



# Food Safety in the Swedish Pork Market

*- A Transaction Cost Approach*

*Erik Johansson*

---

*SLU, Institutionen för ekonomi  
Företagsekonomi  
D-nivå, 20 poäng*

ISSN 1401-4084  
ISRN SLU-EKON-EX--325--SE

*Examensarbete 325  
Uppsala 2003*



# Food Safety in the Swedish Pork Market

*A Transaction Cost Approach*

*Livsmedelssäkerhet i den svenska svinköttsbranschen –  
en transaktionskostnadsteoretisk ansats*

*Erik Johansson*

Supervisor: Petri Ollila

© Erik Johansson

Sveriges lantbruksuniversitet  
Institutionen för ekonomi  
Box 7013  
750 07 UPPSALA

ISSN 1401-4084  
ISRN SLU-EKON-EX--325--SE

## Sammanfattning

Livsmedelssäkerhetssystem som kan garantera att maten är säker genom hela tillverkningsprocessen har blivit allt viktigare. Produktions- och tillverkningssystem blir allt komplexare, och slutkonsumentens är numera knappast inblandade i produktionen. Med ökad komplexitet och avstånd mellan olika led i förädlingen har kontrollsystem för livsmedelssäkerhet utvecklats. Problemet med många födoämnesrelaterade sjukdomar är att de är svårupptäckta; ibland nästan omöjliga. Beroende på födoämnestyp varierar osäkerheten om en viss maträtt är säker. Detta har många orsaker. Många produkter har en komplex framställningsprocess. Alla led i tillverkningen fram tills vi har slutprodukterna på vår tallrik har bidragit till den slutliga kvaliteten. Fläsk/griskött är inget undantag.

Livsmedelssäkerhet har alltid varit centralt i samhället. Som enskild konsument får man kontrollera så gott man kan att maten är säker. Livsmedelstillverkarna utvecklar egna livsmedelssäkerhetssystem med kontroller, säkerhetsprogram etc. så att deras produkter skall uppfylla vissa kriterier. De flesta länder har stiftat speciella lagar och upprättat myndigheter för att garantera säker tillverkning och hantering av föda. Upprättandet av en säker livsmedelsproduktion medför olika kostnader. Utan dessa åtgärder kan än högre kostnader uppstå, nämligen om födoämnesrelaterade sjukdomar bryter ut. Fläskkött är en stor vara i Europa och det är stora variationer mellan producenterna. Kostnaden för att uppnå uppsatta kvalitetsmål varierar. Vad är det i produktionen som påverkar säkerheten och på vilket sätt åstadkommer olika företag den önskade livsmedelssäkerhetssituation?

Syftet med denna studie är att utreda hur livsmedelssäkerhetssystemet fungerar samt kartlägga betydelsefulla institutioner för livsmedelssäkerheten. Häri ingår att undersöka vilka effekter företags storlek och ägandeform har på livsmedelssäkerheten.

Transaktionskostnadsteorin används i studien för att upptäcka ursprunget till de kostnader som livsmedelssäkerhetssystemen medför, t ex kontroller och nationella program. Det finns tre huvudfunktioner som påverkar transaktionskostnader. Med hjälp av en varas karaktär kombinerat med antaganden om mänskligt beteende, kan de ursprungliga kostnaderna för livsmedelssäkerheten klarläggas. Den tredje komponenten är institutionerna, d.v.s. de regelsystem, som människor använder för att kontrollera kostnaderna. Regler påverkar vårt beteende och gör det mer förutsägbart.

Utifrån teorin konstrueras en lista med frågor för att samla in empiriska data och en metod att analysera dessa utvecklas.

Studien visar stora skillnader i kostnader/förutsättningar för livsmedelssäkerhetsarbetet beroende på företagsstorlek och ägarstruktur. De olika kontrollsystemen d.v.s. myndigheternas, företagets egna kontrollsystem och oberoende kontrollprogram inom marknaden för fläskkött har också olika effekt på transaktionskostnaderna relaterade till livsmedelssäkerheten och effektiviteten för företagen.

Spårbarheten och kontrollsystem är exempel på faktorer i anslutning till livsmedelssäkerhet. En verksamhets omfattning har stor betydelse för ovannämnda faktorer. Många kontrolltekniker är relaterade till stordriftsfördelar. Även mindre omfattande verksamheter har fördelar – de kan lättare styra livsmedelsäkerhetsarbetet. Detta beror på mindre komplexa system. De regelsystem som samhället påför företagen bör vara utformade så att företagen kan dra fördel av deras relative storleksskillnader.

Olika kontrollsystem minskar incitamenten till opportunistiskt beteende mellan handelsparter på marknaden. En ägarstruktur där handelsparter är integrerade visar sig också ha liknande effekt. Kooperativ, som ju representerar en speciell form av integration mellan producenter och kooperativa slakterier, har haft stort inflytande på den svenska livsmedelssäkerheten. Dessa företag har utvecklat kvalitetsprogram för sina medlemmar inkluderande aspekter på livsmedelssäkerhet. En ökad livsmedelssäkerhetsstandard vad gäller livsmedlens säkerhet hos de största producentgrupperna på fläskmarknaden (medlemmarna) har också gagnat andra företag i branschen. Program för livsmedelssäkerhet är exempel på institutioner, som visar hur företag hanterar dessa frågor. Externa program (myndighetsstyrda), företags egna kontrollprogram och oberoende program (BRC, ISO) är olika kontrollsystem. Studien visar att incitamenten till effektivitet varierar mellan dessa program. Organisationen och delegeringen av beslut rörande livsmedelssäkerhet påverkar också effektiviteten i livsmedelsäkerhetsarbetet. Efter hand som myndighetspersonernas auktoritet ifrågasätts allt mer, blir det allt viktigare med lagstiftning. Detta skulle ha stor betydelse för kostnaderna för att upprätthålla livsmedelssäkerheten.

För stunden undgår fläskköttsmarknaden många institutionella förändringar avseende livsmedelssäkerhet. Sålunda håller EU på med att ändra sina kontrollrutiner inom livsmedelsproduktionen. Institutionella utvärderingar som denna studie kommer förhoppningsvis att vara användbara då beslut skall fattas om hur framtida regler för en effektiv livsmedelstillsyn skall implementeras.

## Summary

Systems that guarantee safe food have become more important. The food production systems have increased in complexity, and the end-consumers is often little involved in the production. When the consumer was neighbor to the pig producer and the piece of meat was bought from the local butcher, the consumer had an almost “physical” control of the production system. With increased complexity and distance between different production steps other control systems have been developed for the coordination of food safety. The problem with many food related diseases is that they cannot be easily detected; it is in some cases almost impossible. Depending on the food item there is a varying uncertainty whether the item is safe or not.

Food safety is a central issue in society. Individuals take actions to make sure that the food is good to eat. Food processing companies develop their safety systems with controls, safety programs etc. so that their products fulfill certain criteria. Most nations have legislation and authorities to ensure that food manufacturing is safe. Arranging safe food production implies costs. However, without these actions the costs might be even higher if diseases break out. There are large variations between producers involved. The cost for assuring that their food production fulfills various criteria varies. What affects food safety in production and processing, and what are the ways of governing food safety in different companies?

The purpose of this study is to obtain an understanding about the function of the food safety system and relevant institutions for food safety in the pork marketing system. The study attempts to clarify what effects the size and ownership structure of companies have on the desired outcome of food safety.

Transaction cost theory is used to examine food safety. It is used to detect the origin of the costs of dealing with food safety matters e.g. food safety techniques, controls, national programs etc. The theory is based on three functions affecting transaction costs. With help of the theory the characteristics of a good combined with assumptions about human behavior, the original costs of food safety can be detected. The third component is the institutions, i.e. rules that humans use to control these costs. Rules affect human behavior and, thus, make actions by people more predictable.

Based on the theory, the list of questions was developed to collect empirical data. A model for analysis of data was also developed.

The study shows major differences in food safety in companies of different size and ownership structure. The control systems i.e. authorities, own control and voluntary systems in the pork marketing system, proves to have different effects on transaction costs of food safety and efficiency for companies in the sector.

Traceability and control systems are example of factors with a close relation to food safety issues. The size of an operation affects the above-mentioned factors. Many controlling techniques are related to relevant economies of scale. Also smaller operations

have advantages such as easier monitoring of food safety issues. This is because of less complex operations. The institutions of society should be designed to allow companies benefit from their relative advantages according to size.

