



### 3. MANAGEMENT APPROACH

**CHAPTER OBJECTIVES:**

- ❖ *To introduce the reader to the theoretical background of a rational decision;*
- ❖ *To explain the pre-choice activities of making a machinery decision;*
- ❖ *To discuss the choice activities when buying a new machine;*
- ❖ *To describe the post-choice activities after buying the new machinery.*

It is difficult to get information about farmers' decision making. It often constitutes unspoken knowledge that is difficult for farmers to explain to others and which is seldom written down. Decisions on farms do not always have to be explained or defended before they are taken. Convincing oneself is somewhat easier than convincing creditors or shareholders. Furthermore, farmers in most parts of the world have less time for managerial activities, as there are often few or no employees. Finally, the goals of the farm business and the family are often intertwined so that farm profit is not the only objective.

The econometric analyses dealing with areas such as farmers' demand for tractors often fail to find consistent explanations for farmers' net investments and the analysis based on farm level data does not seem to perform any better. One of the reasons for this is that the models lack variables which are important in the decision making process. Although these variables might be difficult to quantify, the conclusion is that researchers do not clearly understand the way farmers make investment decisions.

In 1992 a research project was initiated to give a better understanding of the decision behavior on Danish farms, looking at short, medium and long term decisions. Some of the findings from this research, together with subsequent research in the field, are presented in this chapter.

## 3.1. THEORETICAL BACKGROUND

Neo-classical production economics is based on the assumption that profit maximization is the only goal, and that the decision maker lives in a world with full certainty, full knowledge of all alternatives and their implications and, finally, that the decision maker is able to rank them in an unambiguous manner. It is the *economic man* approach. This provides an easy and stringent framework to operate from, but does not always describe how decisions are made in the real world.

For most theories involved, it holds that the conditions which they assume or have been tested under, are very different from the situation most farmers find themselves in, namely: limited time to find the important information and carry out detailed calculations concerning many alternatives with uncertain outcomes.

Studies show that experience from how decisions are made in industry can be used in analyzing farmers' decisions. In a comparison between industrial buying behavior and farmers' tractor purchase decisions, the conclusion was that they have many points in common. It found that the human element is of importance in both cases. Also, personality and behavioral attitudes, as well as economic factors, influence industrial decisions.

Most decision-makers want to make it look as if they make rational decisions. A rational decision can be seen as a logical, coherent decision that follows the criteria set for the decision process. A rational decision process leads to a rational result, but it is not always the case the other way around. What looks like a rational decision might not be based on a rational decision process.

Judging whether it is a rational decision depends on who is judging it. Three definitions of rationality can be adopted accordingly:

- **Objective rationality** is when a decision from an objective and external assessment made by a neutral observer is judged to follow the ideal given by the *economic man* model.
- **External rationality** is when an external observer assesses the decisions made by the decision-maker to be in line with the observer's perception of the world.
- **Internal rationality** is when the decision-maker makes decisions, which are in line with his own perception of the world.

The three definitions of rationality differ in who is the judge of the rationality and which ideal they are compared with. Often external observers assess other people's decisions differently from their own, as they are distanced from the problem. To describe other people's actions as irrational requires that one can describe the irrationality, because otherwise the reason might just be that the judgment is based on two different perceptions of the world.

## **3.2. OBTAINING INFORMATION**

The surveys carried out in the Danish research project has been based on interviews with the farmers founded on traditional decision models, but the main purpose was to get the farmers to describe how they make decisions. The idea was to get a deeper understanding and the farmers were asked open-ended questions. As the purpose of the analysis was to get comprehensive, in-depth information on the topic of economic decision-making, the analysis was based on a case-study approach. A total of 25 farmers were interviewed. The farmers interviewed have a very different background with respect to size of production and age, but all have animal production.

The farmers are typical, but not representative of Danish full-time farmers in general, as they are younger and with a larger production than the average full-time farmer. Furthermore, they were probably more open concerning their decision-making behavior than the average farmer. The sample of farmers chosen included both farmers that often contact the advisory service, as well as those who seldom do so.

## **3.3. DECISION PROCESS**

The focus here is on how to decide when and why to buy machinery. The findings are listed according to the decision process with focus on pre-choice, choice and post choice activities.

### **3.3.1. PRE-CHOICE ACTIVITY**

When farmers were asked about their decision process when buying machinery, they described it as consisting of two phases. A long phase of 6-12 months where they consider future investments; and a short action phase of up to 2 weeks

(sometimes only hours), where the choice of brand, dealer etc. is actually made. The first phase can be seen as a pre-choice activity and the latter as part of the choice activity. The interesting point is that farmers in the first period, the pre-choice period, do not seem to disclose their ideas to their bank, advisor or sometimes even to their spouse. When the decision is made, people around the farmer see it as a very sudden decision, whereas the farmer thinks it has been well planned.

This is supported by analyses carried out by the Danish Farmers' Union twice a year. Here approximately 1100 farmers are asked what they expect to invest in machinery in the period 3 to 9 months from the time they are interviewed. At the same time, they are asked what they have invested in the past 6 months. Farmers constantly underestimate future machinery investments. The actual machinery investments are fairly constant, around twice the expected level in all the years from 1979 to 1995. This result is similar to previous Danish findings. It should be noted that building investments are much closer to the expected level over the same period.

One would think that the expectations in some years were much closer or even higher than the actual level, but that is not the case, although investments have been fluctuating over time. The level of income does not seem to affect the precision of the forecast either. In all years, farmers expect to invest less during the following 6 months than they did during the 6 previous months. On average 17% of all farmers expect to make machinery investments every year, whereas 25% actually do make machinery investments. The increased investments are hence due to both more farmers carrying out investments, as well as larger investments being made by the ones who intended to invest. Farmers do not seem to learn from this because they are perhaps not confronted with both their first estimate and the actual investment.

The findings seem to show that when outsiders ask farmers about future investments, they disclose only the ones already decided upon, but not the ones under consideration. The results show that only 50% of all machinery investments are decided 3 to 9 months before. Only when asked about all future machinery investments in relation to an investment subsidy scheme, were the expected investments at the same level or even higher than the ones actually carried out.

### 3.3.2. REASONS FOR INVESTMENTS

Findings from the survey seem to indicate that fear of repairs and breakdowns were ranked highest as reasons for investments, followed by price, technology and as a fifth, working conditions. In a latter interview of the 25 farmers it was pointed out that the present machinery was not able to do the job as quickly as they wanted. The technology development and need for larger tractors meant that tractors had to be changed. Farmers also sell machinery in order to get a reasonable second hand price and avoid high maintenance costs. An important parameter in the decision-making is the developments in maintenance cost where only little empirical work has been carried out recently.

It seems that farmers over a period of time become more aware of the problems with their present machinery. Problems with e.g. the gearbox gradually become unbearable and the decision to buy is made. Findings in the UK show that technical performance and price were the most influential factors when deciding which tractor to choose.

Often, however, the fear of future breakdowns is overrated. The fact that a new tractor is better and more comfortable is often hidden in this excuse. The maintenance costs do not seem to increase dramatically over years although it does increase. The total cost seems hence to fall over the lifetime of a tractor when no technological development is assumed. There are however large differences between farms. Better working conditions etc. often give higher utility, but not necessarily higher income. The new technology and methods using fewer tractor-hours to carry out the tasks can give a lower cost, but it is not always the case. It is the farmer's choice whether he is prepared to pay in order to get better working conditions.

Many investments in tractors in recent years have been made due to new methods in cultivating and sowing, requiring fewer, but larger tractors. The yearly sales of tractors are 3,000 - 4,000 in Denmark, which is around half the amount sold in the 70' s. The average size of new tractors in Denmark has increased from 57 kW in 1980 to 77 kW in 1995.

In order to see how well the farmers estimated the machinery costs, they were asked to estimate the annual cost of a tractor costing 300.000 DKK. The results showed that the 25 farmers underestimated the cost by almost 30%. In a similar fashion, farmers were asked what their machinery cost per hectare is. This amount was compared to a calculated amount based on the farmers' own judgment of machinery inventory, maintenance etc. Here the cost per hectare

was also underestimated by 30%. It was clear from the interviews that the calculations leave a lot to be desired and that farmers do not seem to use these amounts in deciding whether to buy new machinery. The evaluation seems by a large degree, to be based on qualitative aspects.

In the second research project more focus was made on the calculations, but the result was negative. Very few of the farmers were able to show how the calculation they say they make were actually made. They seem more qualitative than quantitative in their assessment of the cost of existing machinery and the cost of the new machinery.

Farmers state price and usage as the most important factors in deciding when to buy. The tax year in Denmark finishes in December and statistics show that more than 35% of all new tractors and more than 50% of all new combine harvesters are sold in October to December. It is difficult to say whether the prices are lower in December, but the fact that farmers have more time to make the decision, combined with the fact that EU-payment and other *once a year* payments fall in December, seems to suggest liquidity to be a motivating factor.

Usage cannot explain the many investments made in November and December, as both tractors and combine harvesters are not used until the following spring or harvest. This seems to suggest that liquidity and tax reasons do play a role. For farmers who pay in December, however, the advantage of the tax reduction is often swallowed by interest payments until they use the machinery.

### 3.3.3. CHOICE ACTIVITY

Experience from Denmark seems to indicate that farmers are well informed about dealers and price levels. Findings from the UK, concerning a survey of 55 farmers, show that many farmers received their initial source of information about a particular tractor through previous experience, with previous ownership being the most dominant factor. Agricultural shows were ranked very low, but sales representatives came second. Asked about the influential factors in the purchase decision-making, they said that technical performance and price are the most important factors. The survey found, in line with the previous discussion, that two-thirds of all the farmers did not discuss the decision with anyone before it was made. The ones that discussed their decision discussed it primarily with local farmers. It is interesting that farmers do not get their initial source of information from other farmers and only a third discuss it with other farmers.

Yet they claim that approximately 70% of their neighbors purchased a similar model.

In Denmark there is clearly a high degree of loyalty towards the brand as well as towards the local dealer. It is important to have a local dealer, which can help the farmer out over a weekend. Using experience as a guide means that farmers tend not to look for available alternatives due to brand loyalty.

The survey concludes that farmers' behavior when buying a tractor, to a large extent, is parallel to the behavior of professional buyers in manufacturing and service industries. In both cases, a human element and experience, is the strongest determinant in the decision process. Farmers' purchase of tractors is similar to most industrial purchase decisions in that they are strongly influenced by both behavioral and economic factors.

Danish farmers get reductions when they buy new machinery. In the survey they estimated the reductions to be 20 to 30% of the official price. There seems to be a psychological effect causing more farmers to buy new machinery when they get a high price for their second hand machinery. Companies and importers of farm machinery have tried to make the official price more realistic, but most have returned to a high-price system as the sales fell. They say that farmers prefer to receive a high price for their second hand machine although the swap price is the same in the two cases.

A majority of the farmers interviewed say that their investments are based on the situation here and now, whereupon a frame is set for the cost of the actual machine. It seems crucial that, before these quick decisions are made, the farmer has the necessary information and is able to calculate the true cost, as no sparring-partner is involved in the process.

Concerning the level of investments, most farmers invest according to the earnings of the year and then they set a fixed limit per machine. It is then a case of getting the best possible machine given the amount of money. There is, however, no indication as to why it should be e.g. 150.000 DKK and not 130.000 DKK. There does not seem to be any clear financial consideration behind this level.

Danish farmers rarely contact neither their machinery nor their economic advisor during the pre-choice or choice phase. One of the reasons is that they do not know what the advisor can offer, but also that the costs involved are limited. Other farmers find that advisors are too critical. As farmers do not like a *no*, it is



safer not to ask for the advisor's opinion. Some farmers do ask the advisor when the machine is almost bought. This can be seen as the farmer's way of getting acceptance of the decision in order to be assured that it is the right decision. The decision process, however, is by then so far progressed that the farmer cannot stop.

### **3.4. POST-CHOICE ACTIVITY**

After the decision has been made, the question in relation to the future, is what can be learned from the decision made. Although the same machinery investment is not made often, experience concerning choice of brand and dealer can be used again. If the dealer is trustworthy and good at providing service he is more likely to get the next order. On the more technical and practical issues farmers clearly learn from one decision to the next.

Many farmers do, however, not seek to carry out more calculations. They do not find that the calculations they did carry out last time were wrong. The reason is probably that the calculations were not made with pen and paper. When maintenance is much higher than anticipated or the machine does not work on important times, then that might lead to change in brand. It does not seem that farmers are getting much better at forecasting their future machinery investments when asked in a questionnaire.

Furthermore, farmers do not seem to demand an assessment of their machinery cost. Although it only costs 3 to 5,000 DKK to have a thorough analysis of the machinery cost and advice concerning improvements, only 3 to 4% of Danish farmers have had one made during a period of 6 years. The main reasons seem to be that farmers do not want to know their actual level of machinery cost, as they do not think it can be improved or they find that the current level of equipment is what they want to have. Often they do underestimate the cost of having the way they want to. They think it is less than 200 DKK per hectare although it might be more than 1,000 DKK per hectare.

It is clear from previous research that farmers do not want to spend time on control. When the decision is made the energy is used to look forward and not backwards. In general, advisors have never focused much on control as the farmer find that it is the future that is important. This reduces what is learned from the decisions made and what is used in improving future economic advice.

The aim of learning is to make better decisions. It is however not always possible

to use previous experience if the situation has changed a lot since the last. For investments in machinery some experience can be used again, but not all, as there might be 8 to 10 years between purchases of the same machine.

### **3.5. FINAL REMARKS**

Many farmers indicate that they use not just economic criteria in evaluating their machinery decision. It is clear that their considerations to some extent seem to be similar to the considerations consumers have when they buy a car.

The findings suggest that farmers have a good knowledge concerning technical issues like brand and machine capacity, but not with respect to economic calculations. When buying machinery it is crucial that the farmer collects the relevant information and is able to make the necessary calculations, as no one outside the farm questions the basis on which the decision is made. New machinery may follow in line with the strategy of the farm, but knowledge of the actual cost is essential. For farmers who are not able to evaluate the cost of investments the risk of making the wrong investment is more likely and this can lead to economic problems. There seems hence a need for a discussion with external partners in this phase, but the advisor is seldom contacted.

It is not fair to say that farmers do not make economic calculations prior to investment decisions, but it is clearly difficult for the farmers to describe the considerations in greater detail. With the increased competition on the world market for agricultural products and the political agenda of many countries, the future crop prices are likely to fall. This should increase the awareness of how money is spent on machinery.

There is no harm in having high machinery costs if it is a choice made by the farmer. The additional costs can then be categorized as private consumption or the like. The important thing is that the farmer knows what the level of his machinery cost is.

### **3.6. CONCLUSION**

Although the study described in this chapter was done in Denmark, there is enough reason to believe that the results apply to the majority of farmers all over the world. In most cases, the reason why they under-estimate their future investment in machinery is that they will still make an impulsive decision in

buying unexpected additional machinery or trade in an old one. One can come to the conclusion that the majority of farmers does not have a long-term replacement policy and will rather act irrational or emotional on the supplier's marketing strategy.

Another important aspect arising from the Danish experience is that farmers underestimate their machinery costs by quite a big margin. This may also be applicable to the majority of farmers worldwide and the reason for this is that they firstly doesn't know which components are included when calculating machinery costs and secondly, that they don't have accurate information available when determining the costs. This emphasizes the fact that farmers don't approach their machinery management very economically and does not necessarily make machinery decisions that adds value to their profit.

### 3.7. REFERENCES

This entire chapter was taken from a paper delivered by Dr Brian Jacobsen, Senior Researcher: Danish Institute of Agricultural and Fisheries Economics, for an Internet seminar:

Jacobsen, B.H. 1999 : *The management approach towards agricultural machinery - a discussion of the behaviour behind the decision.* Agekon Internet seminar, June 4 1999. : *AN ECONOMICAL APPROACH TO AGRICULTURAL MACHINERY MANAGEMENT:* <http://www.computus.info/machsem>.

