

CONFERENCE PAPER**AGRICULTURAL RISK MANAGEMENT -EXPERIENCES
FROM AN ACTION RESEARCH APPROACH**

*Mogens Lund, Arne Oksen, Torben U. Larsen, Henning Andersen, Henrik H.
Andersen and Arne Snefrup*

A new model for risk management in agriculture is described in the paper. The risk model is constructed as a context dependent process, which includes four main phases. The model is aimed at agricultural advisors, who wish to facilitate and disseminate risk management to farmers. It is developed and tested by an action research approach in an attempt to make risk management more applicable on family farms. Our obtained experiences indicate that farmers don't apply probabilistic thinking and other concepts according to formal decision theory.

Key words: Risk management, consulting, action research, farm families

Background and aim

This paper introduces a new model to risk management in agriculture. The model is developed by use of an Action Research Approach, which we successfully have adopted previously to develop strategic consultancy tools to farm managers. These experiences were presented at the 13th IFMA congress in 2002 in the Netherlands and later published in Farm Management (Lund & Larsen, 2002).

Our goal is to make risk management more practical applicable on family farms. To accomplish the goal we have – within the framework of Action Research - utilized the hypotheses that risk management in agriculture has to be understood as a process and that the content of the process is context dependent. While it has been recognised for a long time that applied risk management is a process, it is also fair to say that the contextual dimension of this process has not been systematically investigated. The basic idea is to tailor the process of risk management to the values and goals, resources and capabilities of the individual farm family.

In the next section of the paper we will describe our risk process model and briefly explain how it has been developed. Then in the following sections each of the phases included in the model are explained by hands on guidelines, a case story and by providing some reflections, where we especially exploit the contextual contingencies of the process. Main conclusions and implications for the future development and communication of risk modelling in agriculture are presented in the closing section of the paper.

The model framework

The presented model framework for risk management is created by a group of practising farm consultants and researchers in accordance with the development principles outlined in Lund & Larsen (2002). Hence, the practising consultants have provided the team with an improved understanding of the practice of risk management and have taken main responsibility for testing the developed tools in real consulting situations. The researchers, on

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the other hand, were responsible for constructing new supporting tools and studying relevant risk theories that may support and improve the practice of risk management performed by local consultants.

The developed risk model is directed practising consultants, who wish to apply risk management in their consulting services towards farmers. It might be in a consulting situation involving the whole farm family and business operation or in case of a more partial consulting situation, where e.g. an investment in new farm buildings has to be evaluated.

Risk is defined as the likelihood of an economic loss. Hence, the aim of risk management is to minimize such economic losses on the assets, equity, income and future welfare of the farm family (Olson, 2004). Although risks are measured by their economic consequences, it is up to the farm family to value the importance of these consequences. It is also common knowledge that risks can never be completely avoided in farm business management, but it might be balanced in accordance with e.g. the farm family's goals and their risk-bearing capacity.

We believe that a large number of realistic assumptions have to be fulfilled with respect to both the consultant and the farm family if there should be a successful outcome of the risk management process. As examples, the farm family should be motivated, have recognised the needs and be willing to invest some money and time in the process. On the other hand, the consultant should be able to define the risk problem perceived by the farm family and to ensure a relevant outcome of the process.

In order to identify and handle the many assumptions embedded in agricultural risk management understood as a context dependent process, the formulated risk model has been divided into four main phases:

- Recognition and demarcation
- Identification and prioritizing
- Search and evaluation of alternatives
- Implementation and monitoring

The content and application of the risk model is published in a recent handbook written for practising consultants working in the Danish Advisory Service (Lund et al., 2005). In the handbook each of the four phases of the risk model is explained and illustrated according to the same generic structure:

- How to do
- Examples – two examples are used, one showing a total approach to risk management and one example with a more partial focus
- Theoretical reflections

Although our paper is structured in the same fashion as the handbook, we only intend to present the total approach to risk management.

Recognition and demarcation

The first phase of the process model includes a recognition and demarcation of the farm family's needs for applying risk management on their

farm. A consulting contract is intended to be the final outcome of this stage of the process.

How to do

It is assumed to be the consultant's responsibility to identify the need for risk management, including the task of making a clear description of the risk problem perceived by the farm family. The phase includes the following steps:

1. An understanding of the farm's activities, production facilities, size, location, economy, labour force as well as the surroundings including barriers such as environmental and other rural restrictions
2. A knowledge of the farm family's values, goals and plans
3. A dialogue with the family to assess the economic needs for risk management and which risk factors that might be important
4. A further analysis of the farm family's actual risk perception
5. A presentation of the risk tools and procedures, which the consultant intend to utilize in the process
6. A consulting contract is made if the farm family decides to adopt a risk management process

Case story

Our case story is a farmer and his spouse, who bought a farm operation in 1993 and invested in new building facilities to 200 sows in 1998. During 2002 the building capacity was expanded to 250 sows. The production efficiency is considered to be above average. About 30 per cent of the piglets are sold at a weight of 7 kg, whereas the others are sold at a weight of 30 kg. A sales contract has been made, and the recipient is very satisfied with the piglets. In addition, an area of total 58 hectares, where 28 ha is rented, is cultivated. The farmer does all the farm work by himself with minor help from his father and a school kid. Although his wife has fulltime work outside the farm, she is responsible for all the book-keeping on the farm.

Problem recognition

At the time when the new stable was finished in 1998, the sow herd became infected with a vicious lung disease and mycoplasma even though all hygiene and veterinarian measurements have been adopted by the farmer. In the same period there was an economic depression implying that the produced piglets were sold at very low prices. Therefore, the investments have resulted in a tight economic situation on the farm, which have caused some problems with the bank.

The different disease outbreaks in the pig production and the associated problems with their bank have made the farm family worried: Which risk factors are of importance and how might they be managed?

Initially, the farm family had no clear perception of the potential risk factors or their own risk attitudes. After some preliminary considerations and talks with their economic consultant they decided to adopt a total risk management process. A start-up meeting was agreed to take place on the farm two weeks later, where the farmer and his spouse, the economic consultant and

two of his colleagues should participate.

Reflection

The case story indicates some of the difficulties in identifying the relevant risk problem. One major challenge might be the different perception of risk problems between the farm family and their consultants. Typically, agricultural specialists have been trained in formal decision tools, whereas farmers learn about risks and their consequences through their practical work and obtained experiences. It raises the question about the role and responsibility of consultants in the risk management process. Teaching farmers to apply formal decision tools to handle risk problems would be one solution to close the gap (Nelson, 1990). Although this seems to be the traditional approach in agricultural teaching and advisory, we believe that a more efficient starting point is to gain an improved insight in farmers' risk perceptions and their ways to handle these risks in practical situations on their farms.

From a practical perspective there are many kinds of ambiguities involved in the recognition of a risk problem. One reason is that there is always the risk of incomplete information, i.e. not identifying all the potential risk factors. Another more fundamental reason is however that problem representation is always dependent on our subjective knowledge and personal judgements. For an economic consultant dealing with accounting and economic planning price risks are typically seen as some of the most important risks, whereas biological or family risks may have the highest ranks among farmers. Arguing that price risks are more important than e.g. risks of illness involves inevitable value judgements.

Measurement of risk aversion is part of the value judgments. Identification of the farmer's and eventually his spouse's risk aversion is an important step to evaluate if there is a relevant risk problem to solve. Stated simply, risk aversion means that the farm family is willing to sacrifice something to avoid the negative consequences of specific risks. Different methods for elicitation of the degree of risk aversion have been developed (Hardaker et al., 1997), but they tend to be both highly hypothetical and time-consuming to apply. It is reasonable to say that no operational producers are currently available to measure the degree of risk aversion implying that this concept is also infected with a high degree of ambiguity. Therefore, due to both the incompleteness of available information and the subjective nature of our knowledge and judgments there is always the risk of solving the wrong risk problem.

The many ambiguities involved have led us to the conclusion that the recognition of risk problems as well as their content and scope should play a greater role in applied risk management than is usually the case. The six steps procedure outlined in this section clearly illustrates the important emphasis we put on the phase dealing with recognition and understanding of relevant risk problems. There is however no theoretical argument for decomposing the phase into exactly six steps – more or fewer steps might as well be appropriate.

Identification and prioritizing

The aim of the second phase in the process is to identify and prioritize the most important risks. Another labelling of this process, which is often utilized in public risk analysis of e.g. technological risks and food safety risks, is risk assessment (Glickman & Gough, 1995).

How to do

In our process model the second phase has been subdivided into 4 operational steps:

1. Identification of the potential risk factors
2. Prioritizing by the criteria: Significant/Insignificant
3. Prioritizing by the criteria: Likely/Unlikely
4. Prioritizing by the criteria: Influential/Non-influential

In what follows we are going to illustrate the four steps in our farm case.

Case story

Step 1: Identification of the potential risk factors

As a preparation to the meeting on the farm the consultants have made a list of potential risk factors for the production of piglets (not shown here). At the start of the meeting the list was discussed and revised together with the farmer and his spouse. The risks of a negative attitude in the bank, death of the farmer and/or his spouse and the sale price of piglets are all examples of new risk factors that were included in the original list.

Step 2: Prioritizing by the criteria: Significant/Insignificant

In our case each participant was asked to choose two risk factors from the revised list of risk factors, which should be evaluated as significant for the future economic performance of the pig production. The outcome of this step was:

The farmer:	Efficiency, Price of piglets
The spouse:	Efficiency, Price of piglets
Consultant A:	Illness – farmer/spouse, Negative bank
Consultant B:	No recipient of piglets, Production diseases
Consultant C:	Illness – farmer/spouse, Production diseases

A risk factor was considered as economically significant if it was chosen by at least one of the participants. Therefore, this prioritization resulted in a total number of six risk factors, which should be further evaluated. An improved interpretation and a more precisely definition of each of the six identified risk factors were undertaken as another subtask in step 2. The discussion resulted in the statements as shown in box 1.

Step 3: Prioritizing by the criteria: Likely/Unlikely.

As the next step each participant was asked to indicate whether each of the six economically significant risk factors were likely or unlikely.

Box 1. Description and clarification of the revealed significant risk factors

Risk factor	Interpretation	Definition
Illness – farmer/spouse	The farmer has sole responsibility for the production. It also have seriously consequences if his wife is getting sick	Illness and injures between 1 month and 1 year
Negative bank	The views of the bank are of great importance as it may stop for new credit arrangements	Maintenance of a positive attitude in the bank
Production efficiency	The farrow section is seen as the most critical stage in reaching high production efficiency	High efficiency by a large number of piglets per sow
Price of piglets	The farm economy is very vulnerable to low prices on piglets	Price of piglets
No recipient of piglets	Most of the piglets are today delivered to the same farmer	Termination of delivery contract due to acute changing conditions
Production diseases	More epidemic diseases such as PMWS than common production diseases	Diseases which requires total or partial herd replacement

Box 2. Prioritising by the criteria: Likely/Unlikely

Risk factor	Likely	Unlikely
Illness – farmer/spouse	Farmer, consultants A & B	Spouse, consultant C
Negative bank	Consultants B & C	Farmer, spouse, consultant A
Production efficiency		All
Price of piglets	All	
No recipient of piglets	Consultants A & C	Farmer, spouse, consultant B
Production diseases	Spouse, all consultants	Farmer

The result of the prioritization process was that the risk factor “Production efficiency” should be disregarded as everyone made the judgement that there is no significant uncertainty (i.e. downside probability of low efficiency) associated with this factor. No other factors could however be excluded, because adaptation of the principle that if at least one in the group judged the factor as likely, then it should

be regarded as sufficient likely to be further evaluated.

Step 4: Prioritizing by the criteria: Influential/Non-influential

The possibilities of influencing the risk factors were discussed in the group as the following step.

Box 3. The farmer’s and his spouse’s existing organisational preparedness

Risk factor	Existing preparedness
Illness – farmer/spouse	No preparedness against illness/injure with a duration of up to 1 year (except usual social security)
Negative bank	The bank is continuously provided with information, including budgets, to keep the goodwill
Price of piglets	Today no preparedness
No recipient of piglets	In the short-term the piglets may eventually be kept in farm buildings owned by the farmer’s father. Long-term there is however no preparedness towards the risk of termination of the delivery contract
Production diseases	The veterinarian is regularly visiting the farm and the farmer is taking part in the animal health care programme. Production specific hygiene rules are strictly followed and unauthorised entrance to the production area is prohibited. Quarantine facilities are established on farm owned the farmer’s father

It was evaluated that it is not realistic to obtain any kind of influence on the market price of piglets. Furthermore, it was evaluated that the current preparedness against exotic diseases in the production such as PMWS is sufficient at the moment. Hence, a general agreement was reached among the participants that the influence on the following risk factors should be further investigated:

- Illness – farmer/spouse
- Negative bank
- No recipient of piglets

Reflection

In order to identify and prioritise the many different sources of risks, it is necessary to impose some sort of structure on the process. In accordance with common practise in farm management we have divided the potential risk factors into 5 groups (Olson, 2004):

- Financial risks, *e.g.* availability and cost of capital
- Human risks, *e.g.* accidents in the working place or illness of the farmer, his spouse or employees
- Marketing risks, *e.g.* future prices of sale products and inputs
- Production risks, *e.g.* weather conditions, pests or production diseases
- Institutional risks, *e.g.* changes in income support schemes or environmental regulations

It is of course possible to utilize other systematic approaches. One rather well known approach is to make a distinction between repeated and unique risks. Examples of repeated risks in agriculture are fluctuations in crop yields and price variations. Dealing with such risks is the main focus in conventional statistical decision making as described in e.g. Hardaker et al. (1997). Statistical decision making is however grounded on several unquestioned assumptions, where the existence of subjective probabilities is one of the most important.

The inconsistencies of lay people's probability judgements have been researched by many psychologists and economists. As reviewed in Bell et al. (1988) these systematic errors may arise because people tend to overemphasize low probabilities and underemphasize large probabilities and appear to value probabilities of accepted risks lower than risks which they are forced to accept – although the first class of probabilities often are statistically much higher. Such paradoxes seem to be the logical consequence of the use of too much probabilistic thinking in agricultural risk management. With inspiration from the behavioural school our approach is only to use data that can be obtained in the real world and only performing such reasoning that can be carried out by reasonable men (Simon, 1978). In our opinion there is no convincing empirical evidence that ordinary people always do have subjective probabilities for even repeated risks and there is no logical argument why they should do so.

Unique risks such as the risk of new major oil crises or new tsunamis seem to be much more likely today than ever before. Unique risks are generally characterised by having a low likelihood of occurrence, but very high negative consequences if they actually happen. The governance of such extreme risks in the context of agricultural risk management has previously been reviewed in Renborg (1988). According to Renborg unique risks are best managed by farmers through a strategic planning exercise. As explained elsewhere, see e.g. Lund and Christensen (2003), the aim of strategic planning is to formulate a strategic plan, which may fulfil the overall values and goals of the farm family. Therefore, we are reluctant to reduce strategic planning to another word for risk management. Instead, we would rather argue that the formulation of strategic goals and plans are a prerequisite for making successful risk management on farms.

In our risk model no explicit distinction between repeatable and unique risk factors is made. Instead we rely on collective risk assessments which are governed by a priori selected criteria such as grouping the risk factors into Significant/Insignificant and Likely/Unlikely risks. Of course, many other criteria could alternatively be adopted such as ranking the impact of risks on a scale from 1 (no impact) to 7 (very high impact) (Koesling et al., 2004). We believe that the choice of appropriate selection criteria is contingent on a number of conditions, including the number of participants in the risk assessment process, their experiences and human capabilities. From a practical point of view the most important requirement for the chosen criteria to be useful is that they are made explicit to the farm family; and from a more philosophical perspective it is most important to realize that choices of

selection criteria also involves value judgements - which is a fact that tends to be overlooked.

Search and evaluation of alternatives

Choice of alternatives to mitigate or even eliminate if possible the negative economic consequences of the identified risk factors constitutes the third phase of the developed risk management process.

How to do

The content of the third phase has been subdivided into two steps:

1. Formulation of decision alternatives
2. Evaluation of the identified alternatives

Although multiple risk factors have been identified as both likely and significant in the previous phase, it is seldom realistic to handle a large number of risk factors at the same time in this phase. Thus, as a preliminary step to the search and evaluation of alternatives there may be a need for a further prioritisation of the revealed risk factors.

Case story

Searching for and the evaluation of alternatives to reduce the negative economic impact of the risk factors, which have been considered as both significant, likely and influential, were discussed in a new meeting held on the farm. The three consultants participated together with the farmer in that meeting. Based on his own risk profile, the farmer judged decision alternatives to reduce the risks associated with the risk factor illness – farmer/spouse to be of highest personal value.

Step 1: Searching for alternatives

The identification of decision alternatives for the risk factor illness – farmer/spouse was performed in a jointed dialogue between the farmer and the three consultants. A motivation was also explicitly provided for each of the identified alternatives. The outcome of this step is illustrated in box 4.

Step 2: Evaluation of the identified alternatives

Pros and cons of each of the formulated decision alternatives were revealed and discussed between the farmer and the three consultants. It emerges from the discussion that the farmer has preferences for the following alternatives:

- Documentation of the production routines in the piglet production (no. 1)
- Evaluation of personal insurances and social coverage (no. 2)
- Instruction concerning overall managerial tasks (no. 5)
- Agreements with the farm board (no. 7)

Box 4. Identified decision alternatives and their motivation

No.	Decision alternative	Motivation
1	Writing down the most important routines in the piglet production	To ensure that a stranger might be quickly introduced to the operation of the piglet production
2	Evaluation of personal insurances and social arrangements, which may be utilised in case of the farmer's or his spouse's sickness (up to 1 year)	To ensure a balance between the insurance and social coverage with the financial needs in case of illness
3	Annual health check	In order to prevent illness
4	Prevention of occupational hazards	Should be seen as an extension of a previous working place evaluation
5	Instructions concerning overall managerial tasks	To ensure that others may take over in case of an emergency
6	Working instructions, i.e. the spouse and/or the father are supervised in the daily production routines	Should be seen as a supplement to alternatives 1 and 5
7	Agreement with the farm board <ul style="list-style-type: none"> - to borrow labour assistance in case an accurate short term situation should arise - To assist in hiring new employees in case of a more permanent emergency situation 	To involve the established farm board, also in case of an emergency situation
8	Ensuring of the psychological health, e.g. by a weekly day off	To avoid permanent stress

Reflection

In our risk model the search for new decision alternatives has been divided into the same categories as the risk factors, i.e. financial, human, marketing, production and institutional alternatives. The reason is once more the need to put some sort of systematic into the identification process and consultants seem to be accustomed to think in this systematic manner. An obvious drawback is however the risk of ignoring eventually correlations, e.g. statistically significant relationships, between relevant risk factors. A negative correlation between price and production risks might be one example. Inappropriate alternatives may be identified and chosen if such correlations are overlooked or consciously ignored.

Despite the correlation problem our experiences indicate that the lack of available information is not the most important obstacle to formulate efficient decision alternatives to prevent or mitigate the negative economic impact of one or more risk factors. It is evident that the formulation of new alternatives is contingent on the knowledge, experiences and innovative capabilities of the involved persons. Therefore, we believe that the process is mainly hampered by psychological barriers. One of these barriers might be the phenomena called anchoring, which is well known in the decision making literature (Hogarth,

1980). Anchoring implies that people are inclined to look for new opportunities in the neighbourhood of what they currently are doing. Less recognised are the psychological effects of issues such as tacit knowledge. Tacit knowledge is knowledge, which cannot be articulated explicitly, but which is revealed by doing things (Lund & Larsen, 2002). Even though tacit knowledge is beneficial in many respects, it might very well be another psychological obstacle in the search for new opportunities.

More notable is however that decision making in the sense of making choices among revealed alternatives seems to be a very minor part of applied risk management. Although this observation is not new, it is striking that so much of the modern risk literature still are preoccupied with the development of decision criteria that can be deemed as optimal from a purely theoretical perspective. It is contradictory to the empirical observation that choices apparently are so painless to make in practice. If the intention is to educate people to make better decisions in face of risk and uncertainty, whether “better” ought to be interpreted as more rational, more informed or more sensible, the most depressing consequence of this theoretical obsession with decision criteria is that other relevant aspects are neglected.

One such relevant aspect is the question of framing of decisions. In decision theory, the framing problem is usually accredited to Tversky and Kahneman by showing that people’s choice of preferred hospital treatment were changing according to whether the treatment information was presented as the chance of survival or as the risk of death even though the probabilities were the same in both cases (Tversky & Kahneman, 1988). There is however reasons to believe these framing experiments are only one of many signs of the fact that our subjective knowledge and personal behaviour is context dependent (Sayer, 1992).

Implementation and monitoring

Within the developed model framework implementation and monitoring is considered as an important phase in the operational management of risks. Through implementation is the chosen decision alternatives assumed to be put into action plans and by monitoring it should be controlled whether the action plan is carried out as expected.

How to do

Depending on the specific circumstances the implementation can be done in two different ways:

- risk management as part of another consulting service
- risk management as an independent consulting service

In the first case risk management would typically be a supplement to a traditionally strategic consultancy process to farm families. Hence, before any strategic decisions are made the most important risk factors have been identified and appropriate means to reduce or absorb some of these risks have been evaluated and prioritised.

In the second situation risk management is understood as an independent

consultancy product. One possibility would here be to evaluate the farm family's need for risk management on an annual basis and if a need is revealed and other relevant assumptions fulfilled, then a written consulting agreement should be completed.

Monitoring of the risk management process implies that the action plan is continuously governed and eventually revised if significant unexpected events are happening. A clear task division between the farmer and his consultants, regular follow-ups and mutual feedbacks between the involved are main prerequisites for a successful governance of the implemented action plans.

Case story

An action plan for the chosen alternatives to reduce the potential negative impact of the risk factor: Illness – farmer/spouse was formulated as part of the second meeting on the farm. The action plan, which was set-up jointly by the farmer and the three consultants, is shown in box 5.

Box 5. Action plan for the risk factor: Illness - farmer/spouse

Alter-native ¹	Action	Responsible	Outcome	Deadline
1	Writing down the weekly and monthly working plans in the piglet production	Farmer	Text-document	1. Marts 2005
2	Updating the personal health insurance schemes	Farmer	New insurance polices	1. Marts 2005
2	Improved overview of social security benefits in case of illness	Consultant A	Information to the farmer	1. May 2005
5	Compilation of management instructions	Farmer	Text-document	1. June 2005
7	Discussion of compiled plans with the farm board	Farmer	Agreements with the farm board	1. September 2005

1) The number refers to the ranking of the alternative shown in box 4.

Before closing the meeting, it was agreed that the developed action plan should be evaluated on a new meeting held in the start of October 2005.

Reflection

Although implementation and evaluation is an integrated part of any managerial process, it is striking so little the conventional agricultural risk literature has studied these matters. It is typically recognised that the chosen decisions ought to be implemented and monitored, but it is not explained how it should actually happen.

Two main lessons may be learned from our experiences with implementing and monitoring agricultural risks. Firstly, it seems difficult if not impossible to say precisely when a selected alternative has been manifested into actions. The reason most likely is that there are many different

types of actions. One subset of actions invokes physical transformations as when the chemical spaying of crops is changed to reduce the negative effects of pests; another subset is financial actions such as purchasing a future or option to mitigate price risks; one may also think of social actions as e.g. making a mutual agreement between farmers to help each other in emergency situations. The provided case story clearly shows the fuzziness of putting actions into practice. For example, one may of course wonder whether “Compilation of management instructions” is really an action as stated in box 5.

Secondly, we have realised that the monitoring of risks are much more complex compared to traditional planning and control exercises typically adopted in farm management (Olson, 2004). Stated simply, the traditional monitoring approach is to determine some desired objectives, choose and implement appropriate actions in order to obtain the objectives, then observe any derivatives between the planned targets and the realized outcomes and take corrective actions if any significant deviations are observed. This managerial procedure is usually called a negative feedback loop (Stacey, 1993).

Negative feedback mechanisms are not applicable in the monitoring of risks because of one very simple fact: The basic idea of risk management is to prevent the negative consequences of risk factors before they actually happen. Hence, an action plan as shown in box 5 is made to prevent or at least mitigate the negative consequences associated with an illness of the farmer or his wife. Measurement of the realised consequences is therefore an inadequate and indeed very poor indicator of the success of a performed risk management process.

Instead the monitoring of risks should be carried out by applying principles that together are entitled positive feedback (Stacey, 1993). In positive feedback it is explicitly recognised that every plan and thus all kinds of intended behaviour is based on a fundamental set of assumptions. Examples of these fundamental assumptions or hypotheses embedded in the action plan illustrated in box 5 are that the farmer and wife are staying together, that the farm board continues to exist and that the compiled management instructions are not outdated by major changes in the operation of the pig production. Clearly, the nature of these assumptions is contingent on the specific farm and farm family that is considered. Thus, monitoring of risks by positive feedback mechanisms implies that such basic assumptions are revealed and monitored on a timely basis; and if some of these hypotheses change significantly over time, a new risk management process should be initiated, where new risk factors should be evaluated and new actions implemented.

Conclusions

The tentative conclusions that can be obtained from a process oriented and context dependent approach to applied risk management in agriculture are that:

- the definition of relevant risk problems is dependent on value judgements
- the risk assessment is always guided by more or less articulated criteria

- the formulation of new decision alternatives is mainly hampered by psychological obstacles
- the choice process plays a minor role
- the implementation in the sense of putting actions into practice is fuzzy
- the risk monitoring is driven by hypotheses – although they may be unconscious

Recently, Professor Webster has asked whether all the revealed “departures” from apparent “rationality” mean that the classical decision theory has no value (Webster, 2003). Our experiences lead to the same question; and our answer is also equal to that provided by Professor Webster: No. What is needed seems to be that future academia studies on agricultural risk behaviour and decision making are taking better into account the specific practical, social and cultural context of the human actors that are going to be examined. It is however a major challenge to achieve!

References

- Bell, D. E.; H. Raffia & A. Tversky (1988): *Decision making – Descriptive, normative, and prescriptive interactions*. Cambridge University Press, Cambridge, UK.
- Glickman, T. S. & M. Gough (editors) (1995): *Readings in Risk*. Fourth printing. Resources for the Future, Washington D. C.
- Hardaker, J. B.; R. B. M. Huirne & J. R. Anderson (1997): *Coping with Risk in Agriculture*. CAB International, USA.
- Hogarth, R. M. (1980): *Judgement and Choice: The Psychology of Decision*. John Wiley and Sons, England.
- Lund, M.; A. Oksen; T. U. Larsen, H. Andersen, H. H. Andersen; A. Snefttrup; K. Ladekjær, A. Larsen & P. Bonefeld (2005): *Håndbog i risikostyring (Handbook in risk management)*. Handbook in Danish published in cooperation between the Danish Advisory Service and Food & Resource Economics Institute, the Royal Veterinary and Agricultural University.
- Koesling, M.; M. Ebbesvik; G. Lien; O. Flaten; P. S. Valle & H. Antzen (2004): Risk and risk management in organic and conventional cash crop farming in Norway. *Food Economics*, Vol. 1, No. 4: 195-206.
- Lund, M. & J. Christensen (2003): *Implementation of Strategic Planning on Farm Businesses: Lessons from Danish Projects*. In A. Belmann & A. Lissitsa (ed.) (2003): *Large Farm Management*. Studies on the Agricultural and Food Sector in Central and Eastern Europe. Vol. 20. Agrimedia GmbH, Germany.
- Lund, M. & T. U. Larsen (2002): Development of Strategic Consultancy to Farm Managers: Experiences from an Action Research Approach. *Farm*

Management, Vol. 11, No.6: 409-423.

Nelson, G. (1990): *Risk Factors in Agriculture and their implications*. In NJF report no. 67: Risk Management in Agriculture.

Olson, K. D. (2004): *Farm Management – principles and strategies*. Iowa State Press, Ames, Iowa.

Renborg, U. (1988): *Risk Management In Farming – An Approach In Turbulent Times*. In proceedings from the 7th International Farm Management Congress. Copenhagen. Denmark, 1988.

Sayer, A. (1992): *Method in Social Science – A Realist Approach*. 2nd Edition. Routledge, England.

Simon, H. A. (1978): Rationality as a process and as a product of thought. *American Economic Review*, No. 68: 1-16

Stacey, R. D. (1993): *Strategic Management and Organisational Dynamics*. Pitman Publishing, Great Britain.

Tversky, A. & D. Kahneman (1988): *Rational Choice and the Framing of Decisions*. Chapter 9 in Bell, D. E.; H. Raffia & A. Tversky (1988): *Decision making – Descriptive, normative, and prescriptive interactions*. Cambridge University Press, Cambridge, UK.

Webster, J. P. G. (2003): New Times, New Challenges for Farm Management. *Farm Management*, Vol. 11, No. 9: 553-566.

About the authors

Mogens Lund (mogens@foi.dk) is head of the Production and Technology Division at the Institute of Food and Resource Economics and from 2003 he has been the chief editor of the scientific journal “Food Economics”. He has also been a visiting professor at Oregon State University in USA and The Norwegian University of Agricultural Sciences in Norway.

His research experiences include extensive work with risk and efficiency analysis, strategic management, cost-benefit evaluations as well as chain-wide and cross-boarder implementation of HACCP. The research results have been published in numerous articles and books. References to these may be found on the website www.foi.life.ku.dk

His fields of interest include microeconomics, efficiency and risk analysis, strategic management and the economics of agribusiness and food supply chains.

Arne Oksen and Torben Larsen, are from the Department of Economics and Law, the Danish Advisory Service (The National Centre), Aarhus, Denmark.

Henning Andersen & Henrik H. Andersen are from the Sorø-Slagelse