Different control systems weaken incentives for opportunistic behavior between transacting partners in the market. An ownership structure where integration between transacting partners has been made has also proved to have the corresponding effect. Cooperatives represent a special form of integration between producers and cooperative slaughterhouse has had major influence on the food safety situation in Sweden. These dominating companies have developed quality programs for their producers including food safety aspects. An increased food safety standard of the largest groups of producers in the pork market (cooperative members) has also benefited other companies in the sector.

Food safety programs are examples of institutions for how companies are dealing with food safety issues. External programs (authority governed), own control programs (authority verifies and controls companies' own control of production), and voluntary programs, are the main control systems in pork marketing. The study shows that incentives for efficiency in reaching the desired level of food safety vary between programs. The organization and allocation of decisions influence the efficiency of food safety systems. The trend with less respect to authorities and more reliance on dispute settling by legislative enforcement is an institutional change that has an effect on transaction costs and food safety.

The pork market is presently undergoing institutional changes with respect to food safety. For example, the EU is changing its routines for control of food production. Institutional approaches could be useful when deciding about the future implementation of regulations for an efficient control of food production.



<b>1 INTRODUCTION.....</b>	<b>1</b>
1.1 Food safety – a still more important issue in modern society.....	1
1.2 Research problem and purpose of the study .....	1
<b>2 BACKGROUND .....</b>	<b>3</b>
2.1 The Swedish pork market .....	3
2.2 Laws and regulations in the agricultural sector .....	5
2.3 Authorities in the agricultural sector.....	6
2.3.1 Supervision of feed and animal production .....	6
2.3.2 Supervision of food production .....	9
<b>3 THE TRANSACTION COST APPROACH WITH RESPECT TO FOOD SAFETY.....</b>	<b>13</b>
3.1 Interdependence as a source of transaction costs.....	13
3.2 Sources of transaction costs .....	13
3.2.1 Assumptions concerning human behavior .....	13
3.2.2 Rules of interdependence.....	14
3.2.3 Dimensions of a transaction.....	15
3.2.4 Organization of transactions .....	16
3.2.5 Effect of size .....	18
3.2.6 Special properties of cooperatives .....	18
<b>4 THE APPROACH .....</b>	<b>20</b>
4.1. The pork marketing system.....	20
4.2. Tool for detection of transaction costs and institutions .....	20
4.3 Method.....	21
<b>5 CASE STUDIES.....</b>	<b>23</b>
5.1 Skövde Slakteri AB.....	23
5.1.1 Description of the marketing system .....	23
5.1.2 Production (pigs).....	25
5.1.3 The control system.....	26
5.1.4 Slaughtering .....	27
5.1.5 The control system.....	28
5.1.6 Analysis.....	32
5.1.7 Conclusions.....	36
5.2 Swedish Meats ek. för., Uppsala.....	37
5.2.1 Description of the marketing system .....	37
5.2.2 Production .....	38
5.2.3 The control system.....	41
5.2.4 Slaughtering .....	43
5.2.5 The control system.....	45
5.2.6 Question of traceability.....	49
5.2.7 Analysis.....	50
5.2.8 Conclusions.....	57

<b>5.3 SPÅNGA GÅRDSSLAKTERI, GLAD GRIS &amp; GRIS-TO-GO .....</b>	<b>58</b>
5.3.1 Description of the marketing system .....	58
5.3.2 Production .....	59
5.3.3 The control system.....	60
5.3.4 Slaughtering and cutting .....	61
5.3.5 The control system.....	62
5.3.6 Analysis.....	67
5.3.7 Conclusions.....	73
<b>6 GENERAL CONCLUSIONS .....</b>	<b>76</b>
6.1 Size.....	76
6.2 Ownership .....	77
6.3 Food Safety Control Systems.....	78
<b>REFERENCES.....</b>	<b>81</b>

# **1 Introduction**

## **1.1 Food safety – a still more important issue in modern society**

The access to safe food will always be a question of great importance. From time to time society is reminded about this when food born diseases break out. BSE and the food production related foot and mouth disease are examples of recent food diseases that have hit Europe. The attention from media around these diseases was large and the costs related to these two diseases were enormous. Within EU the discussions concerning food safety was intensified and it was stressed that new solutions to these types of problems must be found. Questions regarding food production and safety have come into focus.

The food safety situation varies considerable between the countries in Europe. Salmonella is a major problem in Europe concerning pork production. In 1953 Sweden had a serious epidemic outbreak of salmonella where more than 9000 people were infected and caused the death of 100 people. Through successful eradication programs concerning the disease Sweden together with Finland have gained the status as salmonella free within EU. Still 5,000 people in Sweden per year are found with the disease, six hundred of which have got the disease within the country. In 2002 more than 400 tons of meat was stopped at the border of Sweden because of findings of Salmonella, most of the reported meat was pork. Parts of the pork were labeled as salmonella free (Persson 2003).

Both state and private companies in the pork business use considerable recourses in their ambition to produce safe food. The costs spent on food safety reflect the demand from society. At the moment large changes are going on at the food market. Food producing companies are establishing their own food safety systems. Central authorities are also changing their routines. EU's recent establishment in Finland of a new office concerning control of food production is just one example of authority activity.

Today there are a large variety of pork-producing firms regarding size, owner structure organization etc. The food safety situation in pork production is a result of the joint effort of these firms. The variation in basic conditions between firms gives companies' different possibilities to solve their food safety issues in an efficient way.

## **1.2 Research problem and purpose of the study**

Compared to other food items meat and fresh milk products have always been surrounded by relatively extensive food safety regulations. One reason for this is that the nature of these items makes them relatively sensitive for development of various food born diseases.

The state stipulates rules that firms are subject to, rules implying controls, inspections and practice standards, etc for the firms. But the firms also have internal rules in order to carry out food safety issue in an efficient way. The mix of rule systems gives the incentives for producers to what ways production could be brought out. Firms in the pork markets wish to have the combination of rules that is most efficient for reaching a desired food safety situation.

The main purpose of this study is to obtain an understanding about the function of the food safety system in the pork market and relevant institutions for food safety.

In the examination of the purpose the study attempts to answer the following two questions according to size and ownership of companies:

1. What are the differences between small and large companies in reaching the desired outcome of food safety?
2. What differences does the owner structure of a firm implicate for the food safety situation?

## 2 Background

### 2.1 The Swedish pork market

An average Swede consumed 36 kg of pork meat in 2002. Most of the pork consumed is domestically produced, though, 11% of the consumption is foreign import. The major part of the imported pork comes from Denmark (56%), Germany (25%) and Finland (5%) (Nilsson 2003).

*Table 1 Supply of pork by source, 2002*

---

Production	285.000 tons
Consumption	322.000 tons
Import	60.000 tons
Export	23.000 tons

---

Source: (Nilsson 2003)

Pork is the largest kind of meat products consumed. Beef (24kg), poultry (~13kg), and sheep/lamb (0,9kg) are the three other large meat products consumed (Rutegård 2003).

4500 farmers produced pork in 2001. A structural trend among producer has been that smaller producers have quit while larger producers have increased their production, keeping the produced volumes relatively constant over the time.

In 2000 about 18% of the farmer produced more than 500 animals for slaughter per year. Large farmers delivered approximately 73% of the slaughtered volumes, (Statistics Sweden 2002).

Two major forms of production systems could be noticed; specialized and integrated systems. In an integrated system the pigs are born and raised at the same place. In the specialized system the small pigs are raised at one place and a certain age sold to a specialized fat pig producer. Sow pools (suggpooler) are a special type of specialized production. In these systems a group of fattening producers (satellites) receives animals from a small pig center. It's not unusually that the satellites commonly own the small pig center.

Producers in Sweden can be divided into two major groups, members of cooperatives and producers delivering to Investor owned (IOFs), or private slaughterhouses. Figure 1 shows the distribution between producers delivering to the cooperative and to IOFs/private slaughterhouses.

A total of 44 slaughterhouses reported pig slaughter in 2002 (Swedish Board of Agriculture, 2003). The two cooperative slaughterhouses, Swedish Meats and KLS dominate the Swedish slaughter market with 70% proportion of slaughtered volumes (Figure 2). The remaining volumes are slaughtered by investor Owned and privately owned companies. Most of these companies are organized in the Swedish Meat Trade Association (Sundblad 2003).

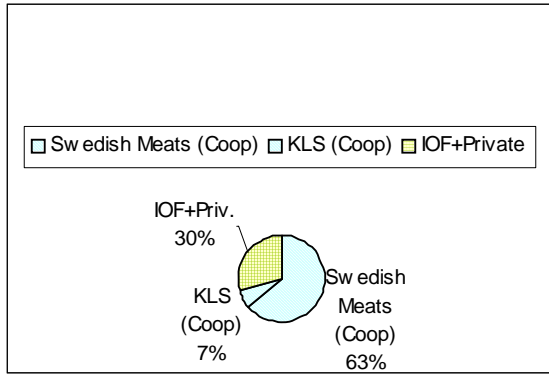


Figure 1: Distribution of producers' deliveries to cooperatives and investor-owned and other private slaughterhouses, 2002. Source: (Sundblad 2003)

A special group is the low-capacity slaughterhouses. The annual slaughter in these operations may not exceed 1000 animal units, or approximately 6500 pigs < 100 kilograms. In 2002 a total of twenty low-capacity slaughterhouses were reported for pig slaughter. Their total slaughter amounted to about 15000 pigs last year. To this group belongs many of the so called "farm slaughter houses" (Swedish Board of Agriculture, 2003).

The relative dominance of the cooperatives in the further cutting and processing of pork is decreasing. Andersson and Hoffman (1997) show a picture where the private cutting/processing industry counts for approximately 60 % of the market.

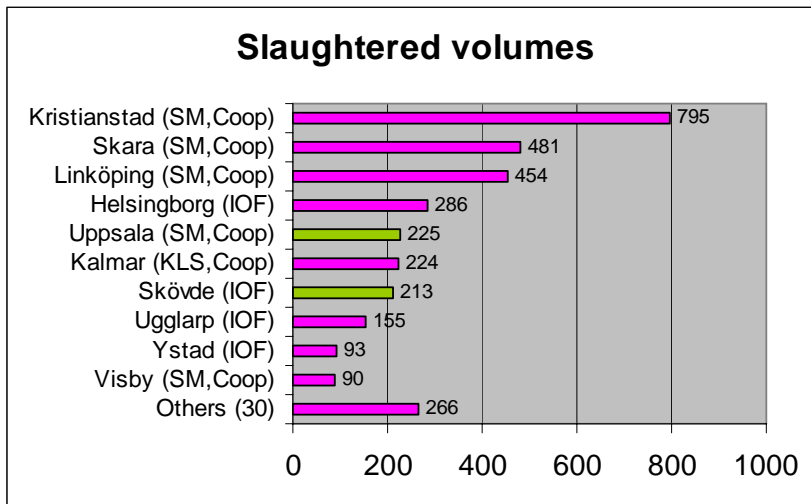


Figure 2: Largest slaughterhouses, and slaughtered pigs per year in thousands of heads, 2002 Source: (Swedish Board of Agriculture, 2003)

## 2.2 Laws and regulations in the agricultural sector

The Swedish Parliament bases the following text on information from a homepage ([www.riksdagen.se](http://www.riksdagen.se) 2002a). Laws and regulations concerning Swedish food production come from two governing bodies, EU and the Swedish parliament. The laws are decided by the Swedish parliament but as a member of the EU Sweden also has to comply with common laws within EU. Since the membership in EU most national rules concerning food and food production are based on EU-directives. EU directives first become a law in a member country after implementation through a governmental institution. The Swedish board of agriculture is an example of an institution that has as one of its major tasks to implement directives from EU in the Swedish legislation. National laws are harmonized in way so they don't interfere with the common legislation in EU.

The laws in the agricultural sector are decided by the Swedish parliament. The law is developed by the Swedish government, (Ministry of Agriculture), and on behalf of the government the governmental institutions (National food agency, National board of agriculture etc) make sure that the law is followed. The government usually prepares new legislations within its expertise authorities. The Ministry of agriculture has twelve expertise authorities sorting under it. Figure 3 describes various ways legislation is introduced in the Swedish food-producing sector.

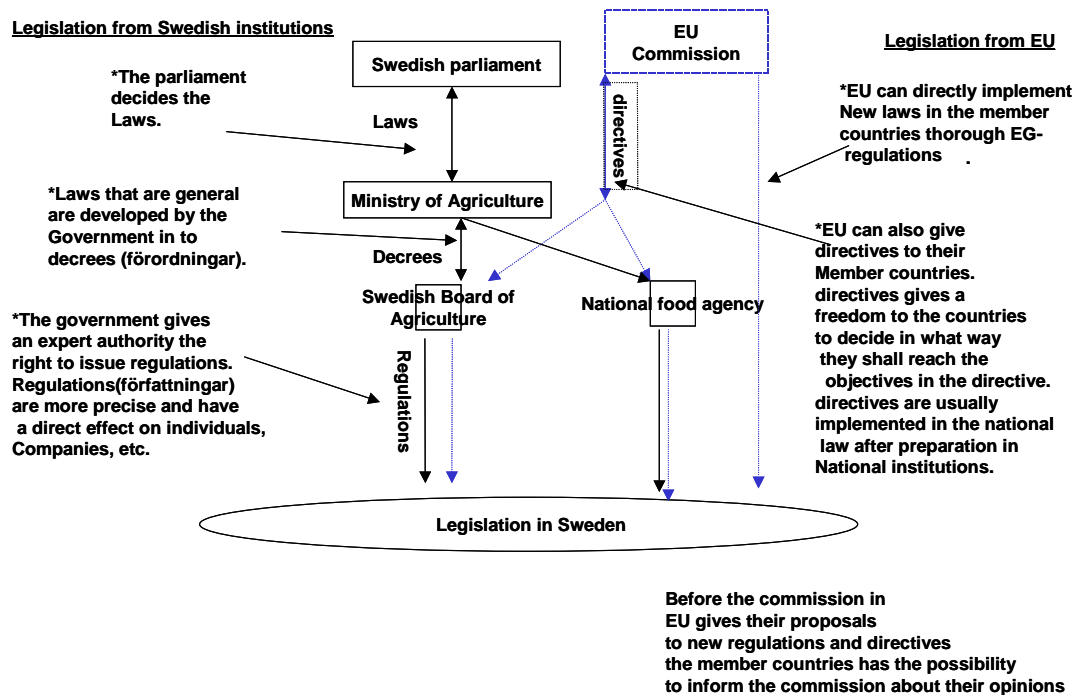


Figure 3: Description about Swedish food legislation.

Besides the above-mentioned ways of influences member countries, EU also issues decisions and recommendations. A decision can be directed to a specific member country or a private person within the union. Recommendations and statement are also issued but are not binding ([www.riksdagen.se](http://www.riksdagen.se) 2002b).

## 2.3 Authorities in the agricultural sector

Figure 4 illustrates how the food production chain is divided into two major responsible authorities.

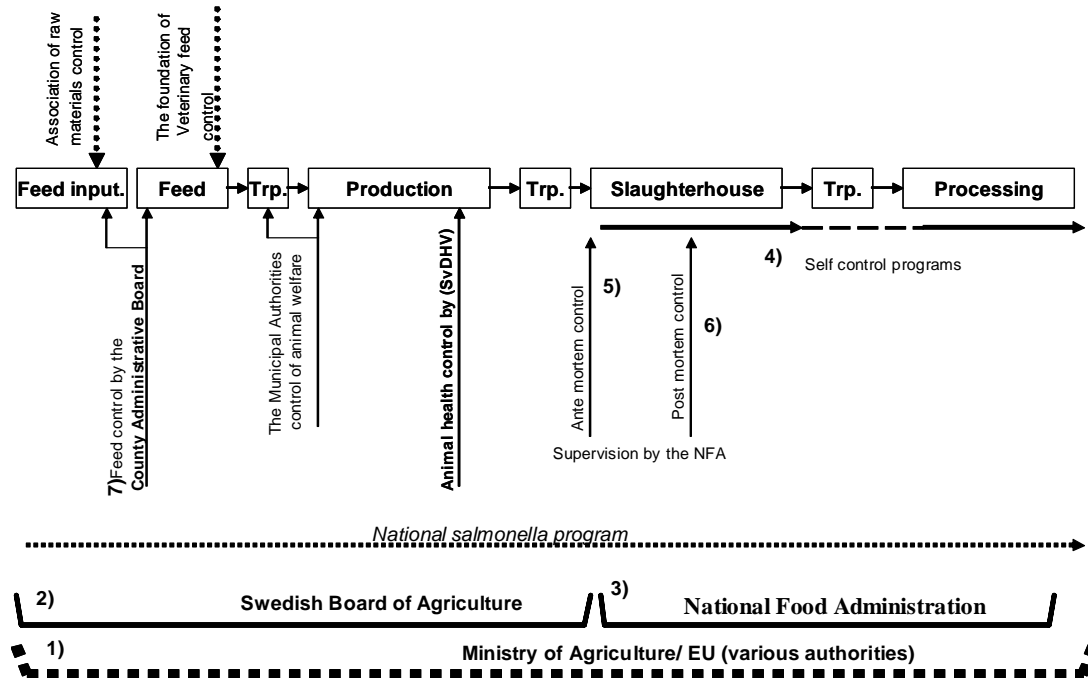


Figure 4. Responsible authorities and controls in the agricultural sector

- 1) The Ministry of Agriculture, Food and Fisheries has the major responsibility for the agricultural sector. Together with EU they supervise and pass laws in the sector.
- 2) The agricultural sector is divided between expert authorities sorting under the ministry. The National Board of Agriculture is responsible for the supervision of production before slaughter.
- 3) Once animals have been slaughtered they are considered food, the responsibility for supervision of food production/processing lies on the National Food Administration (Livsmedelsverket).

### 2.3.1 Supervision of feed and animal production

General presentation of authorities is based on SBA's report (Swedish Board of Agriculture 2001 p. 11).

*The National Board of Agriculture* is the central competent authority concerning animal health and animal welfare, and feed production.



*The County Administrative Boards* are responsible for the supervision of animal production at a regional level. According to the county veterinarian in Uppsala is his responsibility to coordinate the animal health welfare control in the municipalities. He is also responsible for the control of epizootic diseases in the region. Once a year he also gathers the different veterinarian organizations in the region e.g. SvDHFV, district veterinarian etc. and informs about the current animal health situation in the region. A part of the job is to negotiate with politicians about allocation of resources for the municipality activities.

The county administrative boards are also responsible for the supervision and control of feed production at the regional level, and they are also conducting physical checks. The control consists of feed analysis, control of production safety and labeling, and reporting new feed products to the board. The personnel performing the control consist of feed inspector and veterinarians performing hygiene controls.

*The Municipal Authorities* are authorized the direct control of animal health welfare at the local level. In order to achieve the goals of the law the authority shall exercise regular supervision of all kinds of animal keeping. According to the animal welfare law all municipalities should employ an animal welfare inspector for the direct supervision. The municipality may also decide about fees for their matters concerning the supervision.

The following text is based on interviews with two animal welfare inspectors from the municipalities of Enköping and Katrineholm.

During a farm visit the inspector controls medical treatment journals and production reports. A visual control of facilities and animals is conducted. According to the inspector from Enköping the municipality control is an indirect control of epizootic diseases. The control of these diseases is on the responsibility of the farm veterinarian. According to the inspector from Enköping, animals in bad condition are reported to the veterinarian for further investigation if needed.

According to an inspector from Enköping the control varies between municipalities in Sweden. The law prescribes regular controls. The goal of both municipalities is one control per year at farms with more than 100 animal units, and control every third year at farms with fewer animals. In Enköpings case these goals are not always fulfilled because of insufficient resources for inspections. According to the inspector some municipalities do not even have own inspections.

Inspection fees between municipalities vary. The fee for inspection of a farm in Enköping with 10-30 animal units is 500 SEK compared to Katrineholm where the fee is 1590 SEK. Instead of inspection fees some municipalities e.g. Uppsala has decided to have yearly payments for animal producers.

The inspector from Enköping thinks that it is important to cooperate with veterinarians in contact with the farms. For example could information from veterinarians in the Swedish Animal Health Welfare, be useful for the job of the inspectors. According to the inspector in Enköping there is no auditing of her job as an inspection veterinarian.

The inspection by municipalities is the lowest level of control of animal production. A farm that not is engaged in any other animal welfare program is at least subject to municipalities'

control. Indirectly the health status of animals is also controlled during the post mortem inspection in the slaughterhouses.

### **The National Veterinary Institute (SVA)**

SVA is a governmental agency under the ministry of Agriculture Food and Fisheries. The major goal of the organization is to prevent outbreaks of animal diseases that could threaten the supply of animal food items in Sweden. The organization also promotes good animal health and control of zoonoses, i.e., infectious diseases transferable from animals to humans. The institute is responsible for the feed analysis in the official feed control ([www.sva.se](http://www.sva.se) 2003).

SVA has a division specialized on zoonoses, Zoonoscenter. The division was established in 1997 with the purpose of a better control of zoonoses in Sweden. The most common way of being infected by zoonoses is via foodstuffs ([www.sva.se](http://www.sva.se) 2003).

### **The Swedish Animal Health Service (SvDHV)**

SvDHV is a veterinary organization providing health service and health control for animal breeders. About 90% of all pigs in Sweden participate in SvDHV's health service programs. The organization is a branch organization established in 1969. From 2001 ownership of the company is shared between three major owners; Swedish Meats, Svenska Avelspoolen and KLS Livsmedel ek för. Their activities are based on fees from their customers (animal producers). The organization is also supported by the state in order to accomplish control/eradication programs for certain diseases. The Swedish Salmonella Program concerning pig production is an example of program where the state has authorized the SvDHV the direct control of the program (Kyhlfstedt 2003).

The organization has a close cooperation with the state where SvDHV performs animal health preventive tasks on behalf of the state. According to the Swedish legislation (SFS 1988:538) certain groups of producers are obliged to be in connection with the organization, which gives the permit to their production. As example, a piglet producer selling animals can be mentioned. The state also compensates the damage for producers if an outbreak for certain diseases (e.g. salmonella). The level of compensation is dependent on whether the producer is connected to the organization. Example: A certified fat-pig producer receives 70% compensation in case of salmonella outbreak, while a non-connected receives a maximum of 50%. For non-connected "high risk" herd e.g. sow poles is the compensation zero, ([www.svdhv.org](http://www.svdhv.org) 2003). According to a person at the regional office in Uppsala Swedish Meats and KLS are examples of organization that demands that their producers have to be certified by SvDHV's.

In the case of pig production the organization has according to Kyhlfstedt (2003), programs concerning the following diseases, Salmonellosis (Salmonella), Dysentery (Dysenteri), Atrophic Rhinitis (Nyssjuka), Swine Influenza (Svininfluensa), Pseudorabies (Falsk Svinpest) and PRRS (Porcine Reproductive and Respiratory Syndrome). Veterinarian from the organization visits farms and establishes programs. The work of the organization is preventive in nature and in case of an outbreak of a disease the responsible farm veterinarian is contacted for treatment of animals. The organization has thirty own veterinarians for their activities. In addition veterinarians outside the organization are hired.

### **Stiftelsen Veterinär Foderkontroll (The foundation of Veterinary feed control)**

The organization was established in 1960 with the main purpose of preventing salmonella in the feed produced by feed producers. Standards and salmonella programs with the main focus on hygienic aspects were developed. Since 1996 the salmonella program was incorporated in Swedish law and thereby most of the job for the organization was taken over by the national board of agriculture and their authorities. The organization cooperates with the Swedish National Veterinary Institute for further developments of food safety systems. At the moment a new method for detection of toxic substances is tested. The feed companies are also trying to develop a method for “fingerprinting” salmonella bacteria. Fingerprinting is a way to detect salmonella if bacteria are of the same kind. This could be used when the responsibility for salmonella outbreak must be decided.

Today (2003) the organization is a branch organization, which consisting of two feed producers, the only ones remaining on the market. The two companies pay the expenses of the organization based on sold feed volumes. The larger feed producer, Lantmännen, paid about 700 000 SEK in 2002 to the organization. Feed producers can be certified according to the organization’s standard. Some slaughterhouses e.g. Swedish Meats demands that their pig-producers buy feed that fulfills the criteria set by the organization (Larsson 2002).

### **Föreningen Veterinär Foderråvarukontroll (Association of veterinary raw materials control)**

The association is a feed producers’ industry organization. It has developed a hygiene standard for suppliers of raw material of the feed production. Certification of products is a way to guarantee high quality of the input for feed producers. Today feed producers evaluate their input producer based on their food safety system. A satisfactory feed safety is important when competing with other feed input producers.

The standard is developed in corporation with the Swedish National Veterinary Institute (governmental organization). A new standard based on the upcoming new EU law is under development. The standard is supposed to be broader than just hygienic aspects. It covers aspects such as the contents of chemical substances as well as questions concerning trace ability. The hygiene will be just a part of the new feed safety standard. A membership in the association costs 5000SEK/ year (500euro) (Herland 2002).

Besides the control by official authorities, many feed producers have developed additional control programs on a voluntary basis. An example is certification of production according to the ISO-system (Herland 2002).

### **2.3.2 Supervision of food production**

On behalf of the Swedish parliament and government, control of food production is in the responsibility of three public authorities. The National Food Administration, the County Administrative Boards and the municipal authorities hold the responsibility for the official control. The general presentation of authorities is based on the law (SFS, 1971:511).

*The National Food Administration* is the central competent authority concerning food and standard setting at a central level. The NFA is the chief authority for the Meat Inspection Division, (Besikningsveterinärorganisationen) and the Inspection and Co-ordination Division.

*The County Administrative Board* is responsible for the control at the county level and coordinates the municipal authorities' supervision of food producers.

*The Municipal authority*- is the supervising organ for most food producing activities in the county. In case of larger production sites and more complicated processes the municipal authority to the NSA directs the supervision. In the case of slaughterhouses, the National Food Administration generally supervises production sites.

There are 310 people working in the National Food Administration's (NFA) headquarters in Uppsala. In addition, about 80 veterinarians and 120 meat inspection assistants work in the Meat Inspection Division and are stationed at slaughterhouses throughout Sweden.

The NFA is divided in to five departments with its divisions: R & D Department, Food Standards Department, Food Control Department, Information & Nutrition Department, Administration Department ([www.slv.se](http://www.slv.se) 2002).

The Food Control Department is responsible for implementation of food safety regulations in the food sector. This includes the authority exercise towards all organizations/companies handling food ([www.slv.se](http://www.slv.se) 2002). About 75 people are working at the department, thirty of those located centrally at NFA, and the other at regional offices.

The department has recently been undergoing reorganization (2002-01-10). Since the reorganization the Senior Veterinary Inspectors together with Official veterinarians and assistants works under the same unit, The Meat Inspection Division. The organizations setting of today is presented in figure 5. The picture highlights The Meat Inspection Division, which is responsible for the supervision of all slaughterhouses. The activities towards slaughterhouses from the Senior Veterinary Inspectors and the Official veterinarians will be considered in the text below. The following text is based on an interview with a Senior Veterinary Inspector from NFA, Uppsala.

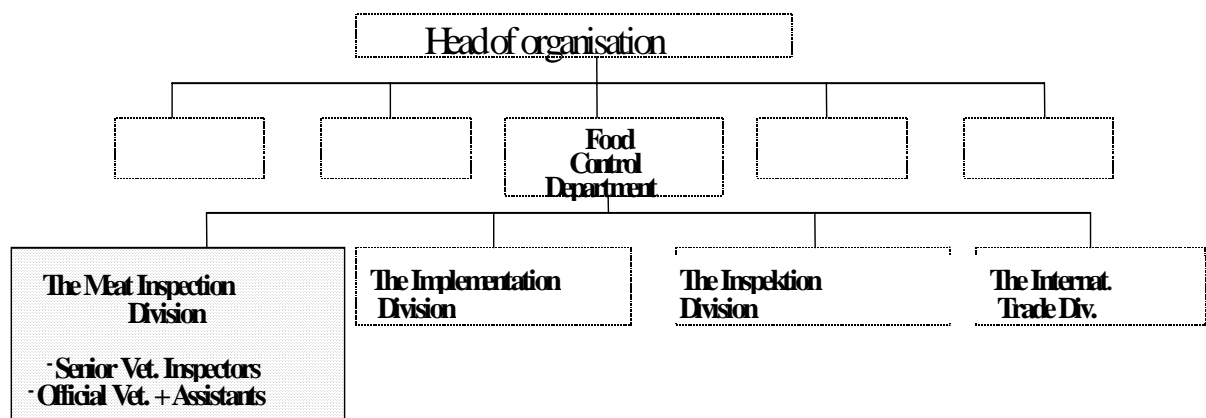


Figure 5. The Meat Inspection Division within the NFA.

The Meat Inspection Division is responsible for the direct control of all slaughterhouses in Sweden.

The official supervision is directed towards inspections, evaluation of self-control program, testing and analyses, and information and guidance (SLVFS 1990:10 p. 13). The controlling authority creates the supervision plan for production sites including all surrounding activities (transports and storage). The “own-control program” is the central part of the plan, and serves as a base in their supervision. A yearly fee is paid by the food producers in order to cover the expenses for the official supervision in their testing and examination (SLVFS 1990:10 p.13).

There are twelve Senior Meat Inspectors in the Meat Inspection Division responsible for the control at slaughterhouses. Six of them are situated centrally in Uppsala and the other at their regional offices (Gålne 2002).

*Inspection* should, according to the law, be accomplished with a satisfactory frequency at all sites. A satisfactory frequency is up to the NFA to decide, but it’s often restricted to NFAs limited resources. The inspection aims to see if production is brought out according to prescribed plans and according to existing law. Own-control programs are evaluated and critical control points reviewed. After the control a report is written. It documents the situation at the slaughterhouse and changes because of found problems are proposed. If changes are needed, the producer gets a time frame to make the correction. When the corrections are made, the producer reports about it. If changes aren’t made within the prescribed time, the producer is reminded and NFA can make a call about fines that should be paid (Gålne 2002).

*Testing* and analyses should be brought out to see that the production meets the outlined quality standards.

*Information* and guidance about the rule system gives producers a possibility to correct and develop their production to meet the authorities’ requirements. (SLVFS 1990:10 p. 8-9).

Including the operations above the organization also use political means to obtain resources for the fulfillment of their tasks. One part of the political means is to negotiate with politicians about allocation of resources needed for various operations. Press releases are a tool to spread information to the general public. This can also be an effective way to influence companies (Gålne 2002).

The following text is based on an interview with a senior veterinary inspector (Gålne 2002).

Together with the reorganization of the NFA new theories and techniques are developed for the future. A goal of the new organization is that duties should be more structured and specified and that more of instructions should be developed for functions at all levels. An example is the hygiene supervision, a task that easily becomes the second priority. More specified routines are the solution to the problem in this case.

A goal of the new organization is that decisions should be delegated further “down” in the hierarchical structure. The Official veterinarians at the sites should conduct more of the supervision tasks that earlier were in the hands of Senior Veterinary Inspectors. One of the goals of the own-control is that the managers at companies shall play an active role in the preparation of the plan. In the new own-control NFA wants to put more responsibility on companies/industry organizations (branchorganisationer) in the design of their self-control

program. Before NFA had made drafts to fill in, a procedure that the NFA probably will leave out in the future. NFA wants a role where they help with supervision, but the companies take the responsibility and play the active role when developing the self-control plans.

The only formal demand to become an inspector is the veterinarian education. The job involves close contact with people at slaughterhouse, and a good ability to communicate is therefore important.

Knowledge about current legislation has become more important for the accomplishment of the job as veterinary inspector. In order to enforce changes that are expensive for the slaughterhouse, the inspector must have the support coming from the legislation. This is probably more important at present when the respect for authorities in general is reduced.

Parallel to the food safety program by NFA some slaughterhouses work with other quality programs like ISO 9000, SSOP, and BRC etc. Some of the inspectors at NFA have gone through training in order to gain experience in those programs also aiming to improve food safety. This could be useful information in the development of NFAs own programs. A general experience is that companies involved in these programs are more familiar with food safety issues. The fact that companies are engaged in other programs doesn't have any direct influence in NFA's control.

According the senior veterinary inspector the attitude and performance related to food safety issues vary between actors in the sector. When problems come up they usually occur because of malfunctions in the self-control. Examples of experienced problems with different background could be the following:

- Cultural problems, where the production earlier has been brought out in certain way and demand for changes cause resistance and problems.
- Low awareness and motivation for food safety issues.
- Learned incorrect ways of performing food safety tasks

The Meat Inspection Division has nine persons at the administrative level, but the main parts are the 250 veterinarians and assistants working in slaughterhouses.

The food safety situation has changed over the years because of new legislations and routines. The veterinarians at sites have the responsibility to adapt the new legislation. The veterinary inspectors, at the central level (NFA), work as a support providing them new information. Based on experience some veterinarians need more support than others in their job. So far the veterinarians performance hasn't been evaluated, but an auditing system of veterinarians is under development.

The main tasks of an inspection veterinarian are the ante-mortem control, post-mortem control and inspection and control of a sites own-control program. The tasks and experiences of Inspection veterinarians further described in each of the three company case studies.

### 3 The transaction cost approach with respect to food safety

According to Williamson (1985 p. 4), the total cost of a good or service is the sum of production and transaction costs. According to North (1992 p. 9) the production costs are the costs for transformation of a good or service from input to output. And the transaction costs are the costs for exchanging goods and services. Humans economize on both transaction costs and production costs and choose the combination of production costs and transaction costs that is most favorable (www.encycogov.com 2002).

There are different types of transaction costs. Williamson distinguishes between transaction costs that are related to the time before and after a transaction. Examples of ex-ante costs are drafting, negotiation and safeguarding of a transaction and ex-post costs are haggling costs, negotiation costs and set up and running costs.

#### 3.1 Interdependence as a source of transaction costs

The root to transaction costs is in the interdependence between humans. Interdependence arises when people do something that interacts with other people's interest. It may be conflicting interests as well as opportunities for co-operation. In order to handle a situation of interdependence humans create rules, rules that make the situation more predictable. Creating common rules thereby has the effect of decreasing uncertainty in situations of interdependence and thereby also affecting transaction costs.

According to Allen (1991) transaction costs are cost related to a transaction between individuals. Allen then exemplifies with Robinson who had information costs when he explored the island on his own. First when Friday showed up he dealt with transaction costs. The example above demonstrates difficulties in differentiating transaction costs from other costs. The following presents three variables, assumptions about human behavior, rules of interdependence and characteristics of transactions with major impact on transaction cost.

#### 3.2 Sources of transaction costs

Transaction costs are found in the following variables:

**Assumptions about human behavior** ----->

**Rules of interdependence /institutions** -----> **Cond.of interdep** ----> **Tr. costs**

**Properties of transaction** ----->

These three variables determine the conditions of interdependence in transaction, which in turn is the source to transaction costs. In the next section these variables will be discussed in further detail

##### 3.2.1 Assumptions concerning human behavior

Transaction costs have either origin in two assumptions about human behavior; Bounded rationality and Opportunism. These two assumptions about human behavior are the major

difference from the neo-classical economic models where full rationality and full honesty are assumed.

People are “intended rational but only limitedly so” (Simon 1961, p. xxiv). This is because of the limited cognitive competence among humans.

Bounded rationality has two sources; neuropsychological limits and language limits. The former recognizes the physical limit of the human brain to receive, store, retrieve and process information. The later one has to do with the limits that the language has in articulating experiences and intentions to others. The effect of these both is that economic actors become bounded rational when making decisions (Williamson 1975).

Opportunism is defined as self-interest seeking with guile. It includes cheating, stealing and lying but has more often to do with different forms of deceit (Williamson, 1985, p. 47). The assumption about the opportunistic behavior does not necessarily mean that people intend to act opportunistically in every situation, but just the possibility of self-interest seeking with guile creates cost for safeguarding against such behavior. Williamson sees the organization as a solution for decision and control to reduce the impact of opportunistic behavior (Davis 1998, p.38).

### **3.2.2 Rules of interdependence**

As mentioned above, rules are a means to reduce uncertainty in the interdependence between humans. In a situation of interdependence (e.g. transaction) there is always a risk that people do things that have a negative effect on the other party. Creating common rules between people the risk of unpredicted negative action by others is reduced. Rules have the effect of reducing uncertainty and thereby the ability to lower costs.

According to Shaffer (1967) rule systems change over time in order to become more efficient. Old rules are changed and new ones arise and thereby change the conditions for transactions, lowering or increasing costs. Hayami&Ruttan (1988) exemplifies that development of new goods (e.g. biotechnological products) may stress the need for new rules. In order to understand the situation of today, North (1993) emphasizes the importance of knowing former institutions. North refers to something called “path dependency” where the current situation is the fruit of experiences from earlier transactions and institutions.

Rules managing interdependence have different levels in society. Formal law e.g. constitutional law and informal laws e.g. internal business practices are examples of rules at various levels in society handling different types of interdependence. An interesting issue is to examine how different rules e.g. external law and internal business practices affect each other and thereby the costs of a specific transaction. Will rules complement or counteract each other in a specific transaction? According to Menard (2000, p.17) the agro sector in many countries is characterized by interference from governments intending to protect consumers. All these rules have an impact on the transaction costs, but very little is known about the exact impact.

Concerning pork production and food safety, external rules (authorities rules), internal business rules and rules concerning human behavior, all become decisive in transactions of pork. In the case of food safety, media’s presence and reporting about food safety issues, also becomes rules with impact on the food safety situation.



According to North (1993, p.18), institutions are the “the rules of the game in society”. Comparing with a football match, the institutions are the rules of the game and organizations could be considered the teams playing. The task of the teams is to win the game within the existing rules (institutions). It’s up to the team to decide their strategies composition etc. in order to win the game. This might includes even breaking the official rules. In many teams it would be regarded as permitted to take the ball with the hands if it’s the only way out to prevent the opponents from scoring. This cheating behavior is thus also a part of the rules of the game. Important for the function of rules is that an authority can enforce the rules. In case of the football match the referee is the authority that controls that the rules of the game are followed.

The introduction of new rules will have different effect depending in what situation they are applied. North (1993) emphasizes that effect of a new rule is dependent on the existing rules in a situation. For example, even if the traffic rules are more or less the same all over Europe, they result in quite different behavior among car drivers. Introduction of the same new traffic rule all over Europe is therefore not likely to have the same effect in Norway and Italy. The existing institutions, in this case the culture will make the outcome of the new rule different.

### **3.2.3 Dimensions of a transaction<sup>1</sup>**

#### *Asset specificity*

Many transactions in the production system of pork require investments in facilities, human capital (training), equipment, animals etc. The degree of specificity of such investments refers to the alternative value of the investments. Pigs used in pork production could be regarded as an investment with high degree of specificity. If a producer can’t sell the pigs to the slaughterhouse because of an e.g. salmonella infected animals, the alternative value of the animal is very low or zero.

Once specific investments have been done the person to a large extend becomes dependent on further transaction for extraction of the value of the investment. Assuming opportunistic behavior means that one part can make use of the situation and force the party with asset specific investments to e.g. lower prices. With a growing importance of an investment (the more the investor puts at stake) and increasing asset specificity the incentives to safeguard the income possibilities increase i.e. the continuity in transactions must be guaranteed. Establishing contracts between sellers and buyers or forward integration (e.g. producer cooperatives) are examples about governance structures to safeguard such investments.

#### *Uncertainty*

Because of limited information about a good (bounded rationality), it is not always possible to know the whole contents of the product at the time of purchase. If the uncertainty regarding a good is high this implies a costs for the buyer /seller, a cost for not knowing the outcome of the transaction. Instead of taking the higher risk, uncertainty regarding a good can be reduced by specification. This implies specification costs, e.g. sample testing. In the production of pork all animals are tested for trichina in order to reduce the uncertainty concerning the good. Uncertainty also opens possibilities for opportunistic behavior from both parties in a

---

<sup>1</sup> Following section is based on Williamson (1985).

transaction. The seller of a good might not tell the buyer about irregularities since this would reduce his/her income. This is only possible if the frequency of transactions between parties is low. Integration of production is another means to reduce the risk for opportunistic behavior with the origin in bounded rationality.

### *Frequency*

High frequent transactions between two parties reduce the uncertainty related to a specific transaction. Both parties are able to gain experience about the goods/services and the behavior of the other party. This reduces the uncertainty. Scale economies of transaction costs can also be reached with the high frequency. The meat inspection by veterinarians is an example of activity where the inspection cost / kg meat can be significantly reduced when the inspected volumes increase.

The high frequency of transactions between two parties also has the effect of reducing opportunistic behavior. One party cannot exercise opportunistic behavior like cheating, lying etc. if the intention is to have repeated transaction. On the other hand, if the frequency of transactions is low, one party is more likely to cheat. Safeguards against such behavior are needed in such cases.

### *Externalities*

Externalities may be understood as unregulated side effects of a transaction. These side effects may affect either one of the transacting partners or a third party. Concerning the food safety, many hazards affecting consumers could be regarded as third party externalities. An example about an externality is a slaughterhouse buying salmonella infected animals from a farmer that in turn causes an infection to a consumer. Usually, if the source of the salmonella cannot be traced back to its origin, the consumers and the state (hospital treatment) pay the costs of the infection. . If the salmonella can be traced back to the slaughterhouse it is possible that some of the costs can be paid by the insurances of the slaughterhouse. This would reduce the problem with externalities.

## **3.2.4 Organization of transactions**

According to the transaction cost theory the institutions facilitating a transaction affect transaction costs. The choice whether a transaction is brought out in the market, within an organization or in any other form, is thus dependent on the efficiency of the institutions surrounding the transaction.

Williamson has presented three principles for the organizing transactions. The principles show how the relative efficiency of different ways of organizing transactions changes and affects transaction costs.

### **Asset-specificity principle**

According to Williamson market contracting is progressively weakened as asset specificity increases". When assets become more specific and dedicated to a specific use/user the risk increases. Holders of specific goods/services can reduce the risk by stronger integration with trading partners. The classical market is, thus, best in dealing with non-specific goods. When the asset specificity increases, also the relative efficiency of various forms of contracts

between trading partners increases. With higher levels of specificity the costs of contracting increases and the integration of the transaction becomes more advantageous. Integration of production compared to contracting has the following advantages:

- If there are conflicting goals between partners, the common ownership implies common goals, which reduces conflicts.
- An internal organization has easier and more complete access to information when disputes must be settled.

### **Externality principle**

Williamson describes externalities such as unintended positive/negative effects following with a transaction.

If the outcome of the transaction is uncertain, this makes further planning difficult. The result of such externalities is thus that it leads to sub -optimization for the transacting partners. Contracts that state the quality of good /services can be established. This can help the partners to correct externalities afterwards. Internalization of the transaction into either party's organization may also be a solution to the problem of externalities.

According to Williamson is the efficient contracting between autonomous trading partners progressively weakened as externalities increase.

### **Hierarchical decomposition principle**

Depending on the relative efficiency of economizing transaction costs the two earlier principles regard the choice between market transactions and internalization of transactions within a firm. Once a transaction is brought into a firm costs related to bounded rationality and opportunism move inside the firm. The third principle focuses on how tasks within a firm should be efficiently organized to economize on these types of costs. The principle answers the question that in an organization should make decisions concerning a certain task.

In order to achieve effectiveness in decision-making an organizations, a firm should be broken up into "entrepreneurial firm-like units". According to Williamson (1985), there should be a clear distinction between strategic planning and operational practices in an organization and in order to achieve effectiveness, decisions should be directed to persons with the best knowledge (economizing in bounded rationality) about a specific issue. Persons directly involved in operational activities should make decisions regarding operational practices and managers involved in the strategic planning should take strategic decisions.

With regard to Williamson, decisions concerning food safety should be made according to the principle of hierarchical decomposition. The question is where in an organization decisions and tasks concerning food safety should be directed. This also regards the allotment/distribution of tasks and decisions between the NFA and the slaughtering companies.

An example is the own control system where the personnel in the company develop the food safety plan. Instead of directing routines at the central level in the NFA, the people in the company assisted by veterinarians at the site develop the own control plan.

### 3.2.5 Effect of size

The pork market consists of actors with a large variation of size. Large size is usually associated with some sort of scale economies. Thus, the size is a characteristic having an effect on a firm's performance. The effect of size on firms has been subject to extensive studies by economists. What are the general conclusions according to size and how can this knowledge be applied on a firm's performance in food safety in the pork markets?

Large size can be associated with the following conditions:

*Economies of scale* is the ability to spread the total cost over a large number of units. In a slaughterhouse and in the pig breeding this could for example concern authorities' control costs as well as the larger operations' ability to use more of special expertise.

The opposite concerning a smaller organization is that they will under utilize economies of scale and, thus, may face higher production and transaction costs.

*Market Power:* Larger organizations may have a larger power in influencing authorities.

*Bureaucracy costs:* According to Coase (1937), the limit in size of a firm is when the costs for organizing an additional transaction within a firm exceed the cost of carrying out the same transaction in a market or another firm. This type of cost often comes from increased costs for coordination i.e. the cost of bureaucracy.

A typical cost related to large organizations is the costs of opportunism. When a transaction is brought from the market in to an organization, the cost for opportunism usually moves inside the organization.

A smaller organization usually has an advantage of being less complex. This makes coordination easier resulting in less internal transactions and costs associated.

### 3.2.6 Special properties of cooperatives

Cooperatives are organizations with special characteristics. The question is if these characteristics influence the way in which a desired food safety situation can be achieved?

Cooperatives are organizations, which have internalized transactions between its members and the organization. For example, in a cooperative slaughterhouse pig producers have joined and built up a commonly owned slaughterhouse. This means that the producers sell their animals to their own slaughterhouse instead of selling them in the market. The uncertainty related to the market can, thus, be avoided. (Historically have cooperatives evolved when some sort of market failures have been present). The obligations between the members and the cooperative are anyhow not reciprocal, which makes the cooperative different from common integration (Rhodes 1985). For example, have cooperatives have generally had receiving obligations of members products but the members have not been obliged to sell their production to the cooperative.

The members of the cooperative also represent different, independently owned profit centers. Only in activities concerning, the cooperative governance they represent a common group. The benefits from the cooperative are usually transferred to its members in two ways. The

first way goes through the price that the members receive from his/her transaction with the cooperative. The other way is through the patronage refund, where the profit of the cooperative is turned back to its members.

Does the form of integration mean that the members have stronger incentives than non-cooperative producers to supply the slaughterhouse with high quality products? Could it also be that the cooperative member experiences a higher safety when his/her products (compared to the non-coop producer) and therefore is more inclined in investing in food safety systems encouraged by the slaughterhouse? The answers of these questions are interesting when evaluating different food safety systems.

## 4 The approach

### 4.1. The pork marketing system

This study focuses on transactions in the pork production system (or the corresponding transfer of products within an organization). The production system of pork with its enclosed transactions is viewed as in figure 6.

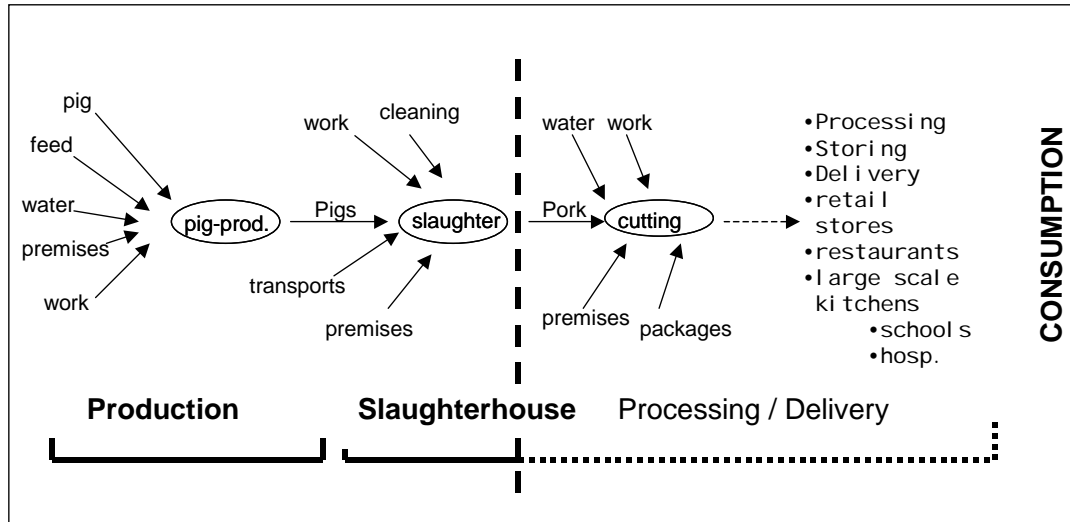


Figure 6. The pork marketing system

The pork-market system is viewed as two production phases, animal production and slaughter. The transactions related to each production phase are marked with arrows.

The study focuses on the transactions in the systems up to the slaughterhouse level. Transaction in the later part (behind the dashed line) of the system concerning further processing, retailers, consumers purchase etc. are not considered in this study.

### 4.2. Tool for detection of transaction costs and institutions

The tool for the analysis is based on the transaction cost theory (assuming bounded rationality and opportunism presented in section 3.2.1) and is developed in order to detect the differences in transaction costs between companies in the study. Figure 7 presents the tool used for analysis of transaction costs.

The arrow in the middle represents the transaction analyzed e.g. the transaction of animals between a producer and the slaughterhouse.

Each transaction is evaluated with respect to *dimensions* of transaction and the institutional setting surrounding it. Above the arrow are the dimensions of a transaction presented. Each transaction is analyzed against the following four dimensions affecting transaction costs: Asset specificity, Uncertainty, Frequency and Externalities. The purpose is to see the dimension effect on transaction costs.

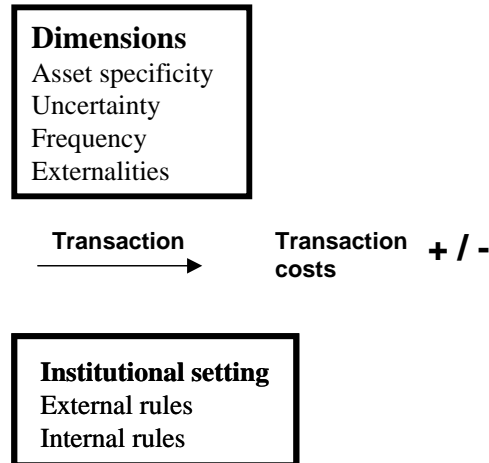


Figure 7. Tool for detection of transaction costs

The *institutional setting* surrounding a transaction is divided into two types of institutions, external and internal. External institutions refer to obligatory food safety regulations based on national legislation. Internal institution can be considered “voluntary” and refers to such institutions as internal food safety systems, voluntarily chosen food safety programs as well as behavioral practices within a specific company. The effects from these institutions on transaction costs are also evaluated.

Special attention is paid to two issues regarding transaction costs in organizations. The first is the effect from size of an organization. What are the differences in transaction costs out of food safety point of view between smaller and larger organizations? The other issue regards the owner structure of the organization. What are the differences in transaction costs in a market system comparing IOFs and cooperatives?

### 4.3 Method

The study has a starting point in understanding the pork production system and the factors affecting the food safety system. According to Halvorsen (1989, p. 78) an inductive method is used when the problem at start is rather un-precise and a part of the study is to get a better understanding of the situation. The limited number of data according to the problem makes a qualitative study more adequate than a quantitative one. With support in the transaction theory a framework is developed to categorize different factors important for the understanding of the problem.

In the search for “unknown” factors important for the food safety situation a method should be used that let people fairly freely express describe the food safety situation and factors contributing to it. The choice of method, deep interviews with various actors in the pork system, enables persons without restraint to describe their situation and also the researchers to get more information about new factors coming up during the interview.

The empirical study concerning food safety and detection of transaction costs is mainly based on interviews with quality managers, owners (farm slaughterhouses), official veterinarians and an inspection veterinarian at the NFA. Contract coordinators, sales managers, and

production chiefs etc. are also personnel that have contributed with general information about the production. In addition follow-up interviews have been made for development of previous studies.

Additional information has been collected from both printed and Internet based company/authority presentations. Official reports and national legislation has also been a source of information.



## 5 Case Studies

### 5.1 Skövde Slakteri AB

#### 5.1.1 Description of the marketing system

Skövde Slakteri AB is Sweden's second largest investor-owned slaughterhouse. The slaughterhouse belongs to a group of four companies. The slaughterhouse was built in 1945 and has had several owners since the beginning. In 1993 the present owner bought the company. The major owner owns 75% of the group of four companies, (www.skovdeslakteri.se 2003). According to director general the rest of the ownership is distributed to 150 shareowners most of them being active farmers or earlier producers.

Two of the representatives in the board are active producers. However, most of the engagement comes from the major owner. The other three companies process pork and get all of their pork meat from Skövde. Mårtenssons AB is one of the largest pork cutting companies in Sweden. Mårtenssons AB delivers meat to both Gudruns and Sohlbergs but also to retailers outside the group. Gudruns Chark in Stockholm and Sohlbergs Chark in Gävle are two companies who produce all kinds of meat products for the consumer market.

A total of 245 persons are working in the company group, about eighty of them in the slaughterhouse in Skövde. The groups' total turnover in 2001 was 1.1 billion SEK of which about 500 million SEK in Skövde. The number of slaughtered pigs have increased from 160 000 in 1998 to 200 000 in 2001, (www.skovdeslakteri.com 2002).

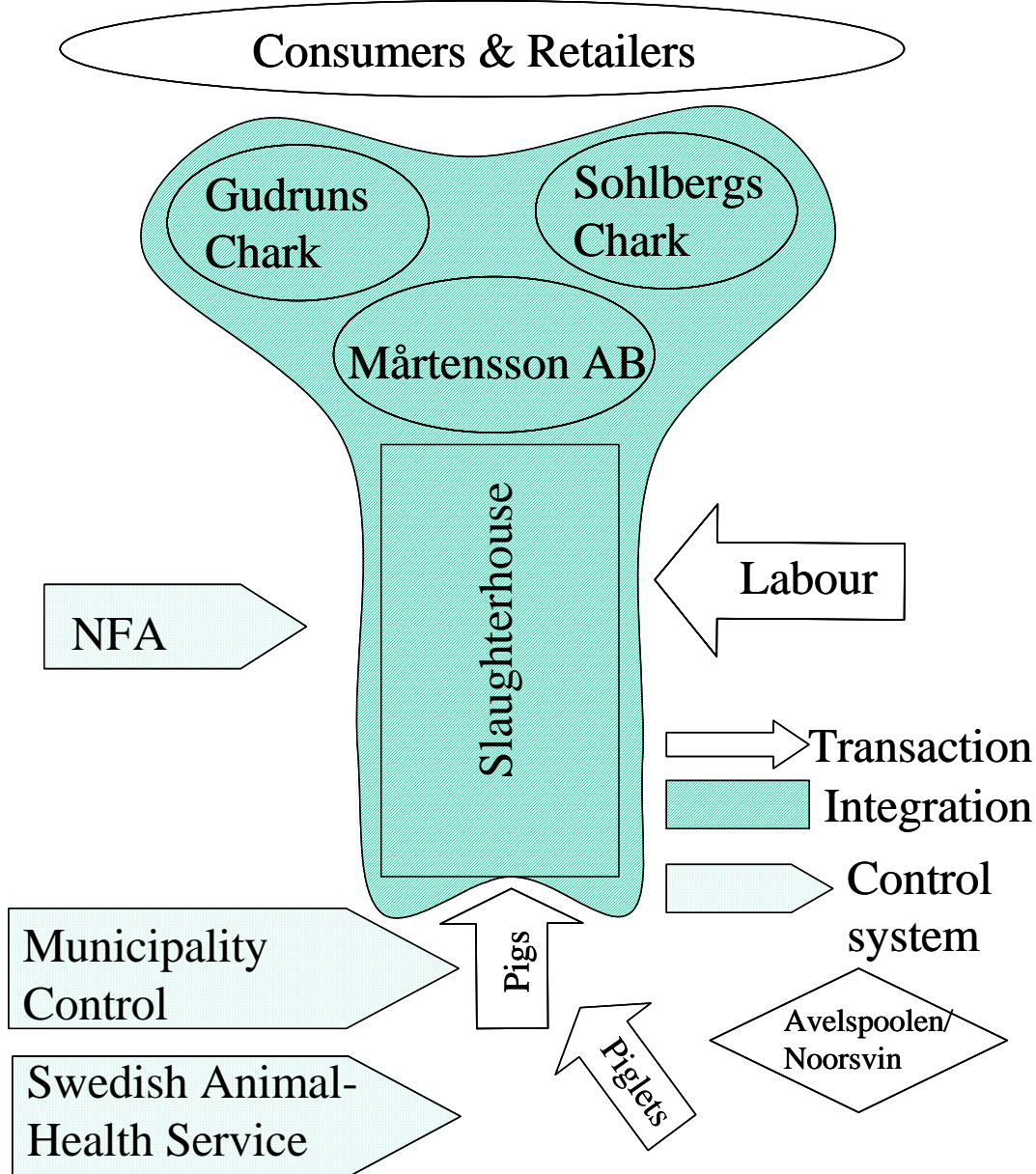
The number of slaughtered carcasses in 2001 was as follows:

Pigs:	205 000
Cattle:	27 000
Calves:	3 500
Sheep/lamb:	5 000

The slaughterhouse runs from Monday to Friday 52 weeks in a year employing 70 people at the production site, ([www.skovdeslakteri.com](http://www.skovdeslakteri.com) 2002).

According to the extension advisor, between seventy and eighty pig producers deliver animals to the slaughterhouse. The number of customers they deliver pork to is according to the production chief between thirty and forty. Two thirds of the slaughtered animals in Skövde are further processed in the three other companies belonging to the company group.

In figure 7 the production and marketing system of Skövde Slakterier AB is presented.



All transactions marked with arrows are analysed.

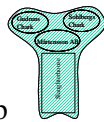
*Fig. 7. The food system of Skövde slaughterhouse*

In the following text the different transactions and control systems are further described.

### Consumers and Retailers

Consumers & Retailers

The company group sells various kinds of meat products to retailers and consumers. The food safety control is not analyzed at retailer and consumer levels.



### The Company Group

The company group is a kind of integration of the production system. Skövde slaughterhouse supplies the three other companies with pork. Mårtensson, which is a cutting company, also supplies Sohlbergs Chark and Gudruns Chark with processed pork. Skövde slaughterhouse and Mårtenