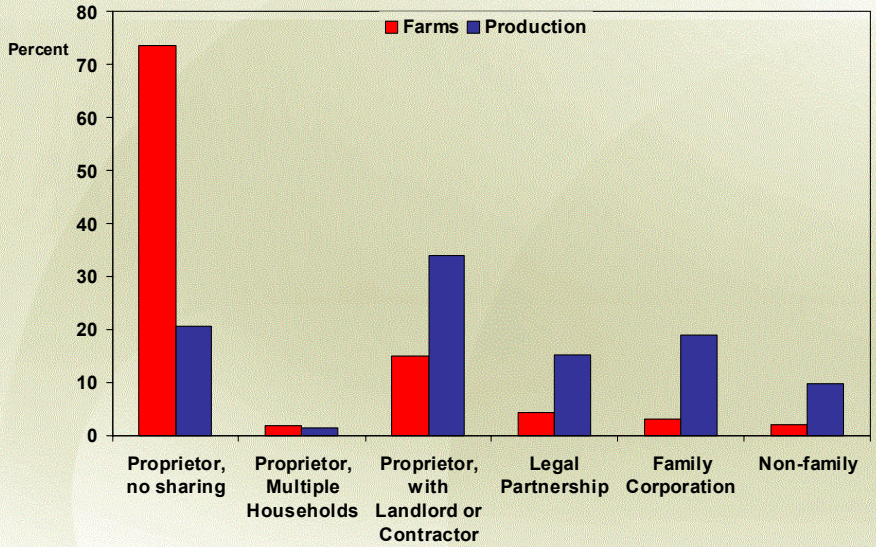
Conceptualization of Modern Household-Farm



Modern Farms Obtain Resources from a Variety of Contributors

- 209,000 farms rent land for a share of production; another 633,000 farms rent land for cash
- 910,000 farms owe debt at year-end; almost all farms use debt during the calendar year
- 632,000 farms use hired labor
- 50,000 farms grow agricultural commodities for other firms for farms under a production contract arrangement
- 93,000 farms are organized as partnerships
- 65,000 farms are organized as family corporations
- 145,000 farms have multiple households providing production assets

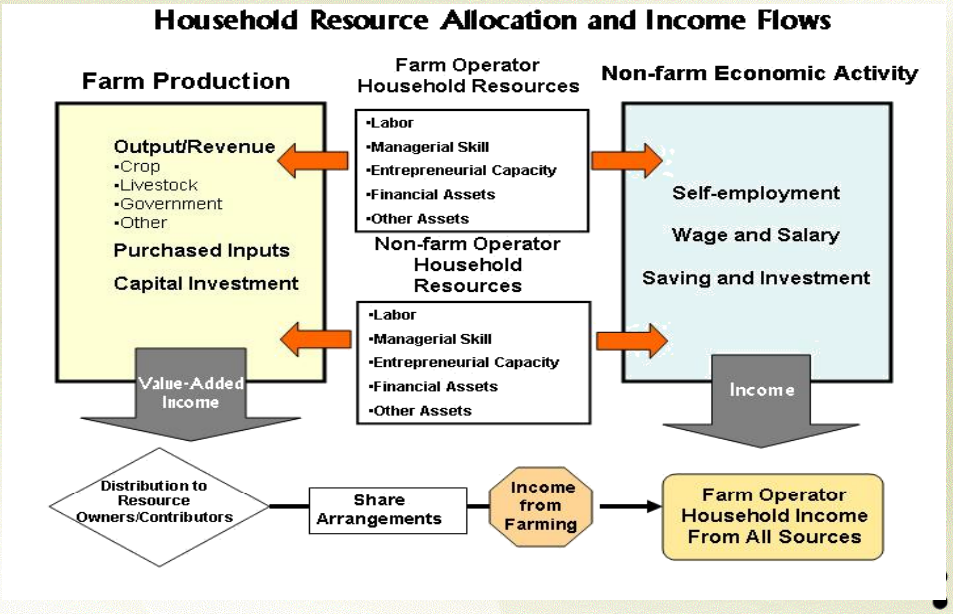
Disconnect Between Farms, Organization Complexity, and Production



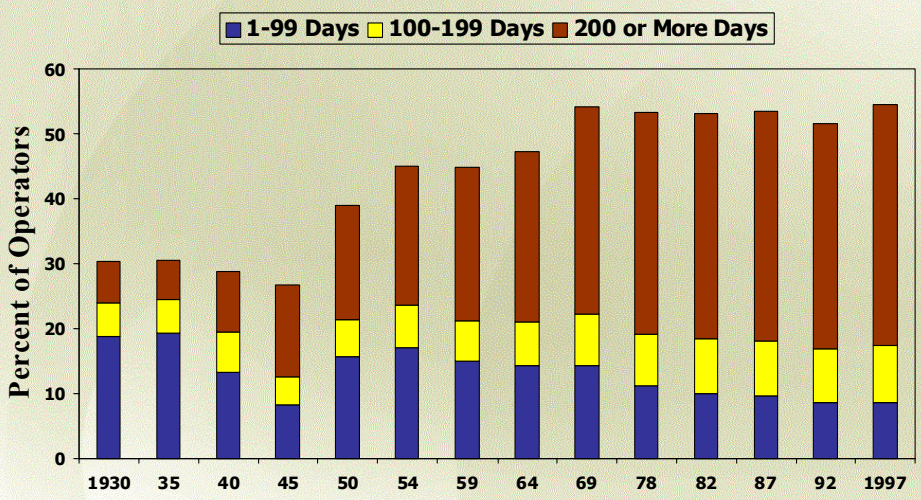
Households and Individuals Involved in the Business Increases

Source: 2001 ARMS/USDA.

Household Resource Allocation and Income Flows

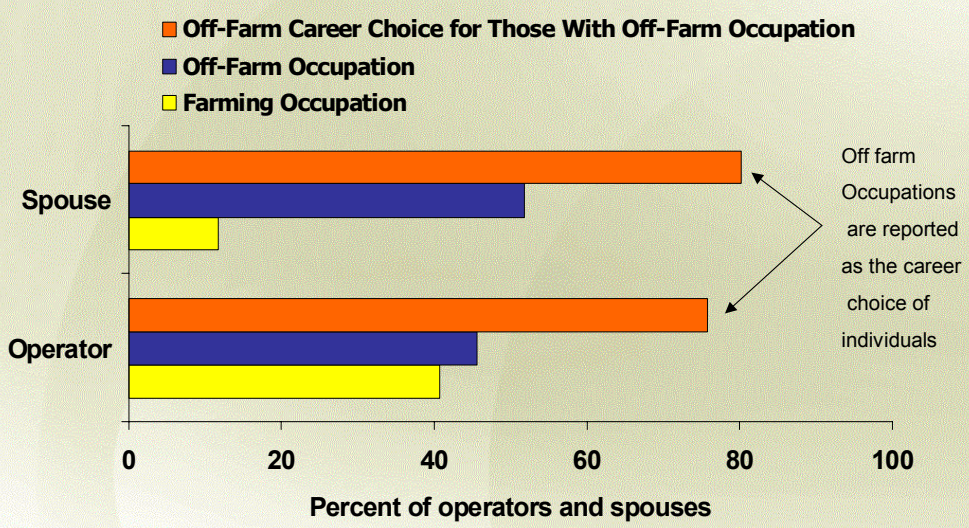


Traditional Census Data Reveal That Multiple Job Holding (Off-farm Work) has Been a Long-Standing Choice of Farm Operators



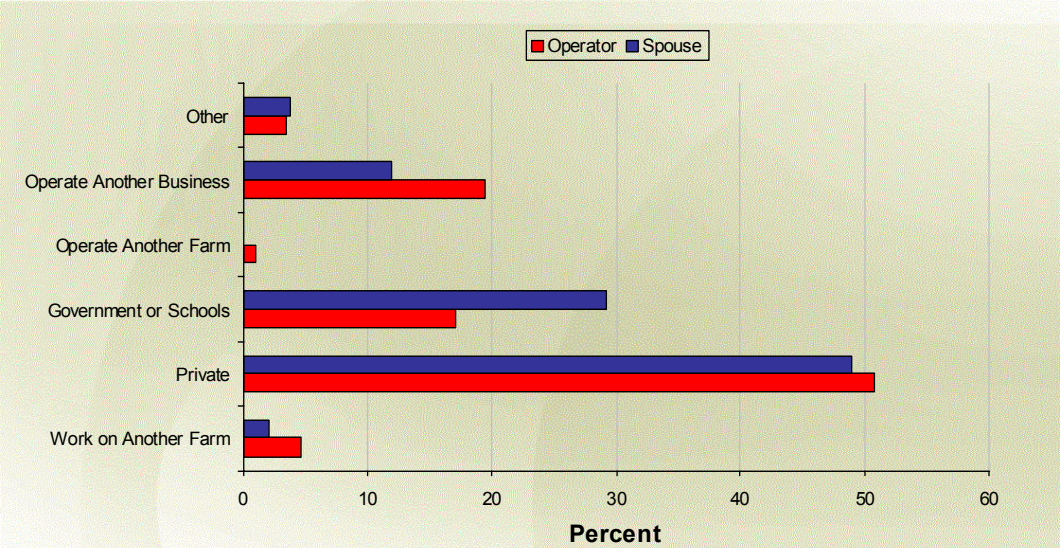
Source: 2001 ARMS/USDA.

Farming may not be the main occupation of farm operators



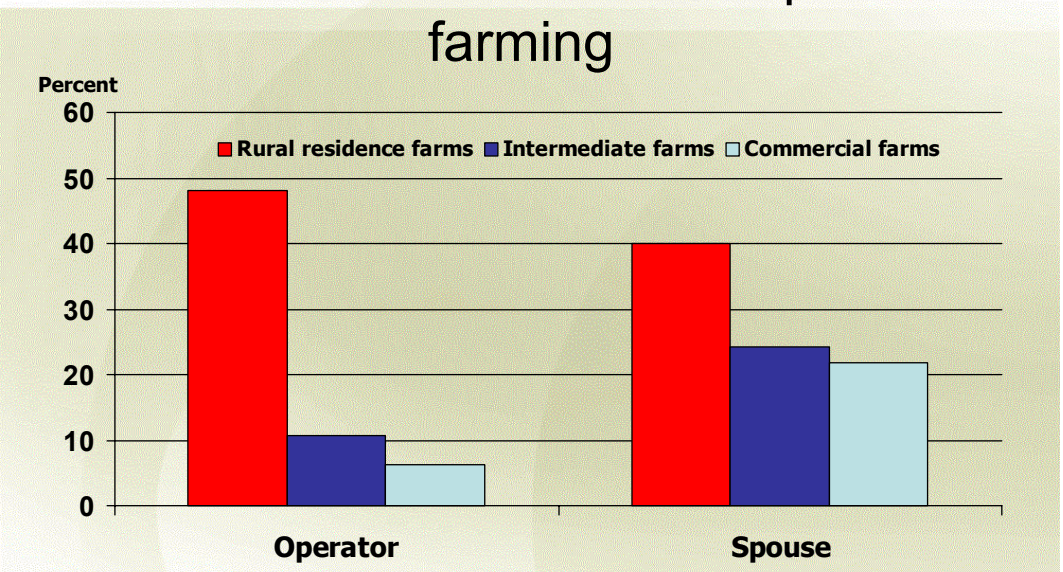
Source: 2001 ARMS/USDA.

Where do operators and spouses work?



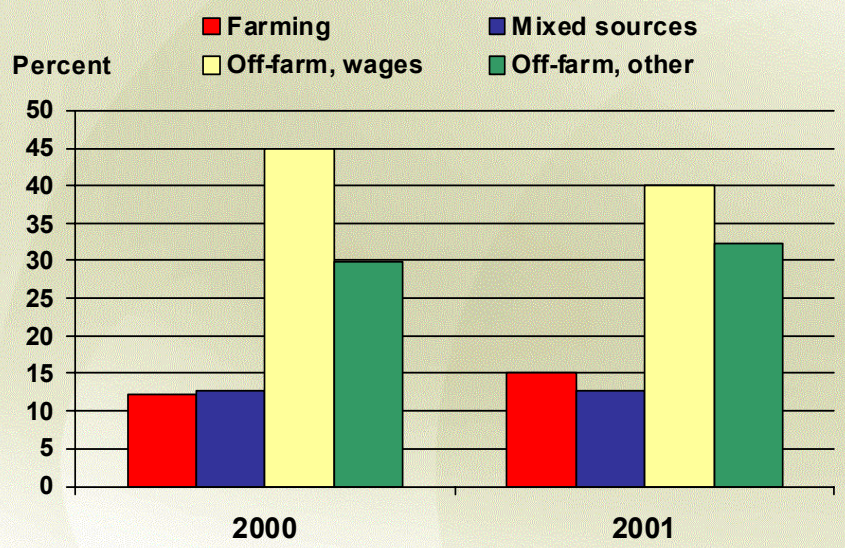
Source: 2001 ARMS/USDA.

Households from all size farm businesses worked off-farm prior to farming



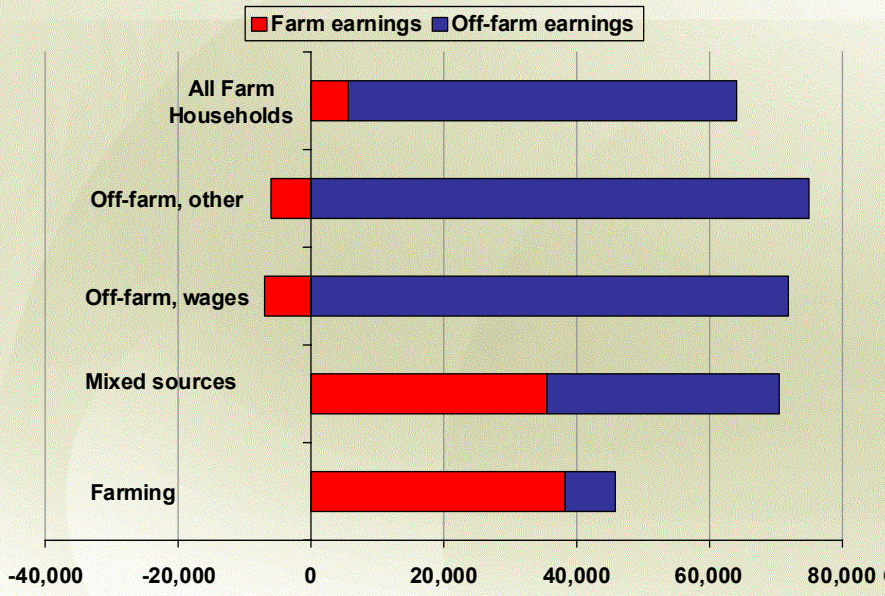
Source: 2001 ARMS/USDA.

Few Farm Households Depend on Farming as a Major Source of Income



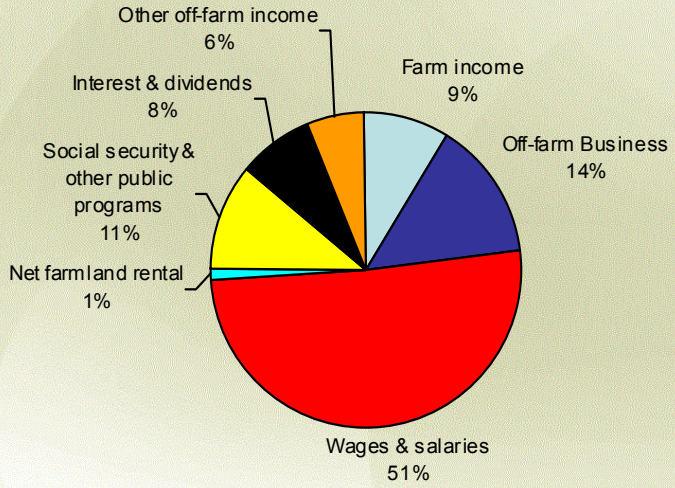
Source: 2000 and 2001 ARMS/USDA.

Most Farms Earn Some Type of Off-farm Income



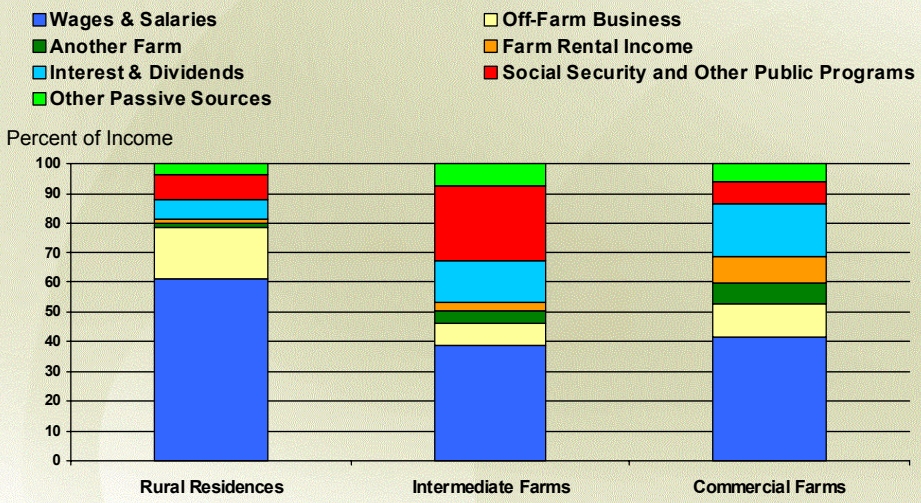
Source: 2001 ARMS/USDA.

Farm Households Earn Income From a Variety of Sources



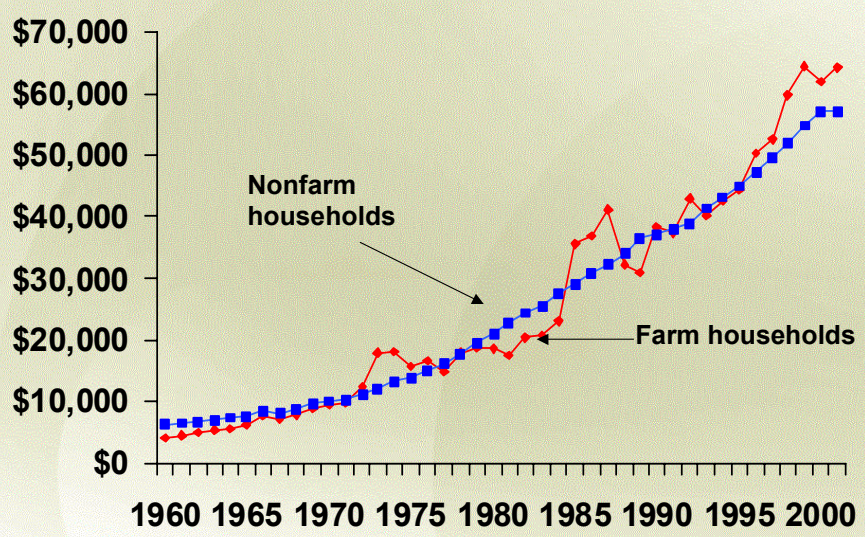
Source: 2001 ARMS/USDA.

There Are a Variety of Off-Farm Income Sources for All Sizes of Farms



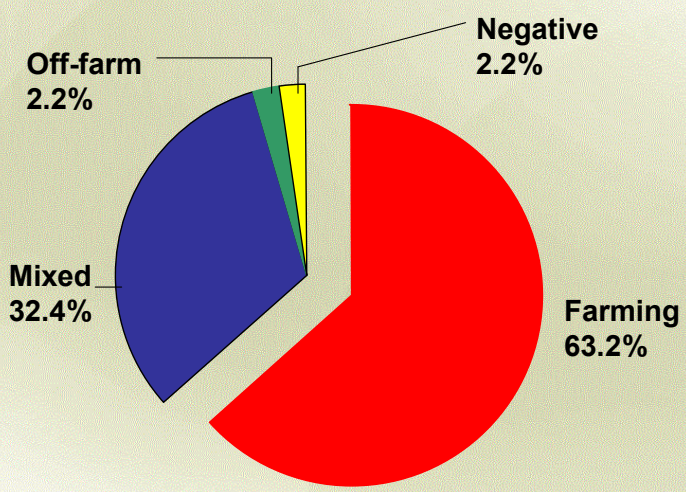
Source: 2001 ARMS/USDA.

Farm Households Have Higher Income Compared With Non-farm Households



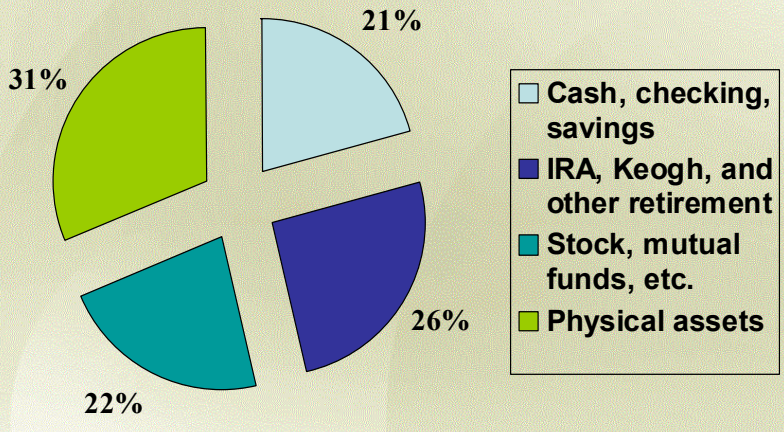
Source: AER 812, ERS/USDA.

Distribution of farm households by equity source, 2000-01



Source: 1999 ARMS/USDA.

Farm households are diversified in their portfolio of financial assets



Source: 1999 ARMS/USDA.

Conclusions

- Value added accounting framework helps track economic performance from farm sector to farm operator household.
- "Net value added" is developed as a measure of income earned by those contributing resources to agricultural production.
- There is no one standard model of how farm households earn a livelihood.
- Dual career farm families are the norm rather than the exception.

Conclusions

- Off-farm work is motivated by concerns for family income.
- Most farm operators who work off-farm are employed by private companies.
- Farm households have varied sources of income and multiple sources of savings and investment.
- Farm households depend on farming as a major source of wealth.
- Households wealth is positively related with farm size.
- Farm households have diverse portfolio of nonfarm assets.

4. A review of the collection of Farm Household Income Data in Ireland

Anne Kinsella [1]

Abstract

In Ireland there is great demand from policy makers and researchers for data on total farm household incomes. Availability of such data is not always as detailed as required. In this document, current farm household statistical data sources as they occur in Ireland are reviewed. Variation in definition, in particular how the farm household is defined may reveal differences in results. The methodology used in some of the Irish surveys is discussed in some detail with examples of some findings presented.

Keywords: Household income, income from farming, farm household

4.1 Background

Household statistical data collection in Ireland involves the co-operation of both public and private institutes. Some of these include Teagasc, the Central Statistics Office (CSO) and the Economic and Social Research Institute (ESRI). This co-operation has facilitated the amalgamation of data into a comprehensive farm household database.

Detailed annual data on farm incomes at farm level for the predominant farming systems is available from Teagasc's National Farm Survey (NFS). The CSO is the official Government statistical agency charged with carrying out the Household Budget Survey (HBS) and are also responsible for carrying out the Census of Population and Census of Agriculture. The ESRI provided further data in their Living in Ireland Survey (LLIS). The voluntary LLIS will be replaced by the EU-SILC project from 2004 onwards, which is compulsory under EU regulations. The Central Statistics Office is also responsible for collection of data on farm incomes at an aggregate level for the entire farm sector.

From a range of sources data is available on Irish farm incomes whilst the HBS and SILC complement with data on household incomes, comparable across all sectors of Irish society. It is imperative that if household income is to become the yardstick of living standards for the farming sector then it is critical that it is also the measure for the non-farm sector to ensure that like is compared with like.

According to Teagasc's NFS the following statistics, table 4.1, are available in relation to the percentage of farms with off farm job as a source of income for 2002. These percentages have been increasing in recent years, the corresponding figures for 2001 being 45.2, 32.9 and 24.1% respectively.

[1] National Farm Survey, Teagasc, 19 Sandymount Avenue, Dublin 4, Ireland.

Table 4.1 Off Farm Sources of Income on Irish Farms 2002

	%
Off Farm Job - Holder and/or Spouse	48.1
Off Farm Job - Holder	34.6
Off Farm job - Spouse	25.8

Source: Connolly, L. Kinsella, A., Quinlan, G., National Farm Survey, Teagasc, 2002.

The most recent Household Budget Survey, 1999/2000, indicates that only 40.6 per cent of farm-household income came from farming, the largest portion now coming from off-farm sources. This situation is likely to intensify, thus increasing the importance of additional off-farm income figures being available for future research in this area.

4.2 What is Farm Household Income?

The term farm household income has many definitions depending on how narrow or wide a definition is used. Firstly the farm household needs to be defined. The CSO Household Budget Survey defines *rural farm households* as

> *'households where the principal occupation of the reference person of the household is farming or, where the reference person is a retired farmer, and there is at least one other household member whose main occupation is farming'*

This definition is quite a narrow definition as it excludes other households involved in farming i.e. where farming is a subsidiary occupation of the head of the household or any other of the household members. Results from this narrow definition, which are shown in figure 4.1 and detailed in annex 4.1, illustrate that 59% of farm household income comes from off-farm sources, when farming income is expressed as a percentage of gross income.

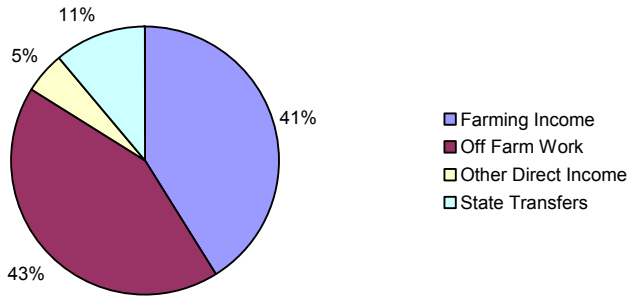


Figure 4.1 Narrow Definition of Farm Household (88,150 farm households) - Farming is the main occupation of the reference person (Expressed as a % of Gross Income)
Source: HBS 1999/2000.

The HBS also applies a broader definition to rural farm household in analysing the results. The broad definition is

> *'a household where at least one member has income from independent activity in agriculture'*

When this broader definition is applied to the 1999/2000 HBS the results show 64% of farm household income coming from off farm sources, a difference of 5%, as detailed in figure 4.2. This difference needs to be borne in mind when interpreting the results. Refer to annex 1 for further details and analysis.

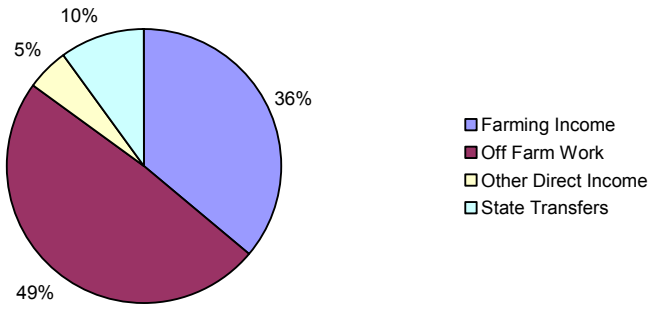


Figure 4.2 Broad Definition of Farm Household (123,000 farm households) - At least one member has income from independent activity in agriculture (Expressed as a % of Gross Income)
Source: HBS 1999/2000.

Differences in definition of what constitutes a farm also means that differences occur in the numbers defined as farm household families. The CSO carry out the survey on a population of over 136,000 farms. This figure includes all farms nationally, even those less than 2 ESUs. The Teagasc NFS is carried out on a sample of over 1,200 farms (chosen by the CSO) representing a total farm population of over 116,000 farms (farms less than 2 ESUs and Pigs and Poultry farms are excluded from the NFS survey). Teagasc are also provided with the total population by the CSO, which is broken into size/system based on EU Typology. However farm households as published in the HBS represent around 88,000 households. This difference occurs due to the main occupation of the reference person (head of household) not being defined as farming.

4.3 Current farm household data sources in Ireland

National Farm Survey (NFS) (Teagasc)

The Teagasc National Farm Survey has as its primary objective to determine the financial situation across a spectrum of Irish farming systems and sizes. This data is provided to the EU Commission in Brussels via the Farm Accountancy Data Network (FADN). In order to achieve its objectives, a farm accounts book is recorded annually on a stratified random

sample of circa 1,200 farms. The sample of farms are picked by the CSO and subsequently canvassed by the NFS Recorders in each area. As new farms are required in relevant sizes/systems a further sample is obtained from the CSO and new farms are canvassed.

Participation in the survey is purely voluntary with participating farms remaining in the survey for many years but with gradual annual replacement of sample. The consent and co-operation of the farmer is critical for the survey is achieve its objective, collecting and analysing data relating to farming activities. This is its main objective with other data, such as demographic and household information, being considered secondary.

Collection of data relating to farm activities accounts for the majority of the survey but certain sections of the Farm Records and Accounts books contain more personal questions with regard to the household. This section of the recording book is detailed in greater detail in annex 4.2.

Such questions for the *manager/operator* include some of the following:

- marital status;
- age;
- other gainful activity outside farm;
- category of work undertaken;
- hours worked;
- income range.

A number of questions are also listed for *Spouse of Manager/operator* including:

- other gainful activity;
- category of work;
- sector;
- occupation code;
- hours worked;
- income range.

A further section asks questions on *farm household* including:

- number of household members;
- those that are attending school/college;
- number working on farm (full-time and part-time);
- numbers receiving pensions and unemployment benefit/assistance;
- age structure.

Certain individuals may find some of these questions quite sensitive so that due care has to be exercised when recording these details, particularly as survey participation is on a voluntary basis and that collection of financial data is as its primary objective.

A category section of 'Don't Know' is also an option for some of the questions. It is important that this section is utilised where necessary so that results can be interpreted correctly.

Table 4.2, as follows, details results for average off-farm income and average family farm income from the 2002 National Farm Survey. Results are also presented under the following subheadings:

- farmer has Off farm Job - Income stated;
- farmer has Off farm Job - Income Not stated;
- farmer has no Off farm Job.

Table 4.2 Estimates of Off-Farm Employment For Farmer Only - 2002

	Sample Number	Population %	Average Off-Farm Income (1)	Average FFI a) (2) €	Income (1) + (2) €
Farmer has Off-Farm Job and Income Stated					
All Farms	158	18	€19,300 (55)	€6,900 (114)	€26,300 (48)
Full-Time b) Farms	33	2	€17,100 (64)	€15,700 (83)	€32,800 (55)
Part-Time c) Farms	125	16	€19,600 (54)	€5,800 (105)	€25,400 (44)
Farmer has Off-Farm Job – income not stated					
All Farms	144	16	-	€10,500 (149)	€10,500 (149)
Farmer has no Off-Farm Job					
Full-Time Farms	628	34	-	€28,900 (77)	€28,900 (77)
Part-Time Farms	246	31	-	€6,800 (105)	€6,800 (105)

a) *Family Farm Income (FFI)* is defined in the Teagasc National Farm Survey as Gross output less total net expenses (direct costs plus overhead costs). It represents the total return to the family labour, management and capital investment in the farm business. For 2002, FFI for all farms averaged € 14,925. On Full-time and Part-time farms FFI was € 27,758 and € 6,591 respectively; b) As defined by Teagasc, a *full-time farm* requires at least 0.75 standard labour units to operate, as calculated on a standard man day basis; c) As defined by Teagasc, a *part-time farm* requires less than 0.75 standard labour units to operate, as calculated on a standard man day basis.
(Figures in brackets are the coefficients of variation - these show that within each group there is considerable variability) Note: The estimates should be interpreted with caution because the underlying data are not always sufficiently robust. This is due to the problem of non-response and the fact that the information is received from respondents without documentary verification.

The most notable difference is between the Part-time category of Farm - those with an off farm job and income stated have an income (1+2) of € 25,400 as opposed to those Part-time farms with no off farm job, income equal to € 6,800.

EU Survey on Income and Living Conditions (EU-SILC) (Central Statistics Office (CSO))

From 2004 onwards the EU-SILC project, compulsory under an EU Commission Regulation, will be conducted annually on circa 6000 households (approximately 500 farm households) and will replace the voluntary European Community Household Panel (Living in Ireland Survey (LIIS)) which was undertaken by the ESRI (in 1994, 1997, 1998, 2000 and 2001). EU-SILC will measure household income plus other key socio-economic variables on an annual basis.

Measuring rates of poverty will be the main focus of this project and to report on targets as set out in the National Anti Poverty Strategy (NAPS). This project will estimate total household income for all households including farm households. The farming income component will be calculated using NFS data. Off-farm income will be collected directly. The information collected will be in the same detail as the Household Budget Survey (HBS) (detailed below) but the sample will be smaller. No information will be collected on household expenditure.

Unlike the HBS, EU-SILC farms will not be linked to NFS farms. Instead the sample will be random with 25% of households surveyed rotated each year. Particular sizes or systems of farming will not be targeted but reweighting of the results during analysis will ensure they are representative. This method should have the advantage of selecting any household involved in farming.

Income and viability study on farm and non-farm rural households in Ireland (Economic and Social Research Institute (ESRI))

This income and viabilty study is funded by the Research Stimulus Fund (RSF) of the Department of Agriculture and Food. The project provides socio-demographic profiles with comparisons done on the economic viability of farm with non-farm rural households and urban households.

Household Budget Survey (Central Statistics Office (CSO))

The CSO is the official Government statistical agency charged with carrying out the Household Budget survey (HBS). Data supplied to the survey is strictly confidential and is protected under legislation (Statistics Act 1993). The HBS is a large scale national survey which collects data on five year basis on the expenditure, income and other details of different types of households.

The survey categorises households as

- farm;
- rural non-farm; and
- urban.

so allowing for comprehensive comparisons between living costs and standards of living between various sub groups. The HBS is specifically designed to estimate the cost of living which is essential for long term planning.

Surveys are carried out every 5 years (Last HBS May 1999-June 2000), with the next scheduled to take place in June 2004.

The information gathered by the HBS also ensures that the Consumer Price Index (CPI) continues to be based on up to date household expenditure patterns, since this is the official measure of inflation and plays a crucial role in future planning.

Since 1987 the sample farm households participating in the Teagasc National Farm Survey were integrated into the HBS. This joint approach means that the CSO is not required to conduct a detailed 12 months farm accounts survey to estimate income from farming as this is already collected by the NFS. The pooling of the data from both surveys

provides a comprehensive farm household's database and is also cost effective in the collection of such data.

How HBS Conducted

The CSO are provided with a sample of farms from the Teagasc National Farm Survey (NFS). Each NFS Recorder is provided with a CSO leaflet explaining the HBS, a CSO letter and a Teagasc letter (see annex 4.3 for examples of documents as listed). The Recorders gives a copy of each document to farms participating in the NFS and provide a list of willing participants to the CSO. The CSO interviewers are responsible for all aspects of the HBS questionnaires.

For other households not participating in NFS, the CSO contacts each randomly selected household by post to explain the purpose of the survey and to give the name of Interviewer who will call on them at a specified time. Co-operation in the HBS requires the participation of all household members ages 15 years and over.

Each participating household (a random sample of approximately 8,000 urban and rural households) contributes information over a two week period. The questionnaire covers two sections - (i) Household questionnaire and (ii) Personal questionnaire. The personal questionnaire covers such items as income details and regular personal expenses while the household questionnaire covers household members, accommodation occupied, regular household expenses and household facilities. In addition each household member aged 15 years and over is required to maintain a daily diary record of their expenditure over a 14 day period.

The co-operation of households is representatively spread over 12 months in order to ensure an overall calendar balance in the sample. A few days in advance of the interviewers initial call the households are issued with a letter specifying interviewers name and approximate calling time.

The coverage of farm households is completed by the CSO (household budget aspect) and Teagasc (farm accounts) under a special joint confidentiality arrangement.

HBS Income Concepts

Different sources of income are assigned different names in the HBS. These are shown in the following table, table 4.3 and are illustrated using the State average (to the base of 100) for the 1999/2000 survey. In 1999/2000 the average household in the state received 12 per cent of its Gross Household Income (GHI) as state transfers but paid 17 per cent in taxes/social insurance.[1]

Direct Income comprises of all income coming into the household from employment, including self-employment in farming, as well as 'other direct income'. Other direct income includes pensions in respect of previous employment or investment income and any farm/garden produce produced for consumption by the household.

[1] For a more detailed analysis of trends in Rural Household Income refer to the following 'Trends in Rural Household Incomes', Patrick Commins, Rural Economy Research Centre, Teagasc.

Table 4.4 shows that the increase in the proportion of direct income obtained from wages/salaries in farm households is quite remarkable, particularly between the years 1994 and 2000 as it increased from 35 to 48%.

Table 4.3 HBS - Basic Concepts

	State Average (per 100) in 2000
Employment Income	78
+ Other Direct Income	+ 10
= Total Direct Income (A)	= 88
+ State Transfers (B)	+ 12
=Gross Household Income (A+B)	100
- Income Tax/Social Insurance (C)	- 17
= Disposable Household Income (A+B-C)	= 83

Source: Trends in Rural Household Incomes, Patrick Commins, Rural Economy Research Centre, Teagasc.

Table 4.4 Components of Direct Income in Farm Households

Source	1987 %	1994 %	2000 %
Wages/Salaries	29	35	48
Farming	59	58	44
Other	12	7	8
Total Direct Income	100	100	100

Source: Household Budget Survey.

4.4 Summary

The above discussion describes how the data for farm household incomes is currently collected and estimated in Ireland. Most information is voluntarily contributed for inclusion in a farm household database, being dependent on the co-operation of individuals.

Currently in Ireland data is available on Irish farm incomes from the NFS whilst the HBS and SILC complement with data on household incomes, this data being comparable across all sectors of Irish society.

In the future, it is imperative that if household income is to become a measure of living standards for the farming sector then it is vital that it is also the measure for the non-farm sector. This will ensure that like is compared with like when measuring total household incomes.

References

Commins, P., *Trends in Rural Household Incomes*, Rural Economy Research Centre, Teagasc (Prepared for presentation to the National Rural Development Forum, Portumna, Co.Galway, 17 January 2003).

Connolly, L., A. Kinsella and G. Quinlan, *National Farm Survey*, Teagasc, 2002.

CSO (Central Statistics Office), Household Budget Survey 1999/2000, Dublin, 2002.

Annex 4.1 Average Household income 1999/2000, by category

	Rural farm (broad definition) €	Rural farm (narrow definition) €	Difference %
Farming Income	12,406	13,511	-8.2
Non-Farm Employment	16,472	14,347	+14.8
Other Direct Income	1,780	1,799	-1.1
Total State Transfers	3,381	3,497	-3.3
Gross Income	*34,037*	*33,154*	*+2.7*
Less Total Direct Taxation	3,785	3,462	+9.3
Disposable Income	*30,252*	*29.692*	*+1.9*
Persons per Household (nos)	3.66	3.56	+2.8
Gross income per Household Member	9,300	9,313	-0.1
Disposable Income per Household Member	8,266	8,340	-0.9

Source: Household Budget Survey 1999/2000.

Annex 4.2 and 4.3 are available with the author.

5. Gathering data on household income in Norway

*Torbjorn Hauk*ås, *Norwegian Agricultural Economics Research Institute*

The purpose on review is to give a short presentation and description of Norwegian data sources and methods for gathering household income on farms participating in the Norwegian survey of agriculture account statistics. I will also present some results from the statistics and look at the development during the last years. The Norwegian Agricultural Economics Research Institute (NILF) is the producer of this statistic in Norway.

5.1 The farm business survey (FBS)

Norway has as many other countries an annual investigation of farm profitability based on accounts from a sample of farms (holdings). This investigation is not intended to be representative for all holdings in Norway. The intention is that the investigation should be representative for commercial farms. The number of holdings getting subsidies from the government were in 2001 about 62,400 but only 37,400 holdings were defined as commercial farms. The definition of commercial farms in this term is that the farms' production creates a Standard Gross Margin (SGM) more than 8 European Standard Units (ESU). There are some exceptions for cereal farms and sheep farms. Farmer, spouse and children 16 years or younger consist the economic unit in the household economy.

The Farm Business Survey (FBS) is mainly based on tax accounts, but the accounts are converted to the principles used in FBS. In addition a large number of data is collected from different sources.

Since 1950 the number of farms in the survey have been approximately 1,000. For the year 2001 it was 948 and for 2002 the number was 960 (not published). Participation is voluntary. There is no limit for how long a holding may be included in the survey, but the holder must not be older than 67 years. Approximately 10-15 per cent of the holdings are replaced each year. It is therefore possible to conduct long-term studies on panel data.

5.2 Household income presented from NILF

The FBS is rather detailed on agricultural income. Other income from on-farm and off-farm activities are registered and published. In addition income from dividends, wages, pensions, sick pay, family labour on investments, and interests are registered. When paid interests and payments to previous owner are deducted from the total income, we get the term Total Net Income (TNI) which is the term of household income in FBS. We also register family allowance, gifts, inheritance, and other no-taxable contributions which are coming in addition to the TNI. Paid tax per holding is also registered.

The building up of terms in household income.

Net income agriculture
+ Net income forestry
+ Net income other farm-based activities
+ Net income other off-farm activities (as self-employed)
+ Dividend
+ Wage income
+ Pensions/sick pay
+ Family labour: investments [1]
+ Interests received
= Total income
- Interests paid
- Payment to previous owner
= Total net income (TNI)

+ Gifts
+ Inheritance
+ Family allowance
+ Other contributions
- Paid taxes
= Available for private consumption
- Private consumption
= Saving

5.3 Data sources

5.3.1 Data from tax accounts

Most of the data in the survey come from the tax accounts. Income from agriculture, forestry, other occupations, dividends, wages income, pensions, sick pay is taken from the tax accounts. In addition are interests received and paid and payments to previous owner coming from the tax accounts. Paid taxes is also coming from the same source.

5.3.2 Administrative data

Often at least one the members in the family is not working on the farm. They have their own jobs and activities and their own economy separated from the farms account. To register the economy for these people we have to use the Tax Return Register.

Until now we had to get these data from the accountants offices or directly from the participants. But this year we are allowed to get this information electronically from The

[1] Family labour: investments is the value of the family labour on investments in Outbuildings etc.

Tax Return Register. Unfortunately these data are not released in time for the FBS this year. Therefore we had to get the information the traditional way.

We do not have access to any central register for no-taxable income. Number and age of children is needed to get the amount of family allowance. Most of these data are gathered from The Tax Return Register.

5.3.3 Data from farmers

Some farmers is making their own tax accounts. In such occasions we get the information directly from the farmers. Sometimes we also have to supply the data by contacting the farmer or his family. Information on Family labour (hours) is gathered from the farmers.

5.4 Composition and development household income in Norway during the last 20 years

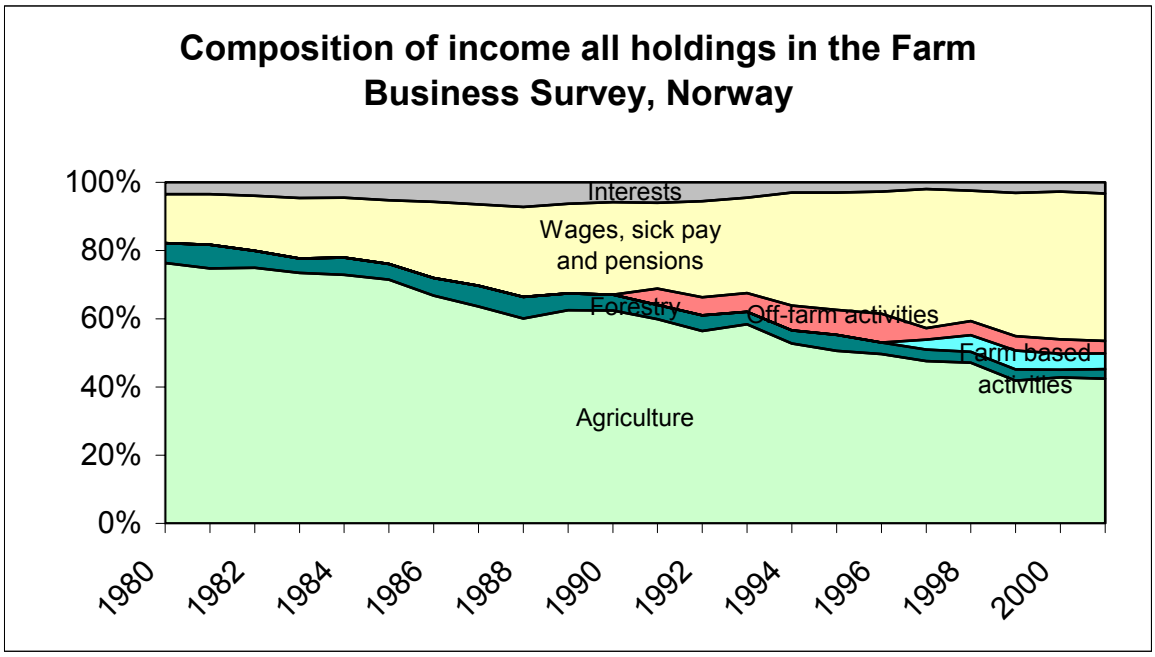


Figure 5.1 Composition of income all holdings in the Farm Business Survey in Norway

5.4.1 Composition of household income in Norway

The figure of the composition of the income shows decreasing contribution from agriculture during the last 20 years. It is more and more common that one or both spouses do have a job outside the farm, especially on small farms.

Some of the farmers do have some business outside the farm. From 1991 this has been devided from the rest of the non-farm income in FBS. The authorities have in a decade stimulated farmers to start new farm based business. The possibility to increase income

from agriculture is limited, and favourable terms on loans and subsidies have been available for farmers who want to start new activities based on farm resources. Example on such activities is different kinds of tourism, services, processing food from the farm etcetera. FBS started specification income from farm based businesses in 1997.

5.4.2 Results Total Net Income in Norway 1992-2001

Contribution from agriculture to the total household income has decreased the last decade. The amount in the early nineties was approximately € 30,000 in average for all holdings in FBS. Equivalent amount in the beginning of this century was about € 25,000.

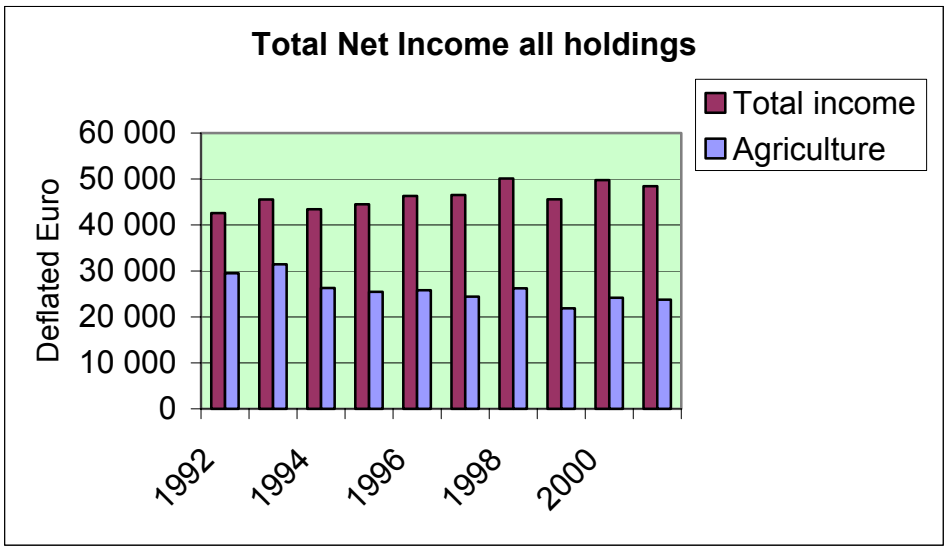


Figure 5.2 Results Total Net Income and Net Income agriculture 1992-2001

The total net income (household income) has increased the same period from approximately 42,000 to € 49,000 on average per farm for all holdings in the FBS. Despite lower net income from agriculture the total income has increased. The main reason is higher contribution from non-farm income, especially wages.

5.4.3 Collecting data on household income in FBS in the future

In Norway we plan to continue gathering household income data in the future. Changes in regulations for accounts may cause difficulties getting the suitable data. More use of administrative data is wished because it is an easy and cheap way of getting data, but we have problems to get the needed information in time for publishing the FBS.

More and more often the participants in FBS deny releasing data from non-farm activities. Especially, this concerns spouses not working on the farms. Until now we have excluded farms being without information on non-farm income in the FBS.

That means that non-farm data are includes for all farms in the FBS in Norway. In the nearest future we may have two populations in the statistic, one with and one without these data. Then it will be possible to include different kind of companies in the statistic. Today we do not have any company in the ordinary statistic. The number of companies in agriculture in Norway is increasing, so we have to find a solution to these problems in the nearest future.

Workgroup Session 2: 'How to collect household income data'

Theme

The previous three speakers have explained their experience with data collection on non-farm income and household data. Probably you have experiences to share too. In this workgroup session we would like to exchange and collect best practices and discuss bottlenecks.

To work efficient we will focus on this issue in each group from a different angle:

1. group 1: Methodological issues (e.g. relating to the issues discussed in the first workgroup session);
2. group 2: Stakeholders (e.g. farmers, ministry of agriculture, researchers, accounting offices);
3. group 3: Organisational effects (e.g. training accountants, cooperation with statistical organisation, collaboration with new users).

Method

In the first 10 minutes of the workgroup identifies 'best practices', as heard in the presentations or from own experience, that are written down by the chair on the flip chart. Keep the view of the group as mentioned above in mind (so group I only notes down best methodological practices!). Then everybody takes 5 stickers and places them on the best practices that he thinks most useful for his own country.

We then use 10 minutes to write down the main bottlenecks (again: keep the view of the group in mind). Sticker also the main bottlenecks with your own country in mind.

Use the last 15 minutes to try to find solutions for the 5 main bottlenecks.

Report the most important best practices, bottlenecks and their potential solutions to the plenary session.

Group composition

Group 1

Catherine Moreddu (chairperson)
Carlos San Juan
Werner Kleinhanss
Timo Sipiläinen
Ann-Marie Karlsson
Ildiko Nagy
Trajkovski Petar

Group 2

Torbjørn Haukås (chairperson)
Beat Meier
Lech Goraj
Kostov Mitko
Hans Vrolijk
Damaris Melle

Group 3

Paola Doria (chairperson)
Benoir Jean Boup
Ashok Mishra
Anne Kinsella
Ilievska Vesna
Finn Andersen
Marju Aamisepp

Workgroup Session 2, Group 1

Best practices

* Sources
  - Tax files: cheap but does not contain all sources/households
  - use census to define your sample
  - survey: household income/ for comparison expenditures. farm account for structural information
  - administrative records (subsidies)

* Methology
  - broad coverage of income sources and wealth and 'good' classification (detailed)
  - panel data: time dimension
  - definition of a farm in a farm account survey
  - in general surveys: identify farms to compare with other households
  - large enough coverage of farmers
  - 'representative' person in the household: who answers the question
  - seasonality for questionaires and income flow
  - variability of farm income => problem for definition

* Bottleneck
  - bookkeeping not compulsory => bias
  - tax files not required
  - dependence on farmers good will => incentives
  - tax incentives for reporting farm income
  - deprecation - capital gains
  - underreporting of income => connection / compare with consumption
  - different structure of households between countries and in time => details about the source of off-farm income and family employment

Workgroup Session 2, Group 2

Best practices

- Explain why
- Confidentiality
- Trust
- Simple indicators
- Sub sample
- Indication of completeness

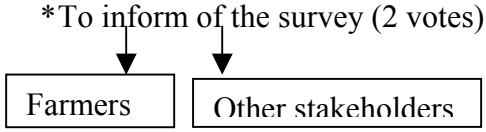
Bottlenecks

- Effects on response
- Against farmers interests
- Item non response
- Administrative burden
- Comparability

Workgroup Session 2, Group 3

BEST PRACTICES

*Training of data collectors -group (3 votes)
- individual (1 vote)
*Training material - manual (4 votes)
- collection guideline (0 votes)
*Training farmers tot facilitate data collection (0 votes)
*Collaboration with other collecting bodies (3votes)
*Collaboration with users - new users (0 votes)
- ongoing (0 votes)
- objectives (2 votes)
*To inform of the survey (2 votes)



*Good diffusion of results (0 votes)

BOTTLENECKS

*Motivation for farmers to say the truth (0 votes)
* Incentives for data collectors to actually go to the farms (3 votes)
*Money constraints (3 votes)
*Time (farmer's perspective) (0 votes)
*Bureaucracy => delay (3 votes)
*Definition (1 vote)
*Which means of diffusion is the best? (0 votes)
*Sample - width (0 votes)
- representative (Sub-samples) (3 votes)
* Validation of data (3 votes)

6. Impacts of the Mid-Term Review on German agriculture requirements for experience with farm modelling with farm modelling based on FADN

Werner Kleinhanss, F. Offermann, M. Bertelsmeier [1]

Abstract

Impacts of the Mid-term Review policy reform on German agriculture are assessed by using Simulation approaches and optimisation models based on FADN data. Beside scenarios related to the basic system of de-coupling (single payment scheme) alternatives of national modifications, i.e. the partial de-coupling of livestock premia, the regional implementation via unified area premiums as well as options of modulation are assessed. Main results are:

- reduction of rye production by 20% due to lower prices without intervention;
- reduction of sucker cows and bulls by more than 20% due to the de-coupling of head age premia;
- negative income effects mainly for dairy farms under conditions of less favourable milk prices. The national possibilities of modifying coupled direct payments across regional uniform arable and grassland premia would lead to a substantial re-distributions of premia in Germany.

Keywords: De-coupling, modulation, direct payments, agricultural policy, models, FADN

6.1 Introduction

The decisions of the Mid-term Review policy reform include modifications of some market regimes, a far-reaching system of de-coupling and the obligatory modulation of direct payments. Beside the standard model of de-coupling - the single payment scheme - the member states will have different options of full or partial de-coupling, i.e. the regional implementation (via unified premia based on land) or the partial de-coupling of arable crop and beef premia. In Germany, different national arrangements of the direct payments are being discussed, which will be determined by the federal and state (laender) governments.

The working group 'Policy Assessment of the FAL' has studied the impacts of the COM proposal of July 2002 (Bertelsmeier et al., 2002), the legislative proposal of January 2003 (Kleinhanss et al., 2003) and the final decisions of June 2003 (Offermann et al., 2003). Among other things, these served as the basis for the political decision making of the BMVEL. Apart from the comprehensive analysis of the effects, the following options were studied in detail:

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- arrangement of modulation;
- de-coupling of direct payments and national options for de-coupling (regional implementation, partial de-coupling);
- price-policy measures, in particular for rye and milk.

This paper focuses on the first mentioned items. Impacts of price-policy measures are mentioned in the overall assessment of the final MTR decisions. The following methods were applied: simulation approaches on the basis of national and EU FADN, and a non-linear programming model for the German agricultural sector.

6.2 Modulation of direct payments

Modulation had already been decided under the Agenda 2000, however, only few member states introduced this option on a voluntary basis. At the beginning of 2003, Germany introduced modulation with reductions of two percent of direct payments exceeding € 10,000 per farm. The COM proposal for mandatory modulation is therefore in the interest of the federal government, aiming at the transformation of budget in favour of the second pillar of CAP (in particular agri-environmental measures, animal welfare). Since last year the COM has submitted the following proposals:

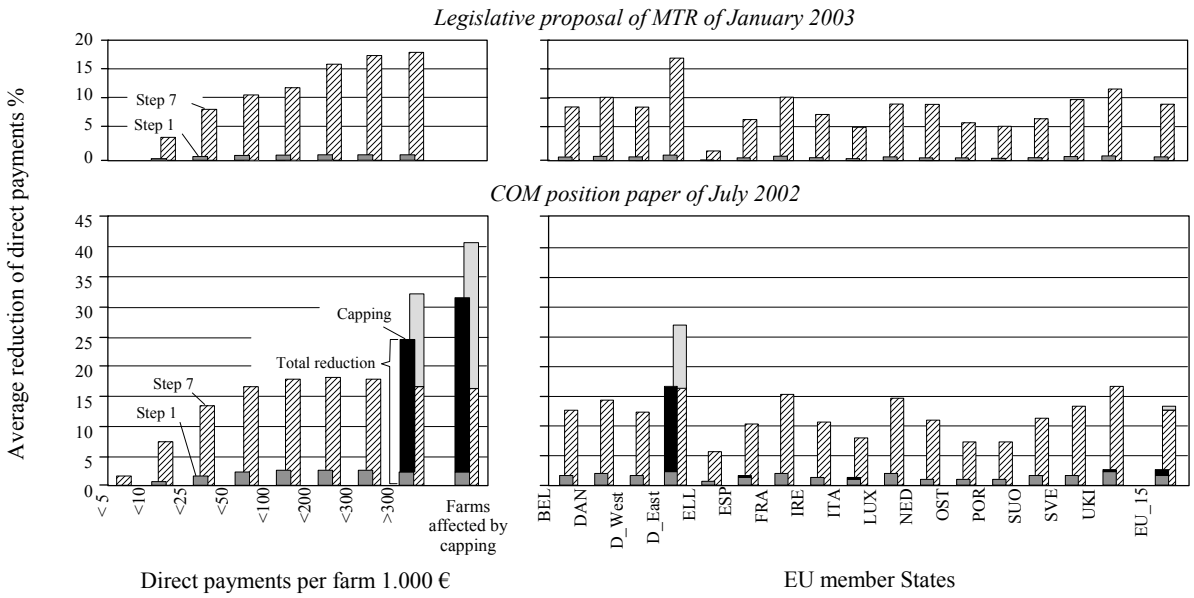
- dynamic modulation (position paper): A free allowance of € 5,000/farm plus € 3,000/labour unit (>2). Premiums exceeding this level should be reduced by 3% in the first year, increasing stepwise by three percent points per year to 20% in the seventh year; the premium disbursed should be restricted to € 300,000 plus the free allowance per farm;
- modulation/Degression: progressive reduction of premia in seven steps of one to 2.5% for premium volumes between € 5,000 and € 50,000 and of one to 19% for more than € 50,000 per farm. One to six percentage points should be used in favour of the second pillar, the remaining budget for financing reforms within the market policy (Pillar One);
- in the final compromise, a mandatory modulation was decided upon with a premium shortening of three percent in 2005 (€ 5,000/farm), which rises to 5% in 2007. A total of 80% of the budget from modulation remains in the member states concerned, whereby a ten percent higher portion was accorded to Germany for supporting measures for rye producing locations.

By means of a simulation approach based on EU-FADN data, the impacts of modulation on premium volumes were calculated. Beyond that, alternative schemes, i.e., degressive payments, were analysed.

Referring to the first proposal it can be mentioned, that capping leads to strongly differentiated effects between both the enterprises and the member states (see figure 6.1):

- in the first year, direct payments would be proportionally reduced by 3%, while the premiums above the capping level would be reduced by 100%. An average premium reduction of up to 65% occurs on the farms affected by capping (Kleinhanss, 2002);

- since in the European Union about 4% of the farms would be affected, while about 45% of the premium volume under capping remains in the new German federal states; farms in this region would mainly be affected.



Source: Own calculation of base of INLB_EU_GD AGRI/A 2, WJ 1999/2000. Kl_2003-09-19

Figure 6.1 Impacts of different proposals on modulation of direct payments

Although the compensation related to workers would be of economic importance, since the capping volume should be reduced by € 3,000/labour unit. It cannot, however, prevent farm adjustments, which might include dividing farms or eliminating positions for paid workers.

Due to these drastic cuts of direct payments in farms of the new Laender, an intensive discussion was started on options for modulation with regard to the ceilings and charges for each labour unit being used for the free allowance. Computations show that the rise of the capping level to € 400,000/farm contributes only little to the solution of the problem described above. Representatives of the new Laender suggested that amounts per labour unit be in the magnitude of labour costs for an occupation-stabilising effect.

Model calculations with different amounts for each labour unit on the free allowance shows the following:

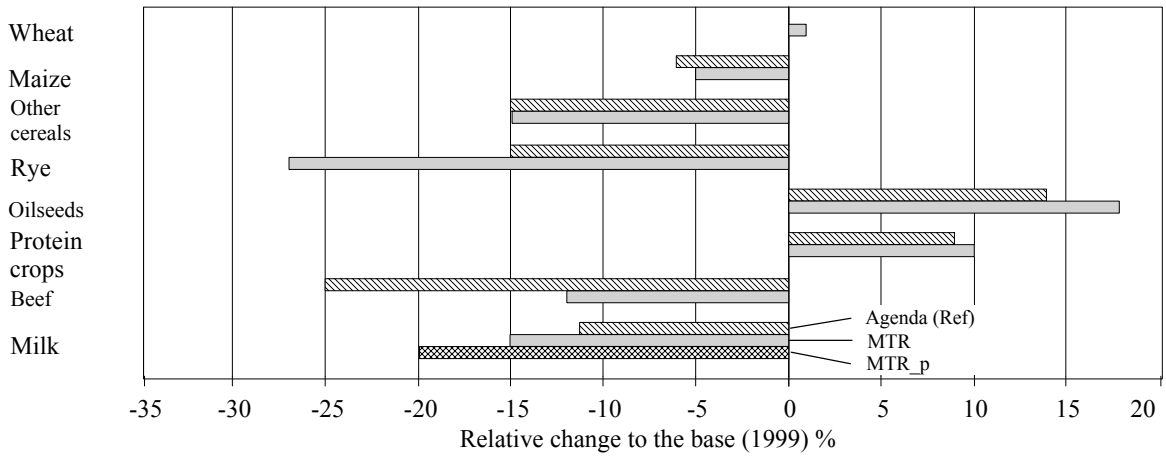
- the capping volume of approx. 170 million euro in Germany (final phase) would be reduced by 90%, or 95% respectively, with amounts of 20,000 or € 30,000 per labour unit;
- the number of the farms affected by capping would decrease by approximately 90%. In the few farms affected by capping the premiums would nevertheless be shortened by up to 50%.

Due to the possibilities for circumventing the restrictions, for example through a farm division or pseudo work relationship, we thus recommend that the negotiation strategy focus not on the 'modification of capping levels', but rather on eliminating them.

This principle obviously was accepted by the COM, because in the legislative proposal the capping level was not mentioned again. The effects of modulation for the new Laender would therefore be smaller despite the suggested premium shortening of up to 19% under conditions of the legislative proposal (figure 6.1).

6.3 Impacts of the final decisions of MTR

Supply and income effects of the final decision of the Mid-term Review were analysed with the farm group model FARMIS (Bertelsmeier et al., 2003). The analysis first focuses on scenario conditions of the single payment scheme. A total of 434 farm groups representing the German agricultural sector were built based on national FADN data. Using consistent aggregation factors, the results are aggregated up to the sector level. The model calculations are accomplished related to the year 2010 (complete introduction of the decided measures). The conditions of Agenda 2000 (updated until 2010) were taken as the reference. Price projections were realised with the partial equilibrium model GAPsi (Frenz et al., 1995; Bertelsmeier et al., 2002), which are shown in figure 6.2 in relation to the base year 1999. Under the conditions of the Mid-term Review, above all, strong price reductions for rye are to be expected. With a favourable milk price development, the milk price will be reduced by 11.2% in the reference scenario, or by 15% in the scenario of the Mid-term Review (MTR), respectively, assuming a 75% price transmission of intervention prices into producer prices. With full price transmission the milk price will be reduced by 20% (scenario MTR_p). With regard to supply changes for beef due to de-coupling, changes of beef prices will be only half of those of Agenda 2000.



Source: GAPsi FAL-MA. Kl_2003-09-19

Figure 6.2 Price changes in the scenarios

The changes of economic conditions through the Mid-term Review, i.e., lower prices, de-coupling and modulation of direct payments, induce farm adjustments which centres on changes in land use, livestock production and incomes. The changes, as shown in the following, refer to the reference; that is, they represent only the changes induced by the reform with regard to the final stage of Agenda 2000.

6.3.1 Impacts on land use and crop production

Changes of land use and crop production are affected by the following policy changes:

- abolition of the rye intervention; lower prices for rye leads to a reduction of its competitive ability compared to other cereals, but to an improved competitive ability as feed;
- lower demand for roughage fodder as a result of adjustments in beef production due to de-coupling.

Cereal production will be reduced by seven percent mainly resulting from a decrease in rye production of 20% and a higher set aside in less favoured areas (table 6.1). The regional changes of rye areas (figure 6.3) range between 19 and 22% whereby the restrictions in areas with high portion of sandy soils predestined for the cultivation of rye are smaller (north/east). Due to lacking production alternatives at these locations, a higher portion of land becomes set aside, while at the other locations, other cereals and oilseeds predominantly replace rye (Uhlmann and Kleinhanss 2002). If, as foreseen in the regulation, 10% of the modulation volume would be used for measures specifically supporting rye, slightly lower adjustments will come. The area cultivated with oilseeds decreases by around 1.5% altogether. The reduction of food-oilseeds by four percentage points is based on the fact that it loses competitive ability under de-coupling, particularly at weak yield locations.

The non-food oilseed surface will be extended by 8% which might be due to low opportunity costs for land for mandatory set aside, rather favourable price conditions, and the premium incentive of 45/ha. The areas of protein crops falls back by about 7% despite the incentive of the production-bound premium of 56/ha.

The existing premium promotion for silage maize is waived out by de-coupling. It will be partially substituted for by less intensive field fodder crops. About 27,000 euro/hectares of 127,000 euro/hectares of unused grassland in the reference will be used again, which is to be attributed to the fact that grassland is needed as reference area for premia entitlements. Contrary to expectations, the surface area of mandatory set aside decreases by around 5.6%. Since 291,000 euro/hectares of arable land will become fallow by de-coupling, the extent of unused area of arable land increases. Arable or grassland fallow might be concentrated in low yielding regions.

Table 6.1 Sectoral impacts of the MTR-decisions

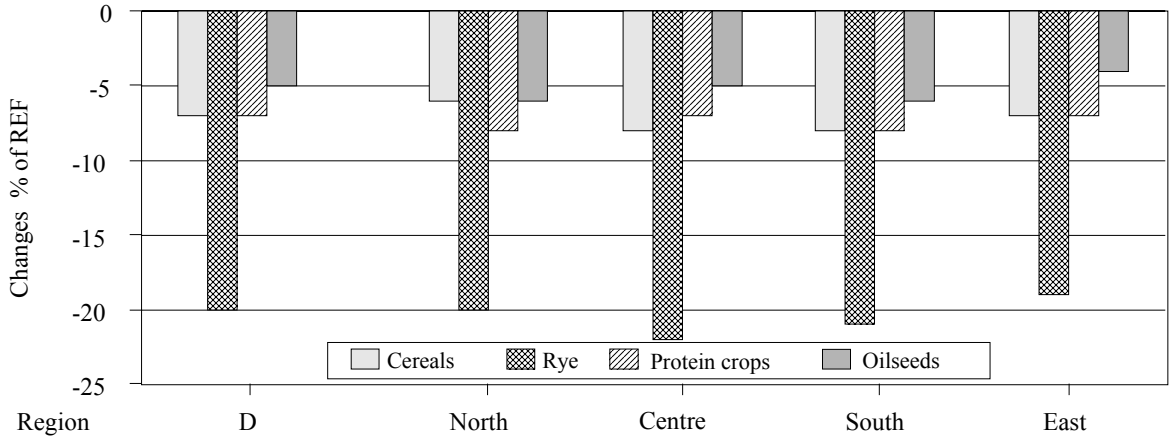
Scenarios		REF	*MTR*	*MTR_p*
Activities/*relative change %*				
Dairy cows	1.000	3.771	*0,1 %*	*0,1 %*
Fettening bulls	1.000	2.073	*-25,9 %*	*-25,9 %*
Suckler cows	1.000	458	*-18,6 %*	*-18,6 %*
Cereals	1,000 ha	7.528	*-7,2 %*	*-7,2 %*
Rye	1,000 ha	765	*-19,5 %*	*-19,5 %*
Protein crops	1,000 ha	235	*-7,3 %*	*-7,3 %*
Oilseeds [1)]	1,000 ha	1.011	*-4,7 %*	*-4,7 %*
Set aside [2)]	1,000 ha	812	*-0,1 %*	*-0,1 %*
"Non food" - rape	1,000 ha	314	*8,5 %*	*8,5 %*
Silage maize	1,000 ha	1.038	*-5,7 %*	*-5,7 %*
Other arable fodder	1,000 ha	773	*35,8 %*	*35,8 %*
Grassland	1,000 ha	4.264	*0,6 %*	*0,6 %*
UAA	1,000 ha	15.642	*-1,7 %*	*-1,7 %*
Grassland fallow	1,000 ha	112	85	85
Fallow of arable land	1,000 ha	0	291	291
Production/*relative change %*				
Milk	1,000 t	29.104	*0,0 %*	*0,0 %*
Beef	1,000 t	1.066	*-13,8 %*	*-13,8 %*
Cereels	1,000 t	46.053	*-7,0 %*	*-7,0 %*
Protein crops	1,000 t	854	*-7,4 %*	*-7,4 %*
Oilseeds[1)]	1,000 t	4.167	*-4,2 %*	*-4,2 %*
Pig meat	1,000 t	4.692	*0,5 %*	*0,5 %*
Poultry meat	1,000 t	387	*0,0 %*	*0,0 %*
Eggs	1,000 t	241	*-0,2 %*	*-0,2 %*
Income/*relative change %*				
Subsidies	Mio. EUR	6.624	*3,5 %*	*3,5 %*
- Direct payments	Mio. EUR	4.787	*5,0 %*	*5,0 %*
NWSF [3)]	Mio. EUR	8.040	*1,3 %*	*-4,2 %*
NWSF/AK	EUR/AK	31.254	*1,4 %*	*-4,0 %*

1) Without non-food rape. Kl_2003-09-19

2) Including non-food rape.

3) Net value added of factor costs.

Source: FARMIS, own calculation on base of BMVEL-INLB, Offermann/Bertelsmeier FAL-BAL.



Source: FARMIS, own calculation on base of BMVEL-INLB, Offermann/Bertelsmeier FAL-BAL. Kl_2003-09-19

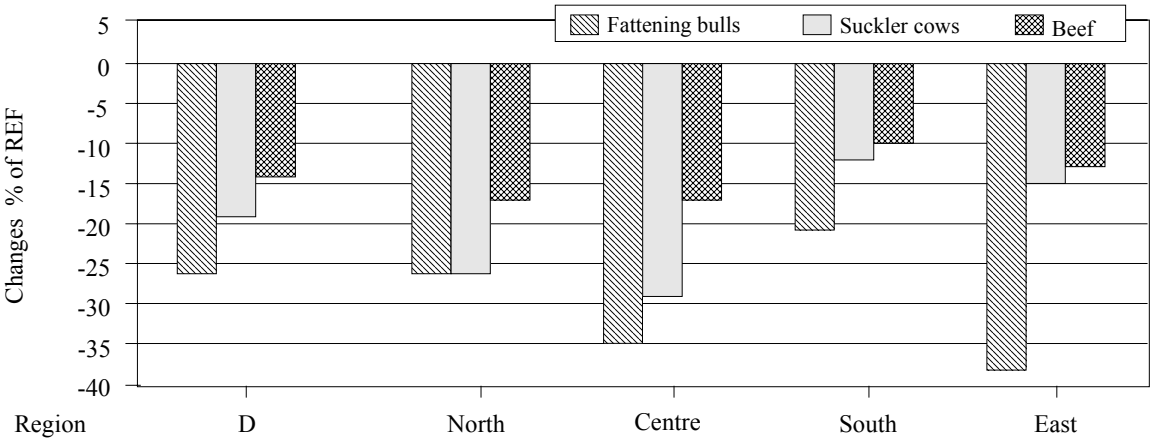
Figure 6.3 Impacts on arable crops production

6.3.2 Livestock Production

The strongest adjustment reactions can be found in beef production, although no specific price-policy measures were introduced (figure 6.4). Bull fattening and suckler cow holding, promoted until now by high production-related premiums, will be reduced under a de-coupling scheme. With proof of area used, beef premia will be fully paid in a single payment scheme even if the beef are no longer held as long as the reference area equals the basis area available. Farmers, whose total gross margins in bull fattening or suckler cow holding were less than the former beef premia, will therefore reduce production to the level where positive gross margins are reached without headage premiums.

Following the model results, bull fattening will be reduced by 26% on average whereby the adjustments in the south will rather be below the average. The number of suckler cows will go down by 19% whereby the adjustments in northern and central Germany are substantially more strongly pronounced than in the other regions. Insofar as agri-environmental measures with a minimum cattle density are applied, suckler cow holding could be stabilised (agrarian environmental measures are not specified in the model). The compensatory allowance for disadvantaged areas, considered in the model as area premium, has no obvious effect on suckler cow production.

The adjustment reactions occur although a rather favourable development of beef price is assumed. With price conditions comparable to those of Agenda 2000, even more pronounced adjustment reactions could be expected due to de-coupled direct payments. These could happen, if, e.g., the most important producer countries for beef in the European Union would not de-couple parts of livestock premiums, whereby the beef supply decreases less strongly, such that smaller price increases occur with beef. The beef production is stabilised by the constant production of cow meat as well as the expansion the heifer fattening, which is why the relative change are less pronounced (-14%) than that of bull meat.



Source: FARMIS, own calculation on base of BMVEL-INLB, Offermann/Bertelsmeier FAL-BAL. Kl_2003-09-19

Figure 6.4 Impacts on production of beef fattening bulls and suckler cows

In contrast to beef, milk production will not be reduced despite inclusion of the milk premia into the single payment. The main changes in the milk sector are the following:

- increasing quota trade and reallocation of milk production towards regions with higher efficiency;
- significant decrease of quota price due to lower milk prices and the de-coupling of milk premia;
- the pig and poultry sector will not be substantially affected by the reform.

6.3.3 Impacts on direct payments and income

The following developments can be expected concerning direct payments:

- due to the rise of the milk premium of approximately 40%, the strongest rise in direct payments is experienced by dairy and beef farms. For arable crops, however, no significant increase is to be expected, since the area premium for protein crops is derived from the existing bonus of 9/t of reference yield;
- the single payment is derived on the basis of the production-bound premiums in the base years. However the extent of eligible animals will be reduced under conditions of Agenda 2000 until 2010 (suckler cows, slaughter premium particularly for the lower number of milk cows due to increasing milk yields). Assuming equal premium levels per unit, the production-bound premium volume of the reference;
- scenario is lower than that of the base years. De-coupling thus secures the higher premium volume of the base, which is why the higher level of de-coupled premium leads to positive income effects;
- direct payments are reduced by modulation up to 5%. Due to the free allowance of € 5,000, small farms are less strongly affected by the reduction of premiums than the large ones. Although modulation, farms will get 5% higher direct payments on average.

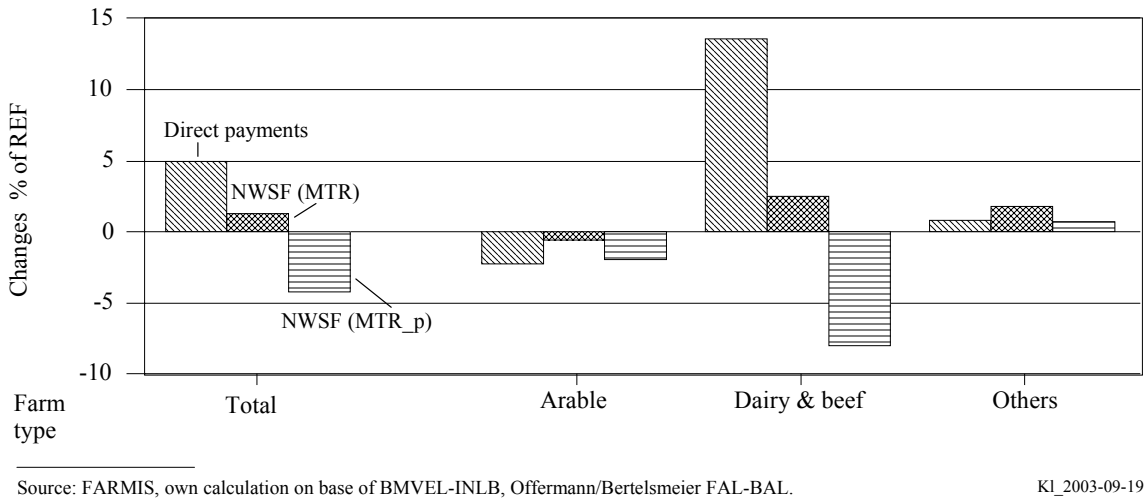


Figure 6.5 Impacts on direct payments on farm income by farm type

In dairy and beef farms direct payments increase by 14% (figure 6.5), while for the other farm types direct payments are reduced due to modulation. Direct payments in the west will increase slightly, mainly due to a higher share of milk production, while there will be a decrease in the new federal states due to a higher share of modulation under given farm structures (figure 6.6).

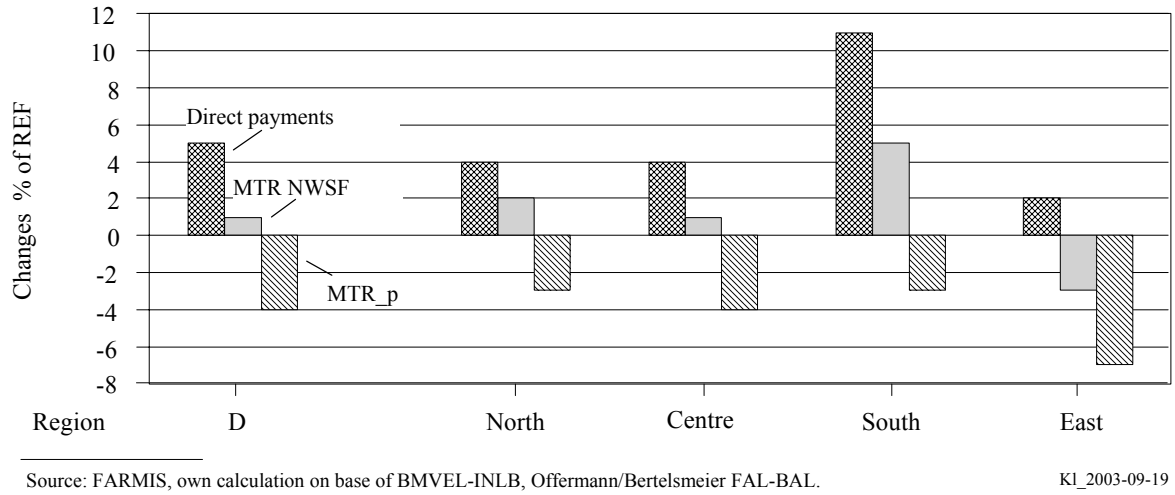


Figure 6.6 Impacts on direct payments and farm income by regions

The incomes, expressed by NWSF (net value added at factor costs) increase by 1.3% in the MTR scenario. While a less favourable milk price development leads to no significant changes in land use and supply, it causes a clear lowering of the income by 4.2% on

average. The full transmission of intervention price changes on market prices induces considerable income losses. Dairy and beef farms will have income losses of approximately 8%. Under favourable milk price conditions, however, a small increase can be expected. The underlying price development for beef can be questioned if the most important European Union livestock production countries decide for a retention of coupled livestock premiums (partial de-coupling). According to our model calculations, a smaller reduction of production is to be expected, which is why a lower rise in beef prices might adjust itself.

6.4 National arrangements of direct payments

Based on the decision of the MTR, the member states will have the following options in modifying direct payments:

- regional implementation: instead of farm individual entitlements, they could be determined as unified premia for UAA, arable land or grassland, based on the total of direct payments in a region and related to the reference areas;
- partial de-coupling of parts of arable crop and livestock premia.

Both options can be combined as well as single payments with unified euro/hectare premiums. Related to the regional implementation, the question of re-distribution of direct payments remains, while for the partial de-coupling, the focus is on the supply effects, especially for beef.

6.4.1 Partial de-coupling of headage premiums

Member states will have the possibility of excluding parts of the animal premiums from de-coupling. Such measures could be used with regard of stabilising beef production which would otherwise be drastically reduced. However, such measure could result in less favourable income effects, administrative burdens and the retention of inefficient production structures for beef (Isermeyer, 2003).

Three possible options were examined only under milk price conditions of the MTR (-15% whereby the same beef price development was assumed as for full de-coupling (Offermann et al., 2003). With the various options for the partial de-coupling of livestock premiums the following might occur (table 6.2):

- coupling of suckler cow premium: This option gives an incentive for suckler cow production. Contrary to the above mentioned strong decrease, suckler cow production will increase by 11.8% above the reference level. It has to be pointed out that quota and premia constraints were not totally used in the reference. The higher supply of male calves favours bull fattening, which will be less strongly reduced by only 21.4%. The beef production decreases only by 10.6% and thus by three percentage points less than with complete de-coupling;
- slaughter premium coupled: Over the coupled slaughter premium, bull fattening (and also heifer fattening) is favoured far more than the suckler cow holding. The extent of bull fattening is reduced less by only 13.7% and thus around 12 percentage points less than with total de-coupling. Beef production decreases by only 6.8%;

- 75% of the special premiums for bulls coupled: With this option, the competitive ability of bull fattening is clearly strengthened in relation to the other lines of beef production. Bull fattening will be reduced by only 3.9% while there will be an increase of 8 or 4% respectively in North Rhine-Westphalia and Bavaria. Also, the competitive ability improves in relation to the suckler cow holding, which is more strongly reduced (-22,2%). The beef production decreases only by 1.8%.

Although the coupled livestock premiums contribute to a stabilisation of the suckler cow holding and bull fattening as well as beef production, the inefficiencies induced by the existing headage premiums will continue, which results in lower income effects. With 0.4 to 0.8% the rise of the net value added is clearly smaller than during full de-coupling. The lower income effects result in particular from the lower level of direct payments. If beef prices were to be less favourable than under the underlying scenario conditions, i.e., due to a lower decrease of beef supply, the income effects of partial de-coupling would be much worse.

The results show that partly de-coupled livestock premiums could induce more moderate changes in beef production compared to total de-coupling, however there will be still less favourable income effects. Therefore, such measures could be used with regard to a stepwise transformation of beef production.

Table 6.2 Impacts of a partial de-coupling of headage premia

				Partial de-coupling of premia		
Farm type		REF	*MTR* [1)]	*Suckler-cows*	*Slaughter*	*Special bull (75 %)*
Activities/*relative change %*						
Fattening bulls	1.000	2.073	*-25,9 %*	*-21,4 %*	*-13,7 %*	*-3,9 %*
Suckler cows	1.000	458	*-18,6 %*	*11,8 %*	*-19,8 %*	*-22,7 %*
Silage maize	1,000 ha	1.038	*-5,7 %*	*-5,0 %*	*-3,1 %*	*-0,7 %*
Other arable fodder	1,000 ha	773	*35,8 %*	*39,9 %*	*36,6 %*	*35,5 %*
Grassland	1,000 ha	4.264	*0,6 %*	*1,5 %*	*0,7 %*	*0,7 %*
UAA	1,000 ha	15.642	*-1,7 %*	*-1,6 %*	*-1,7 %*	*-1,7 %*
Production/*relative change %*						
Beef	1,000 t	1.066	*-13,8 %*	*-10,7 %*	*-6,8 %*	*-1,8 %*
Income/*relative change %*						
HD direct payments	Mio. EUR	4.787	*5,0 %*	*4,5 %*	*3,6 %*	*4,8 %*
NWSF [2)]	Mio. EUR	8.040	*1,3 %*	*0,4 %*	*0,2 %*	*0,9 %*

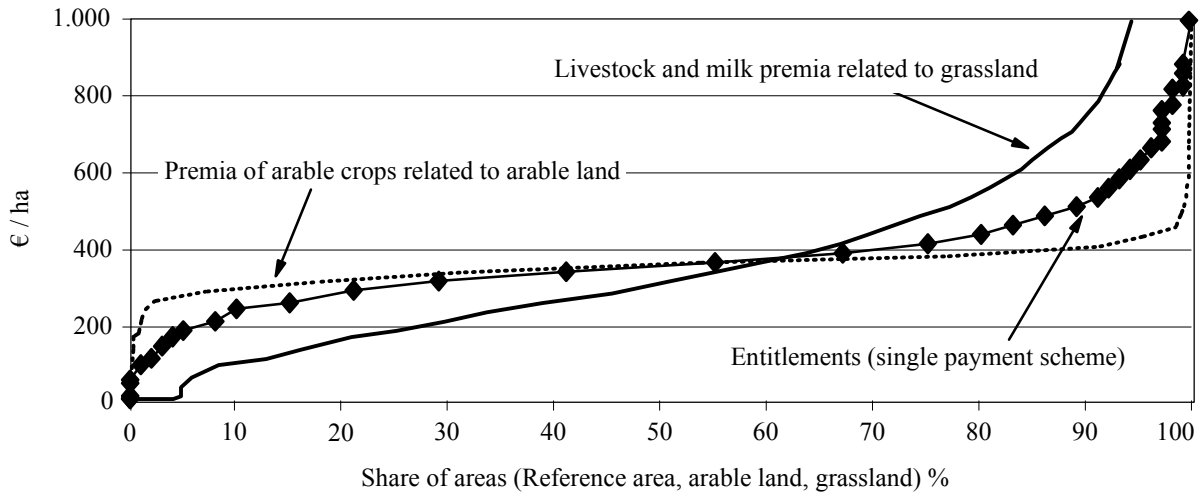
1) Single payment. Kl_2003-09-19
2) Net value added at factor costs.
Source: FARMIS, own calculation on base of BMVEL-INLB, Offermann/Bertelsmeier FAL-BAL.

6.4.2 Regional implementation of de-coupling

The German federal government as well the federal states are in favour of a regional implementation of de-coupling based on Article 58 of the MTR decisions. Considerations tend in the direction of regionally unified premiums for UUA, or premiums for arable areas and grassland, whereby if necessary, parts of the livestock premiums could be disbursed as single payments. In the following, the distribution effects of directs payments are analysed for regional premiums for arable land and grassland by means of calculations on the basis of the national FADN.

Distribution effects of uniform hectare premiums result above all from the following:

- the hectare premium have to be determined by the total of premiums and the total of UAA minus permanent crops in a region. Since sugar beets have not been included in premia schemes so far, sugar beet producer will earn windfall profits;
- due to the large variation in production structures in Germany, there is a broad difference of entitlements of between zero and more than € 1,500 per hectare of reference areas under the single payment scheme. This results in particular from the different range of beef, suckler cows and milk production per hectare. Figure 6.7 shows the cumulative distributions of:
  a) entitlements per hectare of reference area cumulated in Germany (related to the legislative proposal) as well as;
  b) premiums for arable land derived from the premium volume for arable crops and;
  c) grassland premiums derived from cattle and milk premiums.



Source: Own calculations on base of INLB-EU-GD AGRI/A.2. Kl_2003-09-19

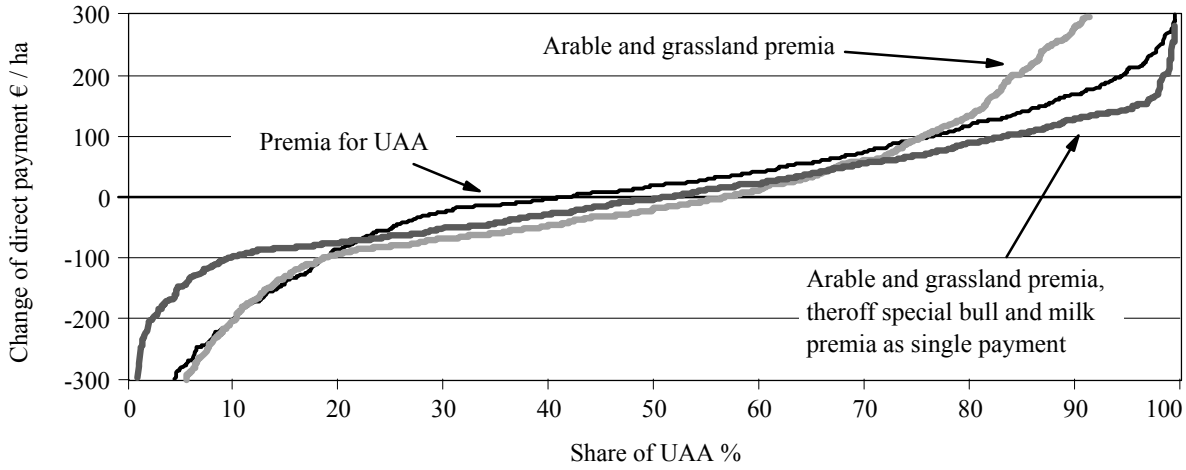
Figure 6.7 Cumulative share of entitlements and hectare premias

The premium for arable land shows a relatively uniform level between 300 and 400 euro/ha; uniform arable premiums would therefore not lead to very strong distribution effects. The grassland premiums derived from the premium volume of milk and cattle is almost zero for approximately 5% of grassland, while it will be more than € 1,000 per hectare for another 5% of areas. The conversion of livestock premiums into surface premiums leads therefore to strong distribution effects. In order to weaken these effects, excluding beef and or milk premia from the land premia has therefore been considered, to including them instead in the single payments disbursed on a individual basis.

Model calculations for one German federal state show that, for example, uniform decoupled premiums per hectare of UAA lead to substantial premium increases in farms with a premium volume in the starting situation of less than to 200 euro/ha. Farms with a premium volume of more than 500 euro/hectare, on the other hand, would have premium losses of up to 50%.

In figure 6.8 the changes of premiums are related to total of areas (either UAA, arable land or grassland) and combinations of hectare premiums with single payments:

- with uniform premiums for UAA, increases or losses of more than 100 euro/ha are to be expected for each 20% of the area;
- with uniform premiums for either arable land and grassland, premium increases or losses of more than 100 euro/ha arises for 15% of the area in each case;
- with a combination of single payments (based on beef and milk premia), arable premia and grassland premia (based on the remaining livestock premia), only premium increases or losses of more than 100 euro/ha arise for 10% of UAA in each case.



Source: Own calculations on base of BMVEL-INLB. KI_2003-09-19

Figure 6.8 Changes of direct payments per hectare of UAA due to unified premia for land

The above mentioned partial de-coupling would likewise lead to a smaller re-distribution of direct payments, but they would induce other supply effects.

Supply effects from the single payment scheme and the regional implementation of de-coupled premia would almost be comparable. The income effects are however totally different. Although the federal and state governments agree in converting the de-coupled premia in unified entitlements based on land, the outcome of negotiations is rather uncertain. It seems to us that insufficient transparency exists in the extent of the distribution effects of unified hectare premiums. Also, it is not certain whether a partial de-coupling of the animal premiums would be decided upon. A combined model of single payments, unified area premiums, and partially de-coupled beef premiums would be administratively difficult to handle.

Model calculations for such a combination model have not yet been accomplished, however, the farm group model FARMIS can easily be further improved in this direction. Based of the experiences in modelling milk quota trade, the model will further developed for the assessment of trade of entitlements with/without land.

6.5 Summary and conclusions

The decisions of the Mid-term Review policy reform at the end of June 2003 include corrections within the market regulations as well as the de-coupling and modulation of direct payments. With the farm group model FARMIS, a non-linear programming model for the German agricultural sector, supply and income effects of the reform are quantified and compared to the conditions of a reference scenario (full implementation of the Agenda 2000 in 2010).

Cereal production will be 7% lower, mainly resulting from a 20% reduction of rye production due to lower prices without intervention. Cropping areas of food-oilseeds, protein crops and maize for silage will decrease while the area used for other arable fodder as well as set aside will increase. The de-coupling of headage premia will have significant impacts on the beef sector. The number of suckler cows and bulls for fattening will be reduced by more than 20%. Milk production will still be realised up to the limits set by the quota regime, despite the milk market reform and the de-coupling of milk premiums.

Under favourable development of milk prices, the income will increase by about one percent on average. Less favourable milk prices, i.e, the full transmission of lowered intervention prices on the producer's price, leads to income losses in dairy and beef farms of 8% on average. Due to modulation, small farms will be less affected than the larger ones; therefore income losses in the eastern regions will be higher than in the western regions.

The national possibilities of modifying de-coupled direct payments across regional uniform arable/grassland premia would lead to a substantial re-distribution of premiums in Germany. Extensive farms in less favoured regions would be the winners, while in particular farms with a high share of milk and beef production would have to accept substantial losses of direct payments. Since the level of the de-coupled premiums would not induce substantial allocation effects (Kleinhanss et al., 2003), making a regional differentiation of the arable and grassland premia, at least at state level, would seem to be worthwhile. Thus premium re-distributions between the states of the Federal Republic of Germany can be

avoided, but even within each state substantial distribution effects would still remain. A higher portion of premia included in the single payments or a partial de-coupling could likewise reduce distribution effects.

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Workgroup Session 3: 'Who gets the support?'

Theme

In the presentations given before this workgroup session we have seen that some farmers get large direct payments (at least in the EU), and others none or only small ones. As made clear in the introduction of PACIOLI-11, this will lead in future to a large number of new research questions. These include questions on transfer efficiency (is it not more efficient to give money only to really poor people for instance?) and to capitalisation of benefits into land or quota values.

In this workgroup session we will try to anticipate those questions to the FADNs.

Method

For each group there is a different task to address this issue.

Group 1
In the presentation and paper of Hans Vrolijk there were a number of graphs that showed the distribution of direct payments, e.g. in the EU cereal and beef farms. Assume that we would like to make a joint paper/publication in the group with such graphs for most countries represented in this Pacioli-meeting (including new EU member states and non-EU countries like Switzerland, USA and Norway) with data by farm type, farm size, and (in large countries:) region, before December 31 2003. What would be the main bottlenecks (methodological, institutional, financial etc.) to do so? What are potential solutions? Report with a transparency with the following format:

Bottleneck	Potential solutions
Etc.	

Group 2
In the presented papers we have seen a number of interesting graphs and tables on income distribution and hands outs of direct payments. Try to define the 10 most interesting graphs of tables for a paper or report on incomes and direct payments that could probably be made with data available in FADNs that collect farm income, direct payments and non-farm income. Include potential methodological problems and solutions.
Report with a transparency with the following format:

Title of graph or table (as complete as possible)	Methodological problems	solutions
Etc.		

Group 3
Define a list of future research questions (focus on 2010 or later, as e.g. EU CAP Reform is introduced and discussions on direct payments have intensified) and derive the need for new types of data from those questions.
Report on a transparency with the following format:

Future research question	Data needed
Etc.	

Group composition

Group 1

Ildiko Nagy (chairperson)
Kostov Mitko
Ken Ash
Anne Kinsella
Werner Kleinhanss
Torbjørn Haukås
Carlos San Juan

Group 2

Hans Vrolijk (chairperson)
Damaris Melle
Catherine Moreddu
Beat Meier
Ann-Marie Karlsson
Ilievska Vesna
Marju Aamisepp

Group 3

Timo Sipiläinen (chairperson)
Trajkovski Petar
Benoir Jean Boup
Finn Andersen
Paola Doria
Lech Goraj
Ashok Mishra

Workgroup Session 3, Group 1

*data compatibility between countries
- access to data (FADN ∅) International level
- quality => standardization of data (even FADN)

solution: - OECD work for standardisation
- other indication e.g. PSE
- find other sources for subsidies on farms
- you can buy the graph from CSO

*Type of subsidies are different by countries

solution: - break down by different type of subsidies
- time aspect

*distribution by farm

solution: - work unit (annual)
- size of land
- ESU (European Size Unit)

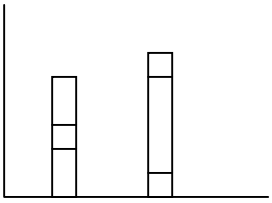
*Absolute level of subsidies by type of farms

-extra idea => EU IACS

Workgroup Session 3, Group 2

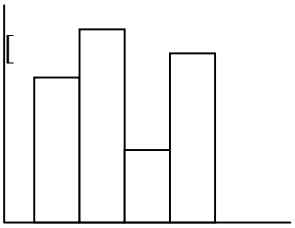
Objective??
- Lorenz curve (per type, region, country)
- Gini measure of inequality
(negative values)

% farms
% ha
% labour
% ESU
% subsidies

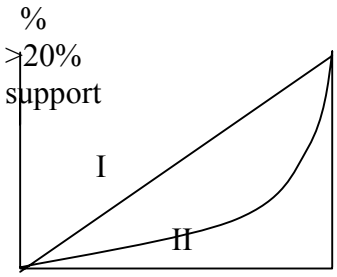


Groups

- subsidies of 20% of farms



- composition of subsidies



-Countries/types

-Market support for different products and on aggregated level
-Gis - level subsidies
- share of subsidies => income
=> output

What to include?

-relation subsidies / productivity and ec. efficiency

Valuation of non commodit outputs

What is the goal!! Define it.

Workgroup Session 3, Group 3

Research Question	Data
Relevant typology of farms	Size Stage of development who is farmer education
Defining incomes and wealth index (consumption)	Income (all sources) Size of household, consumption Assets (all) Liabilities
International comparisons	
Production of public goods (efficient ways to do it)	Alternative suppliers of these goods
Who pays? Consumer willingness to pay	
(what is) How to adjust from high support to low support?	Disaggregated data!
What to support? (acivities or presence)	Data?
supply effect direct payments transmission effect to land etc.	

7. Implementation of the Farm Monitoring System in Macedonia

Vesna Ilievska [1], Mitko Kostov [2], Petar Trajkovski [3], Macedonia

Abstract

The farmers in Macedonia must produce agricultural products in appropriate quantities with appropriate quality, which will respond to the demands of the market, and which will provide good profit for the farmers. To achieve this goal, there is a need to take evidence of the farm data, as a precondition for making analyses of the agricultural production by using some economic parameters.

The Farm Monitoring System (FMS) introduces evidence of the resources, yields, incomes and outcomes, labours in the process of the production of private farmers. This asks for appropriate approaches and methods.

The FMS is adjusted to the specific conditions in Macedonia that are a result of the different levels of development of individual farms. The development of the FMS also depends on the support from relevant institutions in Macedonia and abroad.

FMS is a base for implementation of Farm Accountancy Data Network - FADN.

Keywords: Farm monitoring system - FMS.

7.1 Introduction

In terms of rapid development of an informative society, when there is a need for implementation of the latest technical and technological achievements, the agricultural sector should be considered, too. This implies need of changes in the agricultural sector that is undeveloped, placed in the rural less developed areas, and the farmers are not well informed. This requires on-time quality information with fast sustainable solutions which will contribute to the development in the agricultural sector. The information becomes one of the most important factors for successful managing of the resources in every area. That is why the advisory services can give an important contribution to the development of the agricultural production.

The quality of the advisory services depends on information about the farm that advisors have on their disposal. This is the reason why a well-formed database of farm data is

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needed. This database can be created with help of the FMS. FMS also develops the segment of accounting, i.e. evidencing the farm data.

NEA, the Agency running the FMS, created the necessary preconditions for quality development of FMS. The ongoing development of the FMS follows the changes in the agricultural sector and will soon fulfil the FADN requirements.

The agricultural sector in Macedonia is in a process of restructuring. Adequate information is absolutely necessary in this process, but it is almost impossible to have. In order to solve a part of this problem, a Program for financial farm monitoring is initiated. In the year 2001, this initiative was supported by a World Bank Project in accordance with Ministry for agriculture, forestry and water-economy (MAFWE). At the moment, this kind of support is being realized with a project financied by Sida through Statistics Sweden. By using its own capacities and its own motivation, the Agency established a financial farm monitoring as a pre-condition for giving quality advices. This activity will strengthen advisory services in agriculture, and will enable implementation of FADN. It is also necessary as a connection between wide macro-econimy reform of Macedonian agriculture and rural development. Also, farmers by themselves give efforts to transform their agriculture, as a reflection of demands and opportunities, which are result of approaching of Macedonian society and economy towards European Union through the process of stabilization and association.

Figure 7.1 Local offices of NEA

7.2 Implementation of the FMS

Implementation of the FMS enables development of a farm to be followed by experts. The advisors are present on the field and there they get high quality on-time information. At the same time, they give expert advices to the farmers and help them to overcome certain problems in the process of the agricultural production.

Until year 2000, we had on our disposal only so-cold statistical indicators. These data by themselves are insufficient for quality development of the agriculture. The FMS collects a wide range of data such as: data for the farm resources, the yields, incomes, costs, labor, and so on. FMS covers farms, which have a long-term cooperation with the advisors. The cooperation between a farmer and an advisor is based on mutual trust and an agreement for confidentiality of the data. Some of these farms are selected as representative farms. This selection is made on the base of previous acknowledgments and statistical data.

Different types of data collected with the FMS give possibilities for different analyses, which can be useful for different users. Primary and main users of the database are farmers, but there are a big number of other users, which also can have benefits form the FMS database. This database is continually upgraded.

At this moment, the Agency has an appropriate Information System - software that enables the advisor to connect to the database through the network and to put the data into the database.

The FMS has been functioning continually for almost three years. The FMS has been upgraded during this period and it is getting closer and closer to fulfill the FADN requirements. It is very important to improve the quality of the data and to develop the guidelines and controls towards the FADN regulations. Also, it helps the data collected to be defined and unique at the very beginning of the collection of the data.

The FMS gives a possibility for calculation of the Gross Margins for different types of crops or animals. Also, the FMS covers all the territory of Republic of Macedonia, and it covers all types of farms, with different size.

7.3 Importance of the network information system

The implementation of a network information system that can be used both by small farms and the advisory service will provide direct benefits for individual agricultural producers. The Information system is based on a WEB technology, it is very user-friendly and it is very easy for the users to access to the needed information. It gives possibilities for fast, on-time and quality implementation of the scientific achievements directly to the farmers.

High quality and on-time information gives potential for creation of a development plan for agriculture, through fast processing of the data from individual farms. The database gives opportunities for satisfaction of wider interests on a State level. Also, the database gives the possibility to get closer to the Farm Accounting Data Network, and other interested counterparts, such as agricultural products processors, consumers, statistical offices and other.

7.4 Organization

NEA was founded in 1998 through transformation of former advisory centers for development of the agriculture, which functioned since 1972. The transformation was supported by the World Bank Project with an aim to achieve better quality of advisory services for the individual farmers.

The Agency is an independent institution and it is financed directly from the budget of Republic of Macedonia.

NEA headquarters is settled in Bitola, the biggest agricultural region in Macedonia. NEA has 30 working units all over Macedonia grouped in 6 regional centers. NEA is divided into 3 sectors. The main sector is the Sector for development of the agriculture.

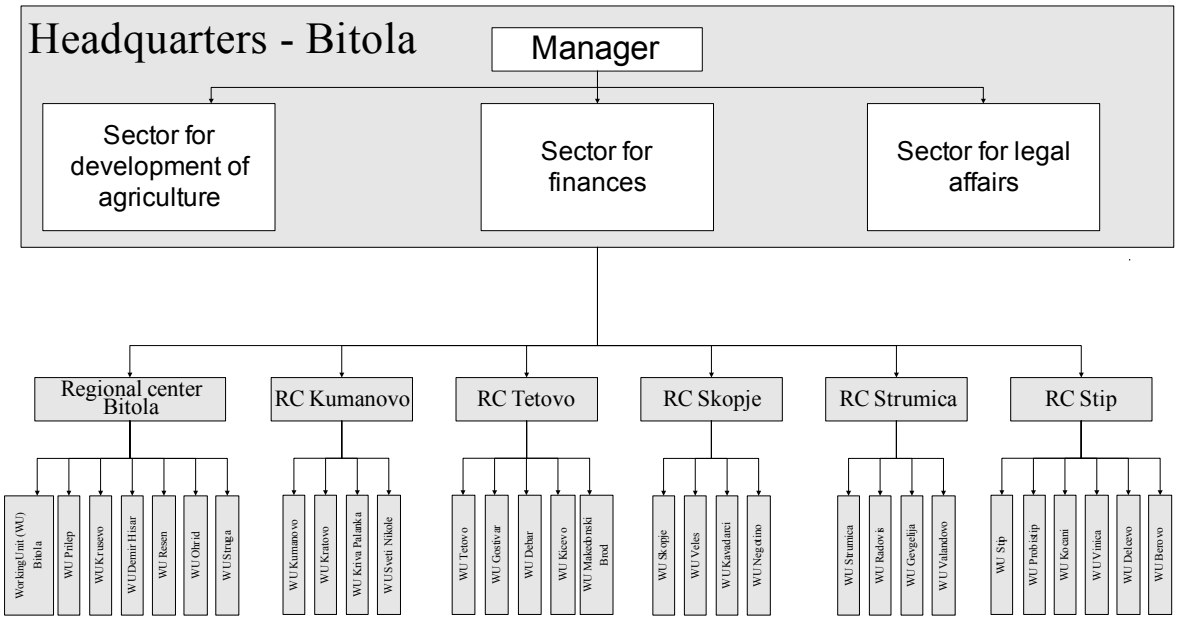

Figure 7.2 NEA organizational structure

Main activities of NEA are:

- giving advisory services to the farmers and farmers associations;
- implementing the latest scientific achievements;
- direct realization of measures for completing the Program for development of agriculture;
- to create technical advisory packages.

The quality of these activities improves with using the database created with FMS. The success of the FMS is based on:

- long-term experience and cooperation between the advisors from the Agency and the farmers;

- the status of the Agency which enables bigger trust, because the farmers knows that the data are protected;
- 30 working units of the Agency covers all the territory of Macedonia and the advisors form the Agency are constantly present on the field;
- the Agency is a link between the farmers and the science;
- the Agency is headed by a Manger Board. The Manage Board is composed from 9 members who are appointed by the Government of Republic of Macedonia on suggestion of the Minister of agriculture, for a term of four years. Six of the members are private farmers, one member is comes from the Agricultural Institute, one member from the Institute for livestock breeding and one member from the agricultural faculty;
- on the meetings of the Managing Board the farmers represent the interest of the farmers, brings out their demands and these demands are later presented to the MAFVE;
- the motivation of the advisors for collecting data, because they are aware that only if they collect on-time and quality data, they will be able to give a high quality services to the farmers.

During the realization of the FMS, NEA is facing with several difficulties, such as:
- insufficient transparency of the results of the FMS. It is a result of the short period of implementation of the FMS (this is the third year);
- insufficient support from the potential users of the results of the FMS;
- NEA is not convinced that there will be any financial support after the end of the financial support from the Project of Sida, especially in the part of covering the costs for traveling (fuel);
- NEA is not convinced that there will be a constructive support for improvement of the FMS until it reaches the FADN standards.

7.5 Methods of collecting and processing data

The present resources of NEA enable monthly visits of the advisors to the farms. During the visit, advisor fills out forms in the notebook for keeping evidence of the data. Data is entered in the appropriate field for such kind of data.

Two books for evidence of the data are created: one is for collecting general data about the resources of the farm, and the other is for collecting data about the yields, incomes, costs, labor. The books contain two-copy papers. One copy is for the farmer and the other copy is for the advisor. The other copy is kept in the archive of the working unit, in the advisor's documentation into a register. The register contains all the farms that are monitored by this advisor. It is recomended that the farmers fill out the forms, but if it is not possible, the advisor should help. If it is not possible at all, than the advisor should fill out the forms by himself. In addition, NEA prepared a manual for the advisors to collect data in the same way.

On the base of the filled forms, the advisor enters the data into the computer using the special application software created for FMS. When the advisor logs in, the system

recognises the advisor and offers him the fill out the forms for all the farms that he covers with the FMS. Each advisor that is working in the FMS has a regional coordinator who helps him to realize all the activities of the FMS. Six regional coordinators have a support by the main coordinator and a person who is responsible for IT-system administrator.

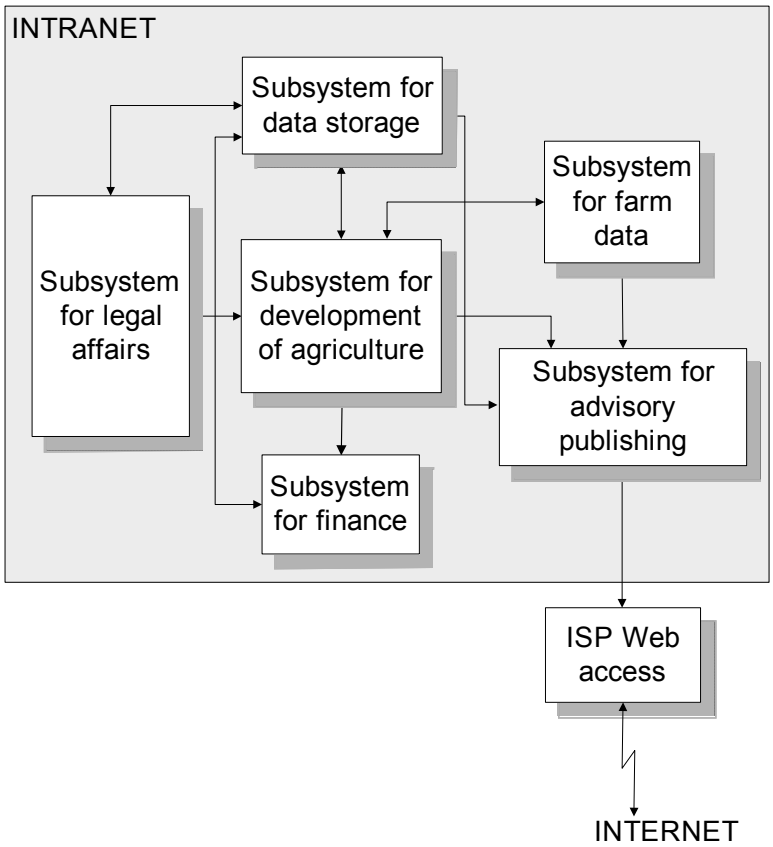

Figure 7.3 Information system of NEA

The Information System is based on WEB technology and it is a integrated multi-user system with Intranet and Internet connections. The Information System in the Agency is composed from severl sub-systems. Theese sub-systems comunicate among themselves. One of these sub-systems is the FMS. FMS is continualy upgradet and it is geting closer to FADN. The database of FMS is well designed to cover all types of data that are used in FADN.

7.5.1 Advantages of the implemented Information system

- The system enables data to flow between the Server and the rest of the personal computers located in the working units.
- The system enables accuracy and quality of the data.

- The upgrade of the software is on a central level, which makes the system economical.
- The system enables a definition of limited rights of access for internal and external users.
- Internet and intranet connections enables fast processing of the data. That is a basic precondition for job to be done on time.
- The need for direct interventions on the software in the working units is reduced to a minimum.

7.5.2 Disadvantages of the implemented Information system

- There is a need for upgrade of the Information System in purpose to be able to process data for biger number of users.
- There is a lack of defined control parameters in the System.
- In the first years of the implementation of the Information System and during the period of the training of the advisors, the costs for telephone bills got bigger.
- The cost for support and maintence of the software by the software company got bigger as a result of bad definition of the output data at the begining.

7.6 Results

The Information System enables entering of about 200 types of different farm data. In the first year of the implementation of the System, the data were more general. In year 2002 the quality of the data was improved. Published reports contain data for representative farms. In the Report for year 2002, the following data are represented.

Table 7.1 Size of the farms by farm type (cultivated land)

Farm type	Total number of farms	Of which farms with ..... ha of cultivated land						Average ha per farm
		less than 1.0 ha	1.0 - 2.0 ha	2.0 - 5.0 ha	5.0 - 10.0 ha	more than 10 ha	Total	
A. Vegetable growers	54	44,67	13,14	8,60	4,70	28,89	100%	2,76
B. Fruit producers	21	51,03	27,86	6,45	14,66	0,00	100%	1,62
C. Vini-culturists	52	19,70	15,55	20,02	16,54	28,19	100%	5,08
D. Arable farms	31	57,06	27,23	15,71	0,00	0,00	100%	1,54
E. Mixed plant farms	80	31,31	19,27	13,23	16,39	19,80	100%	4,00
F. Cattle farms	32	19,99	12,54	23,45	19,14	24,88	100%	3,27
G. Sheep farms	16	14,15	18,55	32,79	34,51	0,00	100%	1,45
H. Mixed animal farms	5	30,01	0,00	69,99	0,00	0,00	100%	2,29
I. Mixed farms	121	27,76	24,48	20,61	12,65	14,50	100%	3,14
Total farms	412	29,72	19,13	17,70	13,81	19,64	100%	3,24

Table 7.2 Farm Typology in Macedonia

Farm type	Definition of farm type	Number of farms	Percentage of farms FMS-network
A. Vegetable growers	More than 2/3 of the production from vegetable growing	54,00	13,11
B. Fruit producers	More than 2/3 of the production from fruit/orchards	21,00	5,10
C. Vini-culturists	More than 2/3 of the production from vineyards	52,00	7,52
D. Arable farms	More than 2/3 of the production from arable crops	31,00	12,62
E. Mixed plant farms	More than 2/3 of the production from plant production	80,00	1,21
F. Cattle farms	More than 2/3 of the production from cows and other cattle	32,00	7,77
G. Sheep farms	More than 2/3 of the production from sheep and goats	16,00	3,88
H. Mixed animal farms	More than 2/3 of the production from animal production	5,00	19,42
I. Mixed farms	Not any activity more than 2/3 of the total production	121,00	29,37
Total farms		412,00	100,00

Table 7.3 Gross margin calculations for some major crops/animals (in Denars)

Crop/animal	Calculated Gross Output	Calculated Direct Costs	Gross Margin
Wheat	41.170,13	19.728,78	21.441,34
Barley	40.916,32	15.717,70	25.198,62
Corn	60.791,02	21.430,10	39.360,92
Tomato	495.699,64	110.096,49	385.603,14
Pepper	994.242,92	303.334,31	690.908,62
Watermelon	177.130,57	40.186,92	136.943,66
Potato	485.757,98	206.758,60	278.999,38
Onion	351.915,80	111.209,47	240.706,32
Cabbage	169.151,50	46.849,22	122.302,28
Beans	228.226,86	30.160,26	198.066,60
Plums	106.666,67	10.666,67	96.000,00
Apple	697.558,76	167.716,67	529.842,10
Tobacco	215.079,23	7.608,10	207.471,13
Lucerne	636.985,56	62.342,27	574.643,29
Milking cow	149.266,88	27.005,04	122.261,84
Sheep	8.641,64	2.061,04	6.581,57

7.7 Conclusions from implementation of the FMS

The FMS is the base for the development of different kinds of activities that will meet the demands of different type of users. For example it is useful for the development of individual farms:

- FMS creates the basic preconditions for making analysis that are very useful for all types of users such as producers, processors, consumers, scientific institutions, Ministry for Agriculture, state institutions and many others;
- FMS enables the start of farm accounting;
- FMS gives possibilities for improvement of the quality of the advisory services;
- FMS creates the basic preconditions for the implementing of FADN. From the year 2004 it will, with the exception of some variables related to cattle, be possible to full fill the FADN requirements;
- FMS helps in creation of better agricultural policy.

The success of the FMS depends on:

1. the motivation and the conditions for work of the advisors, the experty of the advisors and the status of the Agency;
2. continuous efforts to upgrade the system and improve the quality of data in order to be able to respond to all demands of the users;
3. a mutual trust between the advisor and the farmers. For the farmers, the Agency is an independent institution that represents their interests;
4. the support from other institutions what is necessary for sustainability of FMS.

If the Agency do not obtain the necessary support (after the end of year 2004) for continuity and upgradation of the FMS with implementation of FADN, we would lose a very good and very well created database which is a base for development of the individual agricultural production in Republic of Macedonia. The database gives big potentials for proper use of the existing farm resources and capacities in purpose to get helthy food and in purpose to develop the rural areas, with implementation of appropriate economic measures.

We hope that with mutual efforts of the Agency and other Government institutions and with a big help and support from relevant foreign institutions, we will be able to create the basic pre-conditions for sustainable continuity of the FMS.

8. Product concentration and farm specialisation in spain after implementation of the CAP and its reform

Ricardo Mora [1] *and Carlos San Juan* [2]

Abstract

Several concentration and specialisation indexes at farm level are calculated for Spain using survey data from 1979 to 1997. This is an interesting period as it covers all the stages of the gradual implementation of the Common Agricultural Policy and the 1992 CAP reform. The results can be summarised in the following. First, changes in crop concentration have been unevenly distributed across large agrarian regions. Second, this fact cannot be replicated when studying farm concentration indexes. In most regions, farm concentration has gone down. Third, farm specialisation has gone up mainly as a result of an increase in county-level specialisation. However, the evolution of county-level specialisation has been different across large regions. In particular, regions more specialised in export-oriented products have witnessed a bigger increase in regional specialisation.

Keywords: Product specialisation and concentration, specialisation index, Common Agricultural Policy.
JEL Classification: C43, Q12, Q18, R32

8.1 Introduction

Spain's agricultural sector witnessed a radical transformation from 1979 to 1997 both in government policy and in access to the European market as the country became a member of the European Union. Before entry in the EU in 1986, agricultural policy in Spain provided a low level of protection for farmers and Spanish farm products enjoyed only limited access to the EU. Following a transition period, support prices and market regulations became identical to those in the EU and free access to the European market was attained by 1993.

In this paper, we report the evolution of product concentration and farm specialisation in Spain during the abovementioned period. The study uses survey data from 1979 to

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1997 to calculate indexes of agricultural product concentration and specialisation at farm and county level, thus covering all the stages of the gradual implementation of the Common Agricultural Policy and the integration of the Spanish agriculture to the European Market.

Several stages can be identified in relation to policy changes and market access in Europe. First, foreseeing the changes in relative prices, the Government increased guaranteed prices before entry so that price convergence started two years before entry (i.e. in 1984) for most products. The official transition period started in 1986 and lasted until 1992. During those years, intervention prices and market regulations approached progressively the CAP's Common Market Organization (CMO) prices and regulations. From 1993 on, the Spanish farm has been fully integrated in the CAP's CMO. Finally, in 1992, the CAP was reformed in an attempt to partly decouple price and output levels and therefore bring the system closer to the World Trade Organization rules.

This paper contributes to the empirical literature on product concentration and specialisation in three different ways. First, we provide a descriptive study of the evolution of crop and farm concentration across regions in Spain for the four stages of the process of integration. The first phase took place before price convergence, ending in 1983. Even though integration officially started in 1986, most of price convergence had already taken place by 1987. The transition period officially ended in 1992, the year in which the Single Market Treaty was fully implemented. Finally, from 1993 until 1997 reforms speeded up. In our empirical analysis, we use the *Red Contable Agraria Nacional* (RECAN). This data set is a farm-level survey provided by the Spanish Ministry of Agriculture starting in 1979 and covering the entire period of integration. It is unique for several reasons. First, it is the only farm-level data in Spain. Second, it is available for several years prior to integration in the EU. Third, there is information on location within geographical units below the provincial level. Finally, the level of aggregation for crop information is very thin, thus minimizing the problem of aggregation bias.

In our second contribution, we summarize the evolution of regional and farm specialisation in the Spanish agricultural sector from 1979 until 1997. Here, we follow Theil and Finizza (1971) and Mora and San-Juan (2003) and use a general version of a measure of segregation to study the relative importance of farm crop specialisation with respect to regional specialisation. In particular, farm specialisation with respect to the national standard can be decomposed into two terms, 'between regions specialisation' and 'within regions specialisation'.

Finally, in our last contribution to the literature, we follow up on several empirical papers (Deutsch *et al.* (1994), Boisso *et al.* (1994), and Mora and Ruiz-Castillo (2000)) which have introduced bootstrap techniques to compute confidence bounds for different statistics. We present bootstrapped standard error estimates of our decompositions of overall specialisation.

Among our main results, we emphasise the following four: (1) Changes in crop concentration have been unevenly distributed across large agrarian regions. (2) This result cannot be replicated when studying farm concentration indexes. In all regions, perhaps with the exception of Centre, farm concentration has gone down. (3) Farm specialisation has gone up mainly as a result of an increase in county-level specialisation. (4) However, the evolution of county-level specialisation has been different across large regions. The re-

sults are in accordance to those found in Mora and San-Juan (2003), namely, that in regions initially specialised in export-oriented products, i.e. fruits, vegetables and vineyards, regional specialisation has increased the most. In contrast, in regions where generous CAP policies were implemented for the main crops, regional specialisation has either increased very slightly or decreased. Moreover, farm specialisation within small regions has decreased in the areas more oriented towards foreign markets.

The rest of the paper is organized as follows. Section 8.2 of the paper presents the data and describes the composition across large agrarian regions of agricultural production in Spain and its evolution from 1979 until 1997 while section 8.3 presents the empirical results related to the specialisation index. Finally, section 8.4 provides some concluding comments.

8.2 Data Description

8.2.1 The Data Set

We use data from the Spanish section of the *European Farm Accounting Data Network* (FADN). Every year, the survey has information on crop nominal production of around 7,000 farms and 70 crops.[1] Because of sample size, we must aggregate the crop information into 10 major agricultural products: Livestock production, field crop, grain cereals, vineyard, potatoes, industrial crops, vegetables, fruits, dried pulses, and olive grove. Farm location is reported only at provincial level, a geographical unit that includes several agrarian areas for most provinces. However, it is possible to interact this information with altitude above sea level and create three areas within each province: (a) the high region includes all farms located 600 meters above sea level in the same province; (b) the intermediate region comprises firms located between 300 and 600 meters above sea level; and (c) the low region, which includes all firms below 300 meters above sea level. After interacting the province code with the altitude dummy variable, we split the country into 107 different geographical units, with an average size of 4.97 square kilometres. The average number of firms per geographical unit and year is 70, a relatively small number. Therefore, our measurements of specialisation may be suffering from small sample problems: random allocations of firms in the sample may lead to high levels of regional specialisation measurements purely by chance. We address this problem in two ways. First, we aggregate all years into four periods that coincide with the relevant stages of the Spanish integration into the EU. Second, we follow up on several empirical papers (Deutsch et al. (1994) and Boisso et al. (1994)) that have introduced bootstrap techniques to compute standard errors so that we can asses the degree of accuracy in our specialisation indexes.

[1] For a complete explanation of the data set, see San Juan et al. (2000). As is well know the RECAN provide similar farm information from 1979 to 1985 that is before the formal integration on the FADN normalization in 1986.

8.2.2 Crop Concentration by Large Agrarian Regions

In this section, we present a detailed description of the major trends in product concentration for the larger agrarian regions and the periods under study. Following previous studies on regional specialisation, we summarize our results by reporting them aggregated into five major agrarian regions: (1) The North includes the Autonomous Communities of Galicia, Asturias, Cantabria, and the Basque Country. All these areas share the same environmental and soil characteristics, that is, they are all mountainous regions in the North with rainy and mild weather. (2) North-East is formed by the Autonomous Communities of Navarra, Rioja, Aragon, Catalonia, and the Balearic Islands. All these region, with the obvious exception of the Balearic Islands are crossed by the valley of the river Ebro. The inclusion of the Balearic Islands in this group, while not influencing the general results, seems adequate from a conceptual point of view as its agricultural sector is very closely associated in terms of product specialization and farm concentration to that one in some Mediterranean areas of Catalonia. (3) Centre, with Castilla-Leon, Castilla-La Mancha, Madrid, and Extremadura, is a plateau with a range of mountains crossing it North-East to South-west and with continental weather. (4) East includes the Mediterranean regions of Valencia and Murcia. Finally, the South (5) is composed of Andalucia. The Canary Islands were dropped from the sample since one of its major crops, the banana, was not coded in all the years of the study.

Table 8.1 is divided into 5 panels, each one referring to each of the major regions. The four columns in each panel represent the proportion of each of the crops in every period as a percentage of total agricultural production. The crops are ordered within each region according to its weight in the 1979:1983 years.

The North clearly exhibits regional concentration in livestock production and field crops, which are typically related with high environmentally adapted dairy and beef farms. Concentration in these two crops steadily increased from 87.1% of total production in the 1979:1983 period to 95.3% in the 1993:1997 years. On the contrary, grain cereals and vineyard, which amounted to about 7.1% of the production at the beginning of the sample, declined its share in total production to 1.5%. Potatoes kept their share of total production at about 2.2% in all years. The rest of the crops only had a marginal presence before entry into the European Union and remained so for the entire period.

In the Northeast, livestock production decreased its share from 37.2% to 12.4%. In fact, it only remained important in the North-west Catalonian region of Lleida, where intensive hog production is concentrated. On the other hand, fruits, vegetables and vineyard, crops in which the region enjoys certificates of origin, increased their share from 20.1% to 45.4% of total production. Vegetables, a production linked not only to fresh consumption, but also to canned vegetables, increased its share by an astonishing 321%. This trend reflects that the Spanish canned vegetables industry is now concentrated in La Rioja and Navarra in the North-East and, also, Murcia in the East. Grain cereals remained stable at almost one third of total production while potatoes and field crop stayed at less than one tenth of total production for the entire period. The observed increase in olive groves is common to most other large regions and took place in the last stage after reform of the CAP. This is probably due to the effect of the price support system. In 1985, the average minimum guaranteed price was 180 pesetas per kilo. By 1997, the minimum income guar-

antee to the olive oil producer reached 540 pesetas. This increase in the support benefited marginal areas with trees with lower productivity levels, as in the Ebro valley.

In the Centre, grain cereal has always been the most important crop. However, its weight seems to have slightly declined from around 50% at the beginning of the 1980s to 40% for the 1993:1997 period. The timing suggests that the implementation of set-aside new CAP policies after 1992 may have contributed to this decline. This is in sharp contrast with the observed increase in both vegetables and vineyard. The spectacular increase in vegetables was mostly concentrated in irrigated lands in Extremadura and the Tajo valley in Castilla-La Mancha, whilst vineyards of the Duero valley and the Valdepeñas area, both with certificates of origin, account for most of the increase in the vineyard's share on total production.

Vegetables and fruits are the largest crops in the Eastern region. In the first period, 1979:1983, they amounted to 71.2% of total production. Fifteen years later, their share on total production had increased to 81.9%. The output from this region is mostly export oriented to the rest of the EU, and, since prices of these crops are less protected in the CAP, this trend clearly shows that the East is concentrating production in crops where it is more competitive.

Vegetable production in the South was, with 10.7%, only the fourth largest crop in the years before entry in the EU. By the end of the period, the percentage had jumped to 29.3% and this product had become the most important. The increase in industrial crops was also substantial, 5.9 percentage points. In contrast, grain cereals, olive grove, fruits, and livestock production all decreased their share.

In order to summarise all these trends, we present in table 8.2 two indexes of product concentration. The first one is the percentage of the three largest crops over total production by each large region. Obviously, the higher this percentage, the more concentrated production in the region is in these three products. The second index of concentration that we show is Theil's entropy measure of concentration. For each region r and period t, we compute

$$E_{rt} = \sum_i (Y_{irt} / Y_{rt}) \log_{10} ((Y_{it}/Y_t)^{-1}) \qquad (2.1)$$

where Y_{irt} is the production of crop i in region r and period t; Y_{rt} is total production in region r; Y_{it} is national production of crop i, and Y_t is total production. The logarithms are taken on base 10 in order to normalise the index between 0 and 1. Higher values indicate more entropy, or dispersion, and lower values indicate more concentration. A number of stylised facts can be drawn from table 8.2: (1) The North and the East are the regions with more product concentration by the end of the process. In fact, three products account for almost all production in 1993:1997. The North-East is the least concentrated in terms of the three largest crops. Similar results are obtained when using the Theil entropy measures. (2) Concentration has increased in the whole sample in the North, the East, and the South, while it has decreased in the North-East and the Centre, regardless of the index that we look at. For the South, concentration increased remarkably during the transition period (1984:1987) and the recent years (1993:1997). However, the top three products changed during the 1980s and by 1993:1997 they were vegetables, grain cereals, and industrial crops. Therefore, olive grove has dropped from the top three in the South. We will comment on this later on. (3) Finally, while the East has become a relatively concentrated

region, the North-East, a similar region in terms of concentration by 1979:1983, has followed the opposite direction and diversified.

8.2.3 Farm Concentration by Large Agrarian Regions

Trends and changes in crop concentration may take place either through changes in the ownership and size of the farms or through changes in the way that farms operate. It is thus of interest to enquire whether the observed trends in concentration and diversification in the large agrarian regions are related to possible changes in farm size. The pressure and potential provided by a bigger market with decreasing tariffs may lead to farm concentration in order to take advantage of economies of scale. On the other hand, price support, on top of certain direct payments and structural funds, provide an effective way to sustain farmers' income, rendering changes in ownership and size less likely.

We show in table 8.3 the evolution of farm concentration by large agrarian regions. Again, we present two measures: the proportion of the top 100 farms over total production by each large region in the first panel, and Theil's entropy measure in the second panel. The striking result is that, in spite of the differences in trend of crop concentration across regions, there seems to be uniformity regarding farm concentration. More precisely, the results show that there is a tendency to farm dispersion in all regions, perhaps with the exception of the Centre.[1]

Both the North and the North-East experienced most of the changes during the transition period. This fast reaction to the integration in the North was partly induced by the 'milk price war', which pushed up dairy prices, and the decision of the Spanish government not to supervise the implementation of the CMO milk quotas.[2] In the North-East, large farms specialised in cattle intensive feeding suffered a profound crisis during the first half of the 1980s due to the increase in feeds prices.

The South shows a gradual trend towards more farm dispersion. This trend is interesting in that it is the mirror image of product concentration. In this region, both gradual product concentration and farm diversification are present throughout the sample. The reason of this combination is related, as in the North-East, with the increasing output of Mediterranean products which are linked to the food export expansion but cannot take full advantage of economies of scale.

The East mainly experienced diversification in the 1990s. And again, this result is in sharp contrast to what we observe by looking at the evolution of crop concentration, where the most important changes took place during the 1990s.

Finally, no clear pattern emerges from the data in the Centre. There was an increase in farm concentration right after integration, but by the end of the period this effect had vanished, possibly due to the 1992 cereal and grains CMO reform that increased direct support to compensate the reduction in the intervention price.

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[1] This feature is nevertheless compatible with Census reports showing that the number of all farms, i.e. those employing any number of Agricultural Work Units, is decreasing.

[2] Spain had a deficit of milk production that led to a price war in the dairy industry to attract dairy farmers and increase regional market quotas in fresh milk. By doing so, the Spanish local dairy industry tried to keep the domestic market away from international competition.

The overall conclusion by looking at the evolution of farm and crop concentration is clear: the two processes may not be and have not been closely related. In the remaining sections of the paper, we will focus on the study of crop specialisation at farm and county levels.

8.2.4 Crop specialisation by large agrarian regions

Olive grove production in the South shows very clearly why looking at crop concentration and related indexes is not useful to study the patterns of specialisation. The South is specialised in olive grove production in the sense that its share in regional production is exceptionally high for national standards. In 1995, for example, 64% of all olive trees in Spain were in the South. As a result, olive grove for the whole period averages 19.7% of total production in this region whilst it only represents 3.4% at the national level. However, olive grove is not the most important crop in the South.

In table 8.4 we present a direct measure of regional specialisation by region and product. This measure is the ratio of the crop's share in the regional production to its share in the country as a whole:

$$I_{ir} = (Y_{ir}/Y_r) /(Y_i/Y) \qquad (2.2)$$

where Y_{ir} is the production of crop i in region r; Y_r is total production in region r; Y_i is national production of crop i, and Y is total production. Values higher than one show that the crop is more important in the region than in the country, and this intuitively suggests that the region is specialised in this product. In this section, we will follow this interpretation of the index I_{ir}.

A number of interesting results can be drawn from table 8.4: (1) The North is only specialised in livestock production and field crop, and its pattern remains constant throughout the years. (2) In the North-East, the major change has to do with the evolution of vineyard and livestock production. We already know from table 8.1 that the production share of vineyard increased whilst the share of livestock production decreased. In table 8.4 we observe that the region has made a dramatic change in crop specialisation, leaving livestock production and specialising in vineyard. The region also experienced a large increase in the share of fruits. However, this was a feature that also took place at the national level. Therefore, the region has simply maintained its status of specialisation in the fruits market. (3) In the Centre, changes in specialisation are small, and only vineyards seem to have increased effectively their relative importance. (4) For the East, the most noticeable change is related with vegetables. At the beginning of the period, the region's share of vegetables was more than five times larger than the nation's share. However, vegetable crops in the North-East and the South increased dramatically, bringing the index down to 2.85. The importance of fruits and vineyards remained constant. (5) Finally, Olive grove is still the crop in which the South most specialises, although there has also been a reduction of the index, in this case due to the increase in olive grove production in the Centre and the East. The region has become specialised in grain cereals and, more intensively, in dried pulses. On the other hand, vineyard production, a crop in which the region was specialised at the late 1970s, has not followed the nation's trend, driven by the significant increase of production in the North-East and Centre regions, and the index has fallen sharply. Regarding vegetables and industrial crops, we witness a clear trend of increased specialisation in the first

case, based on exports expansion, but a jump at the beginning of the integration and stability in the index afterwards in the second case, probably due to the CAP reforms of industrial crops support.

Note that our descriptive analysis has been implemented for very large agrarian regions. All of them present weather and soil heterogeneity, and therefore it is reasonable to expect several crops being important at this level of geographical aggregation. Our approach in the next two sections consists in studying specialisation at the smallest possible geographical unit, the farm, and also at county-level, where it is reasonable to assume that weather and soil conditions are homogeneous. By doing so, we can check how farms have reacted to policy and how fundamentals that are homogenous at county level are affecting the evolution of specialisation. In this sense, if county level specialisation decreased after integration whilst the opposite happened to farm-level specialisation, then it would be natural to think that the CAP profoundly affected production patterns in Spain. To do so, we need indexes of specialisation that aggregate both for products and geographical units. In the next section, we present results using an index based on Theil and Finizza's index of segregation that satisfy this property.

8.3 The decomposition of farm specialisation into regional and within regional specialisation

In the previous Section we have seen that a slow process of regional product concentration has taken place whilst firm concentration has, if anything, decreased. This fact may suggest that product concentration within the firm has also increased and that the evolution of regional concentration is merely a reflection of farms' responses to the changing environment due to trade diversion effects of integration and to the generalised introduction of guaranteed prices and subsidies with the implementation of the Common Agricultural Policy.

In this section, we present detailed results by large agrarian region of the decomposition proposed in Mora and San Juan (2003) of overall product specialization into two components. The first term is a *between-county* term that measures product specialization at county level as opposed to the national standard:

$$\hat{\mathbf{I}}_{\mathbf{(r)}} = \sum_r (Y_r/Y) \left[\sum_i (Y_{ri}/Y_r) \log_{10} ((Y_{ri}/Y_r)/(Y_i/Y))\right]$$

where subindex r refers to county r, subindex i refers to crop type i, and Y is production. This term is a measure of how product specialization differs in the counties in relation to the national specialization pattern.

The second term in the decomposition measures to what extent the pattern of product specialitions in the farms within each of the counties differs from the pattern of crop specialitaion in the county as a whole:

$$\hat{\mathbf{I}}_{\mathbf{(rf)}} = \sum_r \sum_f (Y_{rf}/Y) \left[\sum_i (Y_{rfi}/Y_{rf}) \log_{10} ((Y_{rfi}/Y_{rf})/(Y_{ri}/Y_r))\right]$$

where the subindex f refers to farm f. Mora and Ruiz-Castillo (2000) show, in the context of occupational segregation, that the sum of $\hat{\mathbf{I}}_{\mathbf{(r)}}$ and $\hat{\mathbf{I}}_{\mathbf{(rf)}}$, $\hat{\mathbf{I}}_{\mathbf{(f)}}$, is itself a direct index of specialization at farm level with respect of the pattern of crop specialization at the national level.

We use county-level geographical units to account for regional specialisation. Thus, we study regional specialisation for the 107 geographical units that result from the interaction of the province codes with the altitude dummies. The results of the decomposition are presented in table 8.5. Each panel corresponds to one of the four periods. Bootstrapped standard errors were obtained with 1,000 replications of the empirical sample with replacement. We also show the values of the decomposition for each one of the larger regions and at the national level in the last row of each of the panels. Obviously, the national decomposition equals the weighted sum of the regional ones, with weights equal to the share of each of the regions in the national agricultural output.

When we look at the national indexes, we observe that total farm specialisation has gone up from 57.8 to 67.6, or 17%. The decomposition into a between and a within component shows that all of this increase is attributable to the increase in regional specialisation, from 27.9 in the 1979:1983 period to 40.0 index points in the 1993:1997 years. Farm specialisation within small agrarian regions has, if anything, decreased at national level, starting from 30.0 in 1979:1983 and coming down to 27.6 in 1993:1997, although we cannot reject the hypothesis that farm specialisation within small regions has remained constant. In the descriptive analysis of the previous sections, it was shown how important agricultural specialisation in large agrarian regions is. Clearly, different regions concentrate in different products. For example, whilst the North would produce mainly livestock production and field crops, the East concentrates production in vegetables and fruits. It is thus of interest to study decomposition (3.15) for each of the regions, as it can be expected that their specialisation will lead to different responses to the new environment of a bigger market and a new policy.

In the North, county-level specialisation has actually decreased for the whole period, whilst farm specialisation within small regions has remained stable at very low levels. This is consistent with the fact that the region as a whole is specialised in dairy and field crops. Furthermore, weather and soil conditions are fairly homogeneous across the region, and differ significantly from the rest of the country. An interesting question to address is why regional specialisation has decreased mainly in the 1988:1992 years. This was the period in which the milk quotas started being actively supervised by the central government, with an inevitable decrease in milk production and prices. In the next period, the Spanish quota increased and reforms were implemented, changing the evolution of regional specialisation.

The increase in regional specialisation in the North-East has been very moderate and took place at the beginning of the integration to the EU. On the other hand, farm specialisation within small regions has increased, reaching levels at the entry period similar to those in the East. It is interesting to note that production shares in the North-East increased for vineyard, fruits, and vegetables, whilst they decreased for livestock production. Our conjecture is that, in the North-East, a mixture of policy and market expansion effect is influencing the results on regional and farm level specialisation.

In the Centre, both regional specialisation and farm specialisation have increased during the whole period. However, the increase in farm specialisation within small regions has not been significant so that we cannot reject that farm specialisation has remained constant. On the other hand, the change in regional specialisation is significant and takes place gradually. This is consistent with the view that set-aside programmes, modulation in grain

cereals, and lowering intervention prices put pressure on firms to specialise and take advantage of economies of scale.

Regional specialisation in the East increased significantly at the entry to the EU and remained stable afterwards. On the other hand, farm specialisation within small regions has decreased for the whole period. Thus, in the export oriented agriculture of the East the integration to the larger European market for fresh and processed food has driven the small regions to the highest levels of specialisation.

The South has experienced the largest increase in regional specialisation: an increase of 29.9 index points or 116%. At the same time, farm specialisation within small regions went down from 48.7 to 27.7. The national results are mainly driven by what happens in both the South and the East. Again, the reasons behind this increase in regional specialisation in the South are related to the intensification of production in crops with increasing exports, mainly vegetables to the EU.

To sum up our results, the evolution of county-level specialisation has been different across large regions. In regions initially specialised in export-oriented products, mainly the South and the East, regional specialisation has increased the most. In regions where CAP policies were implemented heavily affecting the main productions, regional specialisation has either increased very slightly or, as was the case in the North, decreased. Moreover, farm specialisation within small regions has decreased in the areas more oriented towards foreign markets.

These findings are in accordance with those found in Mora and San Juan (2003). They provide descriptive evidence that puts into question the argument of multifunctional frequently used by the EU Commission whereby CAP interventions at regional level supposedly stabilize the structure of land use so as to help preserve landscape and rural areas and limit agricultural surpluses. First, regions initially specialised in CAP-protected crops have witnessed a decrease in the importance of their production at the national level, in spite of the large increases in support prices of their main crops. Second, regions which initially specialised in cereals experienced a significant increase in specialisation both at county and farm level, suggesting that the 1992 reforms related to set-aside programs for cereals had an unexpected negative effect on the production of other crops.

8.4 Concluding remarks

In this paper, we present indexes of crop and farm concentration for Spain based on a farm level survey carried out by the Spanish Ministry of Agriculture. The period of study spans from the beginning of the 1980s until 1997, thus comprising all stages that the Spanish agriculture experienced before and after entry in the European Union. We also present detailed results by large agrarian region of an overall index of farm specialisation first proposed in Mora and San Juan (2003) that decomposes into a between and a within regional term.

We first find that crop concentration has increased in the North, the East, and the South, whilst it has decreased in the North-East and the Centre. This variation cannot be replicated when studying farm concentration indexes. In all regions, perhaps with the exception of Centre, farm concentration has gone down. Moreover, the changes in the

regional production patterns have taken place without dramatic changes in size and ownership of the farms.

We then study the evolution of regional and farm specialisation using county-level and farm information. Since the regions under consideration are homogeneous in weather and soil conditions, we can assume that a decrease in county-level specialisation and an increase in farm specialisation within counties would highlight the effect of the CAP on the production patterns. Total farm specialisation has gone up 17%, an increase mainly attributable to the increase in regional specialisation. However, the evolution of county-level specialisation has been different across large regions. In regions initially specialised in more export-oriented products, mainly the South and the East, regional specialisation has increased the most. In regions where CAP policies were more generous for the main crops, regional specialisation has either increased very slightly or, as was the case in the North, decreased. Moreover, farm specialisation within small regions has decreased in the areas more oriented towards foreign markets.

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Table 8.1 The Composition of Production by Agrarian Region

NORTH	**1979:1983**	**1984:1987**	**1988:1992**	**1993:1997**
Livestock Production	64.95	76.79	82.48	84.45
Field Crop	22.19	11.57	11.78	10.82
Grain Cereals	4.11	4.23	1.77	1.46
Vineyard	3.02	2.62	0.41	0.11
Potatoes	2.65	2.13	1.87	2.34
Industrial Crops	1.72	1.51	1.12	0.58
Vegetables	1.17	1.02	0.35	0.17
Fruits	0.09	0.02	0.08	0.01
Dried Pulses	0.07	0.08	0.09	0.01
Olive Grove	0.00	0.00	0.00	0.00
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**

NORTH-EAST	**1979:1983**	**1984:1987**	**1988:1992**	**1993:1997**
Livestock Production	37.15	15.74	13.25	12.44
Grain Cereals	29.01	35.05	31.36	26.04
Fruits	14.67	14.13	17.67	22.59
Field Crop	4.69	4.72	4.65	5.91
Vineyard	3.56	11.02	10.19	11.15
Potatoes	3.15	6.3	5.19	3.46
Industrial Crops	3.09	4.32	4.46	3.89
Vegetables	2.76	6.93	10.93	11.62
Olive Grove	1.48	1.56	1.94	2.46
Dried Pulses	0.38	0.19	0.32	0.39
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**

CENTRE	**1979:1983**	**1984:1987**	**1988:1992**	**1993:1997**
Grain Cereals	47.24	53.26	45.97	39.08
Livestock Production	18.29	15.9	19.96	17.03
Industrial Crops	16.48	15.98	17.4	17.2
Field Crop	3.9	1.72	2.54	1.74
Vegetables	3.75	2.95	6.19	12.16
Vineyard	3.43	3.43	2.67	5.57
Potatoes	2.94	3.1	2.85	3.04
Dried Pulses	2.3	2.19	1.18	0.77
Olive Grove	1.46	1.14	0.84	2.62
Fruits	0.17	0.28	0.36	0.73
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**

Table 8.1 (continued)

EAST	1979:1983	1984:1987	1988:1992	1993:1997
Vegetables	39.05	50.74	46.09	39.87
Fruits	32.11	30.32	36.29	42.05
Vineyard	11.09	7.82	10.05	12.14
Grain Cereals	6.77	6.70	3.71	2.31
Livestock Production	6.08	1.17	0.70	1.18
Potatoes	2.70	1.79	2.13	1.33
Dried Pulses	1.00	0.64	0.19	0.16
Field Crop	0.59	0.17	0.09	0.00
Olive Grove	0.39	0.29	0.58	0.80
Industrial Crops	0.16	0.31	0.11	0.10
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**

SOUTH	1979:1983	1984:1987	1988:1992	1993:1997
Grain Cereals	26.87	21.93	13.52	24.23
Olive Grove	19.53	17.11	25.65	16.56
Industrial Crops	14.77	28.15	21.76	20.65
Vegetables	10.71	10.89	18.42	29.27
Fruits	8.9	9.69	7.26	4.22
Livestock Production	8.15	6.82	9.67	0.98
Vineyard	5.49	2.50	0.90	0.13
Potatoes	3.05	1.63	1.60	2.81
Field Crop	1.90	0.71	0.76	0.06
Dried Pulses	0.58	0.52	0.42	1.04
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**

Table 8.2 Evolution of Product Concentration by Agrarian Region Output Share of Top Three Products

	1979:1983	1984:1987	1988:1992	1993:1997
NORTH	91.25	92.61	96.15	97.62
NORTH-EAST	80.85	64.93	62.30	61.09
CENTRE	82.02	85.15	83.35	73.33
EAST	82.27	88.89	92.44	94.08
SOUTH	61.18	67.20	65.84	74.17

Theil's Entropy Measure

	1979:1983	1984:1987	1988:1992	1993:1997
NORTH	49.24	40.14	30.17	26.63
NORTH-EAST	72.56	82.29	84.38	85.29
CENTRE	69.11	63.86	67.77	75.37
EAST	66.70	56.03	54.38	53.91
SOUTH	86.22	81.01	80.30	72.41

Note: Higher values indicate more entropy, or dispersion, and lower values indicate more ccentration.

Table 8.3 Evolution of Firm Concentration by Agrarian Region Output Share of Top 100 Firms

	1979:1983	**1984:1987**	**1988:1992**	**1993:1997**
NORTH	34.20	19.75	13.16	18.89
NORTH-EAST	28.66	19.46	18.10	18.25
CENTRE	16.45	21.92	17.97	18.03
EAST	29.60	26.10	18.80	24.59
SOUTH	31.30	26.51	22.13	20.31

Theil's Entropy Measure

	1979:1983	**1984:1987**	**1988:1992**	**1993:1997**
NORTH	94.47	95.78	95.64	95.71
NORTH-EAST	92.44	94.64	94.28	95.05
CENTRE	94.64	92.47	93.87	95.03
EAST	95.88	95.64	95.83	96.05
SOUTH	92.84	93.93	93.72	95.81

Note: Higher values indicate more entropy, or dispersion, and lower values indicate more concentration.

Table 8.4 The Ratio of the Product's Share in Each Large Region to its Share in the Country

NORTH	**1979:1983**	**1984:1987**	**1988:1992**	**1993:1997**
Field Crop	3.55	3.4	2.44	2.33
Livestock Production	2.39	3.59	2.66	2.88
Potatoes	0.89	0.61	0.63	0.83
Vineyard	0.69	0.47	0.09	0.01
Industrial Crops	0.17	0.12	0.10	0.05
Vegetables	0.15	0.10	0.02	0.00
Grain Cereals	0.12	0.10	0.07	0.05
Dried Pulses	0.05	0.07	0.15	0.02
Fruits	0.00	0.00	0.00	0.00
Olive Grove	0.00	0.00	0.00	0.00

NORTH-EAST	**1979:1983**	**1984:1987**	**1988:1992**	**1993:1997**
Fruits	2.07	1.97	2.21	2.31
Livestock Production	1.37	0.73	0.41	0.41
Potatoes	1.07	1.83	1.77	1.24
Grain Cereals	0.92	0.98	1.25	1.23
Vineyard	0.82	2.03	2.43	2.11
Field Crop	0.75	1.37	0.95	1.27
Olive Grove	0.46	0.62	0.56	0.63
Vegetables	0.38	0.76	1.00	0.82
Industrial Crops	0.31	0.37	0.46	0.43
Dried Pulses	0.30	0.15	0.56	0.81

CENTRE	1979:1983	1984:1987	1988:1992	1993:1997
Dried Pulses	1.82	1.87	2.07	1.61
Industrial Crops	1.66	1.42	1.80	1.91
Grain Cereals	1.50	1.49	1.85	1.84
Potatoes	1.00	0.89	0.98	1.09
Vineyard	0.80	0.62	0.62	1.05
Livestock Production	0.67	0.74	0.63	0.57
Field Crop	0.62	0.50	0.51	0.37
Vegetables	0.54	0.31	0.56	0.87
Olive Grove	0.46	0.44	0.23	0.68
Fruits	0.01	0.02	0.03	0.07

EAST	1979:1983	1984:1987	1988:1992	1993:1997
Vegetables	5.61	5.67	4.26	2.85
Fruits	4.55	4.23	4.55	4.32
Vineyard	2.57	1.45	2.40	2.30
Potatoes	0.91	0.51	0.73	0.47
Dried Pulses	0.79	0.54	0.34	0.34
Livestock Production	0.21	0.05	0.01	0.03
Grain Cereals	0.20	0.18	0.14	0.10
Olive Grove	0.11	0.10	0.15	0.20
Field Crop	0.09	0.05	0.00	0.00
Industrial Crops	0.00	0.01	0.00	0.00

SOUTH	1979:1983	1984:1987	1988:1992	1993:1997
Olive Grove	6.30	6.82	7.40	4.30
Vegetables	1.53	1.21	1.70	2.09
Industrial Crops	1.50	2.51	2.25	2.30
Vineyard	1.27	0.46	0.20	0.01
Fruits	1.25	1.35	0.91	0.43
Potatoes	1.02	0.46	0.55	1.00
Grain Cereals	0.85	0.61	0.54	1.13
Dried Pulses	0.46	0.43	0.75	2.15
Livestock Production	0.30	0.31	0.31	0.02
Field Crop	0.30	0.20	0.15	0.00

Table 8.5 Regional versus Firm Concentration

1979:1983	$\hat{I}_{(r)}$ +	$\hat{I}_{(rf)}$ =	$\hat{I}_{(f)}$
NORTH	53.35 (0.34)	8.59 (1.11)	61.94 (1.18)
NORTH-EAST	26.36 (0.66)	29.84 (2.11)	56.2 (2.63)
CENTRE	17.93 (0.44)	28.8 (1.57)	46.74 (1.97)
EAST	52.01 (2.33)	38.82 (1.03)	90.84 (2.98)
SOUTH	25.65 (1.56)	48.69 (2.44)	74.34 (3.85)
TOTAL	**27.87 (0.86)**	**29.95 (1.47)**	**57.83 (2.31)**

1984:1987	$\hat{I}_{(r)}$ +	$\hat{I}_{(rf)}$ =	$\hat{I}_{(f)}$
NORTH	52.85 (1.76)	7.83 (2.18)	60.69 (3.86)
NORTH-EAST	33.44 (1.11)	25.53 (3.37)	58.98 (4.29)
CENTRE	18.98 (0.38)	26.86 (2.76)	45.84 (3.03)
EAST	63.17 (3.22)	34.12 (0.79)	97.29 (3.04)
SOUTH	49.64 (0.86)	31.58 (3.69)	81.23 (3.69)
TOTAL	**34.36 (0.57)**	**25.01 (2.73)**	**59.38 (3.24)**

1988:1992	$\hat{I}_{(r)}$ +	$\hat{I}_{(rf)}$ =	$\hat{I}_{(f)}$
NORTH	40.94 (0.47)	8.05 (0.98)	48.99 (1.24)
NORTH-EAST	28.9 (1.25)	35.76 (1.67)	64.66 (2.8)
CENTRE	21.79 (0.49)	31.06 (2.57)	52.86 (2.98)
EAST	59.37 (2.35)	36.06 (0.72)	95.44 (1.94)
SOUTH	56.4 (1.41)	31.94 (1.79)	88.34 (2.9)
TOTAL	**35.21 (0.67)**	**27.56 (1.52)**	**62.77 (2.16)**

1993:1997	$\hat{I}_{(r)}$ +	$\hat{I}_{(rf)}$ =	$\hat{I}_{(f)}$
NORTH	47.7 (0.46)	8.01 (0.33)	55.71 (0.37)
NORTH-EAST	30.75 (0.94)	38.83 (2.06)	69.58 (2.92)
CENTRE	24.91 (0.74)	32.73 (2.22)	57.64 (2.91)
EAST	56.13 (0.79)	31.07 (1.06)	87.2 (1.44)
SOUTH	55.5 (2.25)	27.72 (1.82)	83.22 (3.93)
TOTAL	**40.03 (0.60)**	**27.59 (1.39)**	**67.62 (1.95)**

Note:

Bootstrapped standard errors with 1,000 simulations in parenthesis.

$\hat{I}_{(r)} = \sum_r (Y_r/Y) [\sum_i (Y_{ri}/Y_r) \log_{10} ((Y_{ri}/Y_r)/(Y_i/Y))]$: Regional Specialisation
$\hat{I}_{(rf)} = \sum_r \sum_f (Y_{rf}/Y) [\sum_i (Y_{rfi}/Y_{rf}) \log_N ((Y_{rfi}/Y_{rf})/(Y_{ri}/Y_r))]$: Farm Specialisation within Regions
$\hat{I}_{(f)} = \hat{I}_{(r)} + \hat{I}_{(rf)}$: Farm Total Specialisation

9. Farm Income and Income From Farming: Towards an Integration of Datasources

Ildiko Nagy and Hans Vrolijk

Summary

This paper describes the possibilities of integrating different datasources on income to give a more accurate picture of farm incomes. It's argued that such an accurate picture is essential for policy development in general and the Common Agricultural Policy in particular. In this paper the FADN as a source of income from agricultural activities is compared to income studies which provide information on income from all households and all sources. After a comparison of both sources different options for integrating these resources are described and evaluated.

9.1 Introduction and problem statement

Incomes of farmers are a central point in the development and evaluation of the Common Agricultural Policy. It's often assumed that farmers, without intervention, will have rather low incomes compared to people in other occupations and have strong fluctuating incomes. To develop these policies data on incomes of farmers is needed. A frequently applied datasource is the Farm Accountancy Data Network (FADN). This system however limits its' data collection to income from agricultural activities of commercial farms. During recent years the awareness has grown that income from agricultural activities is only a part of total income. Hill (1999) even concludes that income indicators based on FADN, although long-established and highly regarded by policy makers, are not a reliable guide to the overall income situation of agricultural households.

FADN focuses on the income from agricultural activities. At the other end of the spectrum are household income surveys that collect information on incomes of households. Not only incomes originating from agriculture, but from all other sectors of the economy. Households are classified to a profession based on the share of income from different activities. The Luxemburg Income Studies (LIS) is an important example of a dataset based on household income surveys in several countries.

9.1.1 Objective

Based on the limitations of FADN and the importance of income from non-agricultural activities, we will explore in this paper the opportunities to extend the usability of the information sources.

The objective of this paper is:

To give a general description of the content and structure of LIS and to explore opportunities for combining information from LIS and FADN databases to monitor household incomes of farmers.

9.1.2 Structure of the paper

Section 2 gives a brief description of FADN and the main focus of FADN. Furthermore the limitations of FADN are described as far as they are connected to the type of income information collected. Section 3 describes the Luxembourg Income Studies with respect to the history, the content and the organisational framework. Section 4 gives more details of the Hungarian household income survey. Section 5 gives a comparison of both data sources. This comparison is the basis for the discussion in Section 6, on the opportunities of integrating both data sources.

9.2 The FADN date

9.2.1 History

The European **F**arm **A**ccountancy **D**ata **N**etwork (FADN) was established in 1965 (DG-Agri, 2002). The primary aim of the system is to gather accountancy data from farms for the determination of incomes and business analysis of agricultural holdings. It is an important instrument for evaluating the income of agricultural holdings and the impacts of the Common Agricultural Policy.

9.2.2 Contents

FADN consists of an annual survey carried out by the Member States of the European Union. Every year data is collected on a sample of the agricultural holdings in the European Union. Holdings are selected to take part in the survey on the basis of sampling plans established at the level of each region in the Union. The survey does not cover all the agricultural holdings in the Union only those, which due to their size could be considered 'commercial'. A commercial farm is defined as a farm that is large enough to provide a main activity for the farmer and a level of income sufficient to support his or her family.

9.2.3 Limitations of FADN

An important aspect of FADN data is the fact that it covers agricultural activities on farms. It only collects information on a limited set of non-agricultural farming activities. This leads to an important distinction: income from farming versus total family income. A farmer can have income from non-agricultural activities, be it on or outside of the farm. This outside income and the income from farm activities together determine the disposable income of a farmer. This distinction is very important for understanding investment behav-

iour, survivability of farms etcetera (Vrolijk et al., 2003b; Gundersen et al., 2003). However, the FADN currently limits its data collection to agricultural and a limited set of small, on-farm, agriculture-related activities (such as forestry, contract services). This implies that certain effects of the policy changes in the recent past (e.g. a shift to non-agricultural activities) cannot be analysed with European FADN data sets (Abitabele, 1999; Hill, 1996).

These observations are not new, so in the past there have been several approaches to deal with these problems. One of the approaches is to extent the FADN database with income from non-agricultural incomes. This approach has been applied in several member states. For political and practical reasons this approach has not been adopted at the European level. Another approach is applied by Eurostat. Since 1992 Eurostat publishes the Income of the Agricultural Households Sector (IAHS). This is a mainly macro-economic approach with some use of micro-economic data. Some general findings, which stress the importance of the objective of this paper, are (Eurostat, 1999):

- agricultural households in all countries are recipients of substantial amounts of income from outside agriculture. Though typically about a half to two thirds of the total comes from farming, there are large differences between Member States and some between years;
- the total income of agricultural households is more stable than their income from farming alone. Non-agricultural income (taken together) is less variable from year to year than is farming income;
- countries differ in the share of income taken from agricultural households in taxation and other deductions.

In this paper we will look at a third option: the possibilities of using FADN data together with data from income studies. The advantage of a micro-economic approach is that it does justice to the large differences between farms. An important example of income studies is the Luxemburg Income Study.

9.3 Luxemburg income studies

9.3.1 History

The main objective of the Luxemburg Income Study is to construct a harmonized database that can be considered as the best source for international comparative studies. LIS is a non-for-profit cooperative research project with a membership that includes 25 countries on four continents: Europe, America, Asia and Oceania. The LIS project began in 1983 under the joint sponsorship of the government of the Grand Duchy of Luxembourg and the Centre for Population, Poverty and Policy Studies (CEPS). The project is mainly funded by the national science and social science research foundations of its member countries. Recently, LIS and the Centre Universitaire (CU) de Luxembourg became partners, with offices being provided by the CU.

The Luxembourg Income Study has made comparable over 100 large microdata sets which contain comprehensive measures of income and economic well-being for a set of over 25 modern industrialized welfare states. The LIS databank currently covers countries

including: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Luxembourg, Mexico, the Netherlands, Norway, Poland, Russia, the Slovak Republic, Spain, Sweden, Switzerland, Taiwan, the United Kingdom and the United States. Negotiations take place with Japan, Korea, Greece, Portugal, New Zealand and South Africa.

9.3.2 Content of the database

The LIS database is a collection of household income surveys. These surveys provide demographic, income and expenditure information on three different levels:
- household;
- person;
- and child.

For a more detailed description of the variables we refer to the description of the content of the Hungarian Household Survey (Section 4).

9.3.3 Organisational framework and management structure

Membership in the LIS project is open to all countries, their respective national research agencies and institutes, and to international research organizations. In order for a country or organization to be a participating member, it must provide microdata suitable for placement in the LIS database. During the first year of membership following submission of microdata, the country or organization can participate without payment of the annual membership fee. During this initial year, it is expected that the organization will locate financial support for continued membership. If necessary, assistance in finding financial support can be provided by LIS. In subsequent years, an annual membership fee is assessed. Affiliated Non-Member Countries are those countries that do not make a financial contribution to the LIS Project.

9.3.4 Who collects and stores the data?

The data is collected by national research institutions or statistical offices, depending on the country. The LIS member institutions collect and store the original datasets. They give permission to the LIS to harmonize the datasets, but the 'new', harmonized raw datasets cannot be distributed by LIS. It is stored on the centre server of the LIS (called LISSY).

9.3.5 Who manages the central database?

The central database is managed by the LIS. The harmonization is carried out by the LIS staff with the assistance of the national research institutions. During harmonization the LIS defines and calculates income variables, which can be very useful for researchers (see annex 9.1).

The user has only remote access to the 'LISsified' final database through e-mail, so the user cannot look into the database itself. Instead, the researcher has to send the com-

mand file to LISSY by e-mail and in few minutes or few hours - depending on the length and the complexity of the task - the answer will arrive. LISSY can 'communicate' in three different statistical languages: spss, sas and stata.

Despite the best intend of harmonizing different databases, from different countries, in many cases the user cannot find the same variables for all countries, or the same variable has a slightly different meaning in different countries. For that reason the user can find useful documentation of the surveys and detailed information of the harmonization (classification) on the LIS homepage (www.lisproject.org).

9.3.6 What kind of research is done on this database

Until now, more than 350 working papers were published by the LIS. All these working papers used the LIS databases. The main topics of the papers are: poverty, income poverty, income inequality, welfare and social policy, effect of taxation on poverty, poverty in different groups of society, labour force participation.

Until now, there is only one paper about farm income and farm households in OECD countries (Kurahsige and Hwan Cho, 2001). This study uses microeconomic data and provides an analysis of the incidence of low incomes in farm households compared to other households. Social security policies as they affect agricultural households are described and the impact of taxes and transfers are examined for both farm and non-farm households by comparing incomes before and after tax and social transfers.

9.4 Case of Hungary - TARKI Household Monitor Survey

The TARKI (Social Research and Informatics Centre) is since the beginning of the 1990s the provider of the Hungarian income data for to the LIS. The TARKI Household Monitor Survey (HMS), which is the source of the LIS, is an annual income study carried out on a representative sample of 2000 households with residence in Hungary.

The information are collected on household level and on individual level. The household questionnaire has to be answered by the family member who is the most relevant in family matters, such as financial situation, depts, savings, division of labour etc. The individual questionnaire is asked from every family member over age of 16. This part of the questionnaire includes more detailed questions about personal income, employment status, attitudes, etc. (see table 9.1 for a more detailed description).

9.4.1 Income data

The aim of the HMS is to collect as exact data as possible about the income and welfare situation of households in Hungary. Therefore different sets of data are collected in this study. Firstly there are questions about the total personal income, secondly very detailed questions are asked about what type of income the person gets and how many times in the last 12 months (there are also separate question for the income in the latest month).

This detailed questionnaire is more likely to give exact information on the personal and household income. Even after this detailed questionnaire, in some cases the problem of

missing data, or under reporting of income occur. These problems are solved by imputation. The imputation is made on personal level.

The yearly total personal income is calculated by adding up the different types of income. And similarly, the total household income for the given year is computed by adding up the total income of the household members (TÁRKI, 2000).

9.4.2 The variables of the HMS

In this section a more detailed description is given on the content of the HMS. This detailed description not only gives a better understanding of the Household income survey but also gives a first idea about the overlaps and interfaces with the FADN database. Part of the questions of the HMS are standard every year. Specific questions can be added on request of the clients. Table 9.1 gives a description of the standard set of variables.

Table 9.1 Variables of the household monitor survey

Level	Variables
Household grid	Demographic data
	Education
	Occupation – agricultural self-employed, or entrepreneur
	Branch of industry
	Profession – ISCO88
	Monthly personal net income
Household questionnaire	Type of savings
	Loans
	Property
	Income from renting out a land
	Strategies avoid from poverty
	The scale of animal breeding and agricultural production
	Income from animal breeding and agricultural production
Individual questionnaire	Working hours per week
	Employment status, unemloyment, second, third job
	Income from main activity
	Benefits coming from workplace
	Different types of income (from casual work, stipend, etc.)
	Subsidies, welfare benefits, social supports
	Child care benefits
	Pensions (old age, disability, widowhood)
	Life annuity
	Profit, share or divident from own etreprice
	Tax return, accounted costs
	Pension fund
	Form of savings
	Attitude questions - satisfaction with job, life, housing, family relations, economic situation
	Hours of work in the farm (not regular q.)

9.4.3 Weighting

There are two weights in the database one for the households and one for the individuals. The household weight is a 4-dimensional weight and corrects the distribution of households to the microcensus data of the Central Statistical Office (1996), according to the type of settlement, education and age of head of household, and the size of household. This set of weights is used for analysing the household level variables.

The individual weights are also 4-dimensional weights and these correct the distribution of the sample according to the sex, age and education of the respondent, and to the type of settlement. This latter set of weights is used for analysing the individual level variables (TÁRKI, 2000).

9.5 Comparison of datasources

Table 9.2 gives a comparison between FADN and LIS. Different aspects are described. This table shows that their are clear differences between the legal and organisational framework. Also in the type and scope of the information their are clear distinctions. It's important to consider these differences in the discussion of integration of data sources in the next section.

Table 9.2 Comparison of data sources on farm income

Attribute	FADN	LIS
Legal framework	EU Countries are obliged to provide information	Countries decide on participation
Harmonisation	Fully harmonised	Aim is to become fully harmonised, but it cannot be totally harmonized
Broadness	EU countries	EU, Eastern European countries and others outside of Europe
Frequency	Yearly	waves, every 5 years since 1980
Recency	2000 most recent information	around 2000 most recent information
Level of information	Farm holding (entrepreneur)	Household and person (sometimes child)
Scope of information	Income from agricultural activities	Total income
Background	Farm economics / policy research	Sociology
Type of information	Farm income Costs and revenues Structural data	Income (also farm income) Expenditure Demographic
Sampling frame	Commercial farms	All households

9.6 Opportunities for cooperation and integration

In table 9.1 a description is given of the content of the Household Monitor Survey. An inspection of the table shows several agricultural variables in the HMS. The most relevant

question which also causes the most methodological problems is the classification of the profession. In the HMS the household can be classified according to the main source of income of the head of the household. *This definition does not coincide with the definition of a farm in FADN.* Recently a debate about an OECD publication highlighted this point (OECD, 2002). The OECD publication overestimated the agricultural incomes in comparison to the FADN figures due to the classification process. If in a certain year the income from agriculture is below the level of income from another source the household is not classified as agricultural anymore. In this way low agricultural incomes are no longer defined as agriculture. Van Bruchem (2003) shows that this effect can be quite substantial. In the Dutch FADN, every year, one third of the farms have an income from agricultural activities that is lower than other income sources. Eurostat (1999) also concludes that the number of agricultural households (where the main income of the reference person comes from farming) is substantially smaller than the number of households where there is some income from farming, and generally smaller than the number of agricultural holdings. These definitions should be carefully considered in applying the data.

In HMS the scale of animal breeding and agriculture and the income from these agricultural activities is explicitly asked. Furthermore the dataset gives an idea about the revenues from renting land. In some years the variables hours worked on the farm is included in the questionnaire.

9.6.1 Connecting databases

Observations in both databases can be directly connected if the same unit is included in both databases. This option is very unlikely given the limited sample sizes in both systems. Furthermore, privacy restrictions would probably prohibit the exchange of information to enable this connection.

9.6.2 Ratio estimation

FADN income statistics are normally reported at group or subgroup level. Based on the HMS the share of non-agriculture income in these groups can be estimated. Subsequently this share can be applied on the FADN farms to make an estimation of total income.

$$\mathrm{FADN}_{ti} = \frac{\mathrm{HMS}_{ti}}{\mathrm{HMS}_{ai}} \cdot \mathrm{FADN}_{ai} \qquad \text{(eq. 1)}$$

in which:

ti = total income
ai = income from agricultural activities

An essential element in this approach is the definition of the groups. As described before both databases apply different definitions of agricultural holdings and households. Care should be taken in selecting similar groups from both databases. However, at a more

aggregate level the distortions will be smaller, than if this estimation procedure would be applied on a small group.

9.6.3 Datafusion and data integration

The third approach is based on datafusion techniques which are mainly developed in marketing research. In this approach observation from both samples are connected based on characteristics that are available in both data sources (Vrolijk et al., 2003a). The assumption is made that if units are very similar on these variables they are probably also similar on other variables. In the case of FADN and LIS the connection could, for example, be based on the number of hours worked on the farm, the scale of agricultural activities and some other demographic variables. For an FADN holding an estimation of the non-farm income can be made based on the household from the LIS database which devotes a similar amount of time on agricultural activities, which has a similar scale of agricultural activities and which has similar demographic variables.

9.7 Summary and discussion

In this paper we describe the relevance of non-agriculture income for the financial position of households in agriculture. This position is essential for understanding investment behaviour, survivability of farms and the well-fare of agricultural households. It directly affects the goals of the Common Agricultural Policy to achieve fair incomes in agriculture. In this paper FADN as a source of income from agricultural activities is compared to income studies which provide information on income from all households and all sources. After a comparison of both sources, different options for integrating these resources are described and evaluated. Ratio estimation and imputation techniques seem to be the most promissing techniques for data integration.

From both a theoretical and a practical point of view, it would be worthwhile to test these ideas in practise. Another follow up to this paper is to consider alternative sources of micro-economic data. In this paper we have focussed on the income surveys. Another option is to use the Household Budget Surveys as organised by for example the Hungarian Statistical Office. These surveys also provide a great amount of detail on the income and spending of households.

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Annex 9.1 LIS SUMMARY INCOME VARIABLES

+ Gross wages and salaries
+ Farm self-employment income
+ Non-farm self- employment income

= Total earnings

+ Cash property income

= Factor income

+ Private pensions
+ Public sector pensions

= Market income

+ Social Retirement benefits
+ Child or family allowances
+ Unemployment compensation
+ Sick pay
+ Accident pay
+ Disability pay
+ Maternity pay
+ Military/vet/war benefits
+ Other social insurance
+ Means-tested cash benefits
+ Near-cash benefits
+ Alimony or Child Support
+ Other regular private income
+ Other cash income

= Total gross income

– Mandatory contributions for self-employed
– Mandatory employee contribution
– Income tax

= Disposable income

Workgroup Session 4: 'Wealth Issues and Organisational aspects'

Theme

In most of our discussions up to now we focussed on income from farming and non-farm income. As the proverb 'farmers live poor and die rich' indicate, a low income does not automatically imply that one has no purchasing power. In this workgroup session the first two workgroups will focus on the issue of wealth.

The third group is asked to reflect on the paper by Ildiko Nagy on the Luxembourg income study: what can we learn from this approach for our future activities? Is it possible to study the income issues in agriculture in OECD countries, using ideas on organisation and data exchange from the Luxembourg Income Studies, in addition to the current FADN organisation in the EU and the OECD activities?

Method

All groups are asked to use the mind map method from working group session I. The central questions are:

1. group 1: problems in measuring wealth;
2. group 2: policy questions on farmer's wealth
3. group 3: LIS concept for OECD agriculture

Report in the plenary the mind map and the 5 most important findings on a transparency**.**

Group composition

Group 1

Anne Kinsella (chairperson)
Trajkovski Petar
Werner Kleinhanss
Benoir Jean Boup
Carlos San Juan
Marju Aamisepp
Ann-Marie Karlsson

Group 2

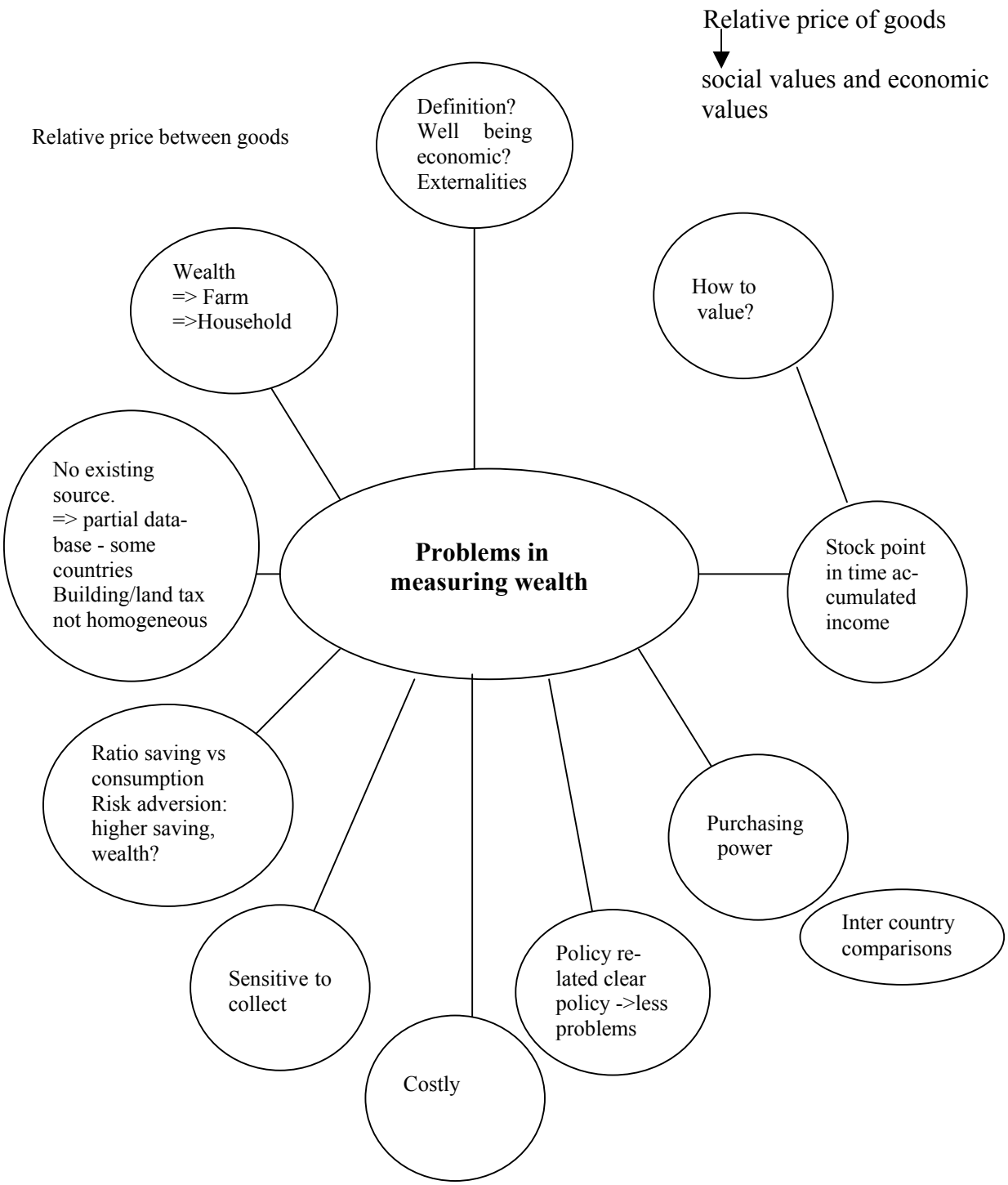
Finn Andersen (chairperson)
Ildiko Nagy
Hans Vrolijk
Catherine Moreddu
Ken Ash
Ashok Mishra
Torbjørn Haukås

Group 3

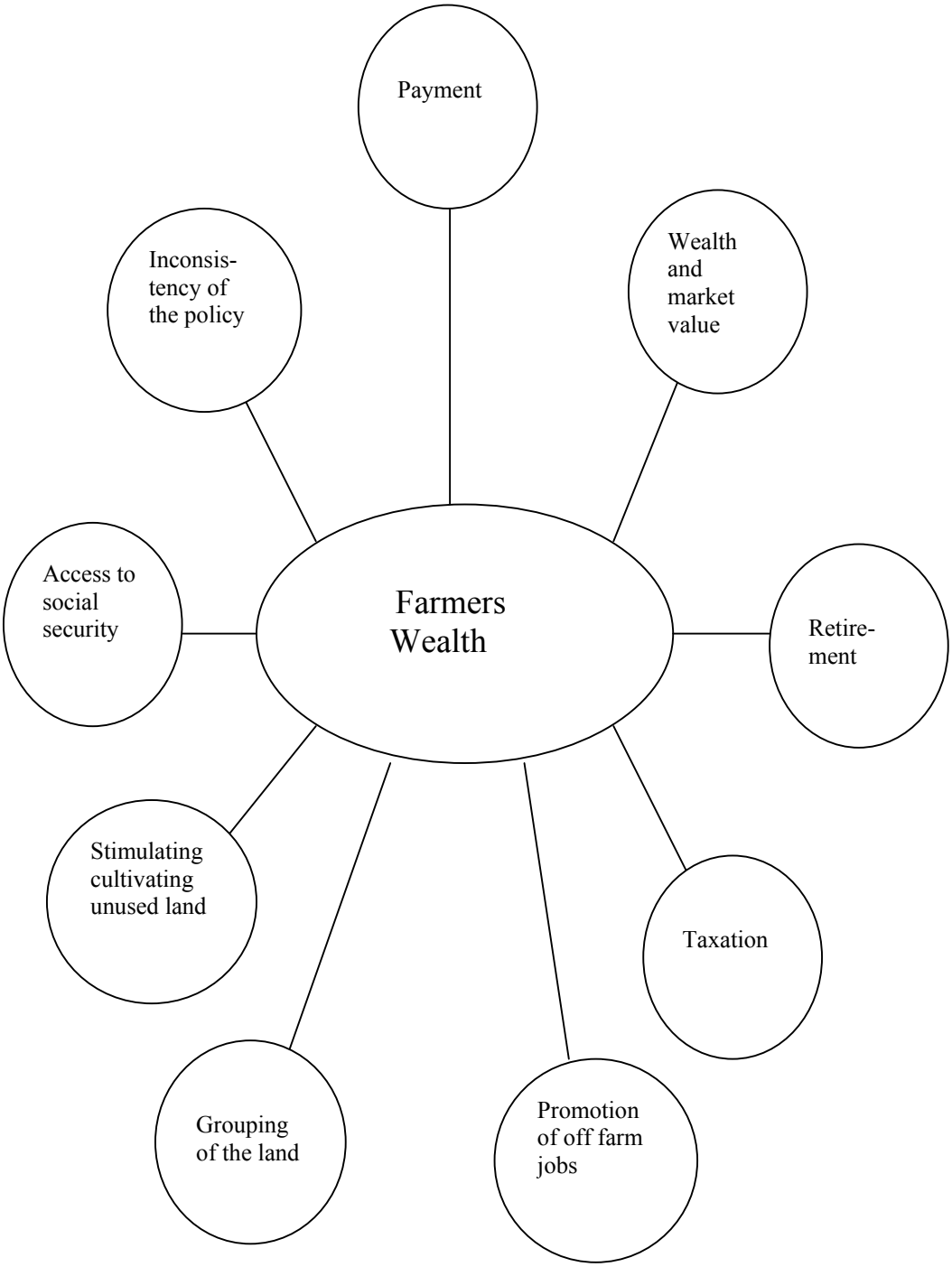
Kostov Mitko (chairperson)
Paola Doria
Damaris Melle
Ilievska Vesna
Timo Sipiläinen
Lech Goraj
Beat Meier

Workgroup Session 4, Group 1

Black holes?



Workgroup Session 4, Group 2



Workgroup Session 4, Group 3

<u>LIS Concept for OECD</u>

1. 2 Dimension - Input (Bring in the information)
   - Output (Dissemination of Info)

Can OECD do this? (input)
- No funds (staff)
- But could we organize it? Can provide methological advice and list of variables

2. Problem individual data? Legality/Confidentiality of data
   Aggregation?

3. Remote Access of Data

4. Use International accounting rules

5. Why do we do this? (Scientific research)
   - why finance this?
   - policy relevance
   - But could be WTO weapon

10. Efficiency and productivity of Finnish FADN farms for 1989-2000

Timo Sipiläinen [1]

Abstract

The objective of the study is to examine the size effect on Finnish dairy and cereal farms. Economies of size are analysed using the concepts of productivity, efficiency and profitability in addition to unit costs. In productivity and efficiency analysis we apply data envelopment analysis (DEA) on Finnish bookkeeping/FADN data. The study period covers 1989-2000.

The results show a high variation in the performance of farms. However, profitability and efficiency are relatively permanent properties since the rank correlation of them is statistically significant over the years. In general, productivity change is slow. Productivity change is based on technical change, which is often induced by farm growth. Profitability and efficiency are related to the size of farms but the changes in productivity and efficiency do not necessarily coincide with the growth of farms. Thus, making economies of size to realize through the growth of farms is not straight forward.

The unit cost decreases when the size of farm increases but the decline slows down. Increasing managerial ability may also make the unit costs to fall. However, there is no connection between managerial ability and realisation of economies of scale.

Keywords: Productivity, efficiency, profitability, DEA, LP, dairy farm, cereal farm

10.1 Introduction

Increasing the farm size has been seen as one of the main means to improve profitability of farms, since profitability typically increases with the farm size. Along with the growing farm size the unit cost of production decreases - at least within certain limits.

When the farm size increases the requirements of controlling, marketing, financing and managing or leading the farm operations also increase, even more than proportionally. Several studies have been conducted to find out whether the unit cost falls steadily or if it starts to increase in a specific farm size. The possibility of increasing unit costs is often linked to the effect of fixed or lacking managerial skills. The unit costs are expected to be lower on large farms, since input indivisibility problem is easier to solve and productivity gains of specialisation and pecuniary economies can be utilised. If management is a fixed

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factor we have to increase the share of other, variable inputs when the farm grows and eventually, the unit cost may start to grow (Alvarez and Arias 2003).

In this study we examined the relationship between efficiency and profitability, and size on Finnish dairy and cereal farms. The aim was to clarify how big the economies of size are, what causes them and how they have realised when the farms grow.

10.2 Data

The data set is collected from the bookkeeping/FADN data base managed by MTT Economic Research in Finland. The data set covers the period for 1989-2000. The farms in the study were specialised either in dairy or cereal production. The results are reported separately for all dairy and/or cereal farms and for a complete panel (a sub sample of dairy and/or cereal farms). Panel data made it possible to study the on-farm changes over time.

Table 10.1 and 10.2 shows the development in the input use and output supply on sample farms. These are also the variables that have been used in the DEA. The annual milk production on dairy farms has increased by more than fifty percent during the research period. The increase has speeded up during the last few years of the study. The increase in input use has been slower than the growth of output except in the category of machinery and buildings. On cereal farms, the real value of cereals return has increased hardly at all although cultivated area has increased by 30%.

Table 10.1 Annual averages of dairy farms (monetary values are annual costs in real terms (at the price level of 1990)

Year	Milk yield (kg)	Other LU (ny)	Labour (h)	Cultivated area (ha)	Materials (€)	Mach. and buildings (€)
1989	116,830	7.78	4,675	26.22	25,864	12,609
1990	119,879	7.88	4,660	25.92	23,901	13,597
1991	119,998	8.38	4,783	24.78	22,754	14,831
1992	124,511	8.51	4,789	25.44	25,155	13,536
1993	121,921	8.08	4,761	24.93	26,204	13,931
1994	125,591	8.48	4,768	25.38	27,169	14,081
1995	130,656	8.45	4,798	28.37	30,556	14,908
1996	135,228	8.90	4,846	29.73	29,513	15,717
1997	140,155	8.60	4,749	30.97	30,264	15,375
1998[a]	146,434	9.49	4,955	33.03	32,996	18,042
1999[a]	158,834	9.52	4,985	34.89	36,856	19,981
2000[a]	174,521	9.79	4,805	34.41	37,244	20,728

Table 10.2 Annual averages of cereal farms (monetary values are annual costs in real terms (at the price level of 1990))

Year	Cereal return (€)	Other return (€)	Labour (h)	Cultivated area (ha)	Materials (€)	Mach. and buildings (€)
1989	44,727	13,194	1,698	38.24	13,930	11,369
1990	50,753	14,826	1,779	38.22	14,136	12,976
1991	48,140	14,337	1,688	34.88	12,408	13,424
1992	41,769	13,786	1,620	32.35	10,954	12,234
1993	43,096	13,296	1,693	34.28	12,036	12,135
1994	46,641	17,437	1,619	36.21	13,907	12,143
1995	44,691	12,378	1,698	40.66	15,793	12,903
1996	53,890	15,897	1,687	45.25	14,692	13,028
1997	49,419	13,245	1,651	46.10	14,832	12,674
1998	42,270	10,303	1,641	47.96	13,993	15,330
1999	37,934	9,053	1,487	48.10	13,360	16,270
2000	56,383	10,102	1,472	50.79	14,384	16,985

Many inputs and outputs in FADN/bookkeeping data do not include price information. Therefore in the analysis we have to assume that the farmers face uniform prices.

10.3 Method

We applied data envelopment analysis (DEA) appproach in the analysis of efficiency and productivity (see e.g. Färe, 1988, Färe et al., 1994). We assumed that farmers tend to minimize their costs of producing a given output. Cost efficiency measures the ratio of the minimum cost (defined by comparisons to other farms in the reference set) to the actual cost of production on the farm (figure 10.1, OD/OA).

If the ratio is one the farm is cost efficient. In case of inefficiency, the ratio is less than one. Cost (in)efficiency can be decomposed to technical and allocative (in)efficiency.

Technical (input) efficiency shows, which is the largest possible proportional contraction in all inputs such that a given output can still be produced. In this case changes in the allocation of inputs are not allowed (OB/OA). If there is a difference between cost efficiency and technical efficiency the difference is caused by allocative inefficiency, which is related to inefficient allocation of inputs (OD/OB). Technical (input) efficiency multiplied by allocative (input) efficiency gives cost efficiency. Since we start from the hypothesis of cost minimization we do not deal with allocation of outputs.

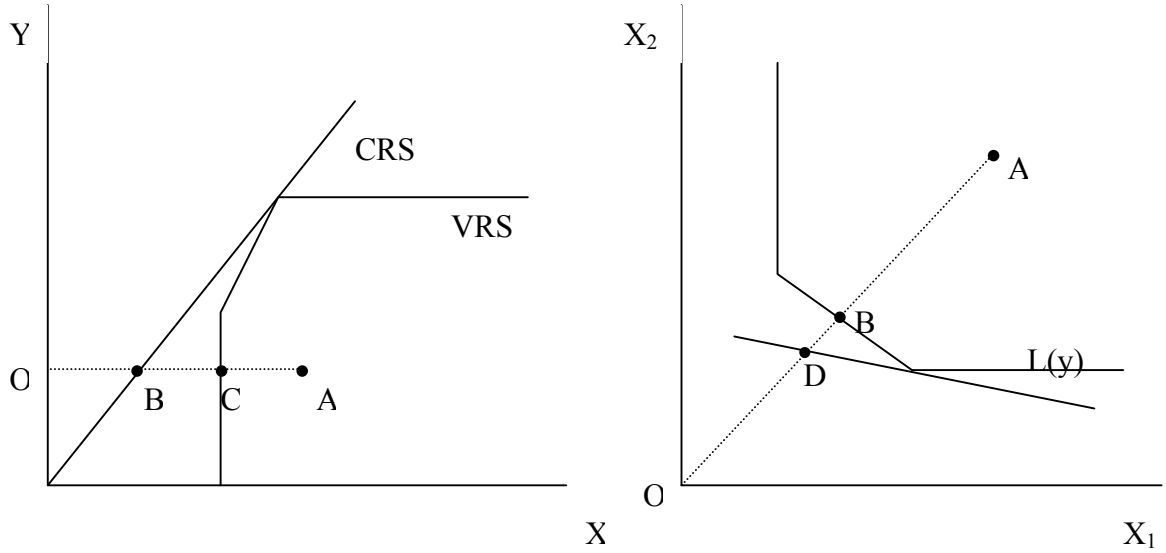


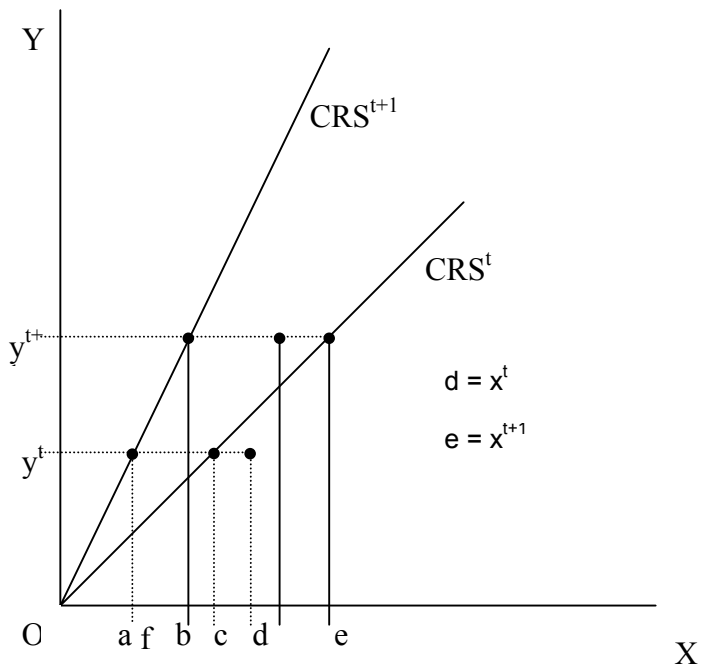
Figure 10.1 Right panel: Cost efficiency (OD/OA), technical efficiency (OB/OA) and allocative efficiency (OD/OB). Left panel illustrates technical efficiency when either CRS (constant returns to scale) or VRS (variable returns to scale) envelopment is assumed

Productivity change over time was measured by the Malmquist index. In this case we also utilise DEA approach, which measures the changes in maximum productivities over time. By calculating period and cross period efficiencies we can define the Malmquist index. It can further be decomposed to technical change and technical efficiency change. This is illustrated in figure 10.2. In the DEA based Malmquist index models we typically assume constant returns to scale, convexity and free disposability.

Malmquist index is defined by the ratios of distance functions. If we take into account that distance functions and Farrell (1957) technical efficiencies are reciprocal to each other it is easy to calculate distance functions by using relatively simple LP models (see more in detail Färe 1985, Färe et al., 1994).

Furthermore, we analysed the profitability of farm. The profitability was measured by the coefficient of profitability, which is a ratio of the sum of farm family income and interest paid to the sum of the wage claim on family labour and the interest claim on total capital.

The strengths of the DEA approach are that in the analysis only minimal assumptions about the production technology are required and the model can easily handle a technology of multiple inputs and outputs. On the other hand, DEA is a deterministic approach thus being sensitive for outliers. Two approaches were used here to eliminate this problem. When we analysed annual data we dropped out farms, which were extremely efficient at the first stage analysis, and recalculated the efficiency scores without them. In the panel data analysis we applied three year moving averages to reduce annual variation and the effect of possible outliers.



$$M_i(y^t, y^{t+1}, x^t, x^{t+1}) = \frac{0e/0b}{0d/0c}\left[\frac{0e/0f}{0e/0b}\frac{0d/0c}{0d/0a}\right]^{1/2}$$

Figure 10.2 A graphical illustaration of Malmquist index, which can be decomposed to technical efficiency change (outside parenthesis) and technical change (in parenthesis)

10.4 Efficiency, productivity and profitability and their relation to farm size

10.4.1 Dairy farms

Figure 10.3 Cost efficiency (Oi(C,S) as a function of milk yield of the farm in 2000. The average milk yield per farm increased by almost 50% from 1989 to 2000. In spite of this, the average cost efficiency increased only slightly but the result is sensitive to the choice of years in the analysis because of the large annual variation. It should be noticed that in the case of cost efficiency we only compared the farm to the observations of the same year. Thus, the unit cost may increase or decrease between sequential years independently of the change in cost efficiency. The average cost efficiency actually tells only how close or how far from the minimum unit cost the farm is operating in that specific year. The Spearman rank correlation between milk yield per farm and cost efficiency was statistically significant. The correlation was lowest at the end of the research period when the growth rates of farms were highest. Although the smallest farms were typically the least cost efficient (according to the constant returns to scale measure of cost efficiency), the largest farms were not necessarily the most cost efficient. The farmwise variation was considerable (figure 10.3). Inefficiency was almost equally divided to technical (radial distance from the frontier) and allocative inefficiency (wrong allocation of inputs in relation to the objective

of cost minimisation). There was no clear connection between relative or absolute increase of milk production over the research period and the change in cost efficiency.

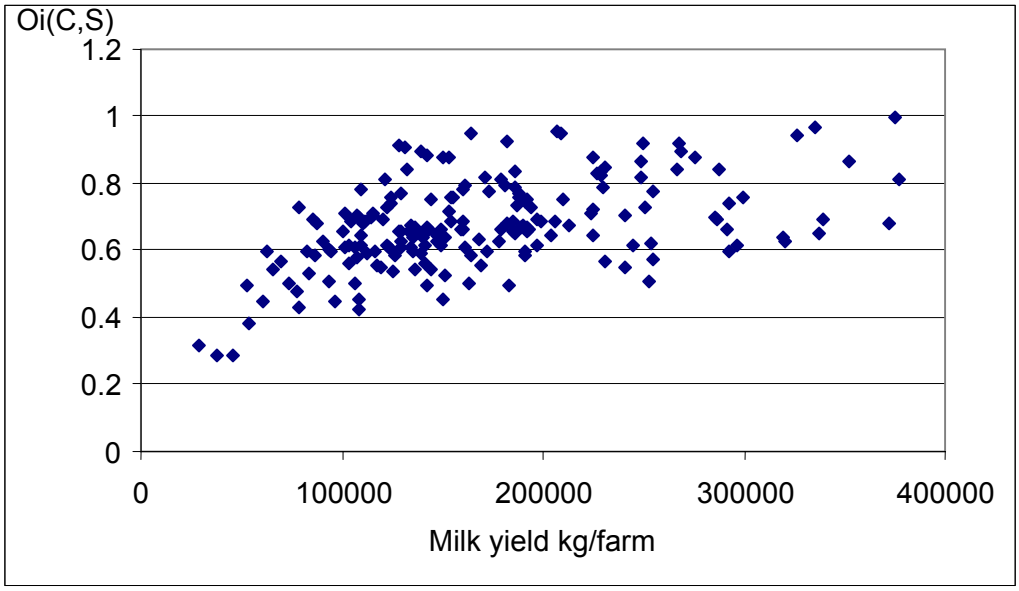


Figure 10.3 Cost efficiency (Oi(C,S) as a function of milk yield of the farm in 2000

Table 10.3 Productivity change (M), Technical efficiency change (TEC) and technical change (TC) in the whole dairy farm data for 1989-2000 (one output, milk)

	M	TEC	TC
1989-90	4.92 %	-2.21 %	7.30 %
1990-91	-2.10 %	-1.79 %	-0.32 %
1991-92	0.61 %	3.82 %	-3.09 %
1992-93	1.52 %	4.72 %	-3.06 %
1993-94	2.52 %	-4.91 %	7.82 %
1994-95	-4.92 %	0.80 %	-5.68 %
1995-96	2.97 %	1.37 %	1.58 %
1996-97	4.47 %	1.17 %	3.27 %
1997-98	-2.72 %	-3.58 %	0.89 %
1998-99	0.68 %	-1.10 %	1.80 %
1999-2000	9.32 %	2.23 %	6.94 %
On average			
1989-2000	1.50 %	0.01 %	1.49 %
1990-1999	0.30 %	0.01 %	0.29 %
1989-1995	0.37 %	0.01 %	0.36 %
1995-2000	2.87 %	0.00 %	2.87 %

Productivity growth on dairy farms was 0.77-1.49%/year, depending on the model, during the whole research period. If we drop out the years 1989 and 2000 productivity change approaches zero. Productivity change was linked to technical change. Average

technical efficiency did not change (table 10.3). The growth rates are biggest in 1989-1990 and 1999-2000. Thus the choice of the period in the analysis affects a lot the rate of productivity change. In the panel data productivity change was even lower (0.22 -0.80%/year) during the whole research period indicating that on the same farms productivity change is slower than the average change in agriculture when entries and exits are taken into account. Average scale efficiency did not change either during the research period.

Relative farm growth and productivity change were interrelated because of technical change. Scale efficiency and the relative growth of milk yield correlate negatively. Either at the beginning small farms have improved their scale efficiency and/or the scale efficiency of the large farms has decreased compared to the scale efficiency of large farm at the beginning of the research period.

Table 10.4 Spearman rank correlation between the increase in milk yield (and milk yield at the beginning of the research period) and productivity change (M), technical change (TC), technical efficiency change (TEC), scale efficiency change (SEC) and pure technical efficiency change (PEC) from 1991 to 1999 (panel data of 72 farms)

	M	TC	TEC	SEC	PEC
Relative growth in milk yield	0.261	0.240	0.114	0.226	-0.140
Absolute growth in milk yield	0.171	0.294	-0.021	0.034	-0.114
Milk yield in the first period	-0.094	0.217	-0.228	-0.490	0.106

Profitability and cost efficiency correlate significantly. There was no systematic change in the relationship between profitability and cost efficiency before and after the EU accession. The coefficient of profitability correlated positively with the milk yield per farm indicating that larger farms are more profitable. However, almost half of the growing farms had not succeeded to improve their profitability during the research period. On the other hand, some farms that had increased their size had been able to improve their performance considerably (figure 10.4). The timing of investments differs but probably the managerial ability of the farmers also affects the outcome.

Efficiency and profitability of farms at the beginning and at the end of the research period correlate significantly ($r > 0.500$) indicating considerable stability of these measures at the farm level. This does not rule out that considerable changes are also possible. Average efficiency has also remained relatively stable during the research period, and thus differences have not diminished, or have diminished only slightly. Efficiency and profitability usually correlate with the farm size. In spite of this, the relationship between the farm growth and efficiency or profitability is not straight forward. Many dairy farms have increased the size of their operation after the EU accession. Therefore it is possible that changes in efficiency and profitability are related to the timing of the growth. It has been observed that because of adjustment costs profitability and especially liquidity do not improve instantly when the growth takes place (Pyykkönen 1996). Increasing farm size provides an opportunity to improve the economic result but it does not follow the growth automatically or instantly. Some farms, which have not grown in size, have been able to

markedly improve their performance. This phenomenon may also be related to the timing of investments or liquidation of fixed resources.

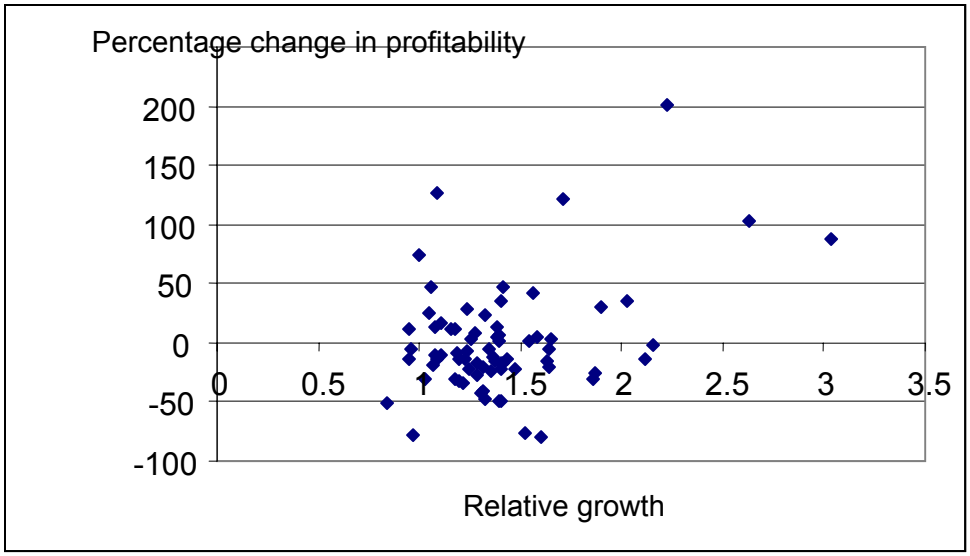


Figure 10.4 Relative (percentage) change in profitability as a function of relative growth

10.4.2 Cereal farms

At the end of the research period, total sales of cereal farms, in real terms, was at the level of 1990 despite the growth of the arable land area by 30%. The average cost efficiency increased by one percent per year during the research period in the whole sample. In the panel data cost efficiency decreased slightly because technical efficiency declined. This change was, however, dependent on the research period because of high annual variation. On cereal farms, the variation of cost efficiency was even larger than on dairy farms. In spite of this, cost efficiency correlated significantly with the farm size.

In the whole cereal farm data, average productivity increased by a bit more than one percent per year (table 10.5). If the very good harvest years 1989 and 2000 were excluded productivity declined 3.5% per year. Thus, annual variation affects productivity measures considerably. In the complete panel of cereal farms, productivity declined by 2.5% per year. Productivity decline on panel farms was caused both by technical regress and a decline in technical efficiency.

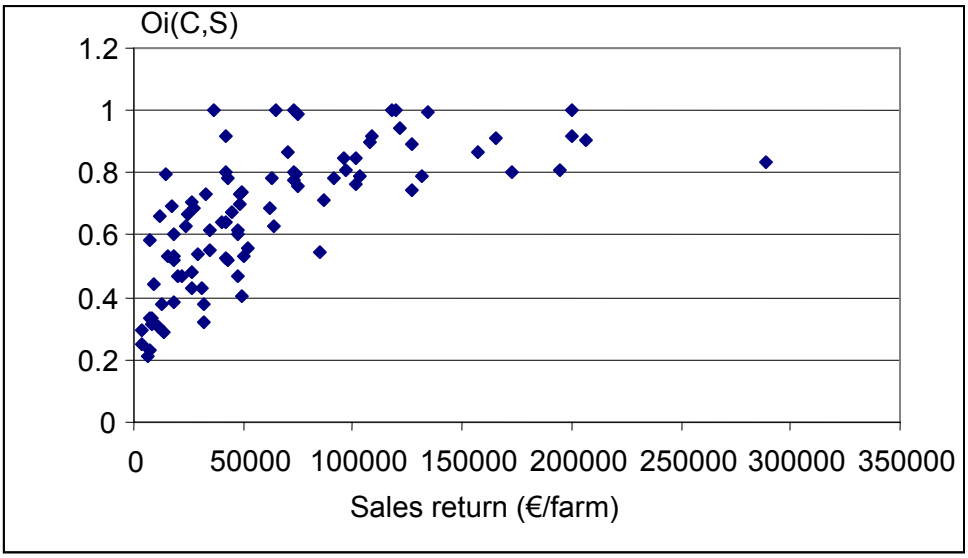


Figure 10.5 Cost efficiency (Oi(C,S) as a function of sales return the farm in 2000 (at the price level of 1990)

Table 10.5 Productivity change (M), Technical efficiency change (TEC) and technical change (TC) in the whole cereal farm data for 1989-2000 (two outputs)

	M	TEC	TC
1989-1990	12.44 %	0.95 %	11.39 %
1990-1991	3.31 %	-12.64 %	18.25 %
1991-1992	-13.69 %	12.84 %	-23.52 %
1992-1993	13.05 %	-0.77 %	13.93 %
1993-1994	7.43 %	-8.23 %	17.06 %
1994-1995	-16.29 %	-2.41 %	-14.22 %
1995-1996	9.38 %	10.24 %	-0.79 %
1996-1997	-0.60 %	8.87 %	-8.70 %
1997-1998	-17.52 %	-16.17 %	-1.60 %
1998-1999	-10.57 %	-8.67 %	-2.09 %
1999-2000	38.92 %	32.88 %	4.55 %
On average	1.16 %	0.70 %	0.46 %

In the beginning of 1990s the correlation between farm size and technical and scale efficiency was low but grew during the second half of the research period. Low correlations were probably caused by actions taken to control overproduction. One of these controlling actions was an extensive set aside program.

Productivity change, technical efficiency change and technical change did not correlate with the growth rate or the initial size of the farm. The only significant correlation was observed between farm size and scale efficiency (table 10.6). In this sense the outcome differs from the results of dairy farms.

Table 10.6 Spearman rank correlation between the increase in cultivated area (and the cultivated area at the beginning of the research period) and productivity change (M), technical change (TC), technical efficiency change (TEC), scale efficiency change (SEC[a]) and pure technical efficiency change (PEC) from 1991 to 1999 (panel data of 52 farms)

	M	TC	TEC	SEC	PEC
Relative growth in cultivated area	0.261	0.240	0.114	0.226	-0.140
Absolute growth in cultivated area	0.171	0.294	-0.021	0.034	-0.114
Cultivated area in the first period	-0.094	0.217	-0.228	-0.490	0.106

[a] SEC measures if farm is moving to or away from the most productive scale size.
[b] PEC measures technical efficiency when the scale effect is removed.

Cost efficiency and profitability correlate statistically significantly with each other but their indication of the economic result may differ at the farm level. A very big difference is that the profitability measurement takes into account direct payments, which are excluded in the case of cost efficiency measurement. Profitability measurement is based on comparisons between actual results and the targets set at the farm level when cost efficiency analysis is based on comparison of the farm to the efficient farms. A disadvantage of the DEA method is that if a farm uses one input very efficiently it may obtain a high efficiency ranking even if it were inefficient in the use of some other inputs.

Profitability correlates significantly with farm size like efficiency measures. There is no systematic change in the correlations over time on cereal farms. In the panel data, there seems not to be a connection between the rate of change in profitability and the growth rate. Instead, efficiency and profitability measures at the beginning and at the end of the research period correlate significantly. The analysis also shows that the minimum size of profitable production has been steadily moving towards a larger farm size.

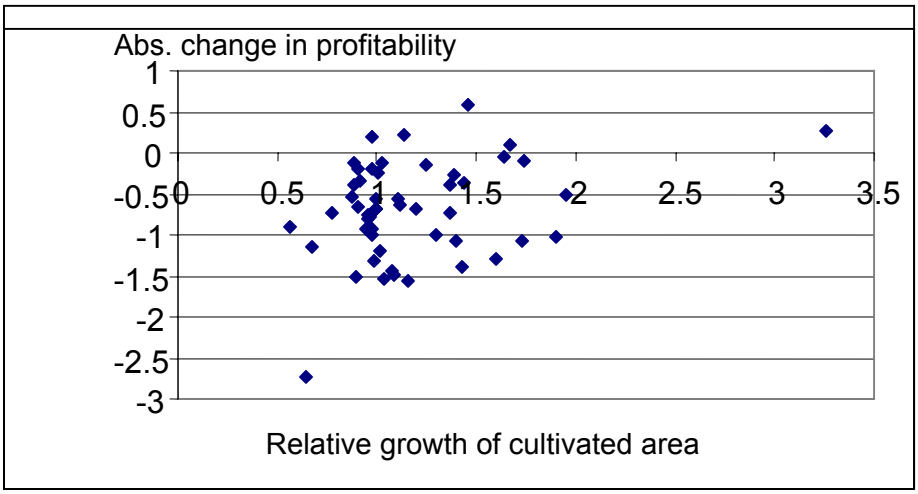


Figure 10.6 Absolute change in profitability as a function of relative growth

10.4.3 Economies of size and managerial ability

Managerial ability and the realisation of economies of size was analysed in a separate study for 1998-2000. In the analysis technical efficiency (or more specifically the rank of the farm's technical efficiency) was used as a proxy of managerial ability. The analysis showed that unit costs declined when the farm size increased but the decline slowed down. Size elasticity at the mean data point was -0.18 on dairy farms and -0.53 on cereal farms. Economies of size prevailed on average and also in almost all of the data points. On the cereal farms economies of size seemed to be bigger than on dairy farms. At the mean data point the unit costs decreased by 0.11% on dairy farms and 0.28% on cereal farms when managerial ability increased by a percent.

In this study, we could not observe a connection between farm size and managerial ability that would have affected on the realisation of the economies of size. In this sense the result differed from the result of Alvarez and Arias (2003) on Spanish dairy farms. The analysis showed that even at the same level of managerial ability the farmers should be able to utilise economies of size in order to reach lower unit costs.

It is not easy to find proper indicators for managerial ability. In this study managerial ability was measured by technical efficiency. The problem in this measure is that it includes in addition to the differences in managerial ability also those farm specific permanent differences (soil quality, micro climate etc.) the farmer cannot affect.

10.5 Conclusions

Unit costs decrease when the farm size increases but the decline slows down. It was not possible to reliably determine whether there is a limit when the unit costs do not fall any more or if they start to increase again. Managerial ability also affected the level of unit costs but managerial ability is difficult to separate from other permanent factors on the farm. In our case we used technical efficiency as a proxy of managerial efficiency. In our study, efficiency and profitability analysis showed that farms tended to stay efficient or inefficient over time. It was also noticed that increasing farm size did not necessarily improve efficiency or profitability, although larger farms typically were more profitable. There are some farm/farmer/situation specific factors that should be studied at the farm level. It seems that combining statistical results and more detailed analysis of some cases may provide useful insights to the problem at hand.

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11. The role of non-farm income and cash flows in the analysis of structural change in agriculture

Meier, Beat [1]

Abstract

Family farm income is much lower than the opportunity costs of the unpaid labour input and the equity invested in the farm. According to the microeconomic theory, such an unbalanced situation should lead to an adaptation process. The situation, however, persists over many years and the number of farms decreases by less than 1.5% per year. Agricultural economists and sociologists have come forward with several explanatory approaches. Another explanation is added by extending the analysis from the farm to the household level and to cash flow indicators.

Keywords: Income, agriculture, Switzerland, FADN, cash flow, household, structural change
Exchange rate:(1€ = 1.5 CHF, 1 CHF = 0.66 €)

11.1 Can family farm income explain structural change?

Results from the reference farms in the Swiss Farm Accountancy Data Network (FADN) allow the economic development of Swiss agriculture to be analysed. Family farm income remunerates the unpaid labour input and the family equitiy invested in the farm.

Figure 11.1 shows the development of family farm income in the hill region. The hill region region is choosen for better homogenity compared to Swiss averages. In comparision, the lowland region has higher results, the mountain region lower results. In 2002, the unpaid labour input reaches 1.2 annual working units and the family invested an equity capital of 362,000 CHF in the farm. In the past years, a family farm income of approx. 50,000 CHF is generated with these inputs. A comparable salary in the nonfarming sector is considerably higher with 60,000 CHF per person. Assuming that this salary corresponds to opportunity costs for labour and calculating an interest at the rate of medium term government bonds (3-6%) for the family owned capital, family farm income should reach more than 80,000 CHF.

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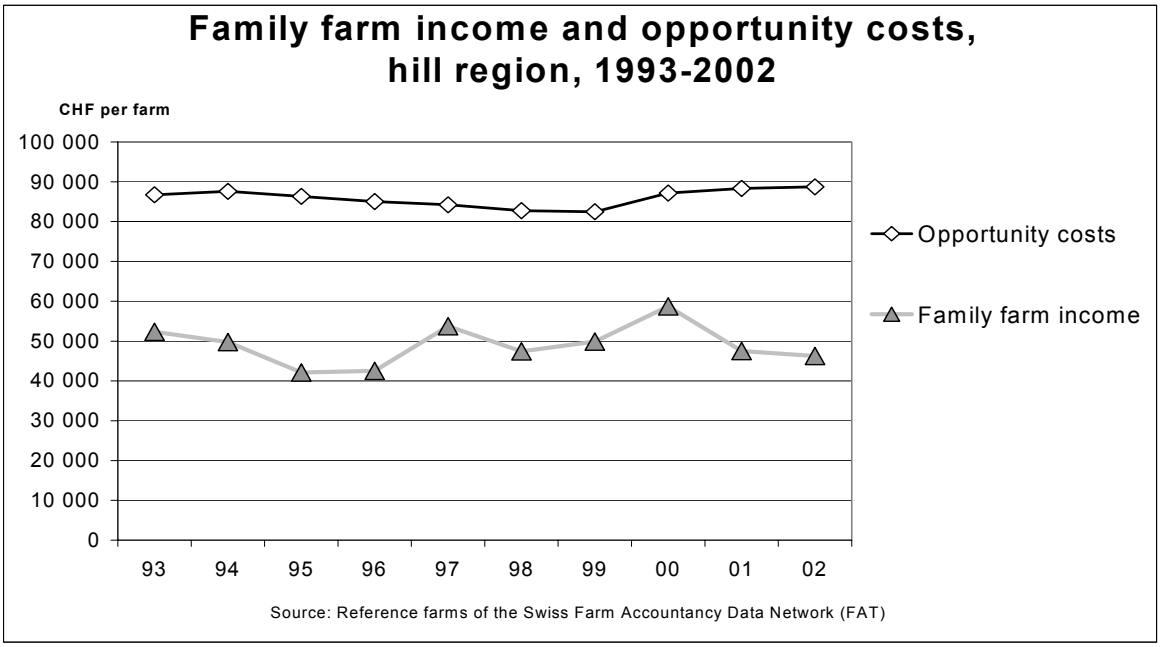

Figure 11.1 Family farm income and opportunity costs in the hill region 1993 to 2002

From an economic point of view, it is fairly surprising that this situation remains nearly unchanged over 10 years. One would expect, that an increased exit of farms should lead to a better balance between farming and non-farming sector. The number of farms in the hill region, however, has decreased by less than 1.5% per year from 1993 to 2002 (based on the universe of the FADN). There are several socio-economic arguments to explain that phenomenon, such as the lack of alternatives in rural areas or the personal attachment to the farm and the farming profession. An major part of the answer, however, can be found on the microeconomic level. The observed system needs to be extended from the farm to the farm household (non-farm activities included) and cash flows instead of profit or income need to be analysed.

11.2 Cash flows on household level give an answer

The adjustment of family farm income by excluding effects with no impact on liquidity leads to farm cash flow (see figure 11.2). These adjustments mainly comprise depreciation, changes in stocks and livestock assets, self-sufficiency and a calculated rent for the farm-house, which is considered as part of the farm in the Swiss FADN. Farm cash flow does not fluctuate significantly. The increased difference between farm cash flow and family farm income is due mainly to rising depreciation (depreciation based on historical acquisition costs). More pronounced fluctuations in family farm income are caused primarily by inventory changes in livestock assets and stocks (e.g. depreciation in livestock assets in 1995, 1996 and 2002, slight appreciation of livestock assets and increased stocks in 2000). Farm cash flow reaches a level of 70,000 CHF. Adding cash flows from non farm activi-

ties, the entire unit entreprise/household creates monetary means of nearly 90,000 CHF (Cash flow before private expenses). These off-farm revenues include independent activities, salaries, pensions, income from financial assets or social transfers. Cash flows from non-farm activities slowly but steadily increase over the past years.

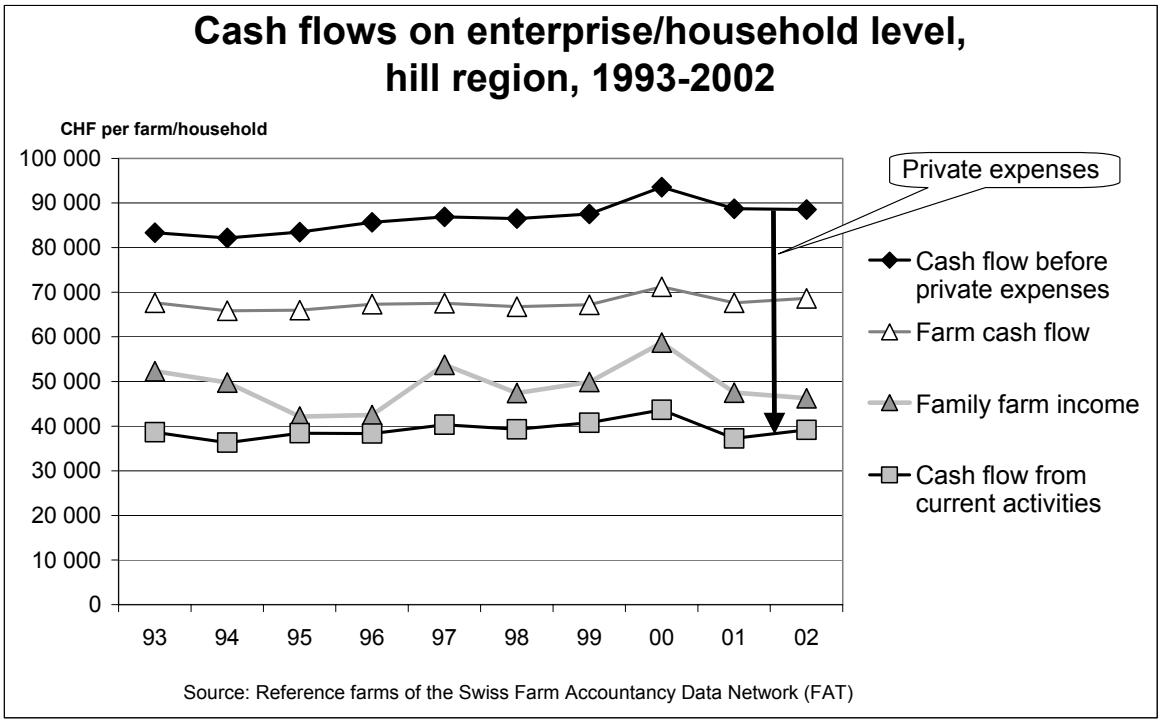

Figure 11.2 Cash flows on enterprise/household level in the hill region 1993 to 2002

From the cash flow before private expenses of 90,000 CHF the families have spent between 45,000 and 50,000 CHF for private expenses. In the cash flow statement, these expenses do not include the calculated rent for the farmhouse or the consumption of farm products.The final cash flow from current activities reaches approx. 40,000 CHF. This cash flow can be used for investment, debt amortisation, extraordinary private drawings or savings. With average investments of slightly more than 40,000 CHF, more than 90% of the investments can be financed with the own generated cash flow.

Having in mind that these values are averages with a considerable variation, the analysis shows: Despite the low performance of the farm itself, the relatively higher cash flows of the entire unit enterprise/household can explain, from a microeconomic point of view, why the number of farms does not decrease more than 2% per year. This conclusion is consistent with the results from an econometric analysis, where the change rate of the number of farms in swiss agriculture can partly be explained by the level of non farm income, whereas family farm income has no significant influence (Mann, 2003).

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12. STARS: Statistics for Regional Studies

Hans Vrolijk [1]

12.1 Introduction and problem statement

Surveys are widely applied to provide information about important population characteristics. The datasets of surveys are mainly used to generate statistics for the whole population. Based on the observations and a set of weights an estimate can be made for the population. Given the availability of these survey datasets, it is interesting to re-use this information to make estimations for regions or specific groups. The original sample was often not designed to make this kind of estimations. The number of sample elements belonging to a region or group can be limited. This results in estimates with a low reliability.

In agriculture, data from the Farm Accountancy Data Network (FADN) are often used to estimate population characteristics. The use of FADN data in regional studies is often problematic due to the low number of observations. Several methods have been developed to use additional information to increase the reliability of estimates (Dol, 1991; Baker et al., 1994; Vrolijk, 1996; Gelman et al., 1998; Vrolijk et al., 2002). Additional information that can be used is for example the agricultural census. The agricultural census gives a complete list of the population of farms. The amount of information in this census is however limited. In this paper we will describe an option to make use of this additional information from the census to make more reliable estimates in regional studies. The procedure has been implemented in the software tool Stars.

In section 12.2 the principle of data imputation will be explained. In section 12.3 the implementation of this procedure in the software tool Stars will be described. Section 12.4 illustrates the approach by making estimates for dairy farmers in a small part of the Netherlands. The validity of the approach is discussed in section 12.5. The paper ends with some conclusions.

12.2 Description of data imputation

In a specific research project attention focuses on farms of a certain region, farms that belong to a certain type or a combination of both. We will call this group the population of interest or population in short. In the imputation procedure, for each farm in the population, a farm in the FADN sample is selected which resembles the farm as closely as possible. The researcher selects the variables, which are used to decide whether a farm resembles a sample farm. These variables are called the imputation variables. The imputation variables should be known for all farms in the sample and the population. Based on these variables the distance is calculated. Different methods are available to establish this distance. The sample farm with the smallest distance is regarded as the farm that resembles

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the population farm as closely as possible. For each farm in the population, 5 or 10 most similar farms are selected from the sample. These best fits are recorded together with the distance measures.

Based on these best fits, estimates can be made for a set of goal variables, which are known in the sample, but unknown for all population farms. In making estimations for the population of interest a choice can be made between simple and multiple imputation. Vrolijk et al. (2002) describe that simple imputation has the disadvantage that the variance of the estimator is underestimated. The estimated (e.g. imputated) value is treated as the real value, although there is a degree of uncertainty about this value. To overcome this problem multiple imputation can be used. In this option, the user can define how many of the best-fit farms will be used to make estimates about the population.

The approach is illustrated in figure 12.1 and figure 12.2. Figure 12.1 describes the traditional approach (see for example Cochran, 1977). The census describes the whole population (N units). Based on the population a stratified sample is drawn. Given the number of farms in the population and the sample, weighting factors per sample farm are calculated. A weighted average of the sample observations gives a good estimation of the population.

Figure 12.2 describes the data imputation approach. The same sample as in figure 12.1 is the starting point. To make estimates of the population of interest (e.g. specific region), sample farms are matched to population farms based on the imputation variable. The sample farm that is most similar to a population farm is used to impute goal variables. The basic assumption is that if the farm is similar on the imputation characteristics, then it is likely that the farm is also similar on the goal variables. To assure that this is a valid assumption, the imputation variables have to be selected in a careful way (see section 12.5).

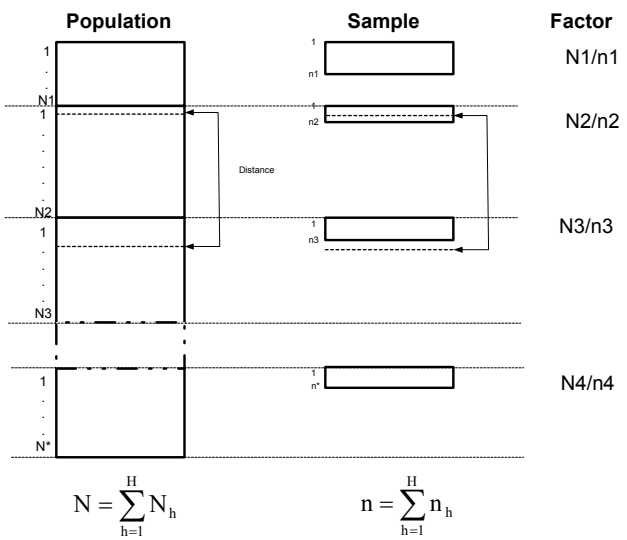


Figure 12.1 Direct estimation using weight of sample units

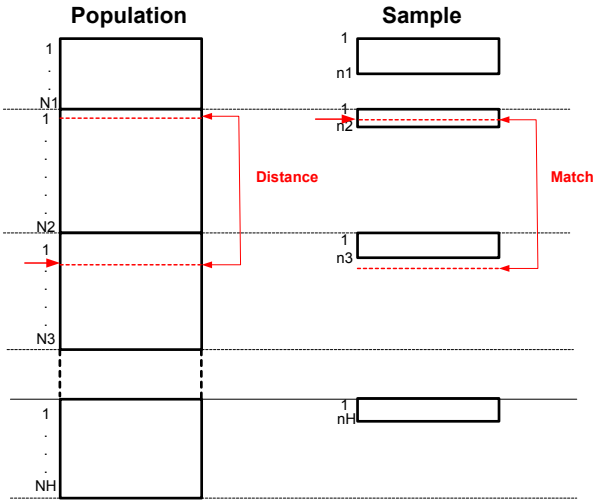
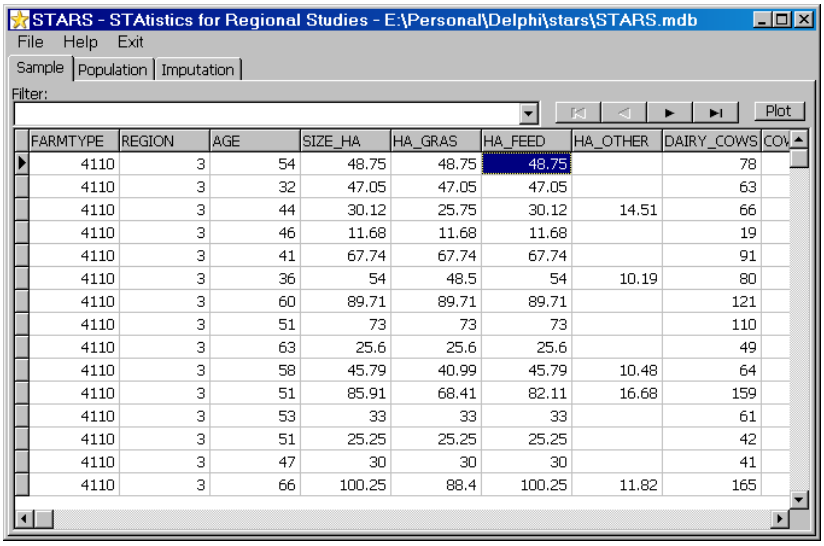


Figure 12.2 Data imputation

Implementation of data imputation in Stars

Stars[1] is a software tool that enables the researcher to apply the ideas described in the previous section. Stars is developed in Delphi. A stars project is stored in a Microsoft Access database. In this database the data describing the sample and the population are stored in separate tables. The imputation procedures defined by the user are also stored in the same database so that imputation procedures can be re-used at subsequent occasions. Figure 12.3 displays Stars after opening a dataset.



FARMTYPE	REGION	AGE	SIZE_HA	HA_GRAS	HA_FEED	HA_OTHER	DAIRY_COWS	COV
4110	3	54	48.75	48.75	48.75		78	
4110	3	32	47.05	47.05	47.05		63	
4110	3	44	30.12	25.75	30.12	14.51	66	
4110	3	46	11.68	11.68	11.68		19	
4110	3	41	67.74	67.74	67.74		91	
4110	3	36	54	48.5	54	10.19	80	
4110	3	60	89.71	89.71	89.71		121	
4110	3	51	73	73	73		110	
4110	3	63	25.6	25.6	25.6		49	
4110	3	58	45.79	40.99	45.79	10.48	64	
4110	3	51	85.91	68.41	82.11	16.68	159	
4110	3	53	33	33	33		61	
4110	3	51	25.25	25.25	25.25		42	
4110	3	47	30	30	30		41	
4110	3	66	100.25	88.4	100.25	11.82	165	

Figure 12.3 Sample data in the data viewer of Stars

[1] The software was developed in cooperation with Wietse Dol and Foppe Bouma. Stars was developed at the LEI.

Before using data, it is important that a researcher has an understanding of the data he or she is working with. To support this phase of getting a grasp of the data, an option to plot the data is offered. Plotting the data supports two crucial activities:

1. Analysing the distribution of values of one variable.
   The researcher can inspect the plot to see the distribution of important variables, for example age of the farmer or size of the farm. Comparing the sample plot with the population plot gives an indication whether imputation is feasible. Outliers in the population with no similar farms in the sample might cause problems in the imputation procedure, because no resembling farms are available for such outliers.
2. Analysing the correlation between variables.
   By choosing two variables the correlation between these variables can be displayed. Analysing the correlation between an auxiliary variable (the variable which can be used as an imputation variable) and a goal variable (which is known in the sample but not for the population) can be useful in selecting the variables that will be used in the imputation procedure.

After exploring the data, the user has to define the imputation procedure. An important distinction is:

Single imputation	For each farm in the population the best fitting farm in the sample is selected. Best fitting is defined based on the imputation variables.
Multiple imputation	For each farm in the population not only the best fitting farm in the sample is selected, but n best fitting farms are selected.

A crucial step in conducting an imputation procedure is the selection of the imputation variables, that is the variables used to calculate the distance between farms, and the type of match required.

Type of variable

Metrical	A metrical variable implies a variable on an interval or ratio scale.
Non-metrical	A non-metrical variable implies a variable on a nominal or ordinal scale.

Type of match

Exact match	In case of exact match, a population farm can only be matched to a sample farm when the values are exactly the same. This matching type is therefore mainly useful when the number of different values is limited. This will often be the case for non-metrical variables.
Fitted	In case of a non-metric variable the type of match is exact. Only for metric variable it makes sense to define a distance and to minimize this distance.

Finally the shape of the distance function has to be defined. The parameters of the equation to determine the distance between a sample farm and a population farm have to be specified. The distance is calculated as:

$$D_{j,k} = \sum_{i=1}^{\#var} \alpha_i (S_{j,i} - S_{k,i})^{\beta_i}$$

in which:

$D_{j,k}$	Distance between sample unit j and population unit k
α_i	Weight constant of variable i
$S_{j,i}$	Normalised score of sample unit j on variable i
$S_{k,i}$	Normalised score of population unit k on variable i
β_i	Exponent of variable i
j,k	Unit identifier
i	Variable identifier

Based on the choice of the imputation variables, the type of match and the distance measure, the imputation procedure can be performed in which N nearest neighbours are selected. Based on these nearest neighbours an estimate is made for each farm in the population and subsequently the average of the farms.

12.3 Estimating regional results of dairy farmers: an example

In this example we explore the opportunities to make estimations for dairy farms in a municipality in the northern part of the Netherlands (black area in figure 12.4). In this example an estimate is made for the variables: total revenues, total costs, net farm result, labour income entrepreneur and number of entrepreneurs (these are the goal variables). Based on the number of observations in the FADN, it is difficult to make direct estimations. However, this municipality is part of a larger grassland area with similar production circumstances. This area, 'Noordelijk Weidegebied' (Northern Grassland Area), is one of the agricultural areas of the Netherlands (see grey area figure 12.4). With data imputation it is possible to use the extra information from dairy farms in the larger region to make an estimation of the results of dairy farms in the specific Municipality. In the FADN, 70 dairy farms from this region are included in the sample.

In the estimation procedure a number of imputation variables is used (the choice of the variables will be explained in the next section):

- age;
- hectares grass;
- hectares fodder crop;
- number of dairy cows;
- economic size.

Figure 12.4 Municipality of interest (black) in Northern Grassland Area (grey)

In table 12.1 the results of the imputation process are described. In this example a single imputation is applied. For each farm in the population in the municipality the most similar farm in the FADN sample in the Northern Grass Area is selected. The similarity is based on the 5 imputation variables as described above (to take into account the different units of measurement the variables are standardised before calculating the distance). Subsequently the average of the imputed values for all farms in the municipality are calculated, assuming that the values of the most similar farms in the Northern Grass Area provide a good approximation of the value of that specific farm.

Table 12.1 Results of imputation process (single imputation)

	Mean	Standard error
Revenues	415,020	15,028
Costs	506,479	15,103
Net farm result	-80,069	4,581
Labour income per entrepreneur	58,066	5,010
Number of entrepreneurs	1.47	0.05

Single imputation has the disadvantage of underestimating the variance. The imputed values for a specific farm are considered as the true values, although there is a certain un-

certainty about these values. In table 12.2 the results are displayed for a multiple imputation process. The three most similar farms are used to make an estimation for the municipality. In this multiple imputation process 100 independent replications are applied. In each replication one of the three nearest neighbours is randomly selected. The values of that neighbour are used to impute the values and make estimations for the region. Comparing tables 12.1 and 12.2 shows that the estimations of the means are not very different. It also shows that the variance of the estimator increases due to the multiple imputation process. This increase is caused by the addition of between replication variance. The columns Min and Max show that the estimation of the average total revenues varies between 405 and 431 thousand. This variance is added to the variance as a consequence of differences between farms within a replication (within variance). The variance increases by 10% for the different goal variables.

Table 12.2 Results of imputation process (multiple imputation)

	Mean	Standard error	Min	Max
Revenues	417,203	16,723	405,002	431,081
Costs	505,405	16,354	492,738	521,129
Net farm result	-76,984	5,502	-85,138	-69,606
Labour income per entrepreneur	63,899	6,459	56,126	75,055
Number of entrepreneurs	1.49	0.05	1.4	1.6

12.4 Validation of the procedure

In the previous section the quality of the imputation process was not explicitly considered. In this section a validation procedure is described. The quality can be judged by using the same approach for imputing values in the sample (which are known) under the restriction that the farm itself cannot be used to impute values. In this way the values of a sample farm are estimated by imputing values from one or more other sample farms that are very similar. Subsequently a statistical test can be conducted to check whether significant differences exist between the real values and the imputed values.

Table 12.3 Potential imputation variables

Age	Percentage other grazing livestock
Hectare	Percentage breeding pigs
Hectare grass	Percentage fattening pigs
Hectare fodder crops	Percentage poultry
Dairy cows	Percentage fodder crops
Dairy cows per hectare	Percentage grains
Total added value	Percentage tuberous plants
Added value pigs	Percentage other arable farming
Percentage dairy cows	Percentage horticulture open air

Table 12.3 lists all the variables that could be used as imputation variables. The inclusion of variables as imputation variables is only useful when there is some kind of logical relationship between this variable and the goal variables. Unlike regression analysis no assumption has to be made about the shape of the relationship. In table 12.4 a naïve approach has been applied in which all potential imputation variables have been used. This table shows that the values estimated by the imputation procedure are close to the real values. No significant differences can be shown by looking at the averages and the standard errors.

Table 12.4 Comparison of real and estimated values

	Real value	Estimated value	Standard error
Revenues	476,902	493,360	32,869
Costs	569,488	573,109	33,472
Net farm result	-79,303	-66,473	9,536
Labour income per entrepreneur	67,817	80,157	11,858
Number of entrepreneurs	1.53	1.49	0.09

An important question is whether all imputation variables are relevant in the imputation process. A balance has to be found between the correctness of the model and the simplicity of the model. In table 12.5 an extreme variant is applied in which the distance is only based on the age of the farmer and the hectares of grassland. This table shows large and significant differences between the estimated and real values. Based on this analysis the conclusion can be drawn that data imputation based on only these two variables result in a low quality.

Table 12.5 Imputation based on age and hectares of grassland

	Real value	Estimated value	Standard error
Revenues	476,902	355,033	21,028
Costs	569,488	459,701	14,797
Net farm result	-79,303	-91,233	9,601
Labour income per entrepreneur	67,817	12,530	10,507
Number of entrepreneurs	1.53	1	0

In table 12.6 the results for an imputation procedure based on 5 imputation variables is described. This table shows that the results are equally good or even better compared to an imputation procedure based on all imputation variables.

Table 12.6 Imputation based on age, ha grass, ha fodder crops, number of dairy cows and economic size

	Real value	Estimated value	Standard error
Revenues	476,902	470,917	34,330
Costs	569,488	560,114	33,836
Net farm result	-79,303	-76,492	9,182
Labour income per entrepreneur	67,817	68,500	11,297
Number of entrepreneurs	1.53	1.53	0.09

This approach provides the advantage that the basic assumption of the imputation process can be tested. Besides theoretical reasons, a quantitative analysis can provide support for the choice of the imputation variables.

12.5 Summary and discussion

Using existing survey data in regional studies leads to several problems. The survey was often not designed for that type of research. A practical problem is that the number of observations is often to limited to make reliable estimations. Different methods have been developed to use additional information that facilitates more reliable estimates. One of these methods is data imputation. In this paper the use of data imputation is described in which information from the agricultural census is used besides FADN data. An example is described in which more reliable estimates are made of the economic performance of dairy farms in a small region in the Netherlands.

The selection of imputation variables is of crucial importance to the quality of the end result. A theoretical model about the impact of these variables on the goal variables should be the basis for the selection. This implies that a general set of imputation variables won't work; these variables should be selected based on the characteristics of an individual research project. Quantitative analysis based on the available sample data should be performed to test the quality of the imputation process.

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'How to arrange the follow-up'

Theme

As stated in the introduction and made clear by Ken Ash in his presentation, the OECD is in principle interested in a follow up based on a number (four ?) of papers that consolidate the results of the workshop and bring it a step further by linking it to the existing literature, analysing our results and work on some data. This raises the following questions:

On which topics is a paper useful and feasible: are these the four working group issues and the idea of the Luxembourg Income Study?;

1. who is interested to (co-)author a paper, and which one?;
2. who is willing to provide some data to the paper-authors?;
3. which organisation and deadlines should we take into account?

Method

Start with plenary discussion.
If there are interested authors and time available the authors could form a discussion group with those that are interested to cooperate on the paper.

If papers will be delivered, the following outlets are to be considered:

- a meeting at the OECD in Paris;
- PACIOLI-12;
- the 86th EAAE seminar 'farm income stabilisation - what role should public policies play' in Capri (Italy), October 2004. See www.eaae.org;
- and of course the FADN meetings in Brussels and any journal.

Questions and answer session

No special points have been discussed.

Evaluation

Points raised in discussion:

- good idea to have a central theme;
- announce workgroup sessions in advance;
- keep costs down.

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