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PACIOLI 1

Farm accountancy data networks and information analysis

Workshop report

August 1995

Agricultural Economics Research Institute (LEI-DLO)

REFERAAT

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The PACIOLI project is a concerted action for the EC consisting of four workshops; the first workshop farm accounting and information management is held March 1995. The objective of PACIOLI is to explore the needs for and feasibility of projects on the innovation in farm accounting and its consequences for the data-gathering with Farm Accountancy Data Networks (FADN).

As a first step on the way to innovation of gathering data with a FADN, there has been made a successful step in creating the platform that will prepare the necessary and feasible proposals for innovating FADNs.

Farm Accountancy Data Networks/Farm accounting/Information management/ Information modelling

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PACIOLI

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CONTENTS

PREFACE

The changing conditions in agriculture during the last years have brought fundamental changes in agricultural decision making on the farm level but certainly also in the agricultural policy making. Since decision making processes are determining the information requirements, it is clear that the activities that supply the necessary information should be adapting to a new situation too.

The LEI-DLO as an institute that tries to fulfill the information needs of (Dutch) agriculture policy makers, is also confronted with this changing environment. During the last five years serious changes in types of data that are gathered and in the data gathering process have taken place. In this respect we are very pleased to be able to discuss with the colleagues throughout the EU, our process of change, the things we are worrying about and the ideas for future directions in the further development of our farm accountancy data network. The platform for this discussing is the project called 'PACIOLI', a concerted action in the AIR-program of the EU.

We hope that by sharing ideas and extensive collaboration the FADN's will be able to generate the information that is required by our clients; in the near future as well as on the longer run. We are very much aware that this ambition will confront us with the need for major changes in our activities. We hope that the PACIOLI project will help us and our FADN colleagues to make a major step in the good direction.

SUMMARY

The PACIOLI project is a concerted action for the EC consisting of four workshops; the first workshop farm accounting and information management is held March 1995. The objective of PACIOLI is to explore the needs for and feasibility of projects on the innovation in farm accounting and its consequences for the data-gathering with Farm Accountancy Data Networks (FADN).

In the first workshop the objectives of the project were discussed and it was concluded that the main objectives for innovation in the FADN's are improvement of the quality of FADN data, the use of data and the cost effectiveness of FADN's. A mature level of strategic information management is a prerequisite for more flexible FADN's that are supplying data with high quality in a cost effective way.

Information models are essential tools in information management activities. Some experiences with the information modelling approach and their applicability for the FADN domain have been discussed.

In development of information models for the farm accounting and FADN domain, some problems have to be overcome. The big diversity in farm systems throughout the EU, the high costs of development and maintenance of the models and resistance against harmonisation and uniformity are the main problems to overcome. On the other hand in the discussion there was an overwhelming consensus that FADN's should not just be improved but it is obvious that there is a need within the FADN-world for innovation of the FADN's. A lot of suggestions were generated that should help to make some good steps in the direction of this innovation process.

The participants that were present at the first workshop agreed that the next step in this process is to make descriptions of the various national FADN's by making a global process model of their FADN. During the second workshop these information models will be compared and the differences and similarities of the FADN's will be explored. This should result in a clear picture of the FADN domain which is an input for the discussion in the third and fourth workshop about what should be changed.

Last but not least this first workshop resulted in a enthusiastic network of accounting experts, information scientists and FADN experts of 7 EU countries. For the remaining three workshops also the other EU memberstates will be invited for participation, in order to get a broader platform for ideas about innovation of FADN's.

HOW TO READ THIS BOOK

This book is the result of the first PACIOLI workshop. The workshop was organized around three days of presenting papers, discussing them and discuss related subjects.

This book follows the order of the performances in the workshop. Chapter one to four contain four presented papers. After chapter four the discussion held in the first working group session is presented. Chapter five to seven contain presented papers, after which the discussion of the second working group session is presented. Chapter eight contains a presented paper. Working group session three contains the discussion around two successive subjects. Chapter nine contains the last presented paper. And last but not least, working group session four contains the discussion about 'what will come up in the second PACIOLI workshop'.

1. INTRODUCTION PACIOLI

George Beers 1)

Summary

This paper gives an introduction and some backgrounds of the PACIOLI 2) project; a concerted action for the EC in collaboration with the RICA/ FADN unit. The objective of this concerted action is to explore the needs for and feasibility of projects on the innovation in farm accounting and its consequences for data-gathering on a European level through FADN (RICA). The concerted action will give an impression of the possible products, of the required resources, of the problems to overcome. PACIOLI also may be considered as a first step in disseminating Dutch experiences with the information modelling approach in agriculture.

The concerted action is a step in preparation and development of projects in which information models will be developed that support the development of information systems to extend the RICA/FADN network with various types of data in order to support EC policy making and evaluation. To make this FADN network more flexible, the opportunities and restriction of the use of the information modelling approach will be explored and discussed in the proposed concerted action.

1.1 Dynamics in decision making in Agriculture

The continuing over-production of food and fibre within the EC, combined with growing environmental concerns, means that farmers are under increasing pressure to reduce both their production levels and their use of inputs. Although reductions in production within the EC following the GATT agreement may lead to some increase in domestic producer prices as the downward pressure on world market prices from subsidised exports is abated, this is unlikely to be sufficient to compensate farmers for all their lost sales. Hence it is vital that farmers make the most effective use of their inputs in order to cut their production costs and maintain their incomes. This pressure to cut inputs will be reinforced by the environmental protection rules and incentives that are being introduced within the EC at national and community level.

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1) George Beers works at LEI-DLO in the Netherlands.
2) This title honours L. Pacioli, who wrote the first textbook on double entry accounting in 1494.

The normal uncertainties surrounding the decision making processes within agriculture in a market economy are exacerbated by this complex mix of regulatory measures. Not only does this render decision making by farmers more difficult, it also makes the job of policy makers more complicated as they have to take account for policy impacts on less favoured and marginal areas as well as the more productive agricultural regions. These uncertainties increase the form and value of more sophisticated management information systems both to guide the producer and to inform policy makers of the likely outcomes of present and proposed policies.

A better control of inputs and a reduction in production costs is needed in primary production, contributing to the protection of the environment and the sustainable exploitation of resources. Monitoring and control systems must be developed and maintained to reach these objectives (OECD, 1991).

Economic information is created by *management information systems* and accounting systems. Integration of financial accounting systems with technical data is now possible and improves the information value of accounting for decision making on a wide variety of decision levels (for example farm, policy making) (Köhne, 1991). However, flexibility in accounting systems lacks, which makes it difficult to adapt to changing circumstances. More specifically this problem exists on the European level where accountancy data are used to inform policy makers; the EC's Farm Accountancy Data Network.

The Common Agricultural Policy shifts support from production to acreage, and introduced set aside and extensification programs. For example the Environmental Policy asks member states to issue a code of 'good farm practice' for the reduction of nitrate pollution, with a possibility to oblige farmers to register the application of fertilizers and manure. Several member states also took actions including obligations on environmental accounting and auditing. However, these data and their effect on farm decisions are hard to compare (Brouwer and Godeschalk, 1992).

Decision making by farmers becomes more complex as economics and environmental aspects demand integration. Information systems require adaptation, there is especially a need for innovation in farm accounting (Poppe, 1992). The need for non-financial data is relatively young and dynamic. These data are generated by a wide variety of organizations; for example trading partners of the farm increasingly supply this data to farmers. Integration of various types of data calls for standardisation and electronic exchange. Modelling of information needs in farm management by the development of reference information models can be regarded as a prerequisite to obtain standardization and harmonization of farm data. These models can be used to exchange data on environmental issues and help farmers to integrate this data with existing economic information.

1.2 Information modelling

An information model is a description of the relevant data and the processes that create and use these data in a certain domain. Information models have proven to be useful instruments in a first step of system development or in ordering a complex of already existing systems (Martin, 1990). To reach agreement on common definitions can be troublesome. To overcome this obstacle, information models have proven to be very useful. In the Netherlands some major projects have started since 1984 to develop and use information models of farms, product chains and farm accountancy. Dissemination of these experiences can be useful for speeding up the learning curve for system development and integration in other countries. Besides, dissemination of the information modelling approach is a prerequisite for using data from various sources in various countries on a European level, in a consistent way. Integration of technical data in the FADN will be a troublesome process if not supported in a structured method that is known by and supported by the various member states.

In order to make use of the information modelling approach on a European level several uncertainties can be identified:

- The Dutch experiences are restricted to the Dutch situation. It is not known to what extend the Dutch models represent the situation in other countries and so, to what extend the Dutch information models are transportable to other countries. Several topics like for example water supply, desertification and farming on hillsides are not present in the Dutch context. Attention must be paid to whether regional determined domains effect the information structure. Not only specific domains but also tax systems and differences in organizational structure will influence the occurrence of data, the structure of them and need for data in several processes

- A consistent methodology for integrating information models is still under development. The methods used have been developed for the use within a single organization. Integrating information models takes place in two different ways:
  - Integration of information models of different organizations; 'inter-organizational integration'
  - Integration of information models of different levels of aggregation (for example farm - national - EC)
  - The body of knowledge on the integration issue is growing in an experimental way. Development of a consistent methodology based on a broadly accepted theory about integration of data and data handling just has been started.
  - The information models in a broadly applied information modelling approach are describing the information models of 'types of organizations' in so-called reference information models. The organiza-

tional aspects of information modelling will vary for different countries. To guarantee a proper spin-off of information modelling activities, it is important that the use and maintenance of the models is embedded in the organizations that are actually performing the information processing described in the models. This requires participation in the development of the models.

Though some experiences are available, there is not yet a clear blueprint for participation and representation of organizations in the development of reference information models.

The proposed concerted action PACIOLI will be focused on a survey of the uncertainties mentioned and their possible implications in future projects for development of information models on farm accounting at farm and at FADN level. The concerted action can be considered to be a preparation on such projects.

1.3 Towards flexible supply of information

Information models have proven to be useful instruments as a first step of complex integrated system development. It is also a tool for ordering a complex of already existing information systems. For data exchange between different organizations, agreement on common definitions of data is absolutely necessary. To reach this type of agreement is usually a difficult task because most organizations want to stick to their own data definitions.

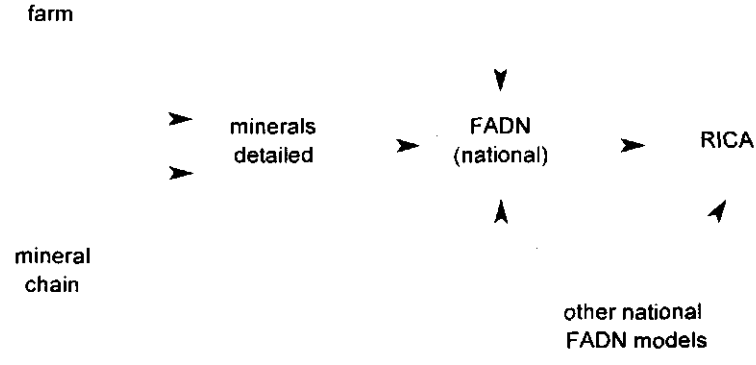

Figure 1.1 The relations between the information models. The arrows represent that the information model of the object system is input for the modelling process of the next information model

To overcome this obstacle, information models have proven to be very useful.

In an early stage of development of the PACIOLI project, the SUMMER project was described (Beers & Poppe, 1993). This project proposed to develop a line of information models aimed at flexibilisation of the RICA FADN on the domain of the use of minerals at farms. To use the information modelling approach for this purpose, a series of reference information models was described:

- Global information model of farms
- Global information model of the mineral chain
- Detailed information model of minerals at the farm
- Information model of national FADNs
- Information model RICA FADN

The relations between these various models are represented in figure 1.1.

It was foreseen that a lot of uncertainties are part of the information modelling processes. To support the 'unknown areas of information modelling', a research line was integrated in the project. These identified uncertainties were:

- The reference problem; what class of object systems can be covered by one model
- Chain modelling; how to model a product 'chain'
- Methodology of development environmental information systems
- Integration; how to integrate the various information models
- Geographical information systems and FADN

1.4 The benefits of information models in a FADN environment

The current FADN/RICA framework requires that a great deal of data is collected from participating farms. One outcome of this project would be the identification of those elements of the data set from each holding which are fundamental to farmer and policy-maker decisions and which are subject to regional variation; this includes data that are currently unavailable. The Commission could consider to give priority to the collection of these data within FADN/RICA. Other data which are less volatile could be collected from a subset of holdings or at intervals of several years from the entire sample. This would enable additional data to be collected via FADN/RICA without imposing undue burdens on the budget, national collecting agencies or participating farmers. Another outcome of the project will be an improved method of data management within FADN/RICA that supports the harmonisation of data. Research carried out on behalf of the EC 1) showed a need

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1) See R. Power et al., Harmonisation of the FADN Farm Return, Dublin, Teagasc, 1989.

for further harmonisation of data. In the future also more explanation should be provided to users of the data on the concepts that are used within the FADN 1).

The result of this concerted action can also be a very useful input for projects that deal with the auditing of CAP-regulations on farm level (for example extensification and stocking-rates). As another result the concerted action will lead to the formulation of specific projects as recommended in earlier FAST studies 2). These projects will consider collecting and interpreting data in for example forestry, links with the small and medium sized business in the agro food sector and on projects for monitoring networks on environmental degradation.

Benefits for farm level information systems are that the advantages and disadvantages of information modelling become clear. It will be demonstrated how environmental data from production record systems and EDI could be integrated in farm accountancy software and other farm information systems.

This project obviously proved to be overambitious and expensive. Therefor a track is developed that is based on a more incremental approach. In fact the PACIOLI project can be seen as an action that aims to prepare to most illustrative, effective and feasible part of an information modelling program.

1.5 Workplan

PACIOLI is organized around four workshops that will be organized during 1995-1996:

Workshop 1 (March 95). 'Introduction and Information Analysis'
In the first workshop the concerted action will be introduced and the final objectives, scope and working procedures will be established. The need for strategic information management in Agriculture will be discussed and some experiences with this in various member states will be presented. A special focus will be on the Dutch experiences with the Information Modelling Program. The feasibility of the information modelling approach in the various countries and the FADN environ-

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1) See D. Defays, Statistical Meta Information Systems Workshop, EUROSTAT, Luxembourg, 1993.

2) See 'The FAST Programme 1984-1987: Results and Recommendations', vol. 5 and vol. 6, 1988.
See also Tims, W. and T. Koopmans, 'Integrated Management of Economical Ecologic Agro-Ecosystems', FAST Occasional Paper nr. 176, Theme SYRENA (SYstèmes des REsources NAturelles), 1987.

ment will be assessed. The possibilities to use information models in the next workshops of PACIOLI will be explored.

The history of the Return Fiche will be the RICA issue for the first workshop.

Workshop 2 (September 95). 'Accounting and managing innovation'

The challenge of the second workshop is to obtain a global overview of the FADN related information systems as they already exist in the various member states. This concerns information systems, manual as well as computerized, on the primary level (for example farms, their suppliers as well as the level of the national FADN's and all information systems involved in them. Besides these other sources of information that might be relevant (for example chambers of commerce, labour offices) will be inventoried. This will be done by an inventory of the data-sources in the agricultural context.

In order to prepare for projects in which actually information models will be developed, it is necessary to think about the organizational aspects. Different factors that influence the organization and implementation of accounting in the member states, will be discussed. In these discussions the focus will be on innovation in accounting and the FADN as a source of information for various purposes. To support these discussions for each country the broad variety of organizations that are involved in agricultural data-processing, will be described globally. Besides the information technical aspects, the focus will be on the institutional structures of the FADN's and their implications for innovation processes.

Workshop 3 (March 96). 'Need for change'

In the third workshop special attention will be given to the policy making processes since policy can be considered to be the primary users (and financiers) of information obtain by FADN's. Attention will be given to the information requirements related to policy making processes and the way these information requirements are influencing the FADN's. Representatives of the users of FADN will be participating in this workshop to give directions for innovation of FADN's on national and EU level. The consequences of the suggestions from policy makers will be discussed as a first assessment. This workshop can be considered as a brainstorming to bring up ideas for innovation of the FADN's.

Workshop 4 (September 96). 'Suggestions for continuation'

In the fourth workshop some ideas from the previous workshop will be worked out to proposals for follow-up. The discussion will be on priorities of topics and identification of projects. Using the material brought up in the other three PACIOLI workshops, innovation projects will be developed for the FADN's, including the information models to be

used and developed, the organizations to be involved and the main threads and benefits of the project.

1.6 Deliverables

Each workshop results in three documents:

a) Full report of the workshop, including papers presented and report of discussions
b) Management summary of the workshop for the RICA community
c) Reflection paper, report paper and discussion about a special 'RICA issue'

These 12 reports can be regarded as the 'physical deliverables' of the project. By purposive invitation of participants in the workshop there will also be tried to establish a network in which follow-up actions are embedded.

1.7 Coordination

The proposed concerted action will be coordinated by Dr. G. Beers, LEI-DLO The Netherlands, supported by a management board with all national representatives.

The members of the management board are:

Beers	coordinator
Astorquiza	repr. Spain
Poppe	repr. The Netherlands
Magne	repr. France
Williams	repr. United Kingdom
Sirén	repr. Finland
Öhlmér	repr. Sweden
Bonati	repr. Italy
Robson	repr. RICA/FADN

The management board will advise the coordinator and contribute to disseminate information about PACIOLI in the countries. Because of the innovative nature of the project the activities are initiated from a research environment. To make use of the experience of the national agricultural (financial) monitoring systems, all partners can realize access to their national farm accountancy data network. A good relation with the ministry of agriculture is important for bringing in the information requirements of the policy makers. For the dissemination and follow-up of the information modelling approach it is experienced to be useful to have good contact with the people that have a responsibility for the agricultural information manage-

ment in for example the ministry of agriculture. The national coordinators that are mentioned above have checked the most relevant organizations in their country on their eventual willingness to support them in their contribution in this concerted action.

The management board is composed of representatives of each participating country. These national coordinators will take care of the organization and contacts within the country (s)he represents. Those national contacts include the organizations and networks involved in the fields as described above and also businesses from the private sector, including (small and medium size) accounting and software companies.

The management board will also be responsible for evaluating the concerted action and recommending continuation of its activities.

2. WHY PARTICIPATE IN PACIOLI?

2.1 Finland

2.1.1 Description of the Finnish delegation

Jouko Sirén, member of the Management Board:

Director of the Agricultural Economics Research Institute (MTTL). The Institute is under the Ministry of Agriculture and Forestry and it is responsible for the economic research in the field of agricultural policy and farm management. The Institute is also responsible for the official Finnish bookkeeping activity. There are about 1,100 bookkeeping farms in Finland. Their economic results are calculated and published by the Institute. MTTL will be the FADN liaison agency in Finland.

Simo Tiainen, researcher in the Agricultural Economics Research Institute (MTTL)

Mr. Tiainen is a specialist in agricultural statistics and especially FADN network. He has worked for some months in DG VI in Brussels with FADN in European Union. At the moment he is working with problems concerning EU farm typology on Finnish bookkeeping farms and Standard Gross Margins (SGM) for different products.

Ari Enroth, specialist, farm management

Mr. Enroth is working at the Union of Rural Advisory Centres. He is an expert in economic planning methods used on farms and in developing those methods. The Association is the central organization for Regional Rural Advisory Centres in Finland. They are owned by farmers and subsidized partly by the state. The Centres take care of the main part of the economic planning on farm enterprises. The Centres also collect and calculate economic results of individual farms that participate in bookkeeping. The data is then delivered to MTTL.

2.1.2 Why participate in PACIOLI?

A considerable increase in economic planning on Finnish farms has occurred only in the past few years. Farms are not obliged to keep books, but for taxation they must keep accounts on incomes and expenditure. Monitoring of the profitability and liquidity is voluntary. About 10 years ago a liquidity calculation started to be required from farms in connection with investment support.

In recent years research aiming at developing the economic planning of farm enterprises and monitoring of their result, as well as systems related to these has been increased. In this connection cooperation with other countries is very useful.

Besides agriculture, Finnish farms often practise forestry and other small-scale entrepreneurial activity, and an attempt is made to develop methods that are suitable for the economic planning of this kind of diversified enterprises. It should be possible to examine both the different parts of the enterprise and the enterprise as a whole. Research on this is underway at the MTTL.

Membership in the EU increases the need for economic planning, because radical changes occur in the prices and costs, and variation in these also increases. Support of investments requires, on the other hand, that farms start to keep more detailed accounts than is the case at present.

Cooperation with other countries is needed in making the Finnish bookkeeping system compatible with the corresponding system in the EU and in the development work.

To assist the development of good agricultural practices with regard to the environment, research has been started to develop a food balance. Information on food balance could be applied in the regulation of production. Experiences of other countries are useful in developing the food balance.

Two important objectives of PACIOLI project:

1. Making the development of systems concerning economic planning and monitoring in different countries more uniform and informative.
2. Development of data processing. How should the transfer of data from enterprises into processing be organized, and how the processed data can be made useful for the entrepreneur, decision-makers, and policy planning?

2.2 France

2.2.1 Description of the French delegation

Jean Magne
Docteur en Sciences de gestion (Ph.D. in management)
Professor of computer sciences
Director of ENITA de Bordeaux

Bernard Del'Homme
Teacher-researcher in agricultural management at ENITA

Jerôme Steffe
Researcher on information systems in agriculture at ENITA

Relation to the FADN
Leader of the ENITA-originated farm accountancy data network, representing about 30,000 farms throughout France.

Expertise in information science
All the research Mr Magne has, thus far, carried out has been done at the laboratory 'Systeme d'Information', which he created in 1978. The latter's research activities are oriented towards the information system within the context of the agricultural concern. The originality of this laboratory consists in bringing together researchers, agricultural specialists and computer scientists, all of whom jointly develop applications designed for the farmer. These applications are then marketed by the network setup by management advisory centres working with the ENITA de Bordeaux.

The scientific themes successively taken up have, to date, been the following:

1. The conception of forecasting models in management utilizable on the farm by the farmer and a technician, supported by a micro-computer (1975-1980).
2. The conception of accounting models utilizable by the farmer working unassisted (1977-1985).
3. The conception of methods of analysis with a view to computerizing the financial diagnosis of the firm (1985-1992).

Today, we are immersed in work concerning the modelling of data as well as the role of data models implicitly inherent in pre-defining management models.

Relation to agricultural policy makers
Mr Magne is the French representative in ISO/TCSC 19 'Agricultural electronics', the data exchange programme between mobile process computers and management computers in agriculture. He also has good contacts with the software industry. He participates in the organization EUNITA, with the special task on dissemination of information and is a member of

the scientific committee of the 'Bureau système d'information', of the French Ministry of Agriculture.

2.2.2 Why participate in PACIOLI?

Our motivation in participating in the PACIOLI programme is essentially dual. We wish 1 - to obtain wider knowledge concerning the various work done on RICA/FADN, and more precisely, greater familiarity with the methodology used in developing an information system.

What are the different methodologies being used by European researchers in defining the information system within the agricultural concern? What are the criteria for selecting information? How do the researchers define and present information so as to optimize utilization in the decision making process? The Dutch example is, in this framework, of particular interest to us.

Today, the need to integrate information of a non-economic nature (into the FADN) is pressing. We would, therefore, like to find out about the approaches proposed by our European colleagues in this field and to discuss with them the optimum methodology allowing for the integration of these new categories of information into the I.S. of the agricultural concern.

We wish, also, 2 - to establish contact with European researchers with a view to working together on the problem of references.

There, the goal is undertake a collective project, the final result being the definition of common references (of both an economic and a non-economic nature) on the European-wide level.

Our own objectives

Our principal aim is to set up a new way of thinking about the conceptualization of the I.S. of the agricultural concern. For some years now, the concept of the management tool itself has consistently determined the conception of a specific model of information. Today, we are confronted with, on the one hand, problems of communication between management tools and on the other, with problems of communication between farmers and advisors, due, in large part, to a heterogeneity of information.

In light of the foregoing, we propose an inverse approach, working directly on information, with a view to obtaining one, standardized model utilizable by all management tools. We are convinced that the definition and implementation of this standard have been facilitated by the evolution of information technology: for example, the object-oriented approach would allow for the definition of a common frame, a common set of objects while allowing each user to treat these according to his or her own need. That is to say, each individual would use only these objects he/she needed without being under the constraint of importing a total environment. Links between or among different management tools would be forged by means of objects common to those tools.

Two suggestions for making PACIOLI work:

1. In order for each participant to have an overall view of the different work being done on RICA/FADN, we would like to suggest the creation of a collection of articles including all research done in Europe. Thus, we would propose nominating for each country, a person responsible for collecting all new publications concerning RICA/FADN whether these are written or not by PACIOLI members. This would make it possible to create a European wide press-book on RICA/FADN, which could be regularly sent to each participant.
2. Lastly, one of the preliminary steps necessary to the harmonization of our information models is the harmonization of vocabulary used. In deed, a clarification of semantics seems necessary to us in light of our future discussions:
   - What is meant by a reference?
   - What is an information model?

2.3 United Kingdom

2.3.1 Description of the English delegation

Nigel Williams BSc MA(Econ)
Current function:
Senior lecturer in agricultural business management
Wye College, University of London

Relation to FADN
Chairman, UK Ministry of Agriculture Farm Business Survey Methodology Working Party.
Member, UK Ministry of Agriculture Farm Business Survey Sub-committee.
Actively involved in the collection and analysis of FBS/FADN data at Manchester University and London University (Wye College) from 1970 to 1978. Manager, Wye College FBS/FADN operation from 1977 to 1984. Author of numerous reports on FBS/FADN data. Author of several computer software packages in use at Wye College and other universities for dealing with current cost accounting procedures.

Expertise in information science
An extensive experience of linear and other programming techniques and their data requirements for economic and behavioural modelling.

Relation to agricultural policy makers
Carried out a number of policy evaluations for UK Ministry of Agriculture.

Alastair Bailey BSc
Current function:
Research Officer in Agricultural Management and Economics.
Wye College, University of London

Relation to FADN
Have extensive knowledge of building secondary data sets, using UK's national FBS and the FADN, for economic modelling purposes. Much of this work has involved the pooling of successive FBS cross sections to form 'Panel Data' sets. This work was carried out for my PhD study and for a project funded by the EC "The FADN Gross Margin Project" with Andrew Errington and Peter Midmore (Reading and Aberystwyth).
Data collection role. Have acted as a research assistant on MAFF Occasional Survey of 'Hardy Nursery Stock' enterprise in England and Wales 1993.

Expertise in information science
The above data sets have been used in conjunction to econometric techniques to obtain production parameters from duality based models. In the long term it is hoped that these models will be combined with GIS and Meteorological data to improve estimation performance.

Relation to agricultural policy makers
No direct involvement as yet. However, most of my work does have policy implication.

Sandra Dedman BSCc aca
Current function:
Lecturer in Accountancy
Wye College, University of London

Relation to FADN
Utilizes FBS FADN derived agricultural business statistics for teaching and practising 'comparative statistics'.

Expertise in information science
A fully qualified chartered accountant trained by a top 8 UK firm which specialises in agriculture. As such she is well versed in the problems of extracting data on complex agricultural businesses and their analysis.

Relation to agricultural policy makers
Strictly firm level business analysis.

2.3.2 Why participate in PACIOLI?

We are participating in the PACIOLI project because we believe that the FADN/RICA is potentially a very useful source of data for research and policy making purposes. We would like to see this potential turned into reality.

Our own objectives

Our objectives are to work towards a situation where the FADN/RICA is more extensively utilized, both by EU bodies for policy assessment and by the 'secondary' researcher, for both academic research and policy analysis.

The "pitfalls"

The pitfalls of the PACIOLI project are that recommendations may be made that are infeasible because of resource constraints at the national level. Equally, we must be prepared to make radical suggestions for change.

To make PACIOLI work we must:

a) ensure that we have a good mix of information scientists, policy makers and practitioners so that all points of view can be incorporated in the recommendations of the group; and
b) we should endeavour to inform opinion within non-participating countries of what we are doing so that a uniform approach is taken forward.

2.4 Spain

2.4.1 Description of the Spanish delegation

Dr. Miguel Merino-Pacheco
Agricultural economist and researcher with extensive work done on different aspects of Spanish agriculture integration in the EU, regional economics, set aside programs, marketing of agricultural products). Based in Germany, he makes long and frequents research stays in Spain. His work has been carried out, up to the present, through the Universities of Madrid, Hohenheim (Stuttgart,GFR) and Humboldt (Berlin (GFR), with private and public funding.

Dr. Mario Mahlau Enge
Agricultural economist and researcher based in Madrid. His main fields of interest in the last years have been economics of animal production, marketing of agricultural products and agricultural credit organizations. He carries out his work mainly on the University of Madrid, collaborating also with the University of Kiel and the IFO of Munich.

Ms. Maria Teresa Dobao Alvarez
Agricultural Engineer at the National Institute of Agricultural Research and Technologies in Madrid (INIA). Presently her responsibility area is dissemination of research results and coordination of research efforts among her institution ad other centers. She works on a special unit dedicated to this task (OTRI; Oficina de Transferenc-a de Resultados de la Investigacion) and has great first hand knowledge of the flows of information and research results among Spanish institutions.

2.4.2 Why participating in PACIOLI?

As experienced researchers we believe in the need urgent need of making the existing RICA data widely available and to contribute to the development of new data. Presently, the publications of the Spanish RICA called RECAN) are highly aggregated and not appropriated for certain kind of research (building LP optimization models and similars for instance).

To include the possibility of organizing the data (also) after production activities will not only make possible to work with economic optimization models, but also introduce ecological restrictions and variables altogether. That will make necessary to introduce also information on quantities of agrochemicals and fertilizers used, and not only global averages measured in monetary units, as it happens up to the present.

The consideration of information about non-agricultural income will transform the RICA into a real tool for policy studies and policy making. Specially because the present trends In Europe are transforming the countryside in the venue of numerous other economic activities in which the farmer and their families are participating and will do even more in the future.

2.4.3 Pitfalls

The seemingly harmless proposals of 2.4.2 are politically difficult to handle. The problems with the consideration of non-farm income of the farm families within the RICA in Southern Europe and France is well known. The introduction of ecological variables, which will allow to evaluate the real environmental contributions and/or damages caused by agricultural activity is also a source of worry for the providers of information to the net; the farmers themselves. The evaluation and planning of these steps following the recommendations of the reborn science of Political Economy could be desirable, in order to overcome the opposition of vested interests and institutional resistance

2.5 The Netherlands

2.5.1 Introduction

This paper describes the Dutch delegation in the PACIOLI concerted action. As the project was initiated by the Dutch Agricultural Economics Research Institute LEI-DLO, we first give some information on the objectives of LEI-DLO to start this project and the roles of the project leader and the national coordinator for the Netherlands. In addition objectives are discussed and the other participants from this country are introduced.

2.5.2 LEI-DLO

The LEI-DLO is the central Dutch research institute for agricultural economics. It is part of the Research Organization of the Ministry of Agriculture, Nature management and Fisheries (DLO). Although a public institute the funding of the institute is based on contract research (approx. 50%), including projects for the Ministries, and carrying out specific defined task for the Ministry of Agriculture like the FADN. DLO (and thus the LEI) is in a transition process to be set at arm's length of the government in the form of a public agency.

The LEI-DLO has played an important role in international cooperation for a long time. With more cooperation within the EU and a shift of research funds from the national level to the EU, the strategic plan of the LEI-DLO indicates international projects (for foreign customers) as an important activity for the next years.

Within this framework the concerted action was started by Krijn J. Poppe and George Beers as a strategic project for the LEI-DLO and as a natural next step in their own work. Poppe has been working with the LEI-DLO since 1981 and coordinates the Dutch FADN. In the past he has been involved in projects using information modelling to develop new accounting systems, including environmental accounting. He is a member of the management committee of the EU-FADN. Beers is specialized in information science research. The concerted action has been developed by these two persons and the cooperation, especially regarding the scientific aspects, are close.

The LEI-DLO is extremely dependent on the FADN: the Dutch FADN is one of the major activities, and much of the contract work is sold and carried out by using this data. More and more projects are carried out by using the data of the EU's RICA. We have the feeling that the current FADN can only survive in the future if it is adapted to new demands from clients, including policy makers. This makes the adaptation of the Dutch FADN as well as RICA an important necessity to maintain the LEI-DLO's leading position in agricultural economics research.

Besides Beers and Poppe, the workshop is attended by Tim Verwaart and Diederik Spiering. Verwaart is head of the Informatics Centre of the LEI-DLO. Main activities of this centre are the support of researchers with informatics and to develop and maintain the software for the FADN. Diederik Spiering is a student of Wageningen Agricultural University, and supports the project leader in organizing this first workshop.

As we were in the position to organize PACIOLI, there is no need to identify pitfalls and suggestions.

2.5.3 Other Dutch participants

We asked three other persons to attend this first workshop. Prof.dr. Alexander Udink ten Cate works with the DLO-organization (see above) where he coordinates the informatics policies of the research institutes. He is also a part-time professor of informatics at Wageningen University. As an expert in informatics he contributes extensively to international discussions in the field of informatics and communication technology.

Ir. Connie Graumans and ir. Aad Alkemade work with the ATC. This organization develops and maintains information models for Dutch agriculture. The aim of the Agro Telematics Centre ATC is to optimize the use of informatics in agriculture. It is a non-profit organization, financed by the government and the farmers' organizations. The ATC has been active in international projects before.

2.6 Sweden

2.6.1 Description of the Swedish delegation

Gunnar Larsson
Head of the Farm Economic Surveys, Statistics Sweden (SCB). His department is producing statistics on farm economics, and the main users of these statistics are the agricultural policy makers. The department is working with the implementation of FADN in the Swedish survey.

Bo Öhlmér
Professor in farm management, Swedish University of Agricultural Sciences. He has carried out research in farmers' need and use of information, the managerial processes and use of information technology.

Per Persson
Head of the Joint Council for Economic Studies in the Food Sector (LES). LES has the responsibility for the cultural statistics in Sweden, i.e., which agricultural statistics should be produced and by whom. LES is responsible for the Swedish accounting suvey linked to FADN.

2.6.2 Why participating in PACIOLI?

We are participating in the PACIOLI project because we believe that the FADN is potentially a very useful source of data for policy making and research purposes. It is important to make the FADN more useful and increase the efficiency in the accounting surveys. Our own objectives are to learn more about the experiences of the FADN in other countries, get ideas on how to improve the Swedish survey and get a basis for evaluation of how much resources Sweden shall spend on the survey. We need to get as much knowledge as possible on how the FADN is used today and how it can be used in the near future. Potential "pitfalls" of the PACIOLI project may be the differences between the countries in the conditions for the FADN work and each country's investment in data information systems and knowledge on concepts and systems, that may make it difficult to make some concrete proposals. To make PACIOLI work, we should point out a few important issues to concentrate them.

3. RICA'S FARM RETURN: INTRODUCTION AND COMMENTS

Krijn J. Poppe 1)

'Change is the law of life. And those who look only to the past or the present are certain to miss the future'
John F. Kennedy, 1963

3.1 Introduction

Farm accounting in Western Europe is most often carried out on behalf of the farmer involved: for his own management, for the stakeholders in his farm (e.g. to report to his bank), or because of obligations resulting from investment schemes or tax laws. In some cases however, farm accounting is carried out on behalf of an information system set up by the EU, called the Farm Accountancy Data Network (FADN), often also referred to as RICA 2).

Although the PACIOLI-project deals explicitly with both forms of accounting, this paper will restrict itself to the RICA-system. The paper focusses on the data that are gathered for the policy makers and researchers that use the RICA. It provides a description of the RICA-organization and the methods that are used to specify the data requirements. A review of these methods is the main purpose of the paper.

Of course the distinction between the two types of accounting, mentioned in the first paragraph, does not always make sense and there is overlap: in some countries accounts made for farmers for tax purposes are used as a basis for the RICA and in general the data requirements of farmers and policy makers tend to overlap. And to promote the participation of farmers in the RICA network, they receive accounts on their own farm that they can use for their management.

In this paper we first look at the organization of the RICA network. This serves readers who are not familiar with the network. Then we turn to the Farm Return, that describes the data that EU member states should deliver to the European Commission. The descriptions result in some comments

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1) The author works as a business economist with the Dutch Agricultural Economics Research Institute LEI-DLO and represents the Netherlands in the management committee of the FADN. He wishes to express his thanks to members of the RICA-team in DG VI/A-3 for discussions on the topics of this paper.

2) RICA is the French acronym for FADN and stands for Réseau d'Information Comptable Agricole. In this text we will use the French acronym to avoid confusion with references in English to farm accounting in general or national farm accountancy data networks.

on the methods used for data management in the RICA system and some recommendations for the future.

3.2 The history and organization of RICA

The original six member states of the EU (then: EEC) created an agricultural policy with commodity support - intervention, import levies, export subsidies, target prices - under common market organizations to support the income of the farmers. The management of this policy created a need for information on the situation in agriculture to monitor the performance of the Common Agricultural Policy (CAP) in relation to its objectives. Most, if not all, member states had faced this problem before on a national level and gathered data on farm incomes through accounts. Thus in the mid sixties efforts were undertaken to create an EEC's farm accountancy data network based on the national networks.

In 1965 the Council of the EEC decided to create RICA (Regulation 79/65/EEC of the Council, published in the Official Journal 109 dated 23.6.1965). It goes beyond the scope of this paper to investigate the history of RICA and there is -as far as I know- no comprehensive written source available 1). According to the Ph.D. dissertation of one of the founding fathers, J.A. Kuperus (1970), it has not been easy to agree on the data that should be gathered. In 1970 he wrote:

> *'In the EEC a comparability of farm accountancy data in the six member states is pursued. The size of the necessary uniform instructions that are needed up to now (from 1966) in several EEC regulations gives a clue to the large difficulties that occur and that will not be get by before long. Very much cooperation of all those involved, the will of all to reach the stated objective and the willingness to change one's own bookkeeping system for this purpose, as well as expertise at management level in central organizations are necessary to reach results in this field' (Kuperus, 1970, p. 178, my translation).*

Whatever the difficulties, the founding fathers of the RICA surmounted them and in the end agreed on a common 'fiche' or Farm Return. The original Farm Return lasted for a decade: in 1977 the current Farm Return was introduced (published as Regulation (EEC) 2237/77 of the Commission dated 23.9.1977 in the Official Journal L 263, dated 17.10.1977) with the preamble:

> *'Whereas it is now time for the 10 years' experience of the farm accountancy data network to be applied to revise the provisions concern-*

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1) Some information can be found in Lommez (1984) and by studying the official regulations as mentioned in CEC: the FADN, an A to Z (1989).

ing the farm return so as to make the accountancy data more comparable and to adapt them to the developing needs of the CAP.'

The introduction of magnetic tapes is mentioned as another reason to revise the Farm Return. Next section describes the 1977 Farm Return in more detail.

The Farm Return is used to gather data on nearly 60,000 'commercial' farms in the EU (the figure will be revised upwards with the data from farms in Austria, Finland en Sweden who, like most OECD-countries, already run a national farm accountancy data network). The RICA is a network of networks: accounting offices keep records of the 60,000 individual farms and submit the data to national liaison offices. The accounting offices come in different kinds. Some member states use commercial accounting offices that submit copies of records kept for tax purposes (and adapt them to the RICA definitions) or that farmers have to keep in order to qualify for investment aid. Sometimes commercial accounting offices keep the records only for the purpose of RICA. In other member states the accounts are made by research institutes or universities. National liaison offices transmit the data to the European Commission in Brussels, that stores the data in a database. This database is used for internal policy analysis, for contract research and to publish results on farm income. Most results are given per type of farming, per region (up to 100 European regions) and per size class. This makes the RICA data base unique compared to much more aggregated statistics as gathered by EUROSTAT. The RICA is managed by the European Commission (DG VI/A-3) with the help of the RICA management committee. A more detailed description of the network, and especially of its field of observation, the sampling, and the publication of results are found in CEC (1989).

3.3 The Farm Return: a description

The Farm Return describes the data that should be gathered on the individual farms for transmission to Brussels (CEC, 1988). These data include:

A. General information on the farm
B. Type of occupation (tenure)
C. Labour input
D. Number and value of livestock
E. Livestock purchases and sales
F. Costs
G. Land and buildings, deadstock and circulating capital
H. Debts
I. Value added tax
J. Grants and subsidies
K. Production

The Farm Return contains a table for each of these items. These tables (CEC, 1988; as an example one of the tables is reproduced in Annex 1) contain the details of these subjects under so-called 'headings' and each heading has one or more descriptions, with a serial number of each (sub)heading described.

The first 10 tables (A-J) contain 487 fixed serial numbers. Some of them have not been allocated to a heading, leaving some additional space for future data requirements. Some of the serial numbers will not be used by some farms. For instance all arable farms will have zeros in table D and E and even dairy farms will have a lot of zeros in these tables on livestock. Where such a practice seemed tolerable for tables D and E, the founding fathers introduced a trick in table K: this contains 890 serial numbers to record the production of the farm (other than the sales of cattle recorded in table E). As each enterprise demands 10 data items, 89 enterprises could be recorded 1).

Two tables demand the use of additional codes to specify the data entries. Table K uses product codes (headings 120 to 311) to specify the output. In addition some of these headings are subdivided again: for instance heading 153 citrus fruit orchards is subdivided into 354 (oranges), 355 (tangerines and mandarines, clementines and similar small fruit), 356 (lemons) and 357 (other citrus fruit). In such a case data on the global heading as well on the subdivisions should be provided.

In reality there is even a third level that is given in the instructions on the product codes. The current subdivision replaced an older and more detailed one, which is still mentioned in the instructions to specify the content of the new subdivision.

The other table that demands the use of additional codes is table J on grants and subsidies. There each subsidy gets two serial numbers, the first for a heading from table E (livestock), F (costs) or K (product codes) that identifies the type of subsidy and then a code for the amount of money received.

After defining the information that should be gathered and transmitted in the tables mentioned, the Farm Return provides additional definitions and instructions. After some general instructions on VAT (to be excluded), values (in national currency without decimal points), quantities (mostly in quintals, wine in hectolitres), ares, average livestock numbers (to one decimal place) and some other points, each heading is defined in more detail.

These definitions come in two types. The difference between the two types is their juridical status. The first type of definitions are the original

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1) In practice the number of enterprises is restricted to 53, which give a maximum number of 1,017 serial numbers. The reason is technical: 1,017 serial numbers demand 4,068 bytes in stead of 5,908. The result is that 1 logical record can be stored in a physical block of 4K. That saves in practice up to 50% in disk space.

instructions from the regulation of 1977, and some adjustments written into legal texts at a later moment. For example the accession treaties with new member states like Greece, Spain and Portugal influenced the Farm Return.

The second type of definitions is the result of clarifications in the management committee of the RICA. These additional comments are often added after discussions on problems with the application of the Farm Return. In the RICA Handbook that contains the Farm Return, the first type of definitions is printed on the left hand pages, the second on the right. As this makes reading difficult, a new version (in print at the moment) takes a less juridical and a more user friendly approach by integrating both texts (using italics for one of them to show the legal differences).

Nowadays nearly all the data items are obligatory. Exceptions are data on the type of loans (preferably but not necessarily allocated to the investment financed by the loan, like land or buildings) and a separation of investments in land and land-improvements. Originally the Farm Return contained a few more items on which member states could escape the legal obligation to gather the data. This included the original very detailed subdivisions of product codes in table K and the data on paid interest.

On all these items the Farm Return indicated that data should be gathered 'if possible' (or similar expressions). These indications were not the result of a pursued flexibility to exchange all data available in the member states, but were written in the text because some member states did not gather these data in their national farm accountancy data network and were not willing (mostly due to non-cooperation of farmers or technical impossibilities) to adapt. After some time, on some of these items full implementation could be reached.

3.4 Recent adjustments

Recently the Farm Return has been modified to cope with the effects of the CAP-reform. The Farm Return did not deal with milk quota and the superlevy on milk. To gather data on the milk quota of the farm an additional product code (312) in table K has been introduced. Although milk quota and the paid super levy can hardly be called a product, this made transmission of that data within the current format possible. However, when trading and leasing of quota became important in some countries, new problems had to be solved. After a short-lived interim solution (RI/CC 1104) used in 1991 and 1992, an update of the Farm Return has been introduced for the year 1994 (and 1993 if possible). This update was necessary because the Mac Sharry reform of the CAP created even larger problems on harmonization of the data. Also the Commission was eager to gather data on the set

aside and on the income support given to farmers on a per ha or per head basis.

This update, published as Decision EEG nr. 2940 of the European Commission, dated 25 October 1993 in the Official Journal L 265 dd. 26.10.1993, changes:

- Table A including a code for the type of the region regarding the Structural Funds
- Table G officially including the value of quota
- Table J adapting codes for subsidies to include subsidies for the environment and forestry
- Table K giving rules to code the set aside areas

And introduces:

- Table L data on quota (buying and leasing)
- Table M data on compensations in arable farming ('Mac Sharry-payments').

3.5 Comments on the Farm Return

The Farm Return gathers only data on the farm business and the income that the farmer earns from his farm business. No data is gathered on e.g. non-farm income (although proposals have been made) or gross margins per enterprise / product, and data are mainly financial by nature, omitting data on the volume of the inputs and implicit prices. This situation can and has been criticized (Hill, 1991; Poppe, 1993). The comments in this section will not deal with such issues of information requirements, but reflect on the methodology used to describe and harmonize the current data.

First of all some opening comments that spring up when one reads the Farm Return. The current handbook with the Farm Return is not easy to read. Partly this will be solved by the decision to integrate the text with the two types of definitions and instructions (those based on legal texts and the additional comments). Partly it is the effect of the chosen methodology with large tables, headings and serial numbers.

Using the Farm Return, one can easily become confused by the numbers used for the headings and the serial numbers: number 90 stands for the interest paid on loans for land and buildings (heading in table F), but is also the serial number used on the magnetic tapes for the average number of equines (horses, heading 22 in table D).

Confusion between headings and product codes is not possible: after having identified 119 headings in table A to J, the Farm Return uses product codes in the first column of table K which starts with number 120.

Due to the record structure chosen for the magnetic tape, the current Farm Return can not be expanded anymore. Nearly all available serial numbers in the range 1 - 1377 have been allocated. It is also clear that much physical record space on magnetic tapes is wasted because zeros are transmitted (e.g. table D and E) or global headings as well as subheadings are transmitted. It is therefor not very clear why totals were included (e.g.

table K) or one was interested in the details for farmhouse consumption. Even for most commercial Italian farms this will have been small amounts, that also could have been incorporated in the value of the production and thus would have saved space. In the new table M the reference yield of the farm (on which the Mac Sharry compensations are based) are transmitted per farm. This is however a data-item which is fixed per (Mac Sharry) region, not per farm.

One of the headings in the Farm Return describes the location of the holding (e.g. district) with a code. The meaning of these codes has to be provided (not necessary in electronic form) by the member state. This is however not used to connect the results of RICA to a geographical information system.

All these opening comments refer to current problems with the Farm Return, especially for new users. Most of them are the result of the decision of the founding fathers to define the data requirements by creating tables with several headings and columns, followed by data definitions.

At that time (late sixties, early seventies) the use of tables was a normal method to define electronic data exchanges. The tables look like punch forms, directly taken from field recording books. To me, today, this is a bit odd. Probably some countries used field recording books with more or less the same lay out as the Farm Return to gather the data. In that case the tables can be filled in directly.

But in most countries the data were gathered by an accounting process, using a chart of accounts to record the farm transactions. Kuperus (1970) mentions several member states which had standardized their farm accounting activities by introducing a standard chart of accounts. The Netherlands introduced one in 1958, which was revised in 1967 (Kuperus, 1970:93). In France the Institute National de Gestion et d'Economie Rurale installed a committee that introduced the Plan Comptable Agricole 1967 in the same year. In Germany a standard chart of accounts, developed by the Ministry with the help of Prof. Zilahi-Szabo of the Justus-Liebig University in Giessen, was also introduced in that period.

To support the accountants in their activities it would have been appropriate to develop a chart of accounts on EC level. For reasons that can only become clear by historical research, the founding fathers did not choose this option. Probably they felt that an introduction of such a chart of accounts would not be acceptable, being too much an intervention in national practices with a lot of maintenance problems. So they opted for a conversion from national charts of accounts: 'Data given in the farm return are to be taken from accounts consisting of entries made systematically and regularly throughout the accounting year' (CEC, 1988).

This conversion was a conversion into tables. From a user point of view one would expect tables like: balance sheet, profit and loss account (or inputs and outputs), cash flow statement, cropping plan, general information. These are the standard statements used in providing information by agricultural accountants. Without further historical research it will not be clear why

the tables mentioned in section 2 were chosen. The cropping plan was integrated with production (table K), and livestock has been taken out of the balance sheet (table G) to table D and out of the costs (table F) and production (table K) to table E. It is strange that the categories of animals in table E are not as detailed as in table D. This suggests that in some member states the sales of animals can not be given in detail (e.g. selling breeding heifers and dairy cows in one sale for a certain amount of money), where the categories can be identified throughout the year on the farm. Grants and subsidies (table J) were included in the table for investments (table G), but taken out of production and costs into a separate one.

In order to allocate grants and subsidies to the inputs and outputs, they were taken out of the tables for costs and production. This would not have been necessary: in table G (Land and buildings) they are included in a special column, and this could have been done in the other tables too.

My hypothesis for the question why the tables in the Farm Return were not geared to the standard tables in agricultural accounts is that there was a strong disagreement on the content of such standard accounts and that standard accounts would not provide enough detail for the analyses foreseen. The citation taken from Kuperus (1970) in section 2 supports the disagreement hypothesis. In his dissertation he also gives an example; it is mentioned that there was in theory agreement to incorporate a cost for the family labour (a practice used in the Netherlands and some other northern countries), but that France opposed this position 'for political reasons'.

The need for detail has led to the discussion if the profit and loss account would provide enough information to monitor the CAP, which is based on policies by commodity (product). The costs in the profit and loss account are not allocated (with the exception of feedingstuffs) to the enterprises. So the costs are given by category and not by category and profit centre. This makes the calculation of gross margins or cost prices very difficult. In theory a so-called 'analytical' bookkeeping was favoured, in which costs would be allocated to products or activities.

In this respect it is a pity that there is not more flexibility in the Farm Return. There has been a trend to make the gathering of all data items in the Farm Return obligatory. However, one could imagine a situation where the Farm Return would make a voluntary exchange of data possible on all the data that are gathered in national farm accountancy data networks anyway, and that would (in a harmonized methodology) be useful to the users. It is known for instance that some RICA partners exchange aggregated data on gross margins per arable crop through a Paris-based organization called IAGC. Another example is data on non-farm income which is available in some member states, and where the RICA committee now works on a voluntary exchange. This suggests a need for increasing the flexibility of the data exchange within the RICA network.

Thus, the impression which the lay out of the Farm Return gives, is that it is not optimally geared to the accountant supplying the data, nor to the user, nor is it efficient in terms of data transmission.

Perhaps this conclusion is a result of applying recent knowledge on data analysis to historic data specification methods. But my impression is that the lay out chosen was a method to solve differences in opinion on methods of calculating income and wealth, by providing the Commission enough detail in different tables to make these calculations themselves. So the first step was to create tables that would provide data from national networks, the second was to negotiate the rules to calculate income. By this incremental method details for analysis would come available without too much discussions to change the national charts of accounts or the national accounting statements. The Farm Return was a conversion of national data that did not intend to harmonize national accounting methodology, but to create a new set of data to compare results from different member states. There was no intention to influence national methods and definitions with the exception of the extra data gathering or minor revisions in definitions of data items that were necessary in some cases. The citation of Kupurus mentioned above shows that this was difficult enough.

However, one of the results could have been that for most of the original national farm accountancy data networks, the RICA remained an 'add-on application' which did not influence the development of the national accountancy methods and definitions. Probably part of the lack of harmonization in definitions, as noted by Power et al. (1989), can be attributed to the fact that RICA's Farm Return tends to follow in stead of setting developments in agricultural accountancy.

3.6 Data for calculations of results

One of the results of the lay-out of the Farm Return is that additional information is needed to calculate the results which are published by RICA. Examples are statistics like Livestock Units and all the income statistics like Family Farm Income and Net Value Added. The calculation of these income statistics demands rules on the valuation of the output of animals (especially the increase in value due to growth which has not yet been realised by sales and the treatment of price developments) and the treatment of (investment) subsidies. Other data needed to be able to analyse or publish results, are data on exchange rates, the inflation and data on the weighting of the farm.

These types of data are not defined in the Farm Return but pop up in internal documents and publications of the Commission. Normative values to calculate livestock units are found in An A to Z (CEC, 1989). This publication also explains many of the income statistics (and defines concepts like Fixed Assets), but the precise definitions are found in a technical document (RI/CC/882 rev.3).

Data on exchange rates and inflation are gathered by the Commission and available through publications with results. The weighting of farms is based on an application of a Common agricultural typology, which is also used by EUROSTAT (Commission Decision 85/377/EEC of 7 June 1985). Although the farm type is one of the headings (variables) in the Farm Return (table A), the weighting factor is not.

Another additional flow of data within the RICA network is the control-program. This is a software-programme that checks the validity of the data. Included are a large number of tests. These relate serial numbers to each other, e.g. if there is milk production there should be dairy cows, or signal unlikely high or low values (in relation to pre-defined boundaries per region). Some of these tests can be passed without rejection of the Farm Return, others can not. The tests in the software programme are described in a technical document.

Results from the FADN are published late by definition: accounts can not be closed before the end of the year and it takes time to gather the accounts and collect them in Brussels. To fulfill the need for actual information, the RICA forecasting system (RFS) has been developed. It asks the liaison agencies to specify the expected percentage changes for input and output items, and to transfer them on paper to Brussels. Details on types of farming or regional break downs are neglected. The relationship between the aggregated input items in RFS and the RICA codes is not always clear.

3.7 Concluding remarks

This paper dealt with RICA, and especially with its Farm Return. Reflections could be made on the institutional framework of the RICA and the need to adapt the Farm Return to new items on the policy agenda. These topics will be discussed in future workshops of the PACIOLI project.

Here we dealt with the Farm Return as such and the methodology used to harmonize the data definitions between the European regions. It has been shown that the Farm Return has been structured as a set of tables, with numbered data items, fields and code-schemes. This methodology origins from a time in which punch forms were used. The tables do not correspond to the work methods of accountants (who use charts of accounts), nor to the data structure which is logical from a users point of view. This makes the Farm Return a tool for conversion of data. As a tool for conversion the methodology seems outdated compared to newer methods of data management. By defining the Farm Return as the highest common factor of the national networks without providing possibilities for additional voluntary data exchange, the RICA does not provide much leadership in the innovation of agricultural accounting.

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Annex

Table C Labour

Heading number and description	Code (1)	Year of birth (2)	Number of annual units (3)	Annual time worked (hours) (4)
A. Regular unpaid labour				
13. Holder / manager	51	52	53	54
	55	56	57	58
14. Holder / not manager	59	60	61	62
	63	64	65	66
15. Manager / not holder	67	68	69	70
	number of persons			
16. Spouse(s) of holders	71	-	72	73
17. Others	74	-	75	76
B. 18. Casual unpaid labour	-	-	-	77
C. Regular paid labour				
19. Manager	-	78	79	80
20. Others	-	-	81	82
D. 21. Paid casual labour	-	-	-	83

4. INFORMATION DISPARITIES IN THE FADN/RICA - CAUSES AND CONSEQUENCES

Nigel Williams, Alastair Bailey and Sandra Dedman 1)

4.1 Introduction

There are marked disparities in the level of detail recorded in different sections of the FADN/RICA return. This disparity is particularly pronounced in the level of detail attained in the recording of outputs and variable inputs. Before looking at these disparities in detail, it is worthwhile examining the different and sometimes conflicting objectives of the participants in the FADN/RICA network as this will shed light on the reasons for some of the disparities.

The FADN/RICA of the EU requires data to satisfy the requirements of Regulation 79/65/EEC which deals with the 'setting up of a network for the collection of accountancy data on the incomes and business operation of agricultural holdings in the EEC.' This network is known as the FADN/RICA. The driving force behind the FADN/RICA is the Common Agricultural Policy, the operation of which requires 'objective and relevant information on incomes in the various categories of agricultural holding and on the business operation of holdings coming within categories which call for special attention at the Community level.' More precisely, 'the purpose of the data network shall be to collect the accountancy data needed for, in particular: a) an annual determination of incomes on agricultural holdings within the field of survey defined in Article 4: and b) a business analysis of agricultural holdings.'

4.2 The FADN/RICA in England and Wales

In England and Wales, the FADN/RICA network is part of the national Farm Business Survey (FBS) and is managed by the Ministry of Agriculture. Farms are recorded by staff based at and employed by a number of regional universities and colleges. Data are generally collected by university staff in a raw form after the end of the financial year and analysed by staff on a full audit basis to produce a complete FADN/RICA return plus a set of management accounts for the co-operating farmer. Participation by the farmer in the survey is voluntary. Farms may not remain in the survey for more than fifteen years and new farms can only be recruited from random sample lists

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provided by the Ministry of Agriculture. The work of the FBS is described in more detail in Giles & Cawley (1993).

The Universities collect data from co-operating farmers to fulfil their obligations to the Ministry of Agriculture and to the EU. In addition the universities may use the data for research, for teaching and extension. These requirements mean that more data are collected from farmers than is needed by the Ministry of Agriculture and the EU.

4.3 Objectives of farm recording systems / statutory requirements

Recording systems on most farms have been derived to meet the need for the preparation of annual financial statements for taxation purposes. Very often the use of the accounts as a source of management information is a secondary consideration. It is likely that the recording system will have developed on an *ad hoc* basis over a considerable period of time, under the guidance of an accountant who has no specialist knowledge of agriculture. Therefore, these systems will show little distinction between those recording systems used for agriculture and those used in other industrial businesses of a comparable turnover. Financial statements prepared for industrial organizations focus predominantly on turnover in relation to factors such as profit and capital employed, and very often the recording systems developed under the guidance of non-agri-specialist accountancy firms will have been designed to give the data that are needed to produce financial statements in a 'turnover:cost' oriented format.

Perhaps the immediate and most obvious consequence of the fact that most data is recorded primarily for tax purposes is the tendency for only financial data recording systems to be in place on sampled farms. The problem then is that it is difficult to ascertain physical data such as input quantities for variable costs and their allocation to different enterprises.

There are a number of statutory bodies (Customs and Excise, Inland Revenue, Department of Social Security, Companies House, and the Ministry of Agriculture Fisheries and Food), which the farmer must consider when designing 'on-farm' information systems. The heavy financial penalties which may be levied as a consequence of the failure to meet reporting requirements of statutory organizations are more readily determinable than the outcome of any cost benefit analysis of the value gained from management accounts based on historic data. Indeed the cost incurred to meet statutory reporting requirements may inhibit farmers from incurring further 'non-essential' recording costs. Very often the management information generated by the farm will not consider past data which are used in the FADN/RICA network, but will focus predominantly on forward projections based on future expectations, often made to satisfy current or prospective suppliers of finance as to the viability of existing or proposed projects.

There are a number of accountancy firms within the UK who possess an agricultural expertise that does recognise the importance of an approach that centres more closely upon farm enterprise performance. Gross margin accounts together with supporting statistical information may even be prepared as standard procedure by such firms. However, it is interesting to note that even these organizations clearly acknowledge that as far as the preparation of the annual financial statements is concerned, there are two reasons for keeping records of data on the farm; firstly statutory requirements, and secondly the provision of management information (see Gamble Lewis and Slack 1991).

The use of farm records as a basis for calculation of taxable profit can produce entries in the farm records which are generated primarily to reduce taxation liabilities and can distort management data if not adjusted. For example it is common to find that wages and salaries include a monthly payment to the farmer's wife which is designed to use up her personal allowance for income tax purposes, and very often does not relate to the actual economic value of the work done. Similarly, it is frequently the case that amounts analysed as wages will include drawings of funds by the farmer to meet personal expenditure. Taxation considerations also impact upon business structure. Tax minimisation leads to an incentive to record as high a proportion as possible of shared business/private resources as a tax deductible cost and so this can inflate the apparent costs in the raw data received by the FADN/RICA.

The problems encountered with a particular set of data will differ to some extent dependent upon whether the participating farm is able to provide full financial statements or only the underlying records. The financial accounting system within the England and Wales is based upon 'Financial Reporting Standards and Statements of Standard Accounting Practise' that have been produced over time to deal with particular accounting issues as they have arisen on an *ad hoc* basis. There is no underlying conceptual framework (unlike for example in the United States), hence inconsistencies in the treatment of data can arise both within and between sets of financial data (see Wilkins ed. 1994). In addition there are a number of adjustments made to the recorded data between the trial balance stage and the production of the final financial statements that need further adjustment to meet the requirements of FADN/RICA.

4.4 Variations in measurement methodologies

The diversity of objectives identified above leads to differences of emphasis in measuring the data. Looking at the farmer first, we see that the precedence given to taxation means that he/she will be primarily interested in actual expenditure rather than opportunity cost. Valuations will be based on cost of production. Depreciation will be calculated on an historic cost

basis, using tax writing down allowances, rather than economic depreciation rates. The balance sheet will be constructed using historic costs rather than current market prices. As an aside, it is worth noting that the fiscal treatment of investments will influence farmer behaviour (see Traill 1982, and Burrell et al. 1983) and any divergence from a tax neutral system will distort decision making. This may not be reflected by a system which focuses entirely on pre-tax opportunity cost as does the FADN/RICA.

At the University level, inputs are recorded using the concept of opportunity cost. Thus a notional rent is charged for the land of an owner-occupied farm. This enables comparisons to be made between farms and groups of farms for management purposes. The opportunity cost principle is further applied with the valuation of stocks, work in progress and produce at market prices rather than historic cost. Depreciation of fixed assets is calculated using current cost procedures and depreciation rates are estimated on economic criteria rather than mimicking tax writing down allowances (see Cunningham & Turner 1988). The balance sheet is constructed using current market prices. However, a full current cost accounting procedure is not adopted. Stocks of purchased inputs are not revalued using the cost of sales adjustment nor is a monetary working capital adjustment made (Hill 1977). Equally no adjustments are made for the effects of inflation on debt (Hill 1984).

The requirements of FADN/RICA broadly coincide with those of the universities. The main divergence is that FADN/RICA requires data on actual expenditure rather than opportunity cost for some categories, e.g. rents. Otherwise there is, as one might expect, considerable uniformity. Thus valuations are made at market prices, depreciation is current cost, as is the balance sheet.

Despite the differences in data estimation between the traditional accounting approach and the economics based approach employed by the Universities, it is interesting to note that participating farmers value the information that they receive from the Universities as they recognise that it reflects the true position of their business much more accurately than do accounts prepared on an historic cost basis.

4.5 Disparities in the recording of output and input data

The differences in data requirements cause time to be spent manipulating basic data to convert from one system to another, e.g. from historic to current cost depreciation. This uses resources that could, in the absence of these disparities, be allocated to recording common data in more detail. As well as these differences between systems, there are clear disparities between the level of detail recorded in different parts of the account.

Taking outputs first, the livestock enterprises are recorded in considerable detail: purchases, sales, opening and closing valuations are recorded for each age category of cattle, sheep, pigs, poultry etc. Transfers between different age categories within herds and flocks are also recorded for cattle, sheep and pigs. This gives a very detailed picture of the livestock enterprises, both in terms of their output and their structure.

Turning to crops, sales, internal transfers (of cash crops) and produce valuations are recorded separately for each enterprise. Somewhat inconsistently, while on-farm consumption of grains for feed and seed are valued, on-farm consumption of grass and arable by-products is not valued even though sales of these items are recorded as part of output.

Much less detail is recorded for miscellaneous income; a category that includes rental income, contract revenues and income from other farm related activities.

The recording of inputs is less detailed than for outputs. Expenditure on variable inputs such as feed, seed and fertilisers are recorded (with their opening and closing stocks), but no attempt is made to relate the level of expenditure on these items to the individual enterprises to which they are applied. This must appear surprising to those unfamiliar with the FADN/RICA given the close practical and theoretical link between level of input use and level of enterprise output. It is doubly so given that EU farm classification is based on standard gross margins.

Fixed inputs are also recorded for the farm as a whole, and by broad category such as labour, machinery and power costs, rent and other land charges. Again no attempt is made to allocate these costs to different enterprises with the exception of physical quantities of land. This is much more justifiable than failing to allocate variable costs since there is little theoretical or practical justification for attempting to allocate fixed costs despite the arguments of some protagonists of the net margin and 'full costing' approach (see Giles 1987).

4.6 Causes of disparities

It is appropriate at this point to reflect on why there are such differences in the detail of recording between outputs and inputs. The reasons would seem to be a mixture of the historical, the pragmatic and the accidental. Firstly, agricultural policy in Western Europe during and after the Second World War was dominated by the need to produce sufficient food for a large urban population whilst conserving foreign currency reserves. This led to a production oriented approach and the emphasis on measuring output within the return reflects this. Looking back over the same period, published data show that variable inputs represented a much lower proportion of

total costs in the nineteen fifties and sixties than they do now. In the early post-war years, expenditure on pesticides was minimal and relatively modest on purchased feed and fertiliser. As late as 1960, FBS data showed that fertilisers accounted for only six per cent of total farm costs while crop protection averaged one per cent (MAFF 1960). As the importance of these variable inputs has grown, institutional inertia and resource constraints have precluded a switch to enterprise gross margin recording within FADN/RICA.

A second reason for the greater level of detail collected about outputs relates to the need for verification of the data, particularly within livestock enterprises. In these cases it is necessary to check that a breeding enterprise can be fully reconciled between opening and closing numbers, births, deaths and sales. A further advantage of having a detailed breakdown of the structure of a livestock enterprise is that it permits valuations to be made with a reasonable degree of accuracy. This is important because there will often be large differences in value between different age groups of animals within a herd or flock and errors in categorisation of animals can lead to a large change in total valuation and hence in income.

As has already been intimated, there is little need for greater detail on fixed or overhead costs (even though some such as fuel could more accurately be described as variable costs). However, there is a much stronger case for gathering data on the relationship between variable inputs and outputs, not least the fact that farm classification within the EU is based on standard gross margins.

4.7 Alternative sources of dis-aggregated input data

Given the inevitable resource constraints on data collection agencies, it is appropriate to consider whether there are alternatives sources of such data.

In the UK, the Ministry of Agriculture funds a series of surveys, independent of the FADN/RICA, called Special Studies. These are surveys which often look at single enterprises in great detail - even going so far as to consider the allocation of fixed costs. The aim of such surveys is to establish the 'cost of production' of a unit of output, be it tonne of wheat or litre of milk. Although these surveys provide a wealth of detail, they are expensive and time consuming. As a result they are usually only carried out on major crop and livestock enterprises and then at infrequent intervals; the data rapidly become out of date, especially for the less frequently recorded enterprises. In an interesting attempt to overcome this problem, the Universities do collect some additional data on the allocation of variable inputs from a subset of dairy farms within the FADN/RICA. These data are used to 'bridge' the gaps between full scale special studies on the dairy enterprise.

Another possible solution is to use the results from commercial surveys such as FARMSTAT. Essentially this is a market research survey which records levels of variable input use on a panel of farms. Originally only data on crop protection products were recorded but more recently data have been gathered on seed and fertiliser usage. Unfortunately, although a wealth of detail is available on input use on an enterprise by enterprise basis, there are no links with output or income. This severely limits the usefulness of such data in the present context.

4.8 Increasing the data content of FADN/RICA

If we accept that there has to be a link between the output data and the input data, then the logical next step is to consider whether the FADN/RICA could be adapted to include more detail on the allocation of variable inputs. There are two ways in which this might be achieved. These can be characterised as the full audit and the survey methods.

Under a full audit the data are rigorously recorded and checked. This is an expensive and time consuming approach, but it does permit detailed validation to be carried out. The enumerator and farmer can have full confidence in the data. In many cases, it is the only way to get good data on a complex business and/or where recording is not perfect.

An alternative is the survey approach. Here the farmer gives his 'best guess' answers to questions. This approach is low cost and quick. Unfortunately there is considerable scope for error because of incorrect recall. The enumerator has no hard data to cross check with. Due to the scope for error, the farmer may have only low confidence in results of the survey and have little incentive to provide accurate data. Such an approach may produce acceptable results on fully recorded businesses with simple farming systems, but the majority of farms do not meet this ideal.

4.9 Other issues for consideration

Having explored the nature of disparities within FADN/RICA and the reasons for them, it is appropriate to examine briefly a number of other issues that are also important to the economic modeller. These issues include; a) decisions on the level of aggregation of data; b) ways of enhancing the statistical validity of the sample and c) the importance of the time series component of successive samples of the data. These issues are introduced in turn in the following sections.

4.10 Level of aggregation

The level of detail presented in the input allocation record is clearly of great importance for both information modelling itself, and the data process. From the point of view of the data collecting agency, feasibility and resource requirements are of importance. However, from the point of view of the researcher engaged in modelling technology and/or firm behaviour, the number of variables and quality of presentation are paramount.

It can be argued that, for modelling purposes, the research need only allocate variable inputs to broad categories of outputs such as 'livestock', 'livestock products', 'cereals', 'other arable crops' and 'horticultural crops'. If it is accepted that it is of only limited value to collect and store input allocations to each of the possible 105 output categories then some level of aggregation is possible. However, at this stage it is important to remind ourselves that the methods we use to aggregate output categories should themselves place no *a priori* restrictions upon the models specification. In addition the information should be consistently aggregated across the sample. For these reasons then, it is postulated that variable input allocation data should be collected for all outputs for each farm.

Subsequently, the output data should be aggregated by the collection centre using standardised procedures. These data would then be combined with the variable input shares to broad output categories to form the record. The aggregation procedure itself should follow developments in the theory of superlative 1) index numbers and the aggregation of economic variables (see Chambers and Pope 1991). For example, the aggregation of outputs should follow a revenue share weighted average format. In this case, however, it should be noted that 'chaining' is inappropriate since the data set is cross section. This is because observations on one farm are not dependent upon observations on another farm within the sample.

The number of aggregate output groups is not, however, arbitrary. The choice of output aggregates should reflect the separability between output groups and also their relative policy importance. Differences between EU regions will also be of importance here.

As an aside, one further data disparity remains between input and output records and it is of equal importance to the researcher. This is that prices, and or quantities, are not presented alongside expenditure in the input record. This has grave implications for modelling both behaviour and

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1) For an aggregate to be superlative it should not place *a priori* restrictions upon a specified functional form. Here then, it should preferably be superlative for second order approximations to the true function, for example the translog.

technology. Given data on expenditure, quantity cannot be recovered without price and *visa versa*. The alternatives are that the researcher resorts to either economic duality or the theory of common prices to imply quantities.

4.11 Statistical Nature of Sample

The question of the statistical properties of the FADN/RICA sample must be high on the priority list of any end user of the data. Concerns relating to the statistical significance of a sample to population ratio of 0.016 for England and Wales must be considered to be well founded. Here the pre FADN/RICA sample of 3,000 farms is drawn from a population of 180,000 statistically significant units (Gasson and Errington 1992). Statistically, the answer to this criticism is simply to expand the sample. This, however, will only be achieved at the expense of an unacceptable loss of data accuracy through the adoption of less rigorous data collection methods or, conversely, a massive increase in the survey costs.

An alternative, *ad hoc* method, might be to keep the sample static 1). Although this approach will result in a slightly less random sample, it may be argued that samples which possess known biases are more reliable than those with no measure of bias. In the case of the England and Wales, such bias could be assessed, albeit historically, with resort to general surveys, such as the "The June Census of Agricultural Holdings" for England and Wales.

4.12 Dis-continuities within the sample and/or population dynamics

The potential for sample selection bias is high within the FADN/RICA sample. In the first instance, the sample is very small in comparison to the population, as noted above. Secondly, the institutional rules which govern the composition of the sample are strict. This second point refers directly to the rules regarding farm type representation and the randomisation of the sample.

As a point of interest, one potential problem within the FADN/RICA sample, is that of the rules regarding 'dis-continuities' for farm records. Here, if a farm radically alters its *modus operandi*, then that farm will be dropped from the sample, unless the resulting farm types are under-supplied within the sample.

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1) The term static is here used to define the year on year composition of farms within the FADN/RICA sample. Stasis under this definition is then achieved by collecting data from the some holdings in each annual survey.

The FADN/RICA answer to these criticisms is to roll the sample. For England and Wales specificly, the convention is now is to employ a 15 year rolling sample with the random selection of new co-operators. Although this procedure does increase the randomness of the sample, and so its representative nature, it does hold grave implications for secondary user's of the data (see Webster and Williams 1988).

For the researcher, this practice is unfortunate on two counts. Firstly, if a balanced "panel" of data is required, then that observation is effectively dropped altogether from the modelled sample. Secondly, the researcher who models the behaviour of economic agents should not ignore corner solutions, since these observations are, simply, the most severe reaction to changes in policy, or price, variables. If the researcher does, or is forced by data to ignore such behaviour, then his/her estimates will be biased towards under estimation. This adverse result of institutional rules will also effect the various primary official statistics computed from the FADN/RICA.

A related, and possibly more disturbing, feature of the FADN/RICA sample is the fact that it is static not only in terms of specific farms but also in terms of farm type and size, at least in the short to medium term. The strict institutional rules which dictate the composition of the sample, do not immediately take account of any temporal shifts in the composition of the parent sample. Where the FADN/RICA sample does change in the face of population dynamics, then the process is strictly reactive and does display a significant time lag. There are obvious dangers in allowing such a small sample to evolve, however, this evolution is more likely to reflect some level of economic dynamics than do the current data collection conventions.

4.13 Conclusions

The FADN/RICA is an invaluable data source for economists and policy makers. However, its usefulness is impaired because of the lack of information on the allocation of variable inputs to the relevant enterprises and also by the absence of data on their physical use and thus the price/quantity relationship of these inputs. Resource constraints mean that there are no quick and easy solutions to this problem. There is a need for the development of more uniform information systems by the participators on the FADN/RICA samples. Alongside these concerns about incomplete data collection, there are also issues relating to the enhancement of the statistical validity of the sample that should be addressed.

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WORKING GROUP SESSION 1

Objectives of PACIOLI

The general objectives of the concerted actions are given in the introduction paper. Due to the variety in backgrounds of the participants of the PACIOLI workshop it was also necessary to reveal the individual objectives of the participants.

The objective of this working session was to reveal the objectives for the concerted action 'PACIOLI' of individual participants. In fact they were asked what their reasons were to participate in PACIOLI. Besides other reasons, the tendency was that what will result after the fourth workshop is seen as most important. They were also asked to give priorities to various objectives.

The possibilities to reach the objectives of the PACIOLI project will increase if the individual objectives are taken into account.

The participants worked on this assignment in five mixed groups with five persons each. After the individual objectives where identified (see figure W1.1 they where asked to divide ten points over the list of objectives. In the analysis after the working group session the objectives where clustered into five main groups. From these clusters the scores where counted, the result is presented in figure W1.2.

No.	Objective
1	Making the development of systems concerning economic planning and monitoring in different countries more uniform and informative
2	Development of data processing. How should the transfer from data to enterprises into processing be organized, and how can the processed data be made useful to the entrepreneur, decision makers and policy planners
3	Work towards a situation in which the RICA/FADN is more utilized, both in EU bodies for policy assessment as by the secondary researcher, for both academic research and the policy analyses
4	Set up a new way of thinking about the conceptualisation of the agricultural concern with the emphasis on information, the possibilities of information technology and on standardisation
5	Asses the need for and the feasibility of projects on the innovation in farm accounting and its consequences for data-gathering on a European level through the FADN (RICA)
6	Speeding up data transfer in the FADN (No time delays)
7	Improve use of accounting by farmers (e.g. by better farm comparison)
8	Improve use of data by forecasting / future oriented
9	Creating accounting of data of all management systems in all management systems.
10	Improving reliability of FADN data
11	Finding cost reducing techniques to improve data gathering
12	Making use of Dutch information models in EU
13	Improve existing and agricultural accounting software
14	Harmonization of accounting definitions between FADN and non-FADN systems.
15	To develop uniform EU wide unit definitions
16	Data collection motivations -economic political and statutory. Need to determine extent to which data generated for different uses is valid for us
17	To provide data users with measures against which the significance of the data can be assessed
18	Determine whether we need to separate economic modelling and decision making models
19	Detailed enterprise costs obtained from a sub sample of FADN
20	Collection of data and income from all sources (using proxy variables..)
21	Integration from data from various sources if feasible
22	Modify in institutional procedures: 6 ⇒ 15 member states, current affairs, delegate tasks: RICA ⇒ member states
23	Decentralise, delegate specific subjects to delegation ⇒ agenda, proposals
24	Specify information requirements; future needs; different end users, win-win situation: feedback of farmers
25	Decide what information to what end-users.
26	Improve system: forecast farm income - midterm (two to five years), early estimates of income (RICA forecasting system m)
27	Systematic dissemination of FADN results by electronic means
28	Producing results; margin costs or production (/ ha, /animal, /100 kg milk)
29	Identify future information needs of member states and users from FADN/RICA (e.g. OFI, environmental)
30	Methods for speeding up flow of account data from member states to commission
31	Definition of environmental variables
32	Harmonization of farm return and
33	Identify fast-track groups
34	Improving statistical design

Figure W1.1 The individual objectives of the PACIOLI participants

The summarized objectives are indicated in figure W1.2. Also the relative weight of the objectives are presented.

Aggregated objective	Score
• Improvement quality of FADN data (1,3,6,10,16,24,26,28,29,30, 34)	37%
• Stimulate the use of FADN data (2,7,8,9,13,17,25,27)	22%
• Improvement of information management in FADN (4,14,15,22,23,32,33)	17%
• Improvement the cost effectiveness (11,19,20,21)	11%
• Need for and feasibility of follow-up projects (5,12,18,31)	13%

Figure W1.2 Summarized objectives and scores

Due to the different backgrounds of the PACIOLI members there are many objectives identified. However, after clustering them into four main objectives it is possible to manage the different objectives.

The first four aggregated objectives indicate the points of the Farm Accountancy Data Network that are subject to potential improvement. The fifth objective is necessary to create a platform for realizing these improvements. Fortunately the objectives match the initial objectives of the PACIOLI project as presented in the introduction paper by Beers (how lucky we are!). The objectives brought up by the participants will be used in designing the programme of the three remaining workshops.

Pitfalls

All participants were asked to think of what might go wrong on the way to the objectives as stated before. In working groups the threads were discussed and clustered in potential pitfalls for the PACIOLI project. The result is presented in figure W1.3 which will be an important reminder in designing the process(ess) towards the objectives.

Pitfalls
Recommendations that are made may be infeasible because of resource constraints at a national level
Entanglement of data gathering and policy making
Diversity of agricultural businesses may obstruct uniform models
Problems with the large variety of data definitions and needs between the countries
Trying to built systems in a constantly changing environment
The problems of not defining agriculture
Willingness of farmers to cooperate
Differences of definitions
Legal and bureaucratic limitations
Complexity of solutions
Not ambitious, to incremental
Definitions in national priorities for data gathering
Differences in pre-condition and infrastructure
Differences in language/culture make harmonization difficult
Differences of background and skill of participants PACIOLI
Not establish a good link with "recommendations that are made may be infeasible because of resource constraints"
Not all countries are represented
Diversity of farming system across the EU makes universal information system building difficult
Diversity within farm types across the EU
Differences of computer systems

Figure W1.3 The potential pitfalls for PACIOLI as identified in the working group discussions

5. INFORMATION ENGINEERING: A SHORT INTRODUCTION

Conny A.M. Graumans 1)

5.1 Introduction

An information system is complex and therefore needs an overall plan to guide its initial development and subsequent change. A good information system is characterized by well structured interrelated subsystems and is relatively easy to maintain. Furthermore, new functional specifications must be easy to integrate into the system. A good information system should provide an up to date picture of the part of the current situation, relevant to the business or organization. It is therefore very important to have a structured approach and method.

Several methods for the building of information systems exist, like Information Engineering, ISAC, NIAM, Critical Factor Analysis, Business System Planning and System Development Methodology. Differences between these methods are sometimes small. In this respect the use of a method is more important than the method used. In the Netherlands it was decided to use *Information Engineering by James Martin (IE)* as the common method in determining the information requirements in agriculture. The following sections describe the Information Engineering Method (IEM) and the organizational setting.

The method used is briefly described below and elaborated on the basis of examples from the *Branch Crossing Model (BCM).*

5.2 Information Engineering

Information Engineering represents a cohesive aggregate of methods, techniques and tools which can be used to create information systems for a business or organization.

The methodology of Information Engineering (IE) is based on four principles (Martin, 1992, 1986).

The first principle is that the development of management systems has to be based on a solid and stable foundation, a so-called architecture, in order to get mutual consistent systems, which use the same data. Four architectures can be distinguished:

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- the information architecture (a description of processes and data);
- the system architecture (a description of information systems and databases);
- the technical architecture (a description of hardware, communication networks, etc.);
- the organizational architecture (a description of tasks for operation, maintenance, education etc.).

The second principle is that data are a more stable element than the processes (and procedures) which use, modify or create the data.

The third principle is laid down in the word *engineering*: it is a method with strictly defined steps, with defined products and reports for each step.

The fourth principle is a top-down approach, starting from the business strategy planning of the organization and ending with the use and maintenance of decision dedicated applications. The stages in this top-down approach are:

- *Information Strategy Planning*. A global description of activities and data resulting in a global information model. On the basis of coherence between processes, clusters of processes are composed. On the basis of the business strategy a priority ranking can be made for working out these clusters in further detail;
- *Business Area Analysis*. A detailed analysis of activities and data, resulting in a detailed process and data model. One cluster at a time, the global model is worked out in further detail.
- *Business System Design*. Identifying possible systems; for such systems processes are mapped into procedures and the data model into datastores.
- *Technical Design and Construction*. Building the applications and testing.
- *Transaction*. Implementation and training of users.
- *Production*. Use and maintenance of the application.

In a larger organization all these stages are completed within the firm. In the Dutch Reference Information Modelling approach, the first two stages were carried out collectively by research institutes and agri-software developers. Stage three and further are then to be carried out by the private sector: for example independent software developers or accountants.

An information model of an enterprise consists of a process model (what the enterprise does), and a data model (what the enterprise has). The process model describes the activities of an enterprise and the information exchange between these activities and the outside world. The data model describes things and events that are relevant to the enterprise and for which data are kept. Activities create or use data. This interaction between data and processes is described as part of the information model.

5.2.1 Process model

Process decomposition

In the first two stages of Information Engineering the process model and the data model play a central role. The process model describes all activities in the business that are related to information or decision making, all the way down to the elementary processes; the smallest units of activity meaningful to the user or executer of the process. The activities of the enterprise are classified into functions and processes.

A function is a broad activity with strong cohesion of information flow. Functions are groups of business-activities which together completely support one aspect of furthering the mission of the firm. A function is divided into processes. A process is a well defined activity, which has a beginning and an ending time. Dividing a company into functions and processes containing several levels (hierarchical breakdown), is a well-known analysis technique used to overcome the problem of complexity.

So all relevant processes of the business can be displayed in a process decomposition-diagram; a structure which shows the breakdown of activi-

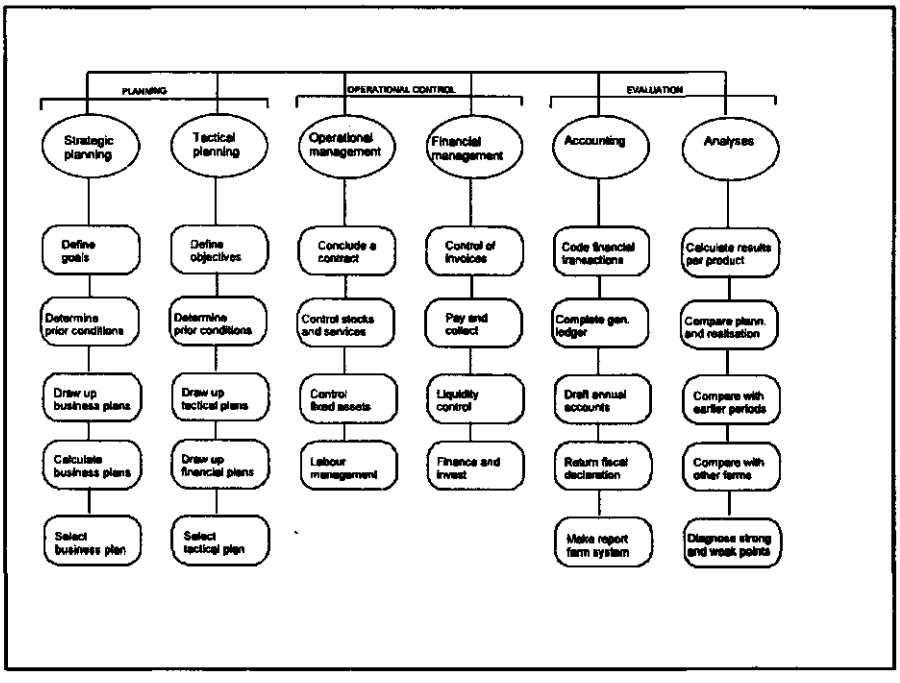

Figure 5.1 Example of a process decomposition diagram of a farm. Six main business functions are decomposed in processes

ties into progressively increasing detail (top-down-approach). Elementary processes have the highest detail.

Figure 5.1 shows the process decomposition diagram for the financial and administrative processes on a farm. In this example, on the level of functions, a division into three general levels of decision making is used; strategic planning (longer term, creating capacity), tactical planning (medium term, mostly one year, planning the use of capacity) and operational decision making (day-to-day planning and executing the decisions). A fourth level (evaluation) is added for bookkeeping, reporting and analysis.

Process

Each process is described in great detail. A process description includes: name of the process, definition, comments, incoming dataflows, outgoing dataflows. Each dataflow is described in terms of entity types and their attributes. Figure 5.2 shows an example of a process description.

5.2.2 Data model

A data model describes the *things* of a company of which data should be kept. The objective is to define all data and the relationships between data described in the process model. In the data model, data are described independent of their use. This guarantees unique definitions of data even if they are used for several purposes. In the data model entity types, relationships and attributes are described.

Entity type

The data model is at least as important as the process model. While processes (the way things are handled) may change, data often stay the same. Central in the data model is the *Entity Relationship Diagram (ERD)* which shows the relationships between entity types. An *entity type* is a fundamental *thing* of relevance to the company, about which data could be kept. Entities can be tangible (a cow, a tractor), intangible events (a veterinary treatment) or abstract notions (a quality type of a delivery). A difference is made between an entity type and an entity. The first being the collection of all the entities to which a specific definition and common properties (attributes and relationships) apply, the latter being an occurrence of an entity type. In a financial data model *balance sheet* could be an entity type, and *the fiscal balance sheet of the farm for 31. december 1993* an entity. Figure 5.3 shows an example of an entity type description.

Process: T.4.1.2.2 Checking received invoices

Definition: The checking of received invoices with the agreed delivery or the executed delivery and with the agreed payment.

Comments: If the invoice is received after the actual delivery of the goods or services it should be compared with the data on the executed delivery. In that case the executed delivery is already compared with the agreed delivery. If the invoice has to be paid in advance of the delivery then a comparison with the agreed delivery should be made. Etc., etc.

Data flows:

Incoming: INVOICE DATA involves:

Entity type	Invoice
attributes	201136 Invoice-reference number external person
	201134 Invoice-data
	201076 Own invoice-number
	201048 Status accepted
	201255 Currency
	700154 Amount
	etc..
Entity type	Invoice-line
attributes	201137 Line number
	201060 Amount
	201126 Debit/Credit
	700165 Quantity
	700166 Unity
	etc..
Entity type	Instalment
attributes	700297 Status paid
	700298 Period of payment
	201081 Amount
Entity type	External person
attributes	700072 Identification
Entity type	Agreed payment
attributes	700240 Period of payment
Entity type	Contract
attributes	700010 Date of contract

Outgoing: STATUS ACCEPTED
(not presented in further detail)
CREDIT-INVOICE
(not presented in further detail)

Figure 5.2 Example of a process description

Entity type: Invoice

Definition: Data on the obligation to pay or receive money for goods or services which are bought or sold.

Comments: The obligation to pay results from an agreed contract. Invoices can be split in incoming and outgoing invoices. In the information model both kinds of invoices are described with one and the same entity type. Etc., etc..

Attributes: 201136 Invoice reference number external person
201134 Invoice-date
201076 Own invoice-number
201048 Invoice accepted
201255 Currency
700154 Amount
etc...

Relationships: INSTALMENT split from INVOICE
INVOICE contains INVOICE-LINE
INVOICE is a result of AGREED PAYMENT
EXTERNAL PERSON sends INVOICE
Etc., etc..

Figure 5.3 Example of an entity type description

Entity types can be described in terms of their relationships and there attributes. An ERD visualises the relationships between entity types.
Several kinds of relationships are distinguished:

- *cardinality* describes how many entities may participate in the relationship. Occurrences are *one-to-one* (a worker can only have one labour-contract), *one-to-many* (an invoice may be paid by more then one payment), *many-to-many* (in a field-operation more then one machine may be used, a machine may be used in more then one field-operation). In the ERD the *many* is symbolized by a *caltrop;*
- *optionality* describes if an entity of a given type always participates in a relationship. In the ERD optionality is symbolized by a *0*.
- *exclusive relationships* may exist if an entity type has two or more relationships that exclude each other.

Relationships can be described by short sentences that connect the entity types. Figure 5.4 shows an example of an ERD.

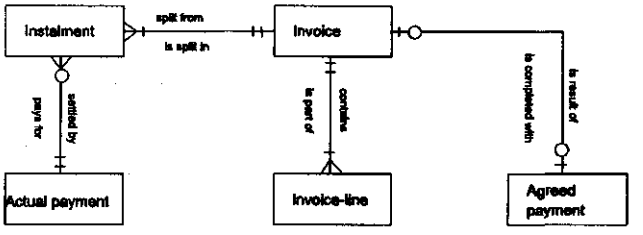

Figure 5.4 Example of an entity relationship diagram

Attribute

An attribute is a descriptor of an entity type. An occurrence of an entity type has a value for each attribute.

Attributes of a tractor are: licence number, brand, price, book value, purchase date etc. Attributes can be basis (eg. acquisition date), optional (eg. licence number) or derived (eg. bookvalue).

One or more attributes (sometimes in combination with one or more relationships) form the key of the entity type. By this key one entity can be identified from all other entities of the same type.

Figure 5.5 gives an example of a description of an attribute.

Attribute:	201134 Invoice-date
Definition:	The date of creation of the invoice.
Format:	ccyymmdd
Possible values:	00000000 - 99991231

Figure 5.5 Example of an attribute description

5.2.3 Interaction between processes and data

Processes create and/or use data. The information exchange between processes is modelled in terms of dataflows and presented in the form of dataflow diagrams (DFD) and Create/Use-matrices (C/U-matrices). Each data-

flow may be broken down into entity types and their attributes, and relationships between entity types.

As process model and data model represent two views on the same business area they must be well balanced. The dataflow diagrams are a first check. They show the dependency between processes. This dependency is shown as information views, which are flows of entities and attributes created in one process and used in another. In addition to the processes also external objects are shown in a DFD. Those objects relate to organizations or data bases outside the business area. Due to their comprehensibility DFDs can easily be used to discuss an information model. Figure 5.6 shows an example of a DFD.

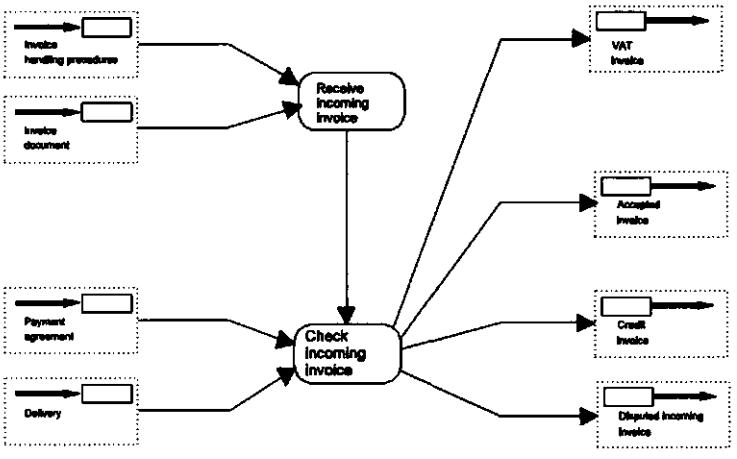

Figure 5.6 Example of a dataflow diagram of the process Control of invoices

A more formal way to check an information model is a create/use matrix. In such a matrix the processes are related to the attributes of the entity types. For each process, information is given on the use of attributes: in the matrix a *c* (for create), *m* (for modify) or *u* (for use) indicates if and how an attribute is used in a process. All attributes of the data model have to be created somewhere in a process and have to be used at least once in a process.

5.2.4 Reference Information Models

Information modelling as part of the Information Engineering Method is a well structured approach for describing business processes and data used. Figure 5.7 gives an overview of the components and modelling tech-

niques of IE. Originally IEM was meant to be used as a method to manage and execute complex information and automation projects. Nevertheless the information modelling part of the method has proven to be of great use for the making of reference information models (RIMs) in Dutch agriculture (there is a separate RIM for each branch of agriculture). These RIMs are used for different purposes:

- to create a profound basis as a first step in the realisation of an information system;
- to realise uniformity in the terminology used;
- to use the technique for knowledge conservation and distribution. Knowledge concerning a specific business area can be described in terms of process model and data model. Information models can well be used for knowledge transfer, for instance for education purposes, but also for the transfer of knowledge from experts towards software engineers.

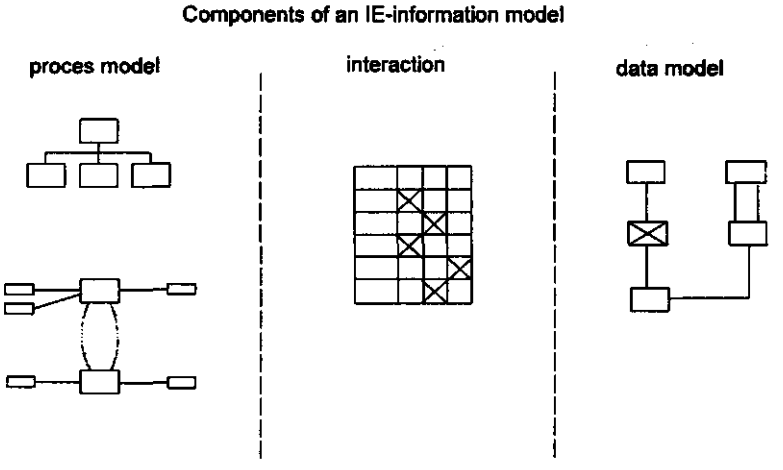

Figure 5.7 Basic components of an IC-information model

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6. INFORMATION ENGINEERING: DUTCH EXPERIENCES

Conny A.M. Graumans

6.1 Introduction

From 1985 to 1991 the Information Technology Stimulation Plan for Agriculture (INSP) was carried out in the Netherlands. This plan was initiated by the Ministry of Agriculture and the three Dutch Farmers Organizations. The most important target of this plan was to stimulate the development and use of management information systems by farmers.

As part of the INSP, in 1985 a programme to develop reference information models for the various agricultural branches was started by the Dutch Ministry of Agriculture.

An information model is a model of an enterprise. It describes the processes and activities of a company (e.g. a farm).

At the start of the project, the objectives for developing the branch reference information models were threefold:

- firstly, to structure and develop the basis for well integrated farm management information systems;
- secondly to highlight the areas (processes, data), in which there was a lack of business knowledge needed to make an effective farm management information system;
- finally to serve as a reference model for everyone involved in information handling and information exchange in a certain branch of agriculture, including farmers, researchers, educators and service institutes.

The use of computers is a relatively new development in farming. Until recently the various types of computer hardware and software were developed independently of each other. There was no means of coordination between the technical aspects (different computers, languages, operation systems, database management systems) and the contents of the programs (different data definitions, calculation rules, ratios).

This lack of coordination led to:

- slower application of computer technology in agriculture than expected;
- the same data having to be entered multiple times;
- difficult communication (technically as well as with regard to contents and meaning of data);
- difficult hardware and software choices for the farmer.

This problem does not only apply to agriculture. Industrial companies have gone through (or are still in) this stage of computer use. Unique to the

agricultural sector is the existence of many comparable companies (individual farms), which are independent, but are also working together in various organizations to achieve optimal management and production.

The Information Engineering Method (IEM) is used to overcome the coordination problem.

IEM is a method fort planning, analysing and developing information systems. It was developed by James Martin & Co, an internationally based consulting firm. IEM provides a structured framework and a set of techniques that lead to the development of high-quality, integrated information systems.

IE is a *top-down* approach to information systems planning and development.

IE has three basic principles:

- Firstly, information systems are developed to support the control and management of business processes. These processes create and use data. These processes, data and their dependencies have to be identified in order to define the contents of automated (sub)systems and databases. A top-down approach implies that an analysis of processes and data for the enterprise as a whole is made first. This model of the enterprise is called *an information model.* It describes all business processes, their mutual dependencies (information flows) and data needed. The top-down approach allows the analysts to divide the overall model into clusters which are in turn described in more detail.
- The second principle is that the information model is the starting point for defining the *contents* of automated (sub)systems, which fit in an overall framework. To design and construct automated systems, technical and organizational decisions also have to be made before any technical design and construction can take place. Detailed models facilitate the functional breakdown of the total information structure in order to define pieces of information systems that may be developed separately but are well embedded in the overall structure. Before the stage of system development, detailed models may be used to clarify the functional definition of a system that will (or will not) be developed. Detailed models are used to define interfaces and thereby facilitate data exchange between different, more or less separately built, information systems.
- The third principle is that the information model must be used within the context in which it was developed. The information model is a *stable blueprint* of the enterprise as long as the enterprise has the same products, resources and environment. It is not merely a description of an information system. The contents of an information model is independent of the technical layout of an information system.

Originally IEM was meant for use within a single organization. In the agricultural context, therefore, some adaptations to this approach were necessary. It was decided to take imaginary representative farms, specialized

in a specific agricultural branch, as the object system of a model. So for each agricultural branch a so-called reference information model (RIM) was made.

The main objectives to come to reference information models for each branch of agriculture were threefold.

Firstly, to deliver a blueprint for the development of various computerized information systems. This blueprint may be used by multiple suppliers. So it was efficient to have the thorough information analysis done only once by specialists.

Secondly there was the need to highlight the areas (processes, data) where there existed a lack of business knowledge needed to make an effective information system. These blank spots were an indication for research and development needs.

Finally reference models were needed as a tool for communication and knowledge transfer for all parties involved.

6.2 Reference information models in Dutch Agriculture

For most agricultural branches in the Netherlands RIMs have been developed (see table 6.1). Since many functions are shared by the various branch models (e.g. accounting, financial management), also a so-called branch-crossing model has been developed.

Figure 6.1 shows that besides the economic and financial functions there is also overlap between the different branch models on other aspects, like nutrition and health care.

The development of RIMs was initiated by the *branch organizations* These organizations were specially founded by the Ministry of Agriculture in cooperation with the agri-business, to coordinate and stimulate automation and telematics in agriculture.

Each RIM was started with the development of a global information model by a working group of about 5 people. The global information models were used to split up the models into clusters that could be worked out in further detail by separated working groups. Each working group consisting of about 5 specialists from research institutes, advisory services, agro industry etc.

During the process of detailing a cluster, results were every now and then discussed in a brought group of interested parties and potential users of the model.

The detailing of a cluster took in the order of 4 to 6 months.
In each RIM a total in the order of 600 to a 1,000 mendays were invested (all people involved taken into account).

Table 6.1 The reference information models in Dutch agriculture. For each type of farm, described in a model, the number of farms is given for which the model is a reference

Branch	# farms
Dairy farming	36,000
Pig husbandry	9,200
Glasshouse enterprise	11,000
Arable farming	21,000
Poultry farming	2,100
Fruit farming	2,800
Mushroom cultivation	750
Potplant nursery	800
Tree nursery	2,600
Forestry	1,500
Branch crossing model	90,000

Early 1993 all six independent branch organizations merged into one organization, called the Agricultural Telematics Centre (ATC).

In the Netherlands the ATC is responsible for the maintenance and further development of agricultural branch information models and derived standards.

6.3 Information models and derived products

RIMs are rather extended and therefore distributed in the form of more accessible products.

These products as distributed by the ATC, are derived from the information models or related to them. In deriving products from the RIMs, three different perspectives haven been applied:

- the type of descriptive elements (e.g. process model, data model, data dictionary, codeset);
- the functional area that is described (e.g. climate control, tactical planning, crop protection);
- the level of detail (e.g. global model, detailed model, summarized model).

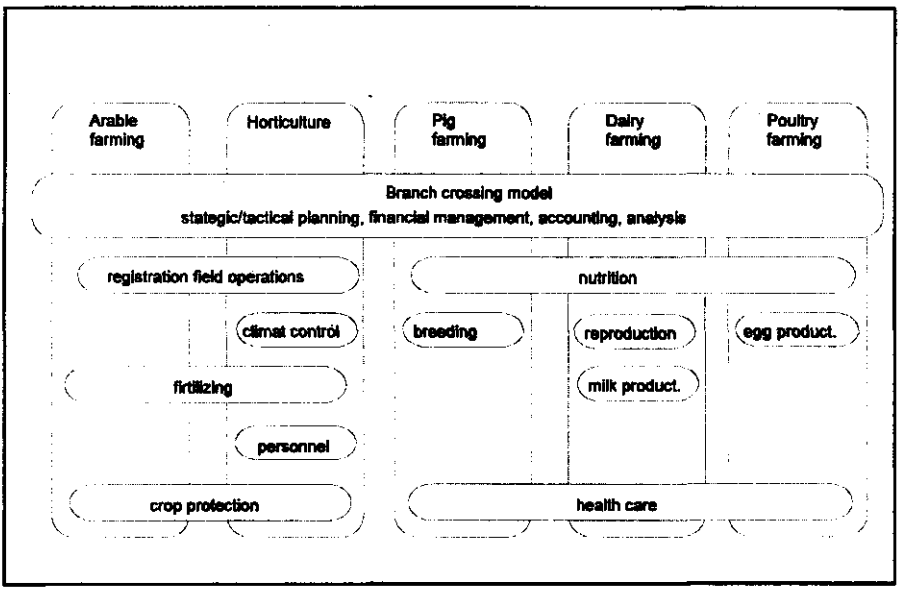

Figure 6.1 Overview of the different reference information models and the branch crossing model. Some clusters apply to more then one information model

This leads to the following information model related products.

Global information model

A global information model provides a solid overview of what takes place within a certain type of enterprise (e.g. a farm). The first step in coming tot a detailed information model is the development of a global information model. A global information model differs from a detailed information model in:

- the process decomposition diagram of a global model shows a maximum of about three levels of decomposition, whereas a detailed model shows up to eight levels of decomposition;
- only the process name and a short definition are given. A detailed model provides a detailed description of how the process takes place;
- the information flow diagrams show only limited information flows. In a detailed model all possible information flows are given;
- the data model contains only the main entity types and entity type relations. A detailed data model shows them all, including entity subtypes etc.;

- per entity type only the most relevant attributes are described. In a detailed model all possible attributes are described;
- attributes are described in a global way; format and domain are not yet filled in. These elements are filled in, in a detailed model.

A global information model of for example a dairy farm covers about a 100 pages A4-paper, as an indication of the volume of a global information model.

Detailed information model

A detailed information model is the result of working out a global information model in more detail. First clusters of processes are distinguished, based on the processes described in the global model. Further detailing takes place cluster by cluster.

Detailed information models are further on in this paper referred to as Reference Information Models (RIMs).

RIMs are meant to be used primarily for software-design (e.g. the development of management information systems, crop management systems, financial accounting systems, etc.).

To give an indication of the size of a RIM, the RIM for arable farming has a volume of about 1,200 pages A4-paper.

Data dictionary

A data dictionary is a dictionary of data definitions. In the Netherlands all data-element, of the data models of the detailed information models, are gathered in one database. This database is called the Agricultural Data Elements Directory (ADED). ADED not only contains the RIM-attributes but also a large number of data-elements used in data-interchange applications in Dutch agriculture. Figure 6.2 shows how information models, transaction models, designs of EDI-messages and standard calculation rules are related through ADED.

Data-elements are the most stable part of information models and are considered the smallest and most elementary building parts of standards for data-interchange and integration of information systems. ADED is a very important instrument from the standardization point of view.

ADED contains about 10,000 uniquely defined data-elements. Each data-element description contains: name, definition, format (length, alphanumeric/numeric, resolution, datatype), the domain (minimum value, maximum value, dimension), codeset. Each data-element is uniquely identified by a six-digit ADED-number.

Subsets of ADED are distributed in combination with special presentation-software, called ADED-view. ADED-view is an aid in searching for specific data-elements by name or by context (usage in a specific entity type or in a specific EDI-message).

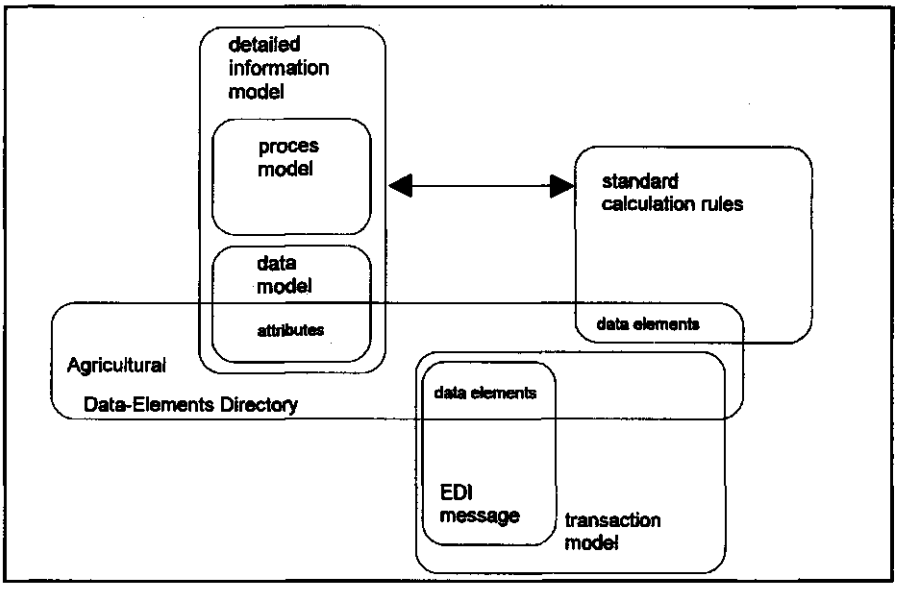

Figure 6.2 Information models, transaction models, designs of EDI-messages, standard calculation rules are all related through ADED

Codesets and standard values

For a number of data-elements (attributes) standard code lists (in some cases completed with lists of standard values) are available.

There are for example standard codesets for: types of soil, durable equipment, fertilizers and other nutrients, pesticides and herbicides, field operations, cultivars, crops, dimensions, etc.. These codesets are kept in a separate database. The codesets are maintained by the ATC in cooperation with specialized organizations.

Codesets, as well as the datadictionary, are important elements for EDI.

Uniform calculation of parameters

Part of the detailed description of a process, is the description of how the process is executed. Especially for the processes involving extensive calculation of statistics and ratios (e.g. for use in farm results comparison), these calculations are described in separate booklets. Examples of topics are: mineral management at farm level, standard ratios for pig farming, ratios for comparing results at crop level. These models are especially used by advi-

sory services, farmer study groups and developers of agro-information systems.

Transaction models

EDI is getting more and more important. The first step in implementing EDI is to analyse the existing information flows between actors, within a chosen subject area.

IEM is of good use for the initial modelling and description of actors involved (processes) and the information exchanged (dataflows). In a next step the dataflows are worked out in terms of entity types and attributes. The attribute descriptions are used from, or added to ADED.

Transaction models are the basis for designing EDI-messages, independent of the syntax used (e.g. ADIS, EDIFACT).

Research information models

Research information models are in most casus extensive models in great detail, describing a very specific area of research. This type of model can well be used to manage and exchange knowledge. This approach, for instance was used in developing crop-management systems for sugarbeets and cereals.

An important advantage of this approach is that there is a clear distinction between the description of the knowledge and between the implementation (the system design and the software). So when switching from one architecture to another, the same well documented knowledge base can be used.

Research information models are used by research centres and agri-software-engineers.

6.4 The potential use of information models and derived products

In the foregoing, different kinds of information models and derived products were described in short. The next paragraphs focus on the actual results of the IE-approach and the use of the information modelling products.

6.4.1 Knowledge management

The well structured approach of IE makes it possible to point out blank spots in existing knowledge. This information can be used as a steering instrument for research on new areas.

Products like research information models and detailed information models provide means for knowledge management and exchange. Figure 6.3 shows how the technique of information modelling is used to describe, manage and exchange knowledge.

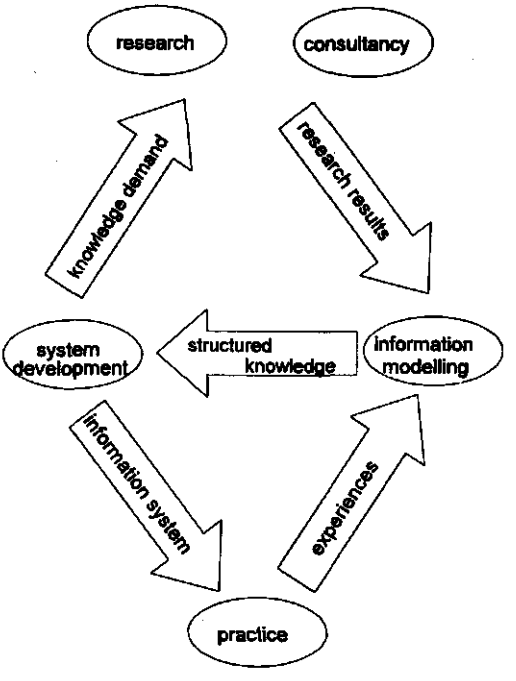

Figure 6.3 The role of information modelling in the process of knowledge transfer

6.4.2 Common language

The IEM-approach provides good means of communication. In this respect a general information model of a specific subject area can be very helpful to communicate knowledge and ideas about, for example, prototypes to be build.

It provides a solid structure to make people from different disciplines and different technical or non-technical backgrounds communicate. Once the method is understood, it is relatively easy to communicate about complex information systems.

6.4.3 Developing information systems

Originally IEW was meant to be an approach for realising complex, well integrated information systems within a large administrative organization. Therefore a number of stages were distinguished: business strategy planning, information strategy planning, business area analysis, business system design, technical design, construction, transition, production. For the RIMs only part of the method, i.e. *business area analysis,* is used. RIMs and derived products form a solid basis for developing information systems. Processes and calculation models can be translated into software procedures. The data model is the basis for the physical database structure.

Dataflows are translated into messages for electronic data-interchange and interfaces for integrating subsystems.

6.4.4 Standardization

In order to be able to integrate information systems and to communicate data, standardization is important, as well on the level of data-definitions and codesets as on the level of models for calculating statistics, parameters and ratios.

The RIMs and especially the derived products serve this purpose well. This material is spread amongst the agri-software-engineering firms.

To check on the correct implementation of standard calculation rules in management information systems, special testsets and procedures have been developed.

6.5 The actual use of information models and derived products

In order to get a better view of the actual use and acceptance of the information models and derived products, in 1993 a survey was held among 40 organizations that actually purchased RIM products.

Table 6.2 shows the main target groups and what RIMs are used for.

The results of this survey indicate that the detailed elements of the data models are used indeed, not only in the design of software by organizations that are developing software for farms but also for internal use within the organization (e.g. accountancy office, extension service).

The second order of usage is not directly related to the development of information systems. It concerns activities in which the organization is analysed in a rather global way. Especially the process decomposition diagram is used to give an overview of the organization. For analysis of activities within a specific domain of farming, the data flow diagrams as they are described in the global process model are used.

Table 6.2 The use of information models by various groups of users

Type of user	RIM used for
Extension service	- training extension workers (pm) - checklist farm analysis (pm) - structuring presentations (pm) - standardization extension software (dm) - design extension software (pm) - internal knowledge management (pm) - development education programs (pm)
Agro-software industrie	- design farm software (dm) - standardization (dm) - user courses (pm) - system definitions (pm)
Farm services	- standardization data-exchange (dm) - development internal IS (dm)
Farm customers/ suppliers	- standardization data-exchange (dm) - design internal IS (pm) - support product chain development (pm) - training employees (pm)
Agricultural research	- reference in management research (dm, pm) - specification prototype IS (pm) - research management (pm) - development IS (dm) - database management (dm)
Agricultural education	- structuring education programs (pm) - case-material in courses (pm)
Farmers	- develop comparative overviews of results for farmer discussion group (dm)
(pm stands for process model elements, dm stands for data model elements)	

This type of usage was identified by activities in education, consultancy and research. In education the process model is used for structuring the courses in agricultural schools by relating certificates to functions on the farm as described in the process model. The more detailed process models are used in case material for courses on *farm management*. In consultancy and extension services the model is used as a check list and to show the farmers an overview of the areas that can be supported by computer systems. In agricultural research some researchers are using the global process model to position their research and to discuss practical relevance of research programmes and product. These different ways of using information

models all have in common that an overall picture of the farm and a structure of the functions on the farm are required.

6.5.1 Levels in the use or RIMs

The use of a RIM basically concerns the taking over of ideas, definitions, etc. from a RIM into a design of e.g. software, databases or course material. In the use of RIMs four levels of intensity can be distinguished:

1) taking over as much as possible in the design of software, in particular parts of the datamodel. The information model is *leading* and implemented to the letter;
2) using parts of the information model only in case there is a gap in knowledge. The information model is used to fill in knowledge gaps;
3) using the model as a sort of *check list* or a *source of ideas*;
4) the model is only studied once to get a general idea of what activities take place at farm level.

6.5.2 Use of RIMs in software design

One of the most important purposes of RIMs is the use in software design, not only by the agro-software industry that supplies the farm computer systems, but also by extension services, farm suppliers. The benefit of using RIMs is twofold; it saves time and effort not to have to define attributes that are already defined in the model and secondly it helps in standardization which might facilitate the compatibility with other information systems in agriculture.

For the agro-software industry the standardization has a conflicting aspect. On the one hand for the farmer it will be profitable when farm information systems are *open systems* that can communicate with other systems and are easily replaceable by systems offered by other suppliers. On the other hand for the software development industry from a marketing point of view, it is important that the developed products are unique.

Standardization on behalf of Electronic Data Interchange (EDI) is getting more and more important. Data models (data dictionaries) provide a solid basis for defining standard messages.

Information models have also been criticized. Especially the agro-software industry complained about the loose connection between their reality and a RIM. An explanation could be that a RIM as a model, provides only one view of reality and that different individuals or different organization often have their own specific view of that same reality. Individual views, sometimes form a different angle, never match completely with a reference model. A reference information model is always a compromise.

Information Engineering has been developed and applied merely in the modelling of administration oriented processes. This method has thus far not proven to be successful for modelling process control (like in climate

control systems for greenhouses). Other available modelling and design techniques might be more suited for that purpose.

6.6 Managing Information Modelling

Once it is decided that an information model is to be made, first a global information model of the business area is developed (Information Strategy Planning). In a period of 3 to 6 months the work is carried out by a small group of experts. The result is a global process and data model. Global because the attributes are not yet defined, neither are the detailed process descriptions. The global information model provides sufficient inside information to make a profound split up in *clusters* of intense related business processes and entity types concerned. The global information model is used to interest the top-management (financers), to identify clusters that can be worked out in further detail in the next stage and to set priorities.

6.7 Conclusions

Concluding we can state that agricultural branch information models and derived products, found a place in the Dutch agricultural society. They are used to facilitate communication at two very different levels: about farms and about farm data.

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7. ECONOMIC PLANNING AND MONITORING ON FINNISH FARMS

Ari Enroth 1)

7.1 Methods for economic planning and monitoring used

Finnish farms have been taxed according to the incomes from farms since 1968. For the taxation all farms keep accounts based on payments, and these are also used in the economic planning and monitoring. Other systems for economic monitoring are the profitability bookkeeping of the Agricultural Economics Research Institute, the result analysis of farms offered by the advisory organizations, as well as the return and economic monitoring systems of livestock farms and the crop monitoring system of crop producing farms.

For the planning of future activities on farms, the advisory organization offers various kinds of planning services to farmers. These services can be divided into long-term economic planning, and budgeting and monitoring services at the annual level. The services for the long-term planning include plans based on the gross margins and liquidity. Gross margins are used in the comparison of the profitability of different production options, and the plans that are based on liquidity are used to examine the liquidity and profitability of the whole farm. In planning the main emphasis has been in calculations based on liquidity, and the profitability study has been complemented by gross margin calculations, when necessary.

Advisory services have been developed in order to assist farmer's own decision-making, and farmers have to pay a service fee for the services they have purchased. In addition to farmers' needs, for over ten years long-term liquidity and profitability calculations have been enclosed in the applications for loans entitled to state support and early retirement. In addition, through tax forms the administration obtains basic information on the profitability of agriculture, but this tax data is not adequate for profitability monitoring proper. Thus a specific profitability bookkeeping system is used to meet the need for data on the profitability of agriculture.

7.1.1 Long-term liquidity and profitability calculations

The Farm Economic Plan, which includes liquidity and profitability calculations that cover the whole farm and the farm family, is the most important long-term economic plan. The economic plan is prepared for a period

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1) The author works as Development Manager at the Union of Rural Centres in Finland.

of five or ten years. The Farm Economic Plan is usually made in connection with larger investments (for example transfers of farms to descendants, construction of production buildings, or purchasing additional land). The same calculation programme is also used in the planning of the reorganization of the debts of farms that have run into financial difficulties, and for other measures the improve the economy of farms.

7.1.2 Plans according to the gross margin method

Before the introduction of liquidity calculation, the economic planning on farms was mainly done on the basis of the gross margin method. This economic plan included gross margin calculations for different products and the combinations of production options made on the basis of these. The economic plans made on the basis of the gross margin method lacked a long-term liquidity study and, on the other hand, measures to restrict production reduced the production options to the minimum, and, consequently, the main emphasis in economic planning shifted to planning based on liquidity calculations. Today gross margin calculations are used in the choice of crops and for planning of changes of the production line.

.7.1.3 Annual planning services

The annual budget of farms is intended for careful planning of the timing of income end expenditure of a single year. The annual budget is prepared on the basis of either months or quarters. Cultivation plans of crop production and feeding plans of livestock production, among others, are examples of annual plans for different production lines.

7.1.4 Annual monitoring services

So far the main emphasis in the economic monitoring services offered by the advisory organization has been in taxation and follow-up of the profitability of different production lines. In 1993 about 6,000 farms got advice on taxation. Other farms do the tax bookkeeping themselves, or take advantage of the services of accountant firms or other experts. In 1993 about 1,200 farms participated in the economic monitoring of livestock production. Economic calculations of milk production, which focused on monitoring the fodder costs, were prepared on about 13,000 farms, and price calculations of crops on about 3,000 farms.

The economic monitoring of whole farms has been restricted to analysis of the data included in tax forms and comparisons between different years. The only monitoring system that covers the economy of the whole farm and is more accurate than taxation has been the profitability bookkeeping, with about 1,100 participating farms.

7.1.5 Result analysis of farms - service

Service called the result analysis of farms has been developed for monitoring the economy of the whole activity of farms, with the main purpose of examining the profitability of agricultural production on the client farms. In addition, calculation models have been developed for result analyses made in connection with training of farmers. The objective of the result analyses prepared in the training is to teach the farmers how result calculations and balance sheets are made, as well as the calculation of indicators and their analysis.

In the result analysis of farms an amended result calculation and the balance sheet are prepared in the same way as in the study of enterprises. The indicators calculated include the gross margin, financial result, net result, return on invested and own capital, debts/turnover, self-sufficiency level, farm surplus, agricultural income, labour income of the farm family, and profitability coefficient. The result analysis of farms is based on tax bookkeeping of individual farms, which is supplemented by data on the property and stocks as well as the wage demand on the labour of the farm family needed in the result analysis.

In spring 1994 the result analysis of farms was available for farmers as an experiment, and the number of farmers using this service is still small. At this stage the result analyses have been made by means of spreadsheet programmes. In 1995 a new account map is introduced in the bookkeeping programmes produced by the advisory organization, and it is possible to prepare the result calculation directly from the bookkeeping programme.

In the training the result analysis has been made on special forms intended for this purpose. Farmers have filled out the forms themselves according to instructions given in the training, and the teacher has then checked the result analyses.

7.2 Economic plans of farms as advisory service

7.2.1 Objectives of planning

Farm Economic Plans are long-term plans in which agriculture, forestry, other entrepreneurial activity, and private household of the farms are taken into account. The objective of the planning is to calculate the liquidity of the whole farm and the farm family as well as the profitability of the activities practised on the farm, and to assist farmers in their decision-making. The majority of the economic plans are prepared in connection with larger investments and in situations where major changes occur in price relations or other factors. The plans are also useful in for example the planning of annual taxation.

Calculations of the Farm Economic Plans have been enclosed in the applications of both loans entitled to state support and early retirement, and from these the authorities granting the loans have obtained informa-

tion on the profitability of the project to be supported and the ability of the applicant to manage the loans.

7.2.2 Calculation programmes

The personal computer programme Mikrolikvi, which has been developed specifically for the planning of the economy of farms, is used in preparing Farm Economic Plans. Prior to 1993 a corresponding calculation programme in the VAX was used in the planning.

The input data is fed into the computer according to result units (basic agriculture, other entrepreneurial activity taxed in connection with agriculture, forestry, entrepreneurial activity taxed separately, and private household), and separate outcome data can be obtained on each result unit and desired combinations of result units. Usually, however, in the case of individual result units only profitability outcomes (result plan and indicators) are needed. All result units are usually included in liquidity study.

Calculations included in Farm Economic Plans are the extensive and brief liquidity calculation, investment plan, tax calculation, result plans, and calculation of indicators, as well as input data on incomes, expenditure, property, debts, and deposits. In addition, a survey on other background information used as the basis for the calculation is attached to the plan.

If necessary, Laina-programme is used in the calculation of the data on loans for the Farm Economic Plan, in addition to Mikrolikvi-programme, which makes it possible to calculate exact repayment plans for all loans on the basis of dates the payments are due. In the calculation of the incomes and expenditure of agriculture and especially support related to production, Tutka-programme, which contains the calculation of the amount of the different forms of support on the basis of data on the area and number of livestock, can also be used.

7.2.3 Input of incomes and expenditure

In Farm Economic Plans incomes and expenditure can be specified as accurately as desired, because in the calculation programme there is the maximum of 38 lines available for each result unit in the case of both incomes and expenditure. An additional square can be used for the calculation of each income or expenditure line, into which the number of production units, yield/output per production unit, price/product unit, and change percentage of the price (rate of inflation) is fed. Thus the additional squares of incomes show the extent of the planned production and the unit prices used in the calculation.

In the specification of expenditure it is also possible to give the data on the quantities and unit prices, as well as rates of inflation used as the basis for each expenditure item. In addition to the normal money expenditure, additional data needed in tax and profitability calculation are also taken into account on the income and expenditure lines. For the purposes of

profitability calculation for example the own wage demand of the farm family is also fed into the programme.

7.2.4 Input of property data

As property data the calculation includes the taxable value and current value of each property item, calculation of the depreciation on both values, as well as data on new investments and sales of property. Tax depreciation and the net assets used in the distribution of the taxable entrepreneurial income are calculated on the basis of the taxable values. Current values are used only in profitability studies. For comparison, the outcome data of profitability calculation (result plan and indicators) are calculated on the basis of both taxable values and current values.

Depreciation of taxable values is planned in a way that is the most rational in terms of taxation, and deprecations on current values are made so that they indicate the decrease in the current value of the property item in question as well as possible. Consequently, the difference between the taxable value and current value of the same property item may be considerable.

7.2.5 Input of data on debts

In Farm Economic Plans debts are reported according to result units, which means that already in feeding the data the loans of a farm must be divided into parts fed into different result units, based on the division made in taxation.

The output data of Laina-programme includes accurate data on interests and repayments according to dates the payments are due. Laina-programme also calculates summaries of each loan, year, and result unit on the loans, repayments, and interests for Mikrolikvi-programme.

7.2.6 Output data of extensive liquidity calculation

Liquidity calculations of Farm Economic Plans can be made on the basis of either individual result units or combinations of these. Usually the most sensible approach is to examine the liquidity of the whole farm family at the same time, because all money transactions are generally made from the same funds and through the same bank accounts.

The totals of incomes and expenditure are presented for each result unit of the entrepreneurial activity. From these the programme calculates the difference between income and expenditure of agriculture and that of the whole entrepreneurial activity.

In calculating the internal financing the interest on debts related to the entrepreneurial activity and taxes paid on the basis of the result of the entrepreneurial activity are also taken into account.

The cash balance of the entrepreneurial activity is calculated by deducting the repayments of debts related to the entrepreneurial activity from

the internal financing. After the cash balance of the enterprise, the private household is examined, that is other incomes, taxes on other incomes, interests and repayments of debts related to the private household, as well as the consumer expenditure of private household. Thus we arrive at the cash balance of the whole farm, which indicates the share of the incomes of the year in question available for financing of investments or saving.

Investments are included in the liquidity calculation as totals calculated according to result units. More accurate specification of planned investments is included in the investment plan. In addition, the taking up of loans and changes in deposits are also taken into account in calculating the change in the cash reserve.

The last line of the extensive liquidity calculation shows the difference between the funds and debts, which indicates how quickly the amount of loans could be reduced, if the cash reserve were used in full for repayments. In practice, however, the loans could be repaid somewhat more rapidly, because this would reduce the amount of interest payments, and there would be more money available for repayments.

7.2.7 Outcome data on profitability

The profitability study of the Farm Economic Plans is made by means of the result plan and indicators. As the result plan is intended for examining the profitability of entrepreneurial activity, it is usually prepared only for the result units of entrepreneurial activity.

The net results show the return on own capital. If the net return is higher than a reasonable interest calculated on own capital, there is also profit. A deflated net result is calculated in order to make the results of different years comparable with each other.

As part of the profitability study the Farm Economic Plans include a simple balance, including the total amount of property and debts, and the amount of own capital calculated as the difference between the two. The self-sufficiency degree (percentage) indicates the relation between the amount of own capital and the total amount of property. In examining the self-sufficiency degree calculation based on current values provides the most accurate picture of the situation.

The relation between the debts and sales (turnover) is used as the measurement for comparison in the case of highly indebted enterprises. Return percentages are calculated on both invested capital and own capital. Interest on invested capital is calculated by dividing the total of paid interests and net result by the total amount of property. Correspondingly, interest on own capital is calculated by dividing the net result by the amount of own capital.

Besides the indicators of overall entrepreneurial activity, the Farm Economic Plans include the income of the family running the enterprise, which in the case of agriculture is agricultural income. Agricultural income shows how much income from agriculture is left as wages for the farm family and interest on own capital. This indicator is calculated both before and after

the taxation. If the income of the farm family after taxation is higher than the wage demand on own labour, there is interest on own capital, and the net result is positive. In the case of incomes of farm families, two deflated figures are calculated for comparison between different years.

For the development plans of the EU investment support system, calculation of the labour income will be included in the profitability calculations.

7.2.8 Other output data

In addition to the usual extensive liquidity calculations, it is also possible to make a separate brief liquidity calculation, in which the items are not specified as accurately as in the extensive calculation. Brief liquidity calculations are useful, in particular, as intermediate output data in connection with preparing economic plans, because the whole liquidity calculation can be seen at the same time on the screen of a personal computer.

In the investment plan the planned investments are grouped on the basis of the result units. Tax calculation presents the amount of taxable earned income and capital income from each result unit, as well as the amount of taxes on this income separately for each taxpayer.

7.3 Annex I

RESULT PLAN + INDICATORS

AGRICULTURE

SALES INCOME
Expenses
Own wage demand
Change in stocks
GROSS MARGIN
Gross margin %
Interests
Taxes
FINANCIAL RESULT
Depreciation (taxation)
NET RESULT (taxable values)
DEFLATED NET RESULT (taxable values)
FINANCIAL RESULT
Depreciation (current values)
NET RESULT (current values)
DEFLATED NET RESULT (current values)
Inflation percentage

CALCULATION ON TAXABLE VALUES
Property in taxable values
Debts
Own capital
Debts/Sales %
Self-sufficiency degree %
Return/invested capital %
Return/own capital %
Income of farm family before taxes
Income of farm family after taxes
Deflated income of farm family after taxes

CALCULATION ON CURRENT VALUES
Property in current values
Debts
Own capital
Self-sufficiency degree %
Return/invested capital %
Return/own capital %
Income of farm family before taxes
Income of farm family after taxes
Deflated income of farm family after taxes

7.4 Annex II

LIQUIDITY		1993	1994	1995	1996	1997
Income from basic agric.	(+)	412636	419488	368217	352861	331765
Expenses of basic agric	(-)	167321	168709	149403	150739	152446
Income from other agric.	(+)	0	0	0	0	0
Expenses of other agric.	(-)	0	0	0	0	0
AGRICULTURAL INCOME-EXP.	(=)	245315	250779	218814	202122	179319
Income from forestry.	(+)	21000	113220	21848	22285	22730
Expenses of forestry	(-)	1000	5124	15759	10768	2207
Income from other entrep.	(+)	0	0	0	0	0
Expenses of other entrep.	(-)	0	0	0	0	0
ENTERPRISE (INCOME-EXP.)	(=)	265315	358875	224903	213639	199842
Interest expenses of ent.	(-)	21776	29162	44151	39720	35150
Taxes of entrepr. Income	(-)	40964	67288	34102	29370	27372
INTERNAL FINANCING	(=)	202575	262425	146650	144549	137320
Repayments of ent. Loans	(-)	16980	26776	53212	54743	56415
CASH BALANCE (ENTERPR.).	(=)	185595	235649	93438	89806	80905
Other income (wage etc.)	(+)	15000	15000	15000	15300	41616
Taxes on other income.	(-)	5182	5302	3070	3292	11836
Interest expenses of pr.	(-)	3873	5186	6317	5801	5285
Repayments of private l.	(-)	3020	4762	6504	6504	6504
Expenses of private hous.	(-)	80000	81999	84048	86149	88303
CASH BALANCE	(=)	108520	153400	8499	3360	10593
Investments in b. Agric.	(-)	50000	230000	20000	20000	20000
Investments in o. Agric.	(-)	0	0	0	0	0
Investments in forestry.	(-)	0	0	0	0	0
Investments in o. Entr.	(-)	0	0	0	0	0
Investments in pr. Hous.	(-)	50000	0	0	0	0
Taking up of loans.	(+)	0	100000	0	0	0
Change in deposits	(+/-)	0	0	0	0	0
CHANGE IN CASH RESERVE..	(=)	8520	23400	-11501	-16640	-9407
CASH DEC. 31		28520	51920	40419	23779	14372
LOANS DEC. 31		570000	638462	578743	517493	454573
CASH - LOANS		-541480	-586542	-538324	-493714	-440201

RESULT PLAN+ INDICATORS AGRICULTURE		1993	1994	1995	1996	1997
SALES INCOME	(+)	412636	419488	368217	352861	331765
Expenses	(-)	167321	168709	149403	150739	152446
Own wage demand	(-)	100000	101000	91809	92727	93654
Change in tocks	(+)	0	0	0	0	0
GROSS MARGIN	(=)	145315	149779	127005	109395	85665
Gross margin - %		35.21	35.70	34.49	31.00	25.82
Interests	(-)	16890	22619	36182	32402	28482
Taxes	(-)	38684	47180	32382	29912	25530
FINANCIAL RESULT	(=)	89741	79980	58441	47081	31653
Depreciations (taxat.)	(-)	45500	59762	54145	49500	45627
NET RESULT (taxaple val.)	(=)	44241	20218	4296	-2419	-13974
DEFLATED NET RESULT (t.v.)	(=)	44241	19713	4085	-2244	-12630
FINANCIAL RESULT		89741	79980	58441	47081	31653
Depreciations curr.v.)	(-)	33000	49330	46771	44455	42353
NET RESULT (curr.values)	(=)	56741	30650	11670	2626	-10700
DEFLATED NET RESULT (c.v.)		56741	29884	11095	2435	-9672
Inflation percertage		0.00	2.50	2.50	2.50	2.50
CALCULATION ON TAXABLE VALUES						
Property in taxable values		465000	595238	561093	531593	505966
Depts		375345	454577	409570	363031	314821
Own capital		89655	140661	151523	168562	191145
Depts / Sales %		90.96	108.36	111.23	102.88	94.89
Self-suffiency degree %		19.28	23.63	27.00	31.70	37.77
Return/invested capital %		13.14	7.19	7.21	5.64	2.86
Return/own capital %		49.34	14.37	2.83	-1.43	-7.31
Income of farm family bef. t.		182925	168398	128487	120220	105210
Income of farm family after t.		144241	121218	96105	90308	79680
Defl.inc. of farm f.aft.taxes		144241	118188	91361	83704	72007
CALCULATION ON CURRENT VALUES						
Property on current values		624500	805170	778399	753944	731591
Depts		375345	454577	409570	363031	314821
Own capital		249155	350593	368829	390913	416770
Self-suffiency degree·%		39.89	43.54	47.38	51.84	56.96
Return/invested capital %		11.79	6.61	6.14	4.64	2.43
Return/own capital %		22.77	8.74	3.16	0.67	-2.56
Income of farm family bef t.		195425	178830	135861	125265	108484
Income of farm family after t.		156741	131650	103479	95353	82954
Defl.inc. of farm f.aft.taxes		156741	128359	98371	88380	74966

WORKING GROUP SESSION 2

Variety in Strategic Information Management (SIM)

The objectives of the working session 'variety in SIM' are to identify the extent in which strategic information management is used in the several countries and to identify a more congruent definition on 'strategic information management'.

The participants have been working in groups per country

The participating countries were asked to give an indication about the state of the art concerning strategic agricultural information management in their country. Refering to the papers on information engineering (chapters 5 and 6) and economic planning and monitoring on Finnish farms (chapter 7) various elements of Strategic Information Management can be recognised and elements not mentioned but active in your country can be added. The sheets used for presentation are copied and showed in the next section to give an impression on the different perceptives on strategic information management and to give an indication of the differences in use of strategic information management.

Strategic Information Management in United Kingdom

UK

Strategic planning

- Long term "one of" decisions
- Personal (e.g. objectives)
- Informal / rarely explicit decision making
- Information gathered informally
- Difficult to model

Becomes explicit when dealing with outside agencies

I. Tax inheritance, capital, pensions
Bank - cash-flow
Press etc.
Discussion groups

II. Extension services

III. Legislation
Publicity materials
agricultural census & statistics

Strategic Information Management in Italy

ITALY

XSIAN (National agricultural information system)
SIAR (Regional)
Agricultural Business
- D.B. on grants and subsidies
- D.B. on farms
- D.B. on agricultural statistics
- Agrometeorological network
- Market prices of crops
- FADN (INEA)
- SILA (INEA)
- Remote sensing (consozzio ITA)
- Regional accountancy data network
- D.B. on pesticides and residues
- Others (Sistan, etc.)
- "Agrivideotex"

Government
- D.B. of farmers organization

FINLAND

Agricultural Business

Advising mainly by agriculture advisory centres

- During last ten years about 50000 liquidity and profitability plans (=5000 plans a year)
- During last two years investments have decreased
- Planning methods are described in Ari Enroths paper

Other plans

- Cultivation plans (and soil fertility analyses)
- Livestock plans
- Annual budget
- Optimisation of income/supports

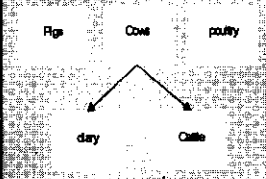
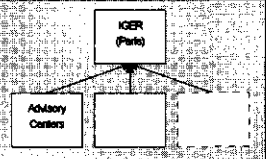
Government

- About ten years ago a liquidity and profitability plan started to be required with investment support.
- Use of official bookkeeping material in agricultural policy

FRANCE

Before the 85-90's

An administrative and professional organization

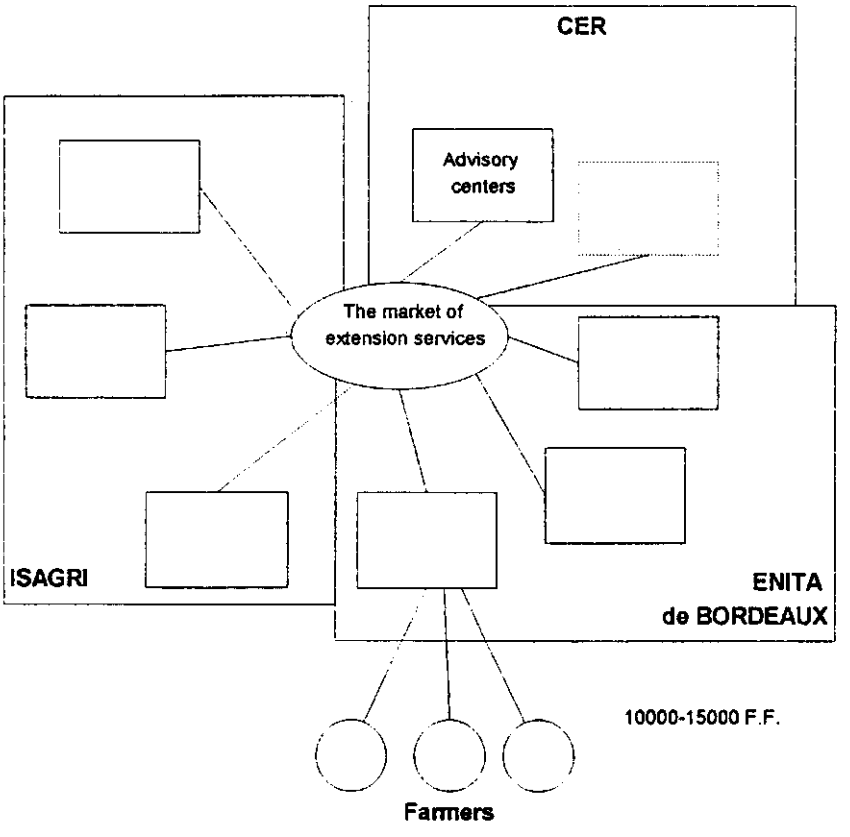
Animal technical chains	Administrative chains	Management chain
Organised by production channels (les filieres) e.g. 	• **National administrative** • **RICA** • **Taxation**	

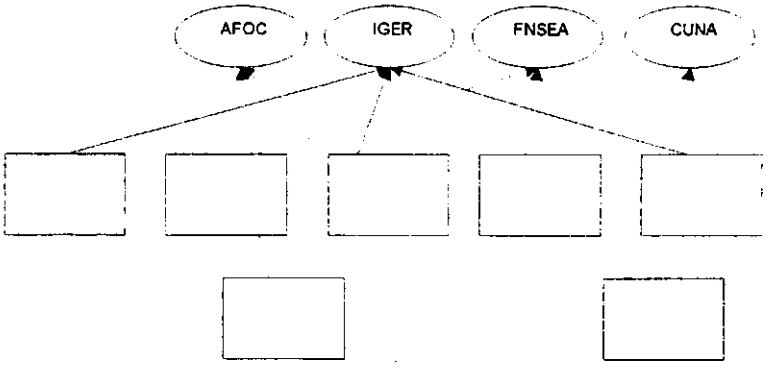
Nine reasons of the big bang

- **Political alternance (1981)**
- **Power of information. Each lobby wants to have its own network, and does not want to share their information**
- **Role of several researchers and teachers who developed the idea: do it yourself e.g. the farmer can make his own accountancy (3 schools: Toulouse, Beaurois, Bordeaux)**
- **New technology: micro computers which can stay at farms**
- **New administrative ideology (ministry of agriculture): Strategic information management system should be determined by the law of the market**

Consequence:

No strategic information management system at the national level


CER
Advisory centers
The market of extension services
ISAGRI
ENITA de BORDEAUX
10000-15000 F.F.
Farmers


AFOC
IGER
FNSEA
CUNA

1. Official system (technical support). Extension service (videotex; markets, warning system)
   RICA information, also decentralized: Madrid autonomous communities
2. Producers associations;
   Sectoral groupings: Ecological Associations (Growing phase)
   * COAC
   * ASAJA
   * OPA
   * CNAC
3. Private
   * banks
   * vertically integrated industries
   * Consulting
4. system of support and technology dissemination (OTRI)

RTD System

Network OTRI/OTT

⇨ It began to operate in 1989. Belongs to ministry of education (CICXT)

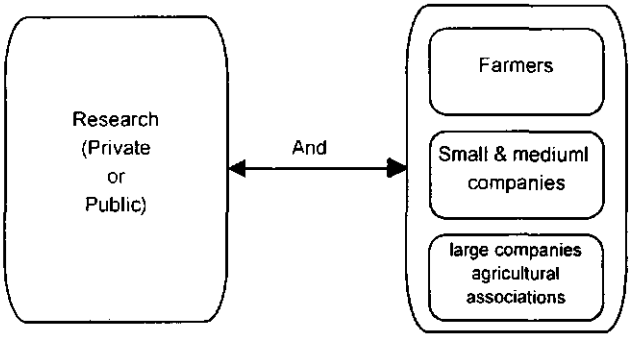
OTRI: Office for the transference of research results
OTT: Office for the transference of technology

Each university or research institute has got its own OTRI, as well as many of the private research organisations (around different fields of knowledge: agriculture, industry,...)

OTRI objective: To transfer all results, knowledge and know-how generated by research.

OTRI/OTT has its own database and disseminates other ones:
* DATRI
* AGREP
* CORDIS
* ARCADE

OTRI/OTT main target:
It is an interface between:



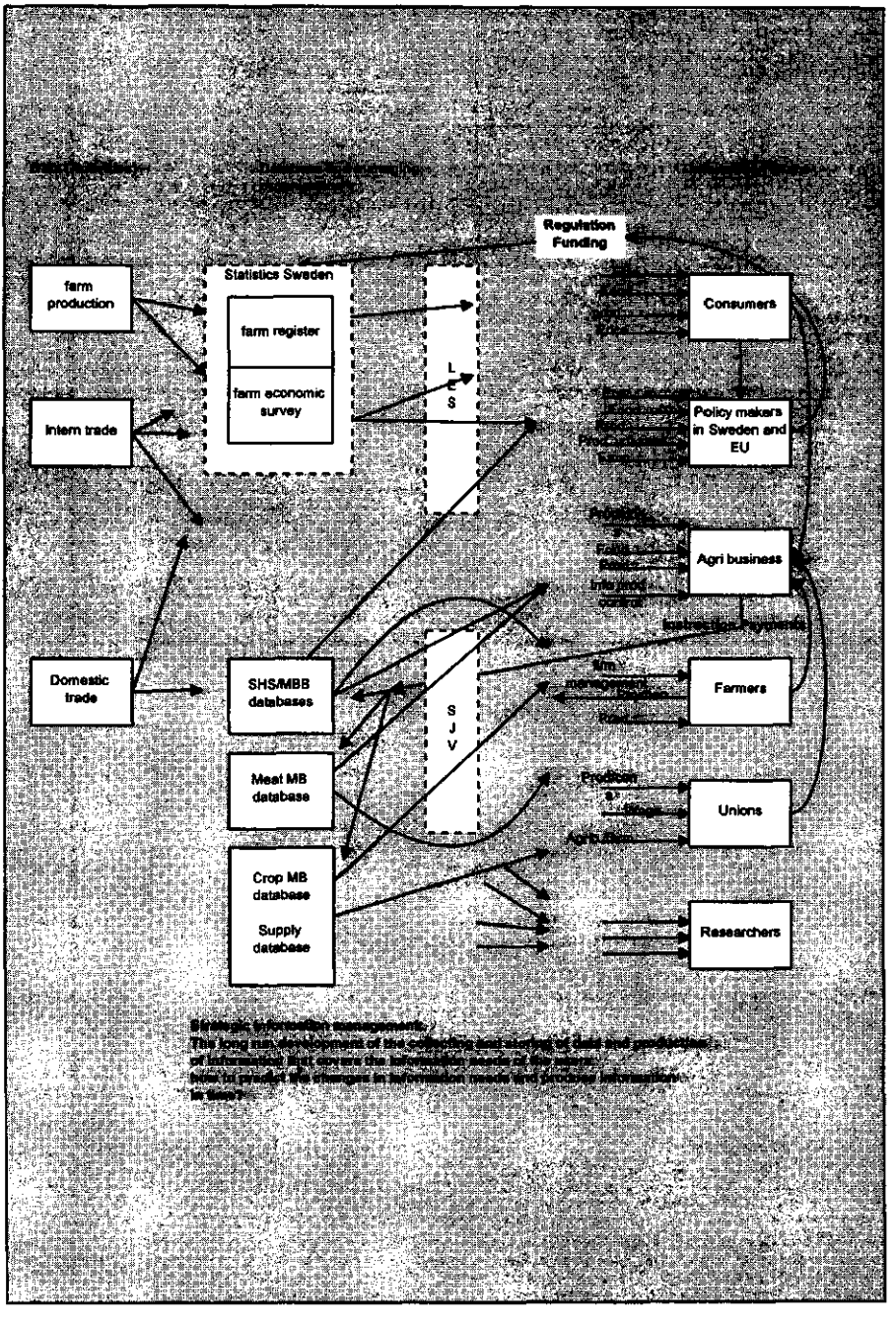
trying always to optimize results and to solve problems
Looking for solutions wherever they are:

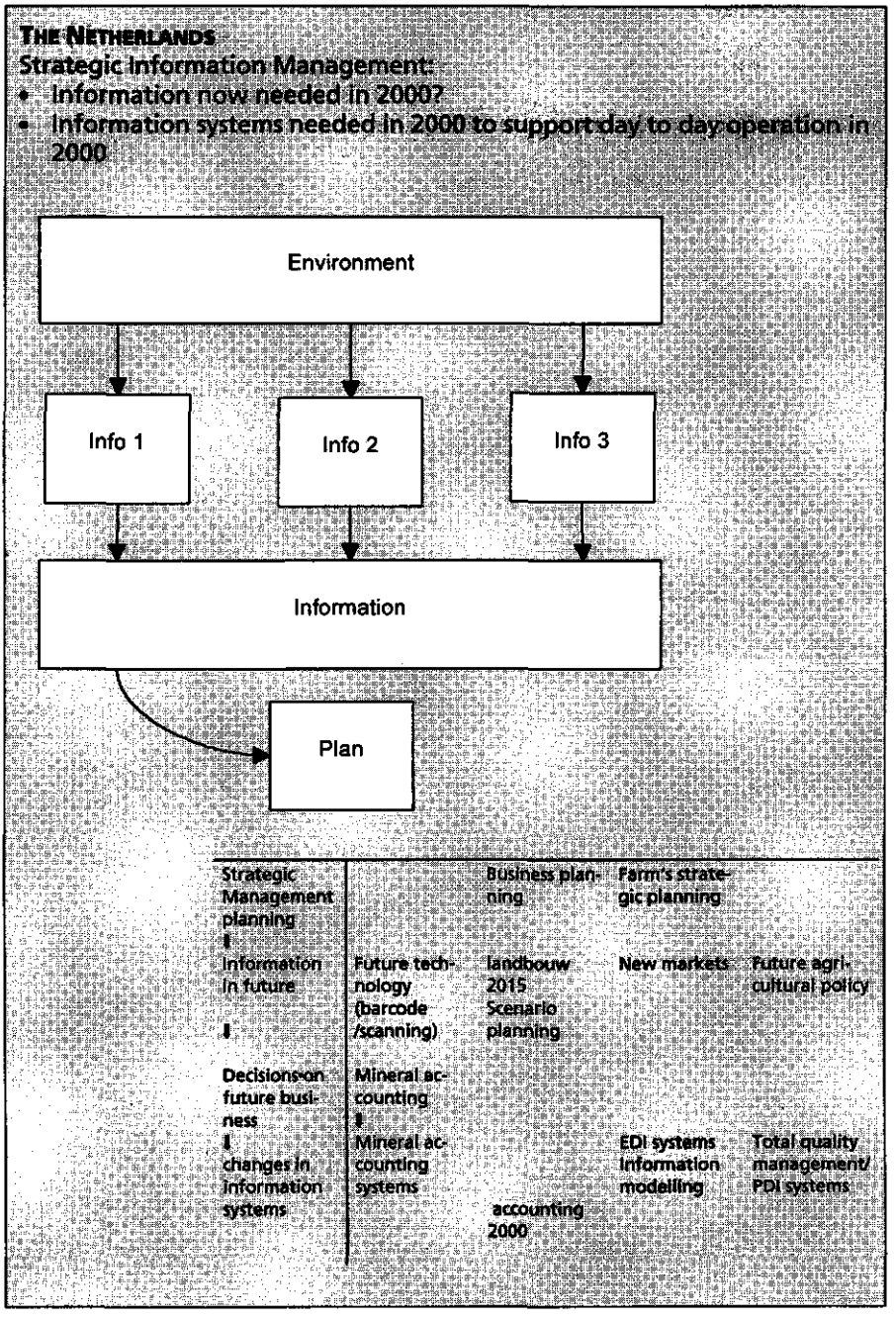
- *EU*
- National level
- Agricultural ministry level

It provides:

- Advisory service
- Financial help

Strategic Information Management in Sweden




THE NETHERLANDS
Strategic Information Management:
• Information now needed in 2000?
• Information systems needed in 2000 to support day to day operation in 2000
Environment
Info 1
Info 2
Info 3
Information
Plan
Strategic Management planning
Information in future
Decisions on future business
changes in information systems
Future technology (barcode /scanning)
Mineral accounting
Mineral accounting systems
Business planning
landbouw 2015
Scenario planning
accounting 2000
Farm's strategic planning
New markets
EDI systems
Information modelling
Future agricultural policy
Total quality management/ PDI systems

Conclusion

From the contributions of the various countries three different interpretations of Strategic Information Management can be identified:

1. Management of strategic information

   This concerns the activities to arrange that important information is available when it is needed.

2. Information for strategic management

   In this perception of SIM the information requirements of decision processes at a strategic level are the focus of attention.

3. Strategy for information management

   In this view SIM is aimed at development of structures for handling information in an effective and afficient way.

In the context of PACIOLI basically we will work with the third perception. This means that Information Modeling, as a method for Strategic Information Management, will be used to support the development of means and methods for effective an efficient handling of data in the farm accounting and FADN environment.

8. DEFINING INFORMATION REQUIREMENTS

Per Persson 1)

Preface

The purpose of this essay is to give a brief insight in the problems which the Joint Council for Economic Studies in the Food Sector (LES) has faced when trying to determine the needs for statistics in the agricultural field for important users of such statistics. From July 1993, the LES has got the responsibility for the major part of the agricultural statistics in Sweden.

This essay starts with a short description of the organization of the statistical production in Sweden. After that follows a theoretical discussion about how to balance the demand for statistics within a given margin of expenditure. The last part of the essay discusses some practical views on how to deal with this problem.

The content of the essay reflects to a large extent my personal points of view. My experience of agricultural statistics is first of all as the secretary of a committee 1991-1992 which dealt with the evaluation of the existing production of agricultural statistics in relation to the new demands of such statistics. The committee was set up in view of the food policy reform in Sweden in 1990. I have also worked with questions regarding statistical production during the last one and a half years as an employee of LES. Before that I was working for the Swedish Board of Agriculture where I also got a lot of experience of agricultural statistics as a user of this kind of material.

I would like to thank Anki Kjellson who has helped me with the translation under great time pressure.

Per Persson

8.1 How to define information requirements

8.1.1 The Swedish organization for production of statistics

Swedish government statistics initially developed in response to the demands from the central government. More than a century ago the central statistical office, Statistics Sweden (SCB) was set up. SCB focused on population statistics but also produced a lot of agricultural statistics. However a fairly great number of sectoral government agencies continued to produce statistics.

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1) The author works at The Joint Council for Economic Studies in the Food Sector in Sweden (LES).

In 1960, the Parliament sought a more pronounced concentration of statistical activities, and during the first half of the 1960s, a large part of the central government statistics were transferred to SCB. For about two decades SCB then had a dominant status in the statistic field, not least in the field of agricultural statistics. It was SCB that, after having listened to the main users of the statistics, evaluated the demand for different statistics and it was SCB that made propositions to the government concerning what statistics should be produced to meet the demands. As a rule SCB also answered for the actual production of the statistics. During this period SCB got funds from the government for agricultural statistics and the main part of other statistics.

In recent years a new management and funding structure has been introduced in the government statistics. The concept of 'a system of official statistics' was then emphasized. The basic idea behind the change was to increase the efficiency of the system by increasing the influence of the users. In this system, the funds and the responsibility for the government statistics has been distributed to some 25 government agencies (Government Agencies Responsible for Statistics, GARS).

SCB retains the responsibility and appropriations for about 50 per cent of the statistics that SCB previously was responsible for. The statistics that remain are demanded by many users and not confined to a specific sector. Some typical examples are population statistics, consumer price index and other indices and national accounts. In addition SCB has coordinating, development and service responsibilities for the entire system.

In statistic fields where SCB no longer has the full responsibility, the office still has an important role as a producer of statistics. However, the tasks concerning evaluation of the demands for statistics from different users and judgement of what statistics should be produced to meet these demands are no longer a matter for SCB (except to some extent for SCBs coordinating function). Instead these tasks have been transferred to the different GARS. The type of statistics that were delegated this way is of a more sectoral character.

In the agricultural field, the Joint Council for Economic Studies in the Food sector (LES) is the GARS and is thereby responsible for several areas within agricultural statistics. LES is a small agency directly subordinate to the Swedish Ministry of Agriculture. Apart from the responsibility for statistics, LES is also responsible for carrying out studies and reports to illustrate the questions which are of interest for food policy considerations and decisions. The work within LES is in principal organized so that experts outside the agency can be engaged for doing different reports etc. The results of this work are then discussed in a number of permanent expert groups with representatives from the Swedish Board of Agriculture, Statistics Sweden (SCB), the Federation of Swedish Farmers (LRF), the Swedish University of Agricul-

tural Sciences (SLU) and the Consumer Committee on Food Policy (KoB). The secretariat of the expert groups also presents some reports (above all within the area of agricultural economics) which are also discussed within the groups. Questions concerning statistics are treated in the same way as other questions in the expert groups.

LES has the responsibility for the following areas of statistics:

- restructure in agriculture
- the employment in agriculture
- yield estimations
- studies on agricultural economy
- the price development within agriculture.

There are connections between the above areas. The studies on the structure in agriculture are for example often used as a basis of selection for studies in other areas. Concerning a definition, there can be differences between what in Sweden is regarded to be included under each headline and the practice within the EU. Questions concerning definitions have been judged to be outside the subject of this essay and will not be discussed further here. Definitions in connection with the actual statistical concept will not be discussed either.

Within the field of agricultural statistics there are other important GARS apart from LES. The most important are the Swedish Board of Agriculture and SCB. The Swedish Board of Agriculture has the responsibility for statistics concerning animal production and SCB has the corresponding responsibility for statistics regarding the use of chemicals in agriculture and other environmental issues.

8.2 What is meant by Official Statistics?

In recent years many reports have been carried out in Sweden which in various ways have dealt with the organization of and responsibilities for the so-called Official Statistics. In connection to this, definitions of what should actually be regarded as Official Statistics have also been discussed. According to established practice, official statistics means:

1. statistics needed for society planning
2. statistics needed for research
3. statistics needed to give general information
4. statistics needed to fulfil the demands from international organizations.

Fundamental for the official statistics is that it should be regarded as a public matter and therefore be paid for by public funds.

What more precisely should be regarded to belong to each headline respectively is partly a question of judgement for the GARS. Within the agricultural area, LES has for example emphasized the statistics which is needed for considerations within the agricultural policy which has been regarded as being a part of the society planning.

Apart from the official statistics, there are a lot of other statistics produced by both public and private organizations. The public organizations mainly produce statistics which are strongly connected to its own activities and which are needed for the following-up of results etc. These statistics are often not interesting in a wider sense. Private organizations often produce statistics which show the conditions on the different markets where they are present. There are many companies which undertake to do studies in this area, such as: the Agriculture Economic Research Institute (LUI) and the Swedish wholesale and retail research institute (HUI). The results are usually not published and the statistics are sometimes only shown to the clients. In some cases private organizations can produce statistics which are of public interest and which also can meet some of the needs which the official statistics aim to cover. One example of the latter is the outline of statistics which the Swedish Dairies' Association (SMR) does on the production etc. of different dairy products. Another example is the summaries of results which the accountancy organization LRF-Konsult makes with the guidance from economic figures from customers. LRF-Konsult is a consulting firm within the Federation of Swedish Farmers (LRF). There is nothing which prevents the mentioned types of statistics from being used to cover certain areas of the official statistics which there is a need for. On the contrary, this is an advantage for the State which then does not need to do its own surveys but can instead 'get a free ride' of others' production of statistics.

In the following a delimitation of the official statistics will be done and questions on the role of the GARS will be discussed. The problem is basically quite simple; namely how the production of statistics should be adjusted to the needs.

In general the GARS must from the beginning create a conception of what kind of users that should be the target group and what statistics they demand for any of the four purposes mentioned above. Apart from general information, the users are usually situated within the public sector 1). This is also natural as the official statistics are financed through the state budget and is aimed at being a basis for decision making within the society planning.

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1) Including international organizations.

8.3 Basic difficulties in defining the need for statistics

There are two main problems in judging the actual need for statistics. The first problem is how to separate what categories of users are the target groups for the official statistics and what type of statistics they demand. This is, as is explained in chapter 8.2, not always easy as the general guidelines for the official statistics are written in rather general terms. A first step is therefore to go through each of the four purposes for official statistics mentioned in chapter 8.2 and for each statistical area try to decide what target groups could be of interest. Examples of target groups whose demands should not be met through official statistics are private companies and trade associations and their demands for statistics and information for market assessments etc.

The second problem is how to narrow down the demand of each user of statistics. Consultations are here necessary but not always sufficient. One problem is that the users of statistics sometimes overrate their own needs which means that the GARS does not get a good picture of the reel needs only by listening to the users. The explanation to this overrating of needs is often to increase the chances of at least getting the fundamental need for statistics met in case of a cut in the initial demand. Often the overrating can also be due to pure ignorance. This can often be shown when a GARS wants to simplify and make an existing survey cheaper through making the figures less precise. A user sometimes rejects such a change even though it does not result in more than some marginal deterioration to him. The attitude of the user in the mentioned cases is partly connected with the fact that he has not got the budget responsibility for the overdimensioned production of statistics.

The difficulty to make the needs for statistics concrete is also often connected to the fact that it can be difficult for a user to make a precise judgement of his need as it can change over time. This is for example the case for the statistics which is used for political considerations. The need is then often directed by the questions which at the moment are judged to be of political interest. During the last two years there has been a demand for detailed statistics on the structure in agriculture to serve as a basis for the design of some of the EU-support systems to the Swedish agriculture. Another example is the economic statistics where the needs largely changed in connection with the reform of the food policy in 1990. When the agriculture was deregulated that year, an important user need disappeared, namely the need for economic statistics as a basis for the yearly negotiations on agricultural prices. Problems occurred with defining the new needs which should be regarded as the principal ones.

From what has been said above it is clear that it is not enough to ask a user which statistics he feels that he needs and the extent of it. Follow-ups and judgements should be made to get a complete basis for a decision.

When target groups from various reasons cannot clearly define their needs, the GARS must itself create a conception of the needs with the help of what has previously been applicable and what can be judged to be valid in the future. Of course there have to be frequent contacts with the user to be sure that the estimates of the needs finally arrived at actually gives a fair picture of the real conditions.

When the needs of the different users of statistics finally have been mapped an aspect of costs has to be brought into the picture before the actual process of statistical production can start. It is not evident that all the needs, which the different users can be judged to have, should be met fully. If there is a case where a need can be judged to be marginal and the cost to produce statistics for this need high, it is not motivated from reasons of limited means to appropriate money for that statistics. The delimitation problems in this area are large and there are no existing models in Sweden which could be used to find a reasonable balance. In chapter 8.4 some thoughts around this very central question will be discussed.

Schematically the steps described above can be shown like below. It should be emphasized that the figure is only an outline of the principal thoughts. If there are *limitations* in the base material which is used in order to enable a decision it might be necessary to follow a simplified course of action. This will however be further illustrated.

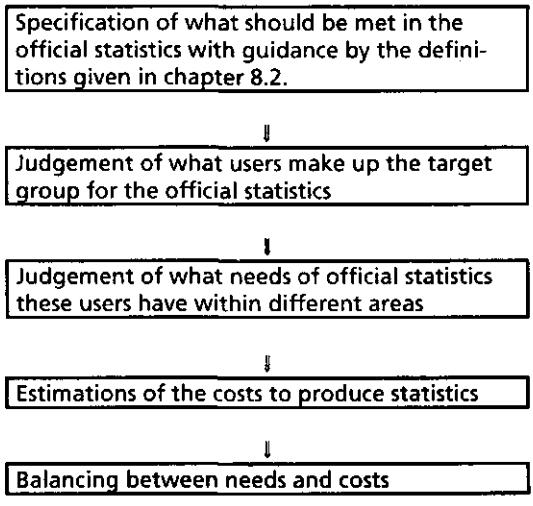

Figure 8.1 Steps in the decision-making when judging the direction and extent of the statistics

The following chapter will mainly be restricted to the two last squares of the figure.

8.4 Balancing the need for statistics against the costs

8.4.1 Theoretical views

The needs for statistics of different users can theoretically be illustrated in a bar chart in the way which is shown in figure 8.2 below. The needs for statistics are here ranked in a progressive scale. The bar B1 gives the level of statistics which user 1 has been judged to need. Bar B2 gives the level of statistics which user 2 has been judged to need and so on. It has here been assumed that the level of the need for statistics can be expressed as a monetary unit. The bars have been assumed to be overlapping which means that the need of user 1 automatically would be met if the *larger* need of user 2 would be met and so on. The diagram concerns a specific area of statistics. For other areas of statistics it is assumed that similar bar charts with different need hierarchies could be produced.

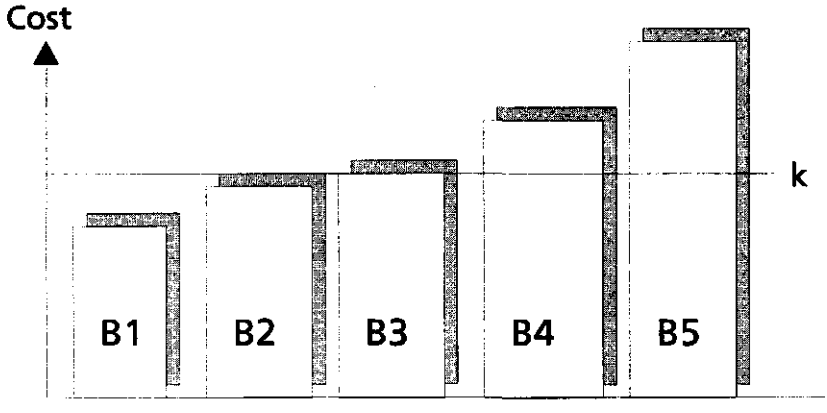

Figure 8.2 Need levels of different users within a specific area of statistics (theoretical approach)

The task for a GARS will be to judge at what level a reasonable limit should be drawn for the costs. In the diagram such a limit has been drawn as a line *k* which touches the need B3. It has here been assumed that the GARS has judged it to be a reasonable balance to meet all the needs up to the level B3. Demand B4 and other needs to the right of the bar B3 will then only partly be met.

The judgement of a reasonable level of costs is of course the principal point in the above model. Many factors influence this judgement. One factor which is interesting to take into account is the marginal value of the statistics for different users (and the society). We can illustrate this question by doing a complementary assumption of what has been said in connection to figure 8.2. We assume that each bar in the diagram contains a hierarchy of partial needs which are of a greater or lesser importance. In the form of a diagram this can be illustrated in the way shown in figure 8.3. It has here been assumed that there is a connection between costs and utility of the statistics. To get a connection to what has been said together with figure 8.2, the drawn graph has been assumed to symbolize the need for statistics of user 4. The height of the graph corresponds to the total need for statistics, B4 in figure 8.2. A basic assumption is that the first currency units are used to meet the most important needs and that the marginal utility decreases gradually when coming upwards along the graph. The line drawn in figure 8.3 corresponds to the line *k* in figure 8.2 and illustrates how far the GARS is prepared to pay for the statistics within this certain area of statistics. The utility of the statistics which corresponds to what is above point A has here been judged to be of so little value that it does not motivate the extra cost.

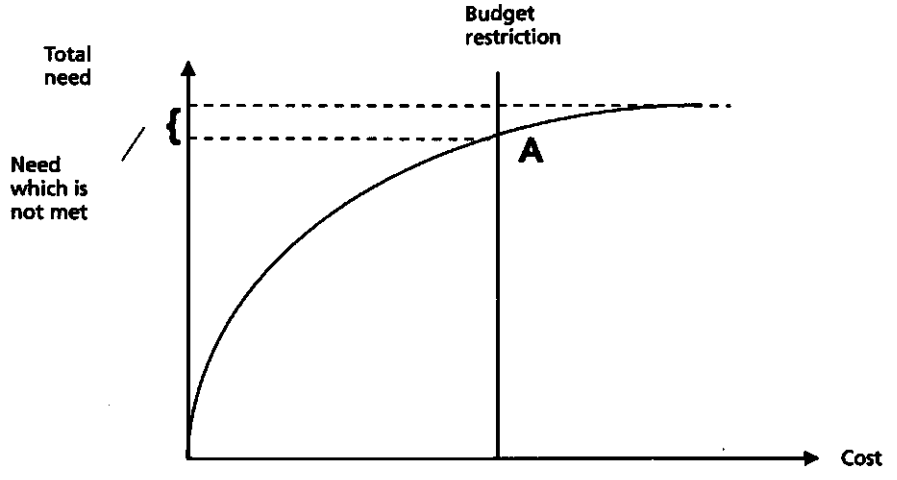

Figure 8.3 The connection between the utility and the costs of statistics for one specific user

A limitation when allocating money between different areas of statistics is of course the size of the GARS's total available budget. To some extent this limit could be influenced through the argumentation when applying for money. Often, however, the level of the budget is rather predetermined and attached to previous distribution of means. Also the cost balancing be-

tween different areas of statistics is many times governed by previous distributions of means.

From a theoretical view point the money should be distributed in a way that optimizes the utility of the used resources. The classical connection, that the marginal utility for the last spent currency unit should be equal for each area, can be used here. A more in-depth discussion will not be made in this context. There are connections to the 'demand bars' in figure 8.2 and the valuation between the needs illustrated by the bars. However a further discussion on this issue would lead too far.

8.4.2 Methods to use in practice

The discussion in section 4.1 assumes an ideal situation where it is possible to clearly separate the demands of the different users and where it moreover is possible to estimate the cost in a clear-cut way. The reality is in general a lot more diffuse. It is many times problematic to find the needs of the users in and objective way. Estimating the costs of producing the statistics to meet different levels of needs is also problematic. To be able to decide the extent of the production of statistics it is therefore often necessary to use simpler models. In the following two separate courses of action will be illustrated. They have both been used in Sweden during recent years.

Easiest defined areas

This method is based on an initial judgement of one user's need which is relatively easy to define. The needs of the other users are thereafter related to the need of this user. Good examples of users with a need which is easy to define are EUROSTAT and the FADN-division. Their demand coincides in principal with the contents of the legislation (incl. gentlemen's agreement) which have been settled as a definition of what the member states are obliged to produce within the statistical area. As a member state Sweden has bound itself to produce these statistics and therefore this need has to be met to 100%. The demand from EUROSTAT and FADN can be seen as a platform to start from in connection with a joint judgement for all the users. As will be discussed further on, the demand from EUROSTAT will also be governing for the production of statistics within different areas.

When the demands from EUROSTAT and the FADN-division have been mapped, the costs are estimated for the statistics which are needed to meet their demands. In these costs should be included both the possible cost for a register and the costs for the actual survey (including the processing and reporting which are necessary to undertake). The next step is then to test how many other users will be satisfied automatically through the statistics produced for EUROSTAT. For the users whose demands are fully met, no further mapping is needed. It is not interesting to find out which part of the statistics is redundant for those users. For the users whose demands are not

fully met, it is necessary to go on with further analyses in order to find the supplementary need for information of those users and what it would cost. The test should then in principal follow the description in section 4.2 where the utility of meeting the further demand for statistics should be compared with the cost to produce such statistics taking into account the existing budget restrictions.

Effects of alternative survey methods

Another course of action is to evaluate if the present survey methods to produce statistics are in harmony with the actual needs of statistics. The course of action is here to try to map what possible alternative survey methods could be used instead of what is used at present. The purpose with such a mapping is to find any breakpoint in the cost picture which could indicate that a move from one statistical method to another would mean considerable cost savings. If the conclusion is that a transfer to an alternative survey method would make the production considerably cheaper the next step is to find out how the statistics are influenced and if the demands from the users still would be met to a reasonable extent. To get an answer to the latter question contacts need to be taken with the users. As was mentioned by way of introduction, a simple yes or no should not be enough. If the user is negative to the change, it is important to present alternative solutions and discuss them with the user.

The course of action described above has been used in Sweden in connection with judgements of to what extent the demands are met when using alternative methods for yield surveys. Compared with what has been discussed before this method tries to find out how different levels of costs satisfy the needs instead of directly estimating the needs and thereafter considering the cost aspect.

One general problem in connection with the production of statistics which could be worth mentioning is that it is often difficult to change the direction and extent of a statistical product considerably, at least in a short-term perspective (1-3 years). The explanations to this can be several. One factor could be that a user wants to keep some continuity in the statistics and for this reason is negative to a change. Large surveys take time to build up as a whole organization often is attached to the survey. Some fixed competence usually has been built up and invested in the shape of computer routines etc. To change method in a short-term perspective is difficult and demands effort and time.

What has now been said means that there is a built-in inertia in the production of statistics which means that fast conversions to new conditions often are not possible or even suitable to carry out. This could also mean that the costs for producing statistics are on the wrong level in relation to the needs, at least in a short-term perspective. This imbalance can however

be hard to avoid in times of change. A GARS should all the time be aware of such imbalances if there are any and work out a plan for how to reach a balance in the easiest possible way. The discussed method which proposes the mapping of alternative methods could be a good instrument to use when doing an overhaul of large and complicated surveys in the long-term perspective.

8.5 Example of defining the needs in various statistical areas in Sweden

8.5.1 Structural statistics

The statistics on agricultural structure in Sweden have during many years been founded on yearly total surveys (through the 'Register of enterprises in agriculture and forestry', LBR). The main advantage with this course of action has been that the quality of the statistics has been kept at a high level as the underlying farm register all the time has been kept up to date. All changes in population can be followed continuously. The main disadvantage has been that the survey has been expensive. The high cost has partly been motivated by the fact that the LBR also has been used for administrative purposes apart from serving as a source of statistics. During recent years it has for example been used as a basis for granting support per animal head and also for granting support to certain crops. From 1995 and onwards this use will cease in connection with the introduction of the EU support systems and of an independent register, IACS (the Integrated Administration and Control System).

As the administrative use will disappear, the need for statistics will only be governed by what is needed for statistical purposes. In the spring of 1994 and in connection with its appropriation demand for the next budget period, LES raised the question about the extent and direction of the statistics on agricultural structure. To sum up, the judgement of LES meant that the demand for statistics from EUROSTAT should be regarded as a dimensioning of all the statistics on agricultural structure for those years when such statistics shall be produced according to the EC-legislation 1). Other demands were regarded as being automatically met through meeting the demands from the EU. The view of LES meant that the extent of the survey would decrease from a total survey to a selective survey with a sample representing 25% of the population. The contents of variables would also be adjusted to the demands from the EU with some additions to meet national needs.

For the years when the EU does not demand any structural statistics, LES judged it appropriate to keep the survey at an unchanged level anyway

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1) With some minor additions to the variables (for example the division between winter wheat and spring wheat).

(with a sample of 25%) to meet national demands (mainly to enable political decisions). The content of variables would be somewhat reduced.

LES also thought it was important to try the possibility to use the IACS-register as a statistical register for structural surveys. If such a connection would be possible, many millions of SEK would be saved. To facilitate this analysis LES found it suitable to keep LBR at an unchanged level also in 1995 despite the extra costs i.e. it was decided to keep the LBR as a total survey for another year. This will enable the linking and matching of the figures in the LBR- and the IACS-register for this year and also make considerable analyses possible concerning differences in definitions and other contents between the two registers. The advantage to carry out the structural survey as a total survey another year is also that the transfer to a selective survey can be carried out without any considerable time pressure. In conjunction with the membership of the EU the work with converting the Swedish statistics has been considerable and the time limits for the adjustments have been tight.

8.5.2 Economic statistics

In Sweden there are two publicly financed surveys which aim to illustrate the economics of farms; one farm economics survey (JEU) and one survey of the cash income, expenditure and net receipts of holders (DU). Both of these surveys are based on samples from the LBR. The JEU include only a small number of farms (approx. 540) but contains many variables. The DU is based on a larger sample (approx. 2,500) but the basis is considerably less detailed than in the JEU. Apart from the JEU and the DU there are some other economic studies which partly touches upon agriculture but which have been appraised to be of lesser interest in this context and are therefore not discussed here. The total income and expenditure of the whole agricultural sector are also calculated yearly and these calculations have recently been adjusted to the demands from EU for the EAA-calculations. These calculations are mainly built upon statistics that already exist within different areas and are not directly connected to any particular survey.

Early in 1994, LES made the judgement that the Swedish need for future surveys on the economics of farms should be limited to the study of a small number of homogeneous groups of farms concentrated to types of farming which are interesting for Swedish conditions, above all dairy farming. The national interest (above all for making considerations within the agricultural policy) is furthermore focused on the study of changes in the profitability over time and not so much the absolute profitability. The present samples in JEU and DU have during recent years been adjusted to the given needs which means that far from the whole agricultural population is being covered by those surveys.

As Sweden joined the EU a new user need appeared through the demands from the EU on a FADN-adjusted accountancy survey which is also regulated in EC-legislation. The new demands meant a need for a wider

coverage of the population. The Swedish survey which best corresponded to the demands from FADN was the JEU. It therefore became natural to enlarge that survey to an extent which corresponded to the FADN-demands. In connection with the membership negotiations between Sweden and the EU a suitable enlargement of the sample was judged to be approximately 500 units (to a total number of 1,000 units). The question concerning regional division had not been discussed on that occasion. The cost for the survey can be estimated to increase considerably by such an increase of the sample. At present the budget for the survey is approximately SEK 4 million per year.

Sweden was granted a transfer period of a couple of years to adjust the JEU to FADN. A study is now being done in Sweden regarding the speed of the enlargement and the allocation of the sample of the survey. The balancing between the interests of the EU and the national interests is here an important part of that study.

The extent of the DU is purely decided by national needs. There is no immediate interest in any enlargements to other populations than the survey includes today. There is a certain risk that the value to the users of this survey will be reduced as it has become technically more difficult to get the information. The DU is founded on the income tax returns and the information which can be collected that way is completely linked with available information in the income-tax return forms etc. At present there is a study on the possibilities in the future to receive information at a certain detail level. Should it be evident that the basis for information will be too weak, it is possible that LES will make the judgement that the survey is too expensive in relation to the utility. An examination of other opportunities to find figures about business economics from a large number of holdings will be carried out. The advantage of having access to a survey which is built upon a large number of holdings is that there are good possibilities of carrying out reliable studies of time series and also that relatively reliable estimates can be done of individual variables which could be interesting to study separately.

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WORKING GROUP SESSION 3

Why information models will not work?

In the Dutch papers (chapters 6, 9 and 14) an impression of the information modelling approach is given. The participants are asked to react on this papers in a critical way. In working groups the most important obstacles that prevent this approach to become successful in agricultural data exchange are identified.

Each group has made a list of maximal 5 factors (in keywords) that determine why it is difficult or even impossible to come to a European Agricultural Datamodel. In the analysis of these lists the results are combined and summarized into ten main problem areas.

Results

Group I
1. Complexity of production systems across Europe
2. technical difficulty at several levels (farm variable definitions)
3. National disposition to accept a single model
4. Different levels of information availability among member states
5. Costs of information modelling
6. Systems tend to be stable, structures change

Group II
7. Diversity in farming
8. Funding of this project
9. Political obstacles; willingness to cooperate
10. Theoretical issues in creating a (uniform) data dictionary
11. Maintenance

Group III
1. Costs of funding, Miss spec. Of the information need: Lack of data
2. Different goals and objectives, institutional differences, existing systems with other definitions: Differences in data definitions
3. Farmers motivation to participate: errors in data
4. Who says yes no to participate: Bias in data
5. Different quality management of data collection: national bias in data

Group IV
1. Is there a problem to solve?
2. Resources
3. Consensus

4. Depth of motivation
5. The existing system

Group V
1. Difficult to understand (Human factor)
2. Differences in accounting years in member-states
3. Heterogeneity in agricultural systems
4. Set-up costs could be high
5. Differences between management systems in quality in systems

Conclusion

The problems as identified by the working groups can be summerized in ten categories:
1. Diversity of farm systems
2. Funding information models (high costs)
3. Maintenance
4. Variety of quality of information (systems) differs (need for quality management)
5. Acceptance single model (need for consensus, unpopular, depth of motivation)
6. Theoretical issues, technical problems fit of problems and information modelling techniques
7. Existing systems as a blocking factor (not used by software industry, different accounting years)
8. Human factor: difficult to understand information modelling technique
9. Future is difficult to predict, changes in technological environment
10. Political resistance, unwillingness to exchange data, institutional aspects

These ten 'problems' have been input in the succeeding working session 'how to make information models work'.

How to make information models work?

In the session on 'why information models will not work' a number of obstacles and threads are identified on information modelling in the agricultural domain. In this session the workshop participants were asked to be more constructive and to find useful suggestions on some of the problems identified.

The participants have discussed in groups clustered by expertise. The five groups representing the fields of relevant expertise are:

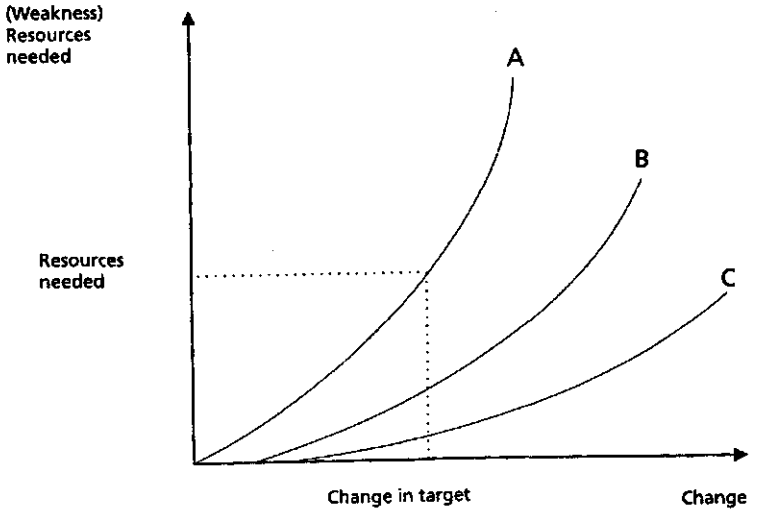
- Accounting
- FADN
- Farm management
- Information science
- Policy making

The groups were asked to look at the list of obstacles and to come up with suggestions to break the resistance of the various barriers. The numbers refer to the problems identified on the previous page.

Suggestions made by the policy making group

Discussed points:
1. Diversity of farm systems
2. Funding of information models
5. 7. 10. Acceptance/motivation/blocking obstacles/political-institutional resistance

Centered in Political Resistance to Change



What shapes those curves?
- existing structures
- interests of groups directly affected
- Subjective perceptions of unaffected groups
- Tradition, fascination with technique etc.

Goal: move curves from A to C
Central character: the farmer (but not only one)

Motivated:
- income
- security
- lifestyle
- keep property
- emotional bindings

Other actors:

- elected politicians
- administrators (permanent & politicial)
- consumers
- tax payers
- third countries
- data users

Combination of forces = Movement !!

Design and build a consensus: 'CONSENSUS ENGINEERING'

Suggestions made by the information specialists

1) Diversity of farms: question of cost, not a structural problem

2) Funding: can be overcome

3) Maintenance: can be organized in an efficient way

4) Quality standards should be well defined in information model (in data definition e.g.)

5) Acceptance is very important and should be organized well before actual start (all member states)

6) Theoretical issues etc.: adopt the Euro Method

7) Information model should be a description of interface, not of systems. Existing systems adaptation

8) Take good care of negative attitude. Not many people have to understand, they can be trained

9) In fact this is the maintenance problem (3)

10) Implement as an interface, do not set up as a model for national systems

Suggestions made by the farm management specialists

1) Diversity of farming systems: Develope more general model

2) Funding information models: If general models are possible; would need only one

3) Maintenance: Generally applicable models require less maintenance

4) Variety of quality of information (system) differ: Single 'general model' built centrally

5) Acceptance of single model: Global model

6) Theoretical issues, technical problems, fit off problems and information modelling techniques: Listen to information scientists

7) Existing system as a blocking factor (for the accountants?): Common entry system for 'parallel' data sets production

8) Human factor difficult to understand information modeling techniques: Actors work on 'need to know' at their level of activity

9) Future is difficult to predict, changes in technological environment. Double sided;
   a) Information Technology evolution
   b) Production Structure Computers and operating systems to converge; general model

10) Political resistance: solution = withhold subsidy payments unwillingness to exchange data institutional aspects: common entry system; centrally developed model

Simple farm management model

A more general solution might be to use more simple farm management models. This implies:

* Robust but simple farm recording model acceptable to farmer, accountant and FADN

* FADN recording agency receives data from farm model; adjusts data from accounting to economic values automatically; add in non-accounting data this stage e.g. farmers' age, off-farm income etc. (could be collected orally by enumerator)

* Enhances data forwarded to national and EU coordination organizations.

Key elements: Simple model will be flexible / adaptable
Lot of data carries to tax accounts and FADN
Extra 'ill-structured' data can be added in by collecting agency
In their highest level more complex model
Simple model will allow rapid feedback to farmers
Simple model will speed up availability of data to FADN
Changes in information technology will enable system to work better / faster e.g. between banks, suppliers, farmers

This approach is 'bottom up' starting from the needs and wants of the farmer and working towards a target which is set by FADN.

Suggestions made by the FADN group

1) Diversity: work of data dictionaires done anyway by M.S. Solution: common data set sight to Brussels but access facilities to total data set in M.S. Note: diversity can also mean variation in data available (i.e. non-farm income) for 'farm-type' data, more sophisticated extraction procedure to be used.

2) Funding: already done. Could be aided by an EU regulation for a new system. Clearly an imbalance between costs of collection and investment in analysis & making data available. Contract research and better marketing could increase resources. But data quality and representativity must be demonstrated. More users = more checking of data.

3) Maintenance: essential to avoid obsolescense - linked to point 2.

4) Common definitions and interpretation will counter variety. On quality checks on processes and a guarantee of minimum data quality by M.S. will help. Also, interchange of data between M.S. will improve quality / comparability. Need for pilot surveys and sample checks on new items.

5) Single model: see 1 - not necessary, but need common definitions, procedures etc. to allow comparability

6) Pass problems to specialists but fix clear objectives and time frame first. Obtain consensus among partners.

7) Existing systems: can they satisfy today's objectives of the European information system? If not, they must change or become obsolete.

8) Human factor: only introduce information models where pertinent and useful. Make changes in stages & employ expertise as needed. Training an essential & continuous process.

9) Change is essential to avoid obsolescence. Policy in future a big problem; for (computer) technology - do not buy but contract your facilities. outsource functions subject to unknown & unpredictable change (spread risks) some functions predictable (costs of production, estimates of current & future years data).

10) Resistance, data exchange (lack of!!), institutions. Use variable geometry - exchange with those who are willing to do so (the others will be converted in due course). Institutionalaspects being solved by technology, i.e. distant E.D.P., 'aristide' in France etc.

General: monitor users needs every 2 -3 years; research your market !!!

Suggestions made by the accounting experts

2) Funding information models (high costs): eliminate duplication to reduce costs

4) Variety of quality of information: improve / standardise definitions

5) Acceptance of a single model: accounting institutions need to produce agricultural accounting standards to regulate agricultural accounting practises.

7) Existing systems as blocking factor (not used by software industry, different accounting years: try to establish greater standardisation of the conceptual bases used for agricultural software.

10) Political resistance, unwillingness to exchange data, institutional aspects: promote negotiations to try to find simple solutions to some of the barriers to data exchange and to develop communication between different groups / institutions.

9. LEI-ACCOUNTING 2000

Tim Verwaart 1), Diederik Spiering 2)

9.1 Introduction

LEI-DLO has a 55 year record in the field of farm accounting. Systems evolved and their complexity grew. In 1993 an internal working committee under presidency of Dr. George Beers evaluated the systems and made an inventory of wishes for improvement and future information needs. The conclusion was that a drastic renewal of the accounting network systems should be considered by the LEI-DLO management. The report contained a suggestion for the decision procedure, in which the installation of a steering committee was the first step (Beers e.a., 1993).

The LEI-DLO director installed the steering committee in the autumn of 1993. It is presided by Prof. Alexander Udink ten Cate (DLO information manager). Members are Mr. Jan Blom (LEI-DLO deputy director) and Dr. Cees van der Meer (Ministry of Agriculture research coordinator) and as an adviser Mr. Lio Aarsen (Ministry of Agriculture information consultant).

By order of the steering committee Mr. Frans Lambi (James Martin & Co.) evaluated the LEI-DLO report. He recommended to carry out an information planning project with special attention for management aspects (Lambi, 1994). The steering committee advised the director of LEI-DLO to install a project team for this task. The director followed this advice. The project team, advised by Mr. Rob Florijn (Moret Ernst & Young Management Consultants), drew up a report, containing a description of the organization, conceptual information model, systems architecture and technical architecture of the renewed LEI-DLO accounting network and a description of the projects to be carried out in order to realize the renewal (Verwaart e.a., 1995).

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1) Tim Verwaart is EDP manager at LEI-DLO in the Netherlands.
2) Diederik Spiering is student agro systems engineering at the Agricultural University Wageningen.

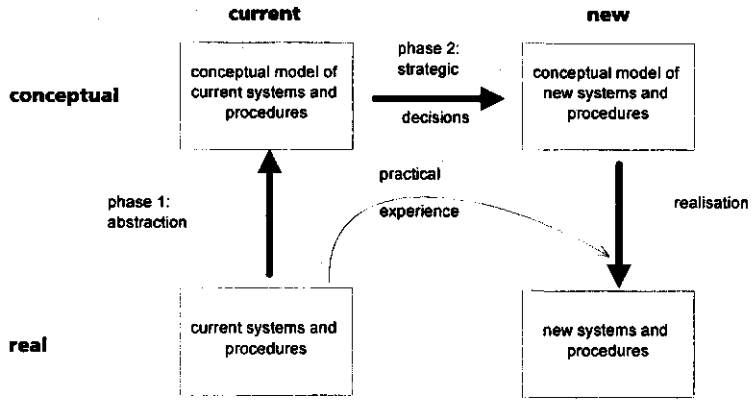


Figure 9.1 The path from current systems to new systems (Florijn, 1994)

The report of the project team completes the second phase of the renewal of the LEI-DLO accounting network (see figure 9.1). This paper is a summary that contains the most relevant aspects for the Pacioli project.

9.2 Background

9.2.1 The current FADN system at LEI-DLO

For many decades the farm accounting data network has been core business for LEI-DLO. From the start, the cost of labour has been the main threat for continuity. Efficiency has always been a major item for the management. About 1960 computers were applied and the results were promising. The current software systems are based on the principles and methods that were developed in those days. The systems evolved and some parts were renewed and based on modern insights and techniques, but he base philosophy ('accounting is simple') remained the same and the core of the accounting system is still the core as it was developed in the sixties. Information needs that were not covered by the base philosophy and the core of the system were covered by separately developed subsystems. These subsystems were linked to the core as well as mutually linked by ingenious but complex mechanisms. Thus a system evolved that contains thirty years of practical experience and offers a very high level of efficiency for the accounting work to be done. Maintainability and adaptivity of the system however are very poor. The cost of changes is not predictable (Beers e.a., 1993).

There is not a single management for the LEI-DLO accounting network. Sector departments (agriculture, horticulture, forestry, fisheries) man-

age the parts of the network that cover their sectors. Departments have their own responsibility for account schemes and data definitions. Apart from that, the departments are to a great extent independent in specifying software requirements. In the past the reporting on financial and economic developments in the sectors was the main objective of the accounting network. The independent position of the sector departments with respect to the accounting network fitted well with that objective. Divergence of systems is a natural development in this environment. It is to some extent acceptable in the context as described. There are coordination mechanisms in the LEI-DLO organization and they were sufficient for the traditional objectives of the accounting network.

9.2.2 The necessity to renew the system

In the latest years the scope of the accounting network is widening to ecological and social aspects, along with the attention of policy makers for these aspects. For these purposes integral information on the agricultural sector as a whole is needed. Information needs are changing more rapidly now then they did in the past, also in other aspects than the widening of the scope. The accounting network is completely financed by the Dutch government, with an exclusive position for LEI-DLO. Due to the general development to market orientation, a more competitive approach is likely to be required in the future. The current accounting network systems cannot provide the flexibility and the integral information that our clients need (Bouwman, 1994).

9.3 Method

9.3.1 Project approach

The approach was to design a new conceptual model of the accounting network processes and information systems and to have it verified in joint sessions with the accounting network managers, department managers and director of LEI-DLO. This approach was suggested by Mr. Rob Florijn (Moret Ernst & Young Management Consultants) and has proven to be successful in this project. It resulted in a conceptual framework for the management of the renewal of the accounting network systems as well as for the renewal of the accounting network management.

In the first phase of the project a user needs survey was executed (Bouwman, 1994). The results of the survey were reported in the management sessions. The results support the project team's hypothesis that renewal of the accounting network is necessary.

In the first management session, the following important conclusions were drawn by the joint managers responsible for the accounting network.

The LEI-DLO accounting network systems have to be renewed because of changing information needs, that cannot be satisfied by the current system. This renewal is not limited to the software systems. Also the organization will have to be renewed in order to improve integration and market orientation. Flexible systems, integration of the data and an alert organization are essential for long-term survival of the LEI-DLO accounting network. On the basis these conclusions, the process and information models were developed and verified. The process model, in which much attention was paid to the management processes, was used as a framework for the description of the new organizational concepts. The models are described in chapter 1.4 of this paper.

Apart from the conceptual models, the projects that have to be carried out to complete the renewal of the accounting network were identified. A summary is given in chapter 1.5 of this paper. Furthermore concepts for the technical infrastructure and project organization were defined and a cost estimate was made. To these aspects no attention is paid in this paper.

9.3.2 Project organization

The project was set up by a team consisting of George Beers and Tim Verwaart (both LEI-DLO) and Rob Florijn (Moret Ernst & Young Management Consultants) (Beers e.a., 1994). It was executed by a team consisting of Aad Boers, Jan van Dijk, Krijn Poppe and Tim Verwaart (all LEI-DLO) and Rob Florijn (ME&Y MC) under responsibility of the LEI-DLO director. During the project, the LEI-DLO accounting network program committee was regularly consulted in order to inform and consult key persons that did not attend the management sessions. On the draft report a quality review was executed by George Verheijen (James Martin & Co.). The project was supported by Lio Aarsen (Ministry of Agriculture) as adviser.

9.4 Information models

9.4.1 Functional decomposition

In the process model for the total business of running the FADN, seven main functions are distinguished:
(1) strategic management,
(2) technical management,
(3) operational management,
(4) setting up the network,
(5) accounting,
(6) using data,
(7) application management.

Appendix 1 contains function definitions and a more detailed description in terms of processes.

During the management sessions the model proved to be a very good framework for discussions on organization, systems and methods to be used. The most important difference with the current conceptual model is the attention for management of the network and systems. As described in section 1.2.1 of this paper, management has not been an item of interest until recently. In the current conceptual model, attention is focused on the techniques (Beers e.a., 1993).

9.4.2 Objects

The relevant objects on which data are to be recorded are mapped in the conceptual object model. This model contains objects on which data are gathered at farm level in the accounting network as well as objects that are relevant in the total context as described in the previous section of this paper. The structure of the conceptual object model is drawn in figure 9.2 Appendix 2 contains a complete description.

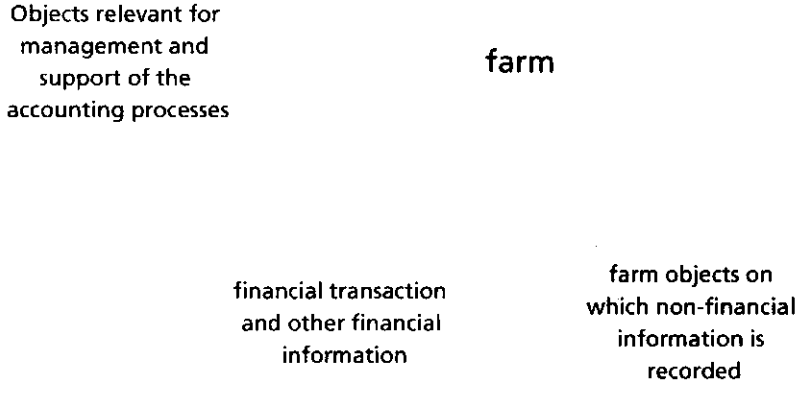


Figure 9.2 Main structure of the conceptual object model

In the new conceptual model the classic dualism of financial information systems is represented. First, we want to represent financial information on a diversity of real world object in a uniform way, coded in a single entity type as 'financial transaction'. This could be called the 'accounting is simple'-approach. Accounting systems are based on this approach and as a consequence they generally are designed as simple system, not paying any attention to real world object structures in there data models. Real world objects are coded in account keys and allocation schemes. As long as the data are only used for financial reporting, this approach is sufficient as well as effi-

cient and very flexible. In the FADN however, the financial data have to be related to non-financial data. Trying to represent these data with the 'accounting is simple'-approach amply contributed to the extreme complexity of the current systems of the LEI-DLO accounting network. In the new model, the real world complexity for the non-financial data is represented in the data model. With this approach, the systems can be as simple as real world complexity allows.

9.4.3 Information areas

Nine main information areas can be distinguished after analysing the relations between processes and objects (appendix 3). The areas are briefly discussed in this section.

'Product specification' is the area that covers strategic management and part of the technical management. Reports describing he sampling plan and detailed specifications of accounting network products (statistical reports, individual and comparative reports for participants, data for research) are information produced for the other areas.

'Process and systems design and quality assurance' covers the detailed description of the data, working processes, rules, standards and coding schemes (including account scheme) for production of information conforming to product specifications and quality standards. Data management is the central activity in this area. Information models recorded in a repository, coding tables recorded in a data base and instructions for their use are the information produced for other areas.

'Planning and progress' is the area that that covers operational planning, allocation of work to staff, personal scheduling, time-keeping and progress reporting. It has interfaces with the 'management information area' and with the production processes at operational level.

'Management information' is not a very exciting area in this context. Standard systems for financial, staff and materials management can be used.

'Agricultural census and sample' covers the maintenance of the accounting network. The list of participants and the stratification scheme, both recorded in a database is the information produced for other areas.

'Data recording' covers the main production process. It results in a record of all financial transactions, inventory data and technical farm level data needed for the production of the specified products.

'Information production' covers the production of all specified reports and the availability of elementary data and standardized computation

schemes for derived data in a data warehouse for research and for ad-hoc client requests.

'Client orders' is the area that covers the handling of client orders for standard products and ad-hoc requests, for which the data warehouse is used. It has an interface with the financial administration for invoicing.

'Application management' is the area that covers the management of software development, maintenance of working instructions and helpdesk for operational problems with the systems.

The identification of the information areas produced a framework for defining information systems and projects for the renewal of the LEI-DLO accounting network. The projects and systems that are the most relevant in the Pacioli context are the subject of the next section.

9.5 Future projects

9.5.1 Adaptation of the organization

Ten projects were identified for adaptation of the organization. The most relevant in this context are;

(1) implementation of a structure for strategic management and product specification (information area product specification),
(2) implementation of data management (information area process and systems design and quality assurance),
(3) implementation of application management (information area application management).

9.5.2 Information modelling

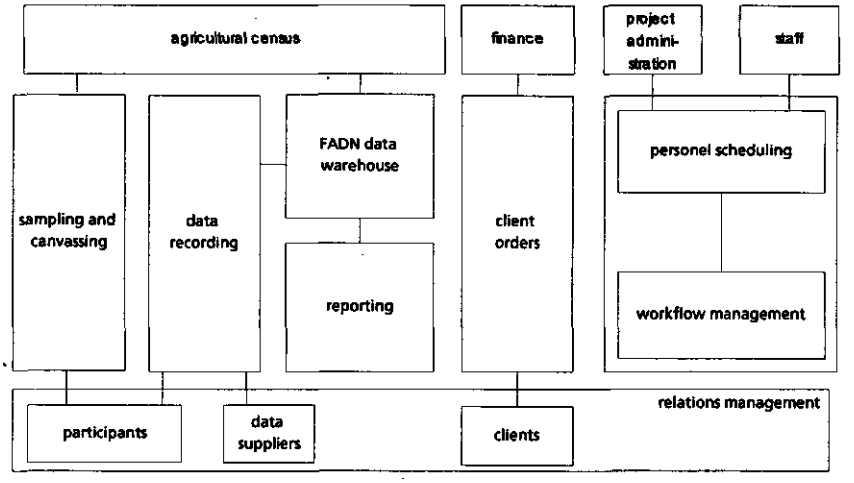
Several projects in the field of information modelling have to be carried out. The most critical is the data management project concerned with the account scheme and the detailed object model. The consistency of the relation between the account scheme and the non-financial information is of vital importance for the complexity and maintainability of the new systems (see figure 9.2). Furthermore it is of crucial importance for the desired integration that no consensus-implementations occur. This project is the first to start. The resulting data model and coding scheme will be the basis for the accounting network systems for the next decades.

9.5.3 Software development

As a framework for the development of software, a systems architecture is drawn up (figure 9.3). The systems in the top of the scheme are generic systems for LEI-DLO and although they are used in the accounting net-

work, they are not in the scope of this plan. Data on participants, data suppliers and clients can be embedded in a generic relations management system.

Unlike the other generic systems, these are in the scope because some specific functionality is related to these data. Projects are identified for analysis, design, realization and implementation of the specific systems.



Figuur 9.3 System architecture

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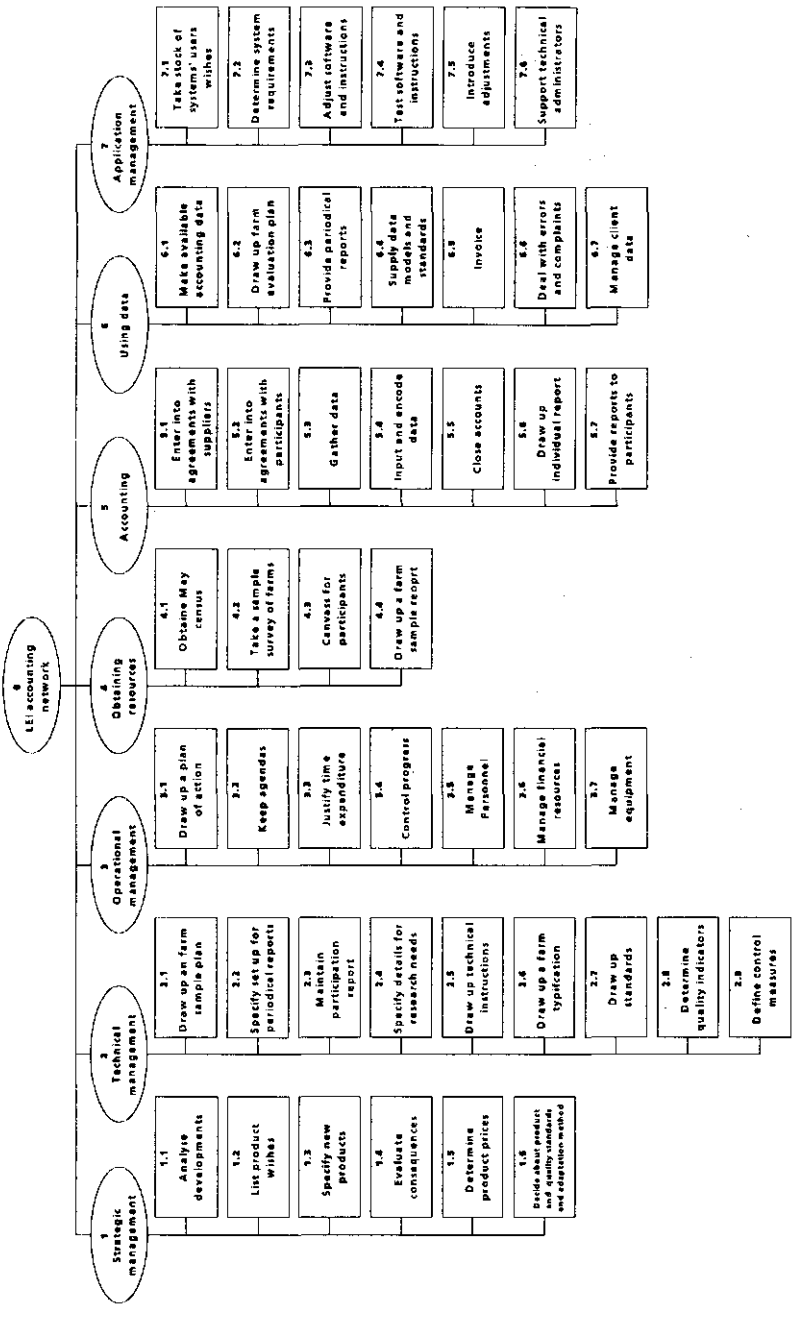
Appendix 1 Functional decomposition scheme and definitions



1. Strategic management
Manage the objectives and define products and quality demands of the LEI Accounting Network

1 Analyse developments
Describe which developments and information flows in the sector take place and research their importance to the LEI Accounting Network; determine which developments to anticipate and describe which problem areas will play a key role in future research.
2 List product wishes
By mutual agreement with clients and customers within and outside the LEI organization, research which changes in the product assortment of the LEI Accounting Network help to anticipate what the relevant developments will be; research LEI Accounting Network users' wishes.
3 Specify new products
Rough design of new products and list product and quality standards.
4 Evaluate consequences
Work out which process changes are needed for realising new products, how the changes can be implemented and what the expected advantages and disadvantages are.
5 Determine product prices
Determine the various prices for products of the LEI information network.
6 Decide about product and quality standards, and adaptation method
Determine which products the LEI Accounting Network will provide in the future and also determine how the necessary adjustments will be carried out.

2. Technical management
Record in detail which information will be gathered and provided, how this process will be carried out and managed and how to ensure the quality of the information.

1 Draw up an farm sample plan
Determine the strata and number of farms in a sample survey on the basis of the determined product and quality standards.
2 Specify set-up for periodical reports
Determine the structure and contents of tables in the periodical reports, resulting from strategic decisions concerning the periodical reports.
3 Maintain participation report
Determine the scheme of the participation reports resulting from changes in product standards.
4 Specify details for research needs
Specify changes in research data resulting from the determined product standards.
5 Draw up technical instructions
Carry out data management and maintain the process model for the LEI Accounting Network as a whole, including the following: definition of periodical reports, report to participants and the use of research terminology, the calculation schedule and all other codes, quality control and management information, and management of additional elucidation.
6 Draw up a farm typification
Draw up the calculation rules for farm characterisation.
7 Draw up standards
Calculate the yearly, seasonal and timeless quantitative standards for application to the Accounting Network (as regards to content).
8 Determine quality indicators
Perform a risk analysis and from this determine measuring points for the quality of data from the LEI Accounting Network.
9 Define control measures
Determine the adjustments to the information model that are necessary to ensure the compliance with the quality demands

3. Operational management
Manage the processes as mentioned in point 4.1 and further.

1 Draw up a plan of action
Periodically draw up and adjust a plan with a time schedule for activities to be carried out, which results must be produced, and which resources must be brought into action.
2 Keep agendas
Set down the daily planning of the employees
3 Justify time expenditure
Periodical record time spend per farm, employee and activity
4 Control progress
Periodically draw up progress reports, compare activities and used resources with the plan of action.
5 Manage personnel
Management and decide about the use of personnel resources.
6 Manage financial recources
Manage and decide about the use of financial resources.
7 Manage equipment
Manage and decide about the use of equipment, stock and offices.

4. Obtain resources
Make decisions pertaining to a sample survey from the population of registered farms and justify the survey to the EU

1 Obtain yearly May census
Order and collect the data for the yearly agricultural census and the accompanying name, address, and residence data; prepare the data for processing.
2 Farm selection
Specify and carry out sample surveys on the basis of the farm evaluation plan.
3 Canvass for participants
Approach the selected candidates and determine their willingness to participate; find out the suitability of their administration.
4 Draw up a farm sample report
Justify the sample survey according to EC regulations.

5. Accounting
Process data supplied by participants or other authorised parties (according to agreements made), resulting in closed accounts and accompanying technical data, including the reporting to the participant.

1 Enter into agreements with suppliers
Make and check the agreements with system managers from which, after participants' authorization, computerised data on the participants will be delivered.
2 Enter into agreements with participants
Preparation and legal covering of data supply by the participant and third parties who have been authorised by the participants; check whether the supply meets the agreements.
3 Gather data
Reception, registration, possible internal distribution and check supplied data on usability, completeness; set down requests for additional data and return data carriers (including data from the first year of participation).
4 Input and encode data
Process delivered data into entries and recorded technical data.
5 Close accounts
Edit, check and completion of recorded data, resulting in closed accounts; calculate indices for the report.
6 Draw up individual report
Draw up reports on individual farms.
7 Provide reports to participants
Provide reports to participants about their own farm and about farm sample plans; discuss reports with participants.

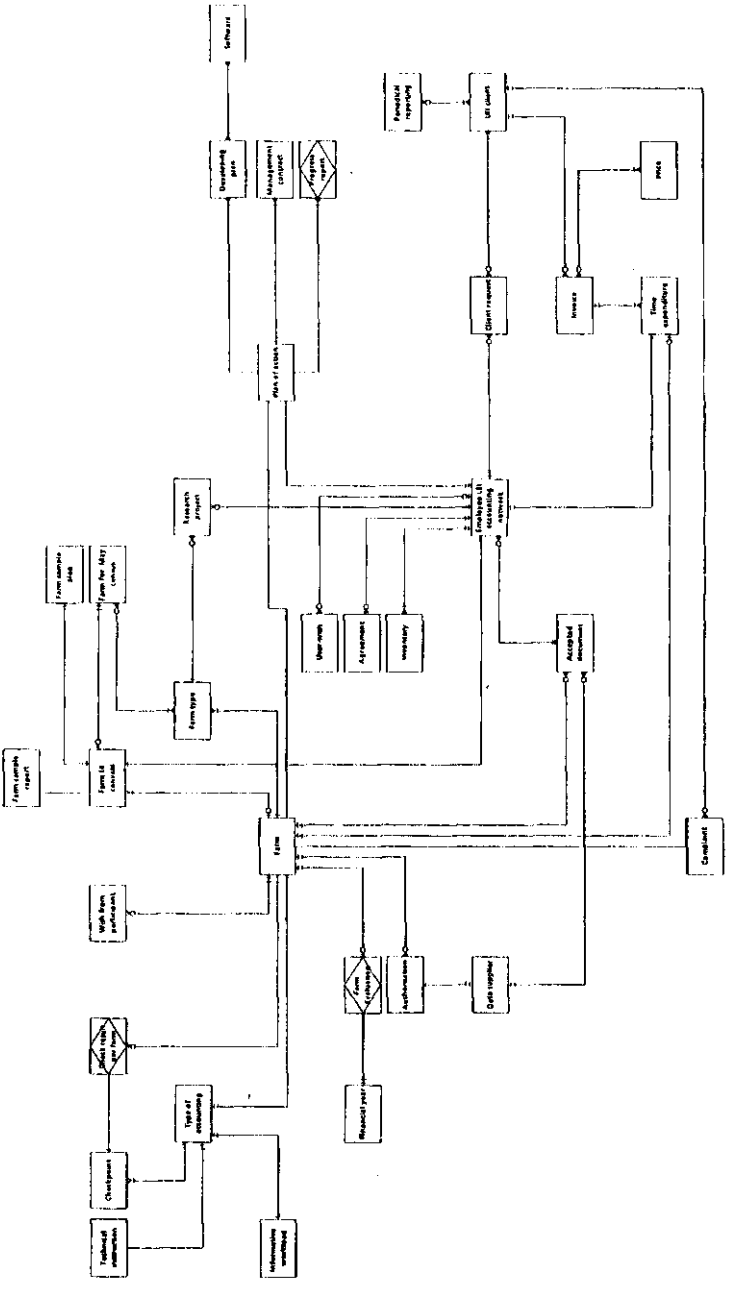
6. Use data
Use accounting data for their intended purposes

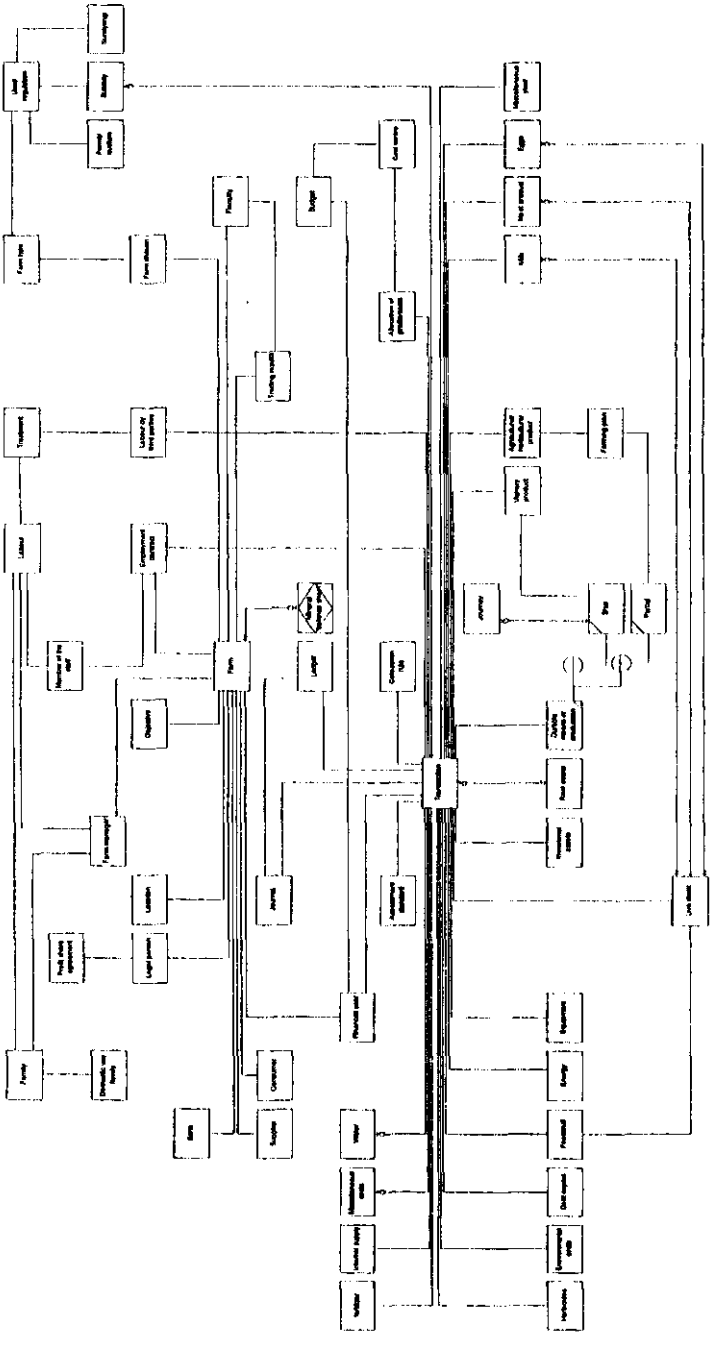
1 Make available accounting data
Record a frozen condition of the account for statistical use with an aggregation for the entire population; perform checks and calculate data for general use; inform users about the status and give permission for use
2 Draw up farm comparison plans
Compose groups and produce the farm evaluation plans.
3 Provide periodical reports
Produce periodical reports according to the determined specifications.
4 Supply data, models, and standards
Provide statistical products to clients, include information models, calculation schedules and quantitative standards
5 Invoice
Draw up and send invoices for services rendered.
6 Deal with errors and complaints
Registration of errors and of complaints from users of the LEI Accounting Network; monitor the full process up to final reporting to clients.
7 Manage client data
Update data about customers and potential customers of products from the LEI Accounting Network.

7. Manage applications
Maintenance of software and instructions, enable the use of software by employees.

1 Take stock of system users' wishes
Gathering of users' wishes and describe the desired software changes and changes in instructions in terms of system adaptation and expected costs and benefits.
2 Determine system requirements
Decide which adaptation of the system needs to be carried out on the basis of changes to the information model and system users' wishes
3 Adjust software and instructions
Keep up software for carry out processes in the LEI Accounting Network and maintain the working instructions for employees working with the LEI Accounting Network.
4 Test software and instructions
Check if software and instructions comply with system demands.
5 Introduce adjustments
Take organizational measures and provide necessary information so that suppliers of data, employees, and information users can actually carry through the changes to the LEI Accounting Network.
6 Support technical administrators (TAMs)
Answer TAMs' questions and provide solutions for problems the TAMs have with implementations of the accounting system and the instructions.

Appendix 2 Object scheme and definitions





Entity Type: Farm to canvass
Farm that is approached by the LEI to participate in the LEI Accounting Network.

Entity Type: Farm division
Division (branch) of a farm (pig farm, outdoor vegetables) from which the results are calculated separately.

Entity Type: Farm results
??(Derived data indicating the profitability of a farm).

Entity Type: Farm type
Farm type according to the farm typology based on the shares of the farm divisions.

Entity Type: Farm evaluation report
Report of the drawn up farm evaluations and the included farms and data types.

Entity Type: Farm manager
Manager of the LEI farm.

Entity type: Pesticide
Data about the supplied pesticides.

Entity Type: Process
Activities performed at the LEI farm.

Entity Type: Type of accounting
Type of accounting (cost-effectiveness/productivity, financial administration, sub-administration etc.)

Entity Type: Financial year
Financial year

Entity Type: Security
Financing method used at the LEI farm.

Entity Type: Cropping plan
Combination of wheat and parcels chosen by LEI farm.

Entity Type: Budget
Financing schedule drawn made by the LEI farm.

Entity Type: Check results per farm
Result and follow-up of the check on accounting performed by the LEI farm.

Entity Type: Checkpoint
Checks to be made on the LEI accounting.

Entity Type: Data supplier
Organization with which agreements are made on the supply of data for the LEI Accounting Network.

Entity Type: Participant's wish
Wish expressed by the participant concerning the services provided by the LEI farm.

Entity Type: Objective
LEI farm entrepreneur's objectives

Entity Type: Eggs
Data about eggs supplied by the LEI farm.

Entity type: Domestic use
Domestic use of the farm's products and means of production.

Entity Type: Energy
Data about the energy delivered to the LEI farm.

Entity Type: Evaluation
Remarks from the evaluation of a research project about the usability of the data from the LEI Accounting Network and the services provided by the LEI farm.

Entity Type: Invoice order
A drawn up concept invoice for the LEI administration resulting from carried out tasks.

Entity Type: Tax system
Fiscal data about the LEI farm.

Entity Type: Function
Data about the functions that are distinguished in the LEI information network.

Entity Type: Performance assessment
Recording the way the employees of the LEI information network performed their tasks.

Entity Type: Accepted documents
Data carriers obtained from third parties that are found to be suitable for processing (and are therefore not immediately returned because of uselessness).

Entity Type: User's wish
Wish formulated by LEI researchers and employees about the characteristics (definition, on time) of the data to be supplied.

Entity Type: Used regulation
Regulation created by the government in support of companies, which the LEI farm uses.

Entity Type: Crop
Crop cultivated by the LEI farm.

Entity Type: Family
The household of the LEI farm's manager.

Entity Type: Soil
The type of soil registered in the LEI Accounting Network.

Entity Type: Ledger
Sorting out of financial information relevant to the LEI farm, using accounting methods.

Entity Type: Internal traffic
Registration of the farm's own produce used within the farm.

Entity Type: Inventory
Furniture, computers etc. managed by the LEI employee.

Entity Type: Journal
Outline of the recorded financial data for the LEI farm.

Entity Type: Selection plan
Outline of companies to be selected from the LEI Accounting Network, divided into groups.

Entity Type: Client request
Request for research, data or elucidation on data by internal or external clients of the LEI Accounting Network

Entity Type: LEI researcher
Client of the LEI Accounting Network carrying out research for LEI-DLO.

Entity Type: Supplier
Organization that supplies goods or services to the LEI farm.

Entity Type: Assets
Stock and financial resources of the LEI farm (in so far as this does not concern a current account or cash, which is registered through transactions)

Entity Type: Location
Location (address etc.) of the LEI farm.

Entity Type: Authorization
Permission from the LEI farm to data suppliers to provide data directly to LEI-DLO.

Entity Type: Management contract
Agreement between the LEI board of directors and the head of a department about provided products and the available capacity.

Entity Type: Materials
Data about materials (other than feedstuffs and so forth) that have been supplied to the LEI Accounting Network.

Entity Type: Employee LEI Accounting Network
Person working with the LEI Accounting Network

Entity Type: May census farm
Farm that is registered by the Ministry of Agriculture, Nature Management and Fisheries and by the Central Bureau for Statistics.

Entity Type: May census year
Year from which the May census data are available at LEI-DLO.

Entity Type: Milk
Data about milk produced by the LEI farm.

Entity Type: Environmental costs
Brief restatement of the farm costs involved in environmental measures.

Entity Type: Prescriptive workload
Expected amount of work that is required for a standard working out a specific accounting.

Entity Type: Research project
Project carried out by LEI-DLO, using data from the LEI Accounting Network.

Entity Type: Other yields
Data about products produced by the LEI farm (other than milk etc.).

Entity type: Plot
Plot of land that is used for building or cultivating crops and registered by the Land Register.

Entity Type: Periodical reporting
Statistical report published by the LEI Accounting Network for a client or for public use.

Entity type: Member of staff
Employee working at the LEI farm, other than an (unpaid) member of the family.

Entity Type: Legal entity
Legal form in which the LEI farm is managed.

Entity Type: Calculation schedule
List of codes used for sorting transactions in a way that is characteristic of the type of accounting

Entity Type: Calculation rule
Way in which registered costs and profits (for example family use, labour, interest family farm income) is calculated by ratings.

Entity Type: Response
Results of an attempt to canvass a farm.

Entity Type: RICA farm
Data provided by the EU about a farm from the RICA.

Entity Type: Ship
Boat.

Entity Type: Software
Software used by an employee of the LEI information network.

Entity Type: Status
The extent to which the account from the LEI farm is processed.

Entity Type: Subsidy
Government subsidy received by the LEI farm.

Entity Type: Price
Price calculated for standard activities to external clients from the LEI information network.

Entity Type: Time expenditure
Time spent by LEI Accounting Network employees on a client or on processing the farm data.

Entity Type: Transaction
Financial facts relevant to the LEI farm (types: payments, stock, internal traffic, labour, write-offs, revaluation etc.).

Entity Type: Technical instruction
Instructions for employees and LEI researchers on the way the data are defined and must be recorded.

Entity Type: Type of cattle
Distinguished categories of animals in the LEI Accounting Network.

Entity Type: Livestock
Animals present on the LEI farm.

Entity Type: Feed
Data about feed delivered at the LEI farm.

Entity Type: Licence
Licence provided by the government.

Entity Type: Produce from fisheries
Data about produce from fisheries supplied by LEI farm.

Entity Type: Meat product
Data about the animals for slaughter supplied by the LEI farm.

Entity Type: Progress reporting
State of affairs for the processing of a specific year in the LEI Accounting Network.

Entity Type: Off-farm income
Funding attracted by the LEI farm.

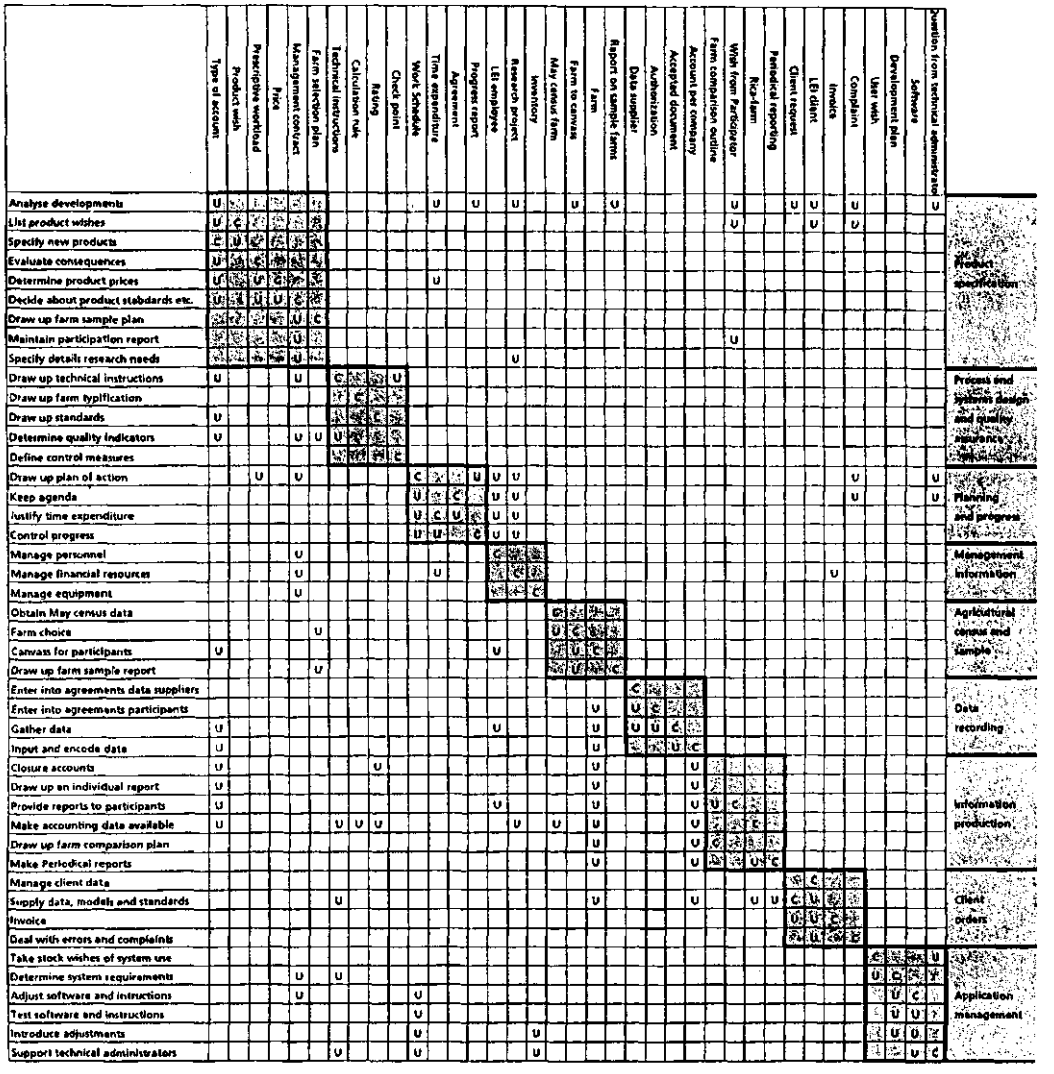
Entity Type: Rating
Standard rating used by the LEI Accounting Network for a specific year.

Entity Type: Labour by third parties
Data about the by the LEI farm agricultural contractor.

Entity Type: Working schedule
Plan for activities to be performed in a certain period of time.

Entity Type: Agreement on distribution of profits
Contract between the entrepreneurs involved with the LEI farm about the distribution of profits.

Appendix 3 Relations between processes and objects



WORKING GROUP SESSION 4

A step up to the next workshop

The objective of this working group session was to develop a list of subjects to be discussed during the second workshop. This list of issues will be input for the development of the programme of the second workshop.

The participants, split up in groups per country, were asked to formulate the subjects to be treated within the scope of the subjects for the second workshop. For the issues brought up by the countries, the participants promised to bee prepared to make a contribution for the nest workshop. Besides this the participants were asked if it would be possible to present a process model of their FADN in the next workshop. All participating countries, except for Italy, promised that they would try to develop a process model.

FINLAND

Description of national FADN
- history & future
- data content
- utilization
- costs
- sample, weighting
- indications

Procedures of innovation in FADN.
Finnish example in the work with Nutrient Balance Sheet (N.P.R.)

Relation FADN and policy making.

A process model and an object scheme of FADN in Finland.

Forestry accounting (Sweden & Finland)

SWEDEN

Environmental data in the FADN:
- quantities of fertilizers, pesticides
- use of manure
- animal health and ethics in the production

Important principles in calculations:
- valuation of stocks
- depreciations, rents etc.
- agriculture - forestry

The use of FADN data on national level and in the commission:
- present situation
- future

UNITED KINGDOM

All countries prepare a simple schematic of the structure of their branch of the FADN. Highlighting problem areas.

FADN/RICA - Into the Next Millenium.

- who are the information users
- what are their information needs
- what new data will be needed
- is the FADN the only source of these data
- how can 'outside' data be integrated into FADN

Changes in sampling procedures within FADN to improve confidence in estimates.

Data needs for economic behavioural modelling.
- technical and/or economic efficiency
- duality theory and data requirement

Measurement of non-farm incomes.
- methods
- inconsistencies with farm income data

Current cost accounting procedures in FADN.
- BLSA

FRANCE

State of the art farm information systems

- French farm information systems
- relationships between those systems and FADN models
- relationships between information models and process models in agriculture
- standards / 'references'

A process model and an object scheme of FADN in France.

SPAIN

Prospective on FADN-system.

Survey on users and non-users (trying to get information on actual situation of FADN network)in Spain.

Improve RICA/FADN network and make it useful according to users necessities and demands.
(It's always important to build tools 'prepared' by future users!)

Introduction of environmental variables in South european FADN-systems.

A process model and an object scheme of FADN in Spain.

ITALY

FADN in Italy
- organizational aspects, restructuring and evolution

Comparison between Dutch and Italian information model

Institutional structures concerning exchange of information in agriculture: the Italian situation.

NETHERLANDS

A first bite for a Reference Information Model (RICA-RIM)
- show complexity of RICA-RIM
- interfacing national data & RICA
- facilitate discussion on domain

Explanation of Euro Method and comparison with Information Engineering (EC sponsored?)

State of the art of farm information systems in Holland (ATC)

Uniform chart of accounts; national and EU.

EU-RICA

Description of existing EU-FADN and description of future system which is currently being developed.

Relation of FADN to policy making and the procedures of innovation in the FADN.

EPILOGUE

In the final session of the workshop the following concluding remarks were made:

- Objectives

Concerning the incentives to participate in the PACIOLI project a lot of different objectives were communicated. However, clear common elements in these individual objectives can be recognized. This implies that there is a good base to work together on a vision on 'FADNs in a new perspective'. On the other hand we have to be aware of the different perspectives from which this objective is perceived.

- RICA/FADN

Within the group that was present in Ameland there was remarkable concensus about 'the need for action'. For all participants it was beyond any doubt that new development of FADNs is necessary to survive. It was clearly stated that improvement of FADNs will not be enough, we should strive for INNOVATION of FADN. There is however a potential thread in the overwhelming consensus within the PACIOLI group. We have to take care that also actors within our environment who are not so enthusiastic, will be involved in our activities too. In the second workshop special attention will be on 'who to involve' on the road to FADN innovation.

- Strategic Information Management

In the workshop it was concluded that Strategic Information Management (SIM) is a difficult concept. In the PACIOLI context SIM is aimed at effective and efficient gathering and distribution of information. The Information Modelling (IM) approach and the Dutch experiences with IM have been introduced. Some problems with the use of information models have been identified, but also some possibilities for the use of IM in Pacioli. It was concluded that the various participating countries as a next step in Pacioli will try to use the IM approach to describe the FADNs in the various member states.

- Supply and demand of information

In further development of FADN it is stressed that more attention for the users of the FADN data is a prerequisite. Another aspect in the thinking about innovating FADNs and farm accounting is to take explicitly into consideration the developments and trends in the information and communication technology (ICT). In this respect one can think of e.g. the farmer as a supplier of data. It is also important not to forget to involvse the financers

of FADN in the further development of plans for innovation of FADNs. To combine the various aspects there is a clear need for a structured approach like the information modelling approach.

- Issues for the second workshop

The second workshop will be September 18-20, 1995 in Maastricht, The Netherlands. For this workshop also the other memberstates will be invited to participate. The second workshop will be about Farm Accounting, FADNs and the processes in which innovation takes place on both domains. All participants will make a global information model of their FADN and these descriptions will be compared and discussed.

- Overall

It was concluded that during the workshop there was a good and open atmosphere. Each of the participants discussed in a free and very open way; the level of interaction was very high. The PACIOLI group is on its way to a network (of flesh and blood) to discuss the 'tricky' issues in the FADN and RICA environment in a pleasant and constructive way. As a first step on the way to innovation of gathering farm data at EU level, one could say that there has been made a successful step in creating the platform that will prepare necessary and feasible proposals for the FADN environment.

ANNEXES

Annex 1 Determing farmers' financial information requirements

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The paper that is reprinted on the next pages describes a large research project carried out in the Netherlands between 1985 and 1990. It created an information model of all the financial decisions that farmers make. The paper is still an adequate description of the methodology of Information Engineering, applied to farm accounting.

The paper can be used in the first workshop as an application to farm accounting of the paper presented on the Information Engineering approach in general, and as a starting point for the paper on the LEI-DLO-project 'Accounting 2000'.

Originally the paper was presented in a workshop at the Department of Agricultural and Applied Economics of the University of Minnesota, St. Paul, in 1990 and published afterwards as chapter 2 in: K.J. Poppe: Information needs and accounting in agriculture, The Hague, LEI, March 1991, Mededeling 444.

Abstract

Information models can be used to promote the adoption of information technology by farmers. This paper describes the development of an information model for all the financial decisions that are made by Dutch farmers. From the point of view of the farmer this is an especially attractive activity because other organizations in the agri-business comply dominate the information flows, which can lead to a lack of integration at farm level. The success of information analysis depends largely on the quality of the information analysts and on the interaction between interested organizations. Diffusion of the know-how of the information analysts to the stage of system design can be supported by the use of a workbench but is nevertheless a critical test for this methodology.

1.1 Introduction

In Dutch farming, the development of information models is used to promote the adoption of information technology by farmers. This paper describes the development of an information model for all the financial decisions that are made by farmers. Theoretical aspects of the method and its place in software development are discussed. Organizational and practical aspects are also stressed. Some details of the model are given as an example, but due to the size of the model (235 processes and 110 entity-types) a complete presentation is impossible.

1.2 Strategies for information requirements determination

'An information system is complex and therefore needs an overall plan to guide its initial development and subsequent change' (Davis and Olson, 1984). This is also true in agriculture, which is dominated by small family farms. Compared with other industries these farms communicate relatively frequently with other organizations. In addition the degree of formality (e.g. in written reports, by record-keeping) of the information is rather low. These circumstances mean that agricultural software must convince the farmer that information handling is a profitable activity and not a waste of time. The swapping of data with suppliers, customers and especially advisors demands unambiguous definitions of the information, even without regard to the use of electronic data exchange. This is especially true if a growth path in the use of information technology is used and new software is first introduced by batch processing in central service.

Several methods for the building of information systems exist. Davis and Olson (1984) provide an overview: (1) asking, (2) deriving from existing systems, (3) analysing the environment in which the system(s) will be used (e.g. by decision, - critical success factors - or process analysis) and (4) proto-typing. Applying their selection criteria (Davis and Olson, 1984:489) and having in mind the introduction of information technology in agriculture on a large scale, only the third strategy has a chance to be successful. In a situation where the use of information technology is nearly absent, asking (representative ?) farmers or analysing the first emerging systems creates a lot of uncertainties. Proto-typing can be very useful, but is expensive and works only on application-level. So, analysing the decisions that are taken on the farm and the information that is used, will be the best strategy to promote the use of information technology on and round the farm.

Within this group of strategies, several formal methods exist, like Information Engineering, ISAC, NIAM, Critical Factor Analysis, Business Systems Planning and Systems Development Methodology. Differences between these methods are sometimes small. In this respect the use of a method is more important than the name of the method. In the Netherlands it was decided to use Information Engineering (IE) as a common method in determining the information requirements. The following sections describe the method and the organizational setting.

1.3 Information Engineering

The methodology of Information Engineering (Martin, 1982, 1986) is based on four principles. The first principle is that the development of management systems has to be based on a solid and stable foundation, so-called architectures, in order to get mutual consistent systems, which use the same data. Four architectures can be noticed: the information-architecture (a description of the activities and data), the system architecture (a description of information systems and databases), the technical architecture (a description of hardware, communication networks etc.) and the organizational architecture (which describes the tasks for operation, maintenance, education etc.) The second principle is that data are a more stable element than processes and procedures which use the data. The third principle is laid down in the word 'engineering': it is a method with strictly defined steps, with a defined product or report for each step. The fourth principle is a top-down approach, starting from the business strategy planning of the organization and ending with the use and maintenance of decision dedicated applications. The stages in this top-down approach are (figure A1.1.):

1. *Information Strategy Planning* (a global description of activities and data from which 'clusters' are selected. On basis of the business strategy a priority ranking can be made for those clusters).
2. *Business Area Analysis* (a detailed analysis of activities and data for a cluster, resulting in a detailed process- and datamodel).
3. *Business System Design* (identifying possible systems; for such systems processes are mapped into procedures and the datamodel into datastores).
4. *Technical Design and Construction* (building applications and testing).
5. *Transition* (implementation and training of users).
6. *Production* (use and maintenance of the application).

In a larger organization all these stages are completed within the firm. In Dutch agriculture the stages 1 and 2 are dealt with collectively by research institutes, experimental farms, the farm-accounting organizations and so-called branch organizations, in cooperation with software-makers, farmers and other interested parties. These branch organizations are founded per branch (type of farming) by the farmers' organizations to promote the use of information technology. Results up to stage 2 are published as a result of public research. In principle next stages have to be carried out by the private sector: independent software-makers or accountants, farmsuppliers and cooperatives that provide farmers with programmes and information. That means that several different and competing applications can be built from the same information model. In such a situation the information from the applications would be comparable, but their user interface could be as different as a pocket calculator from an integrated spreadsheet. In practice the branch organizations also operate some demonstration projects in which proto-types are built

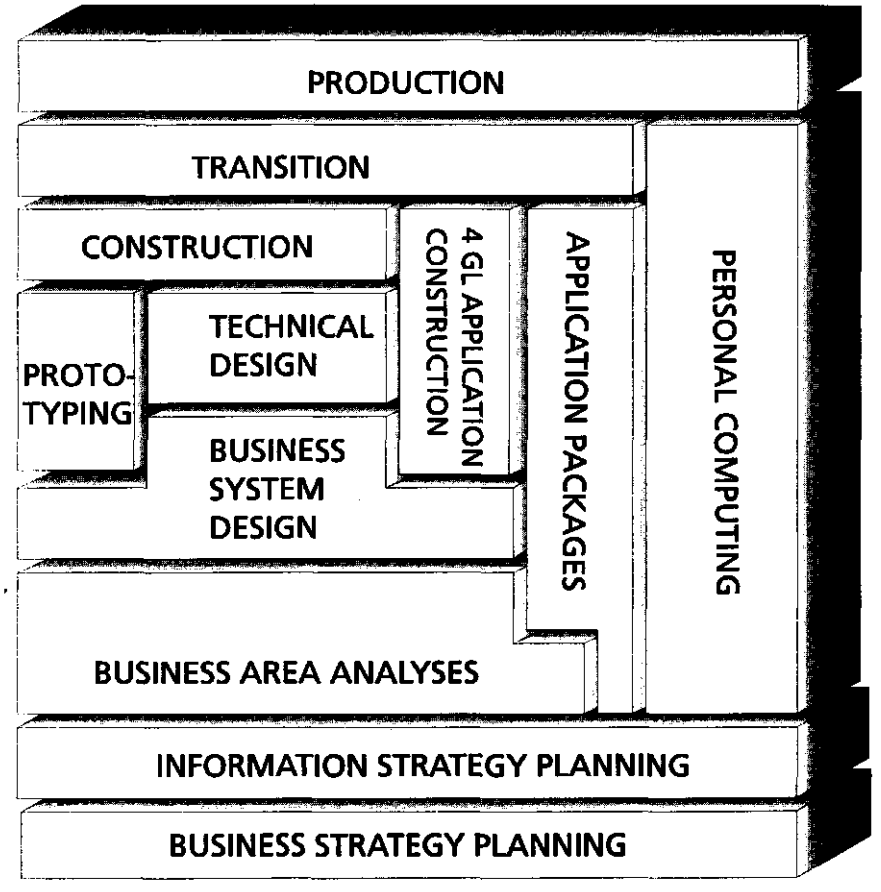

Figure A1.1 The Stages of Information Engineering according to James Martin

for the stages 3 to 5, in order to promote the use of innovative applications that are seen as too risky for the market. They also try to do some tuning in the field of communication networks like videotext and electronic data interchange, which are subjects of the technical architecture. The information model that is developed in the stages 1 and 2 of Information Engineering can also be used to detect blind spots in our knowledge. If decisions are identified, but calculation rules can not be formulated, then research proposals can be formulated to transform unstructured decisions into structured ones. The creation of the financial information model also lead to a publication on possible research topics for accounting in agriculture (Poppe, 1988). Education is another user of the information model. The decision-oriented approach makes an information model an attractive framework to organize seminars, courses and even text-books. Data definitions and calculation rules that are harmonized in the information model are interesting subjects for education.

Information models are huge pieces of knowledge and of agreements that need consistency checking and maintenance. These activities can be supported by organizational procedures (see paragraph 2.10) and by specialized software, the so-called workbenches. A workbench is a software-package in which the information model can be written down in such a way that changes can be made relatively easy, that consistency checks can be made, that diagrams can be drawn and that documentation on revisions of the model (when and by whom ?) is available. Results can be used in the further development of software, hence the name CASE-tool (CASE = Computer Added Software Engineering). In this project IEW (Information Engineering Workbench) from Knowledge Ware Inc. is used. Especially after the brainstorming-stages of a business area analysis have produced a more or less stable process model and data model, a workbench is useful in elaborating, checking and maintaining the model (Brand, Brinkkemper en Van der Steen, 1989).

1.4 Process model

In the first two stages of Information Engineering the process model and the data model play a central role. The process model describes all activities in the business that are related to information of decision making. The last addition makes sense: if we make an information model of moving cattle to another pasture, then essential processes are: deciding which cattle, deciding on which day, deciding by whom etc. But processes like driving cattle, opening the gate of the pasture and closing the gate would normally not qualify because these activities do not generate information. The total activity of moving cattle however can create the information that the cattle have been moved on that day. And if driving cattle can be done in several methods (e.g. by feet, by horse or by motorbike) and if the method will be evaluated later, than that activity is also an activity from an information point of view. The trick is to find the elementary processes, that are the smallest units of activity of meaning to a user as a decision-maker. The name of a process always contains a verb.

All processes of the business can be displayed in a process-decomposition-diagram, a structure which shows the breakdown of activities into progressively increasing detail. Elementary processes are the level with the highest detail; on a higher level there are functions, groups of business activities which together completely support one aspect of furthering the missions of the firm.

Figure A1.2 shows the process-decomposition-diagram for the financial and administrative decisions of the farmer. Functions with production-oriented decisions like health care, roughage production, cattle replacement, etc. have not been worked out in our model; Information models for each type of farming have been made by the branch organizations.

The functions in the process decomposition diagram are grouped into three levels of decision making: strategic planning (longer term, creating capacity), tactical planning (medium term, mostly 1 year, planning the use of capacity) and the operational decisions (day-to-day planning and execution of decisions). This classification is based on Anthony (1965). A fourth level is added for bookkeeping, reporting and analysis, for which the term 'evaluation' has been introduced. In this way the classification of the functions represents the decision-process, which has a circular character, quite well.

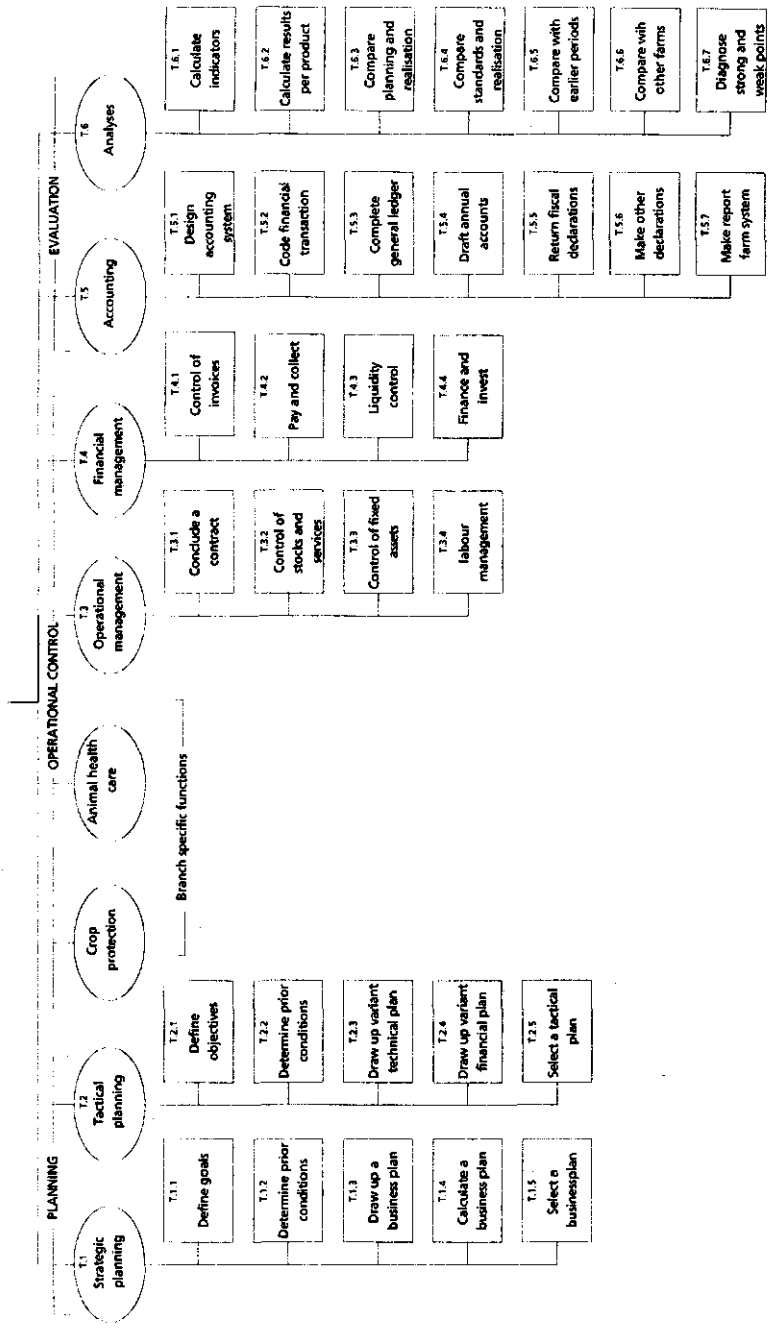

Figure A1.2 Process-decomposition diagram

Due to the size of the model (about 235 processes) not all elementary processes can be shown in figure A1.2. Annex 1 contains a list of the main processes. An example of the description of an elementary process is given in figure A1.3. It starts with a number and the name of the process. A definition and an explanation clarify the content of the process. In terms of elements of the datamodel (entity-types and attributes) the needed and produced information are given. In addition a process-description can also contain calculating rules and an estimation of the frequency of the process in the number of times per year the decision is taken.

1.5 Data model

The data model is at least as important as the process model. While procedures for decision making may change, data often stay the same. Central in a datamodel is the Entity-Relationship-Diagram (ERD). An entity is a fundamental thing of relevance to the decision maker, about which data could be kept. Entities can be tangible (a cow, a tractor), but can also be intangible events (a vetinary treatment) or abstract notions (a quality type of a delivery). A difference is made between an Entity and an Entity type, the latter being the collection of all the entities to which a specific definition and common properties (attributes and relationships, more details later on) apply. In a financial datamodel 'Balance sheet' could be an entity type, and the fiscal balance sheet of the farm for 31. December 1988 an entity. In other words, an entity is an occurrence of an entity type.

Entity types can be described in terms of their relationships and their attributes. An ERD visualises the relationships between entity types, hence the name Entity-type-Relationship-Diagram would be more correct. A relationship is a reason of relevance to the decision maker why entities from two entity types may be associated. Several kinds of relationships are distinguished:

- *Cardinality* describes how many entities may participate in the relationship. Forms are one-to-one (a worker can only have one labour-contract, but note that there can be 3 workers on the farm and therefore 3 labour contracts), one-to-many (an invoice can be paid by more than one payment, but a payment relates to only one invoice) and many-to-many (in a field-operation more machines can be used, and a machine can be used in more than one operation). These forms are also written as 1:1, l:n, and n:m, and symbolized in an ERD by a 'caltrop', a split line.
- *Optionality* describes if an entity of a given type always participates in a relationship. If this is not necessarily so, the relationship is called optional, which is symbolized in an ERD by a 'O' at the end of the relationship. For example, the relationship between the entity types Cow and Vetinairy treatment will be optional. In fact it will be an optional 1:n relationship because a certain cow will have been treated zero (so optional), once or many times.
- *Exclusive relationships* can exist if an entity type has two or more relationships that exclude each other. For example Vetinairy treatment can be given to a cow and to a pig (3 entity-types with two relationships) but as one treatment can only be given to a cow or (!) a pig, these relationships exclude each other.

Process: T.4.1.2.2 Checking received invoices

Definition: The checking of received invoices by comparing the agreed delivery or the executed delivery and with the agreed payment(s).

Comments: If the invoice is received after the actual delivery of the goods or services it should be compared with the data on the executed delivery. In that case the executed delivery is already compared with the agreed delivery. If the invoice has to be paid in advance of the delivery then a comparison with the agreed delivery should be made. In both cases the invoice should also be compared with the agreed payments. Depending on the outcome of these checking procedures the invoice will be accepted or disputed. The checking is carried out at the level of the invoice-lines but general conditions (e.g. on the terms of credit) can also be disputed.

Data flows:

Incoming:	INVOICE-DATA involves:		
	Entity type	Invoice	
	attributes	201136	Invoice-reference number external person
		201134	Invoice-date
		201076	Own invoice-number
		201048	Status accepted
		201172	Percentage cash discount/penalty
		201198	Circumscription
		201202	Payment stipulations
		201208	Date of receipt
		201233	Type of invoice
		201255	Currency
		700154	Amount
		700158	Total VAT
		700326	Number of delivery notice
	Entity type	Invoice-line	
	attributes	201137	Line Dumber
		201060	Amount
		201126	Debit/Credit
		700165	Quantity
		700166	Unit
		700167	Circumscription
		201224	Price per Unit
		700169	VAT amount
		201086	VAT type
		700171	VAT percentage
		700295	VAT mark
		201049	Status acceptation
	Entity type	instalment	
	attributes	700297	Status paid
		700298	Period of payment
		201081	Amount
	Entity type	External person	
	attributes	700072	Identification
	Entity type	Agreed payment	
	attributes	700240	Period of payment
	Entity type	Contract	
	attributes	700010	Date of contract

Relationships

INVOICE credited by INVOICE
INVOICE is result of AGREED PAYMENT
INVOICE is credited it in INSTALMENT
INVOICE-LINE is part of INVOICE
EXTERNAL PERSON sends INVOICE
CONTRACT leads to AGREED PAYMENT
CONTRACT exl concluded with EXTERNAL PERSON

AGREED PAYMENT involves:

Entity type	Agreed Payment	
attributes	700240	Period of payment
	200535	Date of payment
	201216	Amount
	700243	Price per item
	201211	Agreed method of payment
	700246	Currency
	201172	Percentage cash discount/penalty
Entity type	Contract	
attributes	700010	Date of contract
Entity type	External person	
attributes	700072	Identification
Relationships		
	CONTRACT leads to AGREED PAYMENT	
	CONTRACT exclusive concluded with EXTERNAL PERSON	
DELIVERY		
INVOICE-PROBLEM SOLUTION		these dataflows are not presented
Outgoing:	STATUS ACCEPTED	due to lack of
	CREDIT-INVOICE	space

Figure A1.3 Example of a description of a process In the workbench a difference is made between a description of a process (Definition, Comments and Dataflows) and a description of a dataflow (Name of the flow, Involves and a list of all the places where the flow occurs). According to the original methodology the two are combined is this example

Relationships can be described by short sentences that connect the entity types. In addition conditions can be formulated (e.g. a budget consists of twelve periods, a cow can have at maximum 2 calves at a moment). Due to the size of the model (about 110 entity types) the total ERD can not be shown in figure A1.4. An entity subtype is a collection of entities of the same type to which a narrower definition and additional attributes or relationships apply (e.g. 'fattening pig' can be an entity subtype of the entity type 'pig'). An attribute is a descriptor, whose value is associated with individual entities of a specific type. Attributes of a tractor are its licence number, the brand, its acquisition cost, the book value, acquisition date etc. Attributes can be basic (e.g. acquisition date), optional (e.g. licence-number) or derived (e.g. bookvalue). As derived attribute values can be calculated by the calculation rules of the process model, they are mostly excluded from the data model. Some basic attributes can be identifiers (or: key attributes) which mean that they can identify one and only one entity from all the other entities of the same type. If

attributes are given an identifying number, that number can be used in data transmission to refer to that attribute definition. An example of the description of an entity type is given in figure A1.5. The description starts with the name of the entity type. A definition and an explanation provide further clarification. The attributes, their character and the relationships complete the description. Figure A1.6 gives an example.

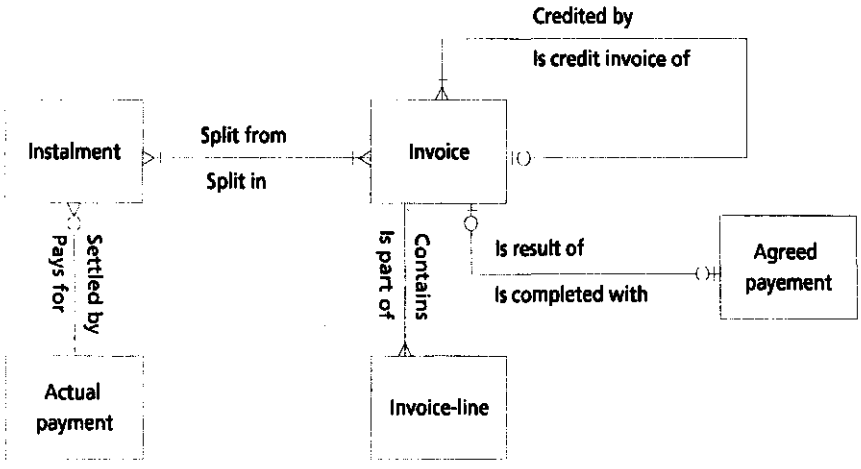

Figure A1.4 Example of an entity relationship diagram (All relationships between the involved entity types are shown, relationships between the involvedentity types are shown, relationships with other entity types -like those between Invoice and External person- were ommited for lack of space)

of a description of an attribute: name, description, possible attribute values and sometimes a domain and its format are given. A domain is a meaningful collection of values from which the values of several attributes can be taken. Domains like date, time, address are used to guard descriptions, formats and possible attribute values of comparable attributes, like customer address, employee address, delivery address etc. Figure A1.7 gives an example of a domain description.

Entity type: Invoice

Definition: Data on the obligation to pay or receive money for goods or services which are bought or sold.

Comments: The obligation to pay results from an agreed contract. Invoices can be split in incoming and outgoing invoices. In the information model both kinds of invoices are described with one entity-type, -which has two relationships with External person/organization: 'mailed by' for incoming invoices and 'received by' for outgoing invoices. These relationships are exclusive. In the agricultural sector nearly all the invoices are made by external organizations, which means that farmers have incoming invoices on their sales. Farmers seldom create invoices. Outgoing invoices are identified by an increasing number (attribute 'own invoice-number'). Incoming invoices are identified by the identification of the external organization and their invoice-reference number. The attributes 'description reason cancelled' and 'cancelled amount' are to be used in situations where the farmer and the external person make a verbal agreement to change the invoice without making a credit-invoice.

Attributes :		
	201136	* Invoice-reference number external person
	201134	Invoice-date
	201076	Own invoice-number
	201048	Status accepted
	201172	Percentage cash discount / penalty
	201198	Circumscription
	201202	Payment stipulations
	201208	Date of receipt
	201233	Type of invoice
	201255	Currency
	700154	Amount
	700158	Total VAT
	700292	Cancelled amount
	700293	Description reason cancelled
	700324	Indication transfer
	700325	Number of times dunned for payment
	700326	Number of delivery notice
	700333	Date transfer to collecting agency
	700336	Planned instalment
	700345	Date receipt dunning
	700347	Last date of dunning
	700356	Explanation solving dispute
	700357	Credit invoice to be expected

* = key

Relationships: INSTALMENT ex2 split from INVOICE
INVOICE contains INVOICE-LINE
INVOICE credited by INVOICE
INVOICE is credit-invoice of INVOICE
INVOICE is result of AGREED PAYMENT
INVOICE is split in INSTALMENT
INVOICE-LINE is part of INVOICE
AGREED PAYMENT is completed with INVOICE
EXTERNAL PERSON sends INVOICE
EXTERNAL PERSON receives INVOICE
INVOICE ex1 is send to EXTERNAL PERSON
INVOICE ex1 is send by EXTERNAL PERSON

Figure A1.5 Example of a description of an entity type

Attribute:	201134 Invoice-date
Definition:	The date stated on the invoice as date of creation of the invoice
Format:	-
Possible values:	-
Domain:	Date

Figure A1.6 Example of a description of an attribute

Domain:	Date
Definition:	The day that a certain action takes place, will take place or has taken place, recorded in a notation of the year, month and day (YYYYMMDD)
Comments:	Uniform domain for all information models
Format:	X(10)
Possible values:	-

Figure A1.7 Example of a description of a domain

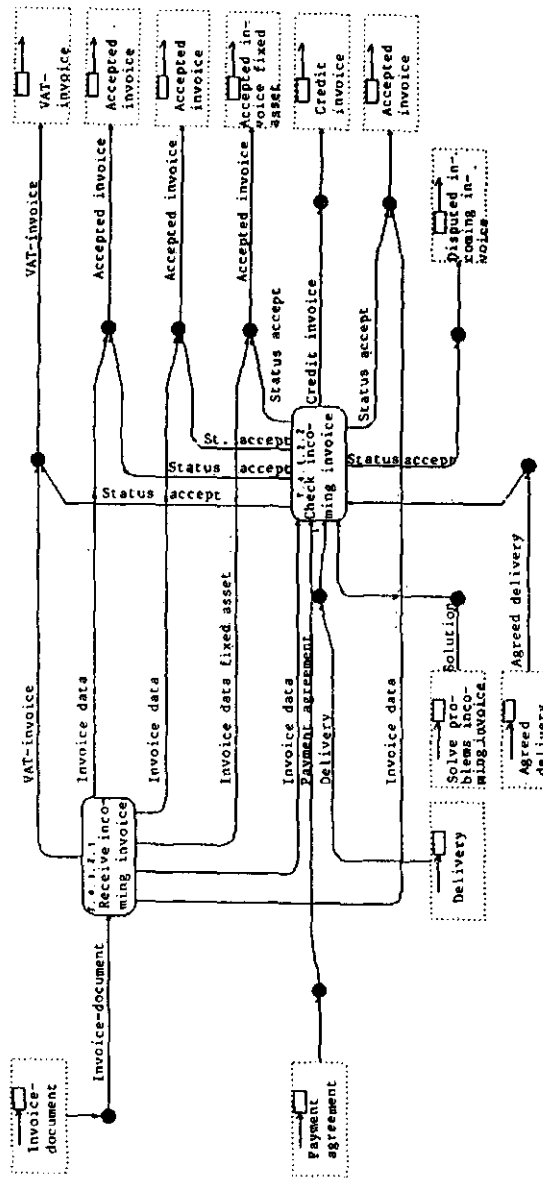

Figure A1.8 Example of a dataflow-diagram

1.6 Integration of process model and data model

As process model and data model represent two views on the same decisions they must be well balanced. The dataflow diagrams (DFD' s) are a first check. They show the dependency between processes. This dependency is shown as information views, which are flows of entities and attributes created in one process and used in another. Figure A1.8 gives an example of a dataflow diagram (or process dependency diagram). In addition to the processes also external objects are shown in a DFD. Those objects relate to organizations or data bases outside the farm that provide or receive information. Due to their comprehensibility DFD's can easily be used to discuss an information model.

A more formal way to check an information model is a create/use matrix. In such a matrix the processes are related to the attributes of the entity types. For each process, information is given on the use of all attributes: in the matrix a 'c' (for create), 'm' (for modify) or 'u' (for use) indicates if and how an attribute is used in a process. A first technical check is that all attributes must be created somewhere and must at least be used once.

A workbench like IEW provides some additional methods for checking. An experienced information analyst has also some general rules to judge a model. He will look for redundant relationships and he will notice that a non optional 1:1 relationship often means that the two entity types can be joined into one, unless one of them is an entity subtype. Sometimes an n:m relationship must be replaced by a new entity type and two relationships because a decision maker wants to know something of that relation. For entity types that are used and 'transformed' in different processes (like an invoice) a life cycle analysis can be interesting. It describes what can happen to an entity from the moment it becomes of interest to the farm till the time it ceases to be of interest.

1.7 Uniformity and bookkeeping

Uniformity of terminology is one of the main attractions of using information models. The definitions of entity types, their attributes and domains, as well as the descriptions of processes and their calculating rules all help to create uniform information between decision makers and between the farmer and other organizations in the agri-business.

With respect to bookkeeping however this is not enough. In an information model of farm decisions, bookkeeping will be modelled in a few processes (e.g. code payments as journal entries for the general ledger, value stocks on the closing date, make profit- and loss account) and in a few entity types (e.g. payment, inventory, profit- and loss account, account-name).

Because the annual accounting report of the farm is used by the farmer, his accountant and tax advisor, his bank and his advisory service uniform directives are important. The use of (parts of) profits- and loss accounts in study circles of farmers and the publication of reference norms on costs and profits by experimental stations also favour the introduction of such directives.

Therefore, the Agricultural Economics Research Institute LEI and the Organization of Agricultural Accounting Offices VLB published, in addition to the information model, a loose-leaf edition with a uniform scheme of account names (Chart of accounts) for the agricultural sector, under the Dutch acronym GRAS. It contains a scheme of account names and numbers, with uniform descriptions. In terms of the

information model they can be seen as possible attribute values for the attributes of the entity type Account-name. It also contains lay-out models and calculating rules (e.g. on depreciation) for the profit- and loss account, the balance sheet, the income statement and the flow of funds. In terms of the information model they can be regarded as calculating rules for the process Making annual accounts. Included definitions of ratio's and key figures (e.g. labour-unit, livestock units, solvability) can be seen as calculating rules for the process Calculate key figures, and as entities for such an entity type. Also included are valuation norms which can be used to value home produced feed or to value the inventory changes in livestock. These norms, which are updated every year, can be regarded as possible attribute values for the attributes of the entity type Valuation norm.

1.8 Model and reality

Davis and Olson (1984: 489) stated that every strategy for information requirements determination has its own uncertainties. In this section we look at the problems in applying IE in the way we did for Dutch agriculture. Some uncertainties have to do with the quality of the information analysts, the organization they work with and the money they have available. Those aspects are dealt with in the next section. Here we focus on the method of IE which creates an information model, and - as one of my favourite quotations states 'a model is always less than reality, except a photo model, who is in fact more than reality'. So it seems fair to mention the major discussions that were raised in the process of building this model for all the financial decisions that are made by farmers. In an arbitrary order:

- What does the representative farmer look like? A description of the decisions of all 130,000 Dutch farmers, or even of the top 10%, can hardly be realised in one information model. Even in financial decisions there are differences between farms in the same type of farming (e.g. is there a recording of stocks, are accounts payable and accounts receivable recorded, does paid labour occur, does the farmer create and send invoices or is that done by his cooperative or his costumers ?). In a reference information model such discussions can be solved by introducing additional optionalities, but that does not make the model any easier to handle. Developing several alternative models isn't attractive either.
- In addition to the first point there is the complexity of the family farm, especially when there are more entrepreneurs, as in a father-son partnership. Sometimes there exist in such a case only one cash-account but three or more separated forms of capital.
- Is an information model a model of everything that a farmer knows, or does it only describe the things he would be willing to record? Take for instance the entity type Contract which was introduced in the datamodel for important long-term contracts (like loans, futures etc.). From a legal point of view there is an implicit contract behind every financial transaction. The same reasoning can be applied to Inventory. Analysts that stress the methodological point of view according to which the incorporation of an entity or a process in a system (be it by hand or automated) rises only in the next stage of IE tend to incorporate such entity types and relationships. Others object for practical reasons. Beforehand it is not clear where the limits are. If an information model only describes the things which are nowadays recorded by farmers on paper, one could easily miss innovative aspects of information

technology due to the introduction of sensors and connection of personal computers with dedicated machinery (e.g. climate computers).

- Another point of discussion is the modelling of decisions that are of infrequent occurrence, like choosing a legal form, handing over the farm to the next generation and some fiscal decisions. We choose to show these decisions as processes in relation to others in the process-decomposition diagram but not to work them out in detail for reasons of efficiency.
- Aspects of time play a minor role in IE. If one receives a delivery of concentrates first and the invoice a few weeks later, or just the other way around does not have much influence on the information model. But if a farmer wants to calculate his fodder costs on a week-to-week basis then data on invoices and supplementary payments by cooperatives at the end of the year will be missing. That brings in extra processes and data, e.g. estimating the compound feed price.
- Where are the limits of the farm? Beforehand it is not certain that the farmers who use information technology will share out the same activities as their yesterday colleagues. At the moment nearly all farmers leave the bookkeeping activities to their accountant. So one could argue that processes as depreciating assets, calculating the profit and making the annual report could be omitted from the model. The same argument applies to planning calculations on investments, which are often done by the advisory service. Omitting such decisions would not only lead to less uniformity in information shared by the farmer and his advisors, but one can also imagine that better software and training could bring such activities back to the farmer.
- In addition to that point it looks reasonable to include entity types in the data model that have a clear function in the exchange of information between the farmer and other organizations. Some of these data, like a profit- and loss account or even a journal entry, are in terms of IE redundant information: all their attributes are derived ones that can be calculated as often as necessary. Because these entity types play such a central role in communication, and because their incorporation has an important positive influence on the communication value of the data model itself, accepting some redundancy here makes sense.
- In practice some information in annual accounting reports and management systems seems not to be directly decision relevant in terms of a processmodel. Information analysts tend to classify such data as meaningless, but that can be misleading. Information analysis is based on the idea that it makes sense and that it is possible to predict information requirements. Some experts question that axiom. March (1988) pointed out that a lot of information is not directly meaningful to take decisions or to reduce uncertainty, but that it acts as background information and to stimulate the creation of ideas and alternatives.
- We used the information model mostly as a normative approach to decision making by farmers. That does not necessarily mean that for instance investment decisions are in reality taken in a rational way, using a net present value concept as calculating rule. Another example is the calculation of cost-prices of arable products in a multi-product farm. Farm economists use gross margins and linear programming as a planning tool and are afraid that cost-prices based on full cost will lead to wrong decisions by farmers in the short run. Farmers however ask software makers to extend their programs from gross margin calculations to cost-prices.

For software development it is important to be aware of this limitations of using an information model. The advantages of using a model however outweigh these limitations because most of them only occur because one has to make a clear picture of the potential information users.

1.9 Organizational aspects

The determination of farmers' financial information requirements with the assistance of an information model has been carried out by the Agricultural Economics Research Institute LEI and the Organization of Agricultural Accounting Offices. Technical information models were made by the branch organizations for every type of farming. In this section we discuss the organizational aspects of the co-ordination within and between such models.

The financial information model has been made between 1985 and 1990. Thirteen working groups published on detailed subjects. The first three groups reported on the first stages of Information Strategy Planning: an introduction on the aims of the project, a global datamodel and a global processmodel. These studies were used to create interest with potential participants and to identify clusters that could be worked out in detail in the next stage. In that second stage, eight business area analyses have been carried out: on paying/collecting, on drawing up an inventory, on invoices/accounts payable/accounts receivable, on bookkeeping, on planning cashflow, on strategic/tactical planning, on business analysis and on stock management/personnel management. In addition, two reports were written on the uniform scheme of account-names: one on the scheme of accountcodes itself and one on lay-out models for the report with the annual accounts.

The advantage of splitting up the work between several working groups is that it is much easier to recruit specialists from accounting offices. These people find it already difficult to co-operate intensively for some months; a longer period would mean that only junior members of the staff would be available. Another reason is that specialists on bookkeeping, planning, fiscal matters etcetera can be asked to co-operate on the moment their experience is needed. Another advantage is that more people share their knowledge with the project and distribute the results. A disadvantage is of course that in the end only the management of the project knows all the details. Besides the two project leaders, only two other persons were more or less directly involved in most of the activities throughout the whole project.

Only halfway the project it became clear that workbenches like the Information Engineering Workbench would be useful for consolidation and maintenance. Until that moment the consolidation of the different reports into one model was postponed. Although all working groups had not only published an information model but also extensive reports on the current knowledge with respect to the subject and had documented there choices, it has been a labour intensive activity to enter all the results in the workbench. This had to be done by persons who did not take part in all the working groups, and even a good documentation has to be read and to be digested.

The two reports on the uniform account-scheme have been worked up into the loose-leaf edition GRAS mentioned above. The eight reports on the information model will get the same treatment at the moment they are all stored in the workbench.

The working groups were all supported by a methodological expert of *James Martin Associates* and by a reference group in which senior experts represented the accounting offices, the advisory service, the Ministry of Agriculture, the faculty of economics of Wageningen University, the agricultural banks, the insurance companies, the organization of agricultural software companies, the branch organizations and the experimental stations. A further co-ordination with the branch organizations, which will incorporate the financial information model into their technical model, took place in a working group with information analysts from this project and the branch organizations. They also dealt with a uniform application of the method and the workbench. This detailed co-ordination will make it possible to integrate the financial model in all branch models. That is efficient (otherwise the work should be done by 6 branch organizations) and it guarantees uniform definitions for mixed farms and for advisors working in different types of farming. In addition, all branch organizations had a working group on finance in which persons from this project collaborated with people from that sector in order to tackle specific financial subjects for that type of farming (e.g. calculating the value of livestock) and to integrate the financial and technical model.

On the whole 1) the working groups used fourteen man years (full time basis), excluding the commitment of persons in the reference group, the persons of branch organizations and James Martin Ass. About 75% of this time was used for making the information model itself, including coordination with the branch organizations, and 25% for the uniform scheme of accounts.

Measured in money at NLG 1,000,- (USD 500,-) a day, which includes a fee for fixed costs like computers and buildings, and also for travel costs and material, the direct labour costs would have been 2,8 million. This was financed (directly in money and by paying two researchers with the LEI) by the *INSP-plan* for promoting Information Technology of the Ministry of Agriculture (75%), by the Organization of Agricultural Accounting Offices (20%) and by the Agricultural Economics Research Institute LEI (5%).

1.10 From model to systems

An information model is an analysis of decisions and data within the farm and the relations with the environment of the farm in order to build an information system. The description of the method Information Engineering in section 3 already explained in general how a model can be used to create one or more systems. Here we look at the question in more detail, especially for the financial information model.

First of all it must be stressed that some results of our activities can be used directly in existing systems. The definitions of entity-types and attributes, calculation rules and of course the uniform account scheme can be implemented in existing software packages directly by the user or in new releases by the makers of the software. A few examples: several accounting offices already implemented the uniform account scheme and together with the information model itself it was used to discuss and solve differences in methodology between accounting practices and definitions used in planning software of the advisory service.

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1) Estimation in June 1990 for the whole, nearly completed model.

Beside co-ordination between software applications, the promotion of new applications is important. In the next stage of Information Engineering, called Business System Design, possible systems should be identified. That means first of all that a software maker has to identify product-market combinations. Considerations concerning interested types of farming, the number of farms, the level of knowledge that users have, the frequency of the decisions, and the product policy of the software maker will all influence the decision as to which systems will be developed. A matrix of processes versus existing systems can be very informative to analyse competing systems and to look for new market opportunities.

Also depending on the user knowledge that has been assumed, the degree of automation of the processes has to be established. Decisions that can be successfully automated tend to have the following characteristics: structured, frequent, demanding a lot of manual capacity, seen as problematic in present systems, able to communicate with existing automated systems, can be improved by using information technology, stable. Next, the processes can be mapped into procedures: a procedure is a method to execute one or more elementary processes. For one process, alternative procedures can exist, e.g. with different technics and/or at different places. An example: the process *Calculate liquidity report* can be done at farm level by a manual procedure (using a pocket calculator), it can be done at farm level in a procedure using a PC, if desired in connection with a network to import data from the bank-account, and it can be done by the bank or an accountant and transferred on paper or over a data-network to the farmer. The system design also demands a description of a user dialogue and of administrative procedures that support the automated ones. The data model will have to be converted into a data structure, including data stores and applying the normalisation rules. Depending on the product/market combination that has been identified, the technical context of the system must be chosen, including communication standards and interfaces.

Until now the interim reports of the project have been more successful in the coordination of terminology in existing systems than in creating totally new applications. One reason may be the low number of personal computers in Dutch farming (table A2.1), which makes it risky for software makers to develop new integrated packages. They tend to improve existing systems that also have been successful as central batch processing services.

Beside the low number of personal computers in agriculture there are perhaps some other reasons for the - until now - imperfect fit between model building and system design. One of them is that the use of Information Engineering supposes that the method is used in all stages, from strategic planning to the maintenance of software. In practice, a lot of software makers use another method or no method at all to control their development activities. Several software makers, be it practical farmers or researchers in institutes or experimental stations, work alone or in very small teams without much formal training in software development. Their product policies tend to be a reaction to questions by users on their existing programmes or to research ideas. In the years to come, a further professionalisation of the industry, including a restructuring, is likely.

Another reason is that even with the help of a workbench like IEW and the publication of detailed research reports on the content of the model, it is difficult to transfer knowledge from the information analysts who build the model to the users. The co-ordination between the financial model and the technical models was handicapped by the same problem. A first reading and discussion of the financial model by the branch organizations did not lead to many reactions, but when a connection in a workbench had to be made much more detailed questions rose. In

the same way it seems that ideas on possible systems which bubbled up in the process of making the information model are difficult to diffuse by publishing the model itself. A closer cooperation between persons who build the model and software makers could be helpful to stimulate the creative aspects of the system design.

The improvement of workbenches and other tools (like COBOL-generators), so that information models can be used directly to write programmes and create databases, certainly will mean a greater demand for information models, also in agriculture.

Table A2.1 Use of information systems in Dutch farming, 1989

Type of farming a)	Number of farms	Pers. (mgt.) comp	Video-tex users b)	Central service c)
Arable	6,570	600	1,085	0
Horticulture	11,680	1,250	3,430	725
Dairy	19,540	800	475	29,130
Pigs	3,580	1,400	30	6,200
Poultry	760	250	0	4,000
Total	47,040	4,300	5,020	40,055

a) Excluding mixed farms (which are however included in the total number of farms) and farms smaller than 50 Dutch size units, the size necessary to provide work for at least one person under efficient circumstances; b) More than one count per farm likely in arable and horticulture; c) Management information, excluding all forms of bookkeeping and annual accounting reports, which are obligatory for all enterprises by fiscal law. More than one count per farm occurs in dairy due to a large product range; The number of farms could be 10,000 - 15,000. The number of farms in intensive livestock includes many mixed farms.
Source: 3CLO.

A last point to be mentioned is the maintenance of the model. Maintenance is necessary for several reasons. First of all, agricultural research creates new know-how, which makes parts of the model obsolete. New administrative procedures by the government (e.g. the introduction of *set aside* in arable farming) or by other organizations (e.g. the introduction of quality-marks of a product that will influence its price) have the same effect. In the coming years the financial information model, including the uniform account scheme, will be maintained by two groups of experts. It is however not expected that all costs of those maintenance efforts can be shared with the users of the know-how.

1.11 Conclusions

A further introduction of information technology in agriculture can only be successful if a careful analysis is made of the decision making process in which the farmer should use the software. Information modelling provides such an analysis. An application from the point of view of the farmer is especially attractive because other organizations in the agri-business complex dominate the information flows,

which can lead to a lack of integration at farm level. More uniformity in definitions is a big advantage of information models.

Information analysis is not a cheap activity, but it can lead to better and cheaper software: most mistakes in software development are made in this stage of analysis, and correcting those mistakes is, in addition, more expensive than de-bugging programming errors. The use of a workbench can lead to better models.

The success of information analysis depends largely on the quality of the information analysts (Davis and Olson, 1984: 489) as they have to decide what exactly will be included in the model and what will be left out. They decide in a way, what reality looks like. Project management is therefore important and discussions with potential users (in our situation among others the branch organizations) must be stimulated. Nevertheless it is sometimes difficult to diffuse the know-how of the information analysts to the stage of system design.

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Appendix List of processes in the financial information model

- T.1 Strategic planning
  - T.1.1 Define goals
  - T.1.2 Determine prior conditions
  - T.1.3 Draw up a business plan
    - T.1.3.1 Select products
    - T.1.3.2 Calculate required land and quota
    - T.1.3.3 Calculate required other fixed assets
    - T.1.3.4 Calculate required labour
  - T.1.4 Calculate a business plan
    - T.1.4.1 Make an investment plan
      - T.1.4.1.1 Determine type of investment decision
      - T.1.4.1.2 Analyse replacement
      - T.1.4.1.3 Analyse investment project
      - T.1.4.1.4 Make a complete investment plan
    - T.1.4.2 Make a finance plan
      - T.1.4.2.1 Calculate required funds
      - T.1.4.2.2 Determine type of loan
      - T.1.4.2.3 Determine required security
      - T.1.4.2.4 Determine interest risk exposure
      - T.1.4.2.5 Determine required insurances
    - T.1.4.3 Select legal form and fiscal options
    - T.1.4.4 Calculate budgeted accounts
  - T.1.5 Select a business plan
    - T.1.5.1 Take advice
    - T.1.5.2 Decide

- T.2 Tactical planning
  - T.2.1 Define objectives
  - T.2.2 Determine prior conditions
  - T.2.3 Draw up variant technical plan
    - T.2.3.1 Select varieties and periods
    - T.2.3.2 Make a production plan
    - T.2.3.3 Make a maintenance plan
    - T.2.3.4 Make a labour plan
      - T.2.3.4.1 Calculate required labour per period
      - T.2.3.4.2 Determine available labour
        - T.2.3.4.2.1 Grant holiday claims
      - T.2.3.4.3 Balance available and required labour
  - T.2.4 Draw up variant financial plan
    - T.2.4.1 Make a marketing plan
    - T.2.4.2 Make a purchasing plan
    - T.2.4.3 Time investment
    - T.2.4.4 Make a tax plan
    - T.2.4.5 Make a plan for family transactions
    - T.2.4.6 Make a liquidity plan
    - T.2.4.7 Calculate budgeted accounts

T.2.5 Select a tactical plan
- T.2.5.1 Take advice
- T.2.5.2 Decide

T.3 Operational management
- T.3.1 Conclude a contract
  - T.3.1.1 Call in a quotation and market orientation
  - T.3.1.2 Make a quotation
  - T.3.1.3 Weigh alternatives
  - T.3.1.4 Conclude a contract
    - T.3.1.4.1 Record agreed delivery
    - T.3.1.4.2 Record agreed payment
    - T.3.1.4.3 Record other agreed terms
  - T.3.1.5 Control of contract
- T.3.2 Control of stocks and services
  - T.3.2.1 Control of production plan, marketing plan and purchasing plan
  - T.3.2.2 Control arrival (incoming delivery) of goods and services
  - T.3.2.3 Consume good or service
  - T.3.2.4 Production of a good
  - T.3.2.5 Control departure (outgoing delivery) of goods and services
  - T.3.2.6 Take stock
    - T.3.2.6.1 Record physical stock
    - T.3.2.6.2 Determine quality
  - T.3.2.7 Control stock differences
- T.3.3 Control of fixed assets
  - T.3.3.1 Delivery of fixed asset
  - T.3.3.2 Use of fixed asset
  - T.3.3.3 Maintain a fixed asset
  - T.3.3.4 Put a fixed asset out of use
  - T.3.3.5 Control departure of a fixed asset
- T.3.4 Labour management
  - T.3.4.1 Recruit personnel
    - T.3.4.1.1 Select target group recruit process
    - T.3.4.1.2 Select recruit channel
    - T.3.4.1.3 Select a candidate
    - T.3.4.1.4 Evaluate recruit process
    - T.3.4.1.5 Conclude labour contract
    - T.3.4.1.6 Maintain data employee
      - T.3.4.1.6.1 Record data on schooling and training
      - T.3.4.1.6.2 Record employee statement
      - T.3.4.1.6.3 Record statement reduced Wage tax
      - T.3.4.1.6.4 Record statement classification group Wage tax
      - T.3.4.1.6.5 Record authorization for lower Wage tax rate

T.3.4.1.7 Contract work out
T.3.4.1.7.1 Contract out a task
T.3.4.1.7.2 Contract A number of hours of work
T.3.4.2 Operational labour planning
T.3.4.2.1 Determine operations to be executed and the labour requirement per operation
T.3.4.2.2 Determine available employees
T.3.4.2.2.1 Grant holidays and floating days
T.3.4.2.2.2 Record announcement of illness
T.3.4.2.2.3 Record announcement of labour disability
T.3.4.2.2.4 Record announcement of work resumption
T.3.4.2.3 Make a weekly plan and provisional day plans
T.3.4.2.4 Arrange work at call
T.3.4.2.5 Make day plan and assign tasks to workers
T.3.4.3 Carry out labour and evaluate labour performance
T.3.4.3.1 Record data executed task
T.3.4.3.2 Record presence employee
T.3.4.3.3 Examine absence employee
T.3.4.3.4 Examine executed task
T.3.4.3.5 Examine skill of employee
T.3.4.3.6 Examine execution of contracted work
T.3.4.4 Calculation of wages
T.3.4.4.1 Record fixed data of employer
T.3.4.4.2 Record valuation data wage calculation
T.3.4.4.3 Calculate wage, holiday grants and cost reimbursements
T.3.4.4.3.1 Grant bonus payments and profit share
T.3.4.4.3.2 Grant cost reimbursement
T.3.4.4.3.3 Calculate wage
T.3.4.4.3.4 Calculate claim on holiday grant

T.4 Financial management
T.4.1 Control of invoices
T.4.1.1 Create outgoing invoice
T.4.1.2 Register incoming invoice
T.4.1.2.1 Receive incoming invoice
T.4.1.2.2 Check incoming invoice
T.4.1.3 Solve invoice problems
T.4.1.3.1 Solve problem outgoing invoice
T.4.1.3.2 Solve problem incoming invoice
T.4.1.3.3 Make pseudo credit-invoice
T.4.1.3.4 Clear incoming invoice and credit invoice
T.4.1.4 Control accounts receivable
T.4.1.4.1 Control invoice
T.4.1.4.2 Control debtor

- T.4.2 Pay and collect
  - T.4.2.1 Pay per bank
    - T.4.2.1.1 Pay per payment order / cheque
    - T.4.2.1.2 Pay periodical per bank
    - T.4.2.1.3 Record and check bank payment
  - T.4.2.2 Pay in cash
  - T.4.2.3 Collect per bank or in cash
- T.4.3 Control liquidity
  - T.4.3.1 Record agreed instalment
  - T.4.3.2 Estimate period of receipt
  - T.4.3.3 Calculate optimal period of payment
  - T.3.3.4 Control liquidity plan
- T.4.4 Finance and invest
  - T.4.4.1 Determine finance options
  - T.4.4.2 Determine possible liberation of invested funds
  - T.4.4.3 Determine investment options
  - T.4.4.4 Select an alternative

- T.5 Accounting
  - T.5.1 Design accounting system
    - T.5.1.1 Record units of the family farm household
    - T.5.1.2 Select accounting report options
    - T.5.1.3 Select method of stock registration
    - T.5.1.4 Maintain accounting codes
    - T.5.1.5 Maintain codesystem for inputs and outputs
    - T.5.1.6 Set up valuation standards
    - T.5.1.7 Maintain input-output coefficients
  - T.5.2 Code financial transactions
    - T.5.2.1 Record and code payment data
    - T.5.2.2 Record inventories
    - T.5.2.3 Record and code private transactions
      - T.5.2.3.1 Record contribution of money, goods or services from the family household in the business
      - T.5.2.3.2 Record use of business goods or services by the family household
    - T.5.2.4 Record other periodical items
      - T.5.2.4.1 Calculate and code depreciation
      - T.5.2.4.2 Calculate and code revaluation
      - T.5.2.4.3 Calculate and code calculated interest
      - T.5.2.4.4 Calculate and code calculated rent
      - T.5.2.4.5 Calculate and code calculated labour costs
  - T.5.3 Complete general ledger
    - T.5.3.1 Determine objects to be valued
    - T.5.3.2 Fix balance sheet items
      - T.5.3.2.1 Take stock of accounts payable / receivable
      - T.5.3.2.2 Value field inventory
      - T.5.3.2.3 Make corrections on entries
  - T.5.4 Draft annual accounts
    - T.5.4.1 Make and analyse liquidity report
    - T.5.4.2 Make fiscal annual accounts

T.5.4.2.1 Calculate fiscal balance sheet
T.5.4.2.2 Calculate fiscal profit and loss account
T.5.4.2.3 Calculate fiscal report fixed assets
T.5.4.2.4 Calculate fiscal capital report
T.5.4.2.5 Calculate fiscal flow of funds report
T.5.4.2.6 Calculate distribution of profit
T.5.4.3 Make commercial annual accounts
T.5.4.3.1 Calculate commercial balance sheet
T.5.4.3.2 Calculate commercial profit and loss account
T.5.4.3.3 Calculate commercial report fixed assets
T.5.4.3.4 Calculate commercial income statement
T.5.4.3.5 Calculate commercial capital report
T.5.4.3.6 Calculate commercial flow of funds report
T.5.5 Return fiscal declarations
T.5.5.1 Calculate declaration of VAT
T.5.5.2 Make report on WIR (Law on Investment Account)
T.5.5.3 Return declaration Income tax
T.5.5.3.1 Calculate Income tax and return declaration
T.5.5.3.2 Ask for taxing on 3-year average
T.5.5.4.3 Receive and check definite tax assessment
T.5.5.4 Return declaration Company tax
T.5.5.4.1 Return declaration Company tax
T.5.5.4.2 Return declaration Dividend tax
T.5.5.5 Return declaration Wealth tax
T.5.5.6 Calculate salaries and return declaration Wage tax and Social Security premiums
T.5.5.7 Return other declarations and make applications
T.5.6 Make other declarations
T.5.7 Make report on farm structure

T.6 Analyses
T.6.1 Calculate and analyse indicators
T.6.1.1 Make a sensitiveness analyses
T.6.1.2 Calculate indicators
T.6.1.3 Analyse indicators
T.6.2 Calculate and analyse results per product
T.6.2.1 Calculate gross margins
T.6.2.2 Calculate costprices
T.6.2.3 Analyse product results
T.6.3 Compare planning and realisation
T.6.4 Compare standards and realisation
T.6.4.1 Calculate normative results (standards)
T.6.4.2 Analyse comparison standards and realisation
T.6.5 Compare with earlier periods
T.6.6 Compare with other farms
T.6.6.1 Conclude contract for data exchange
T.6.6.2 Determine data to be compared
T.6.6.3 Determine farms to be compared
T.6.6.4 Receive data
T.6.6.5 Analyse report farm comparison
T.6.7 Diagnose strong and weak points

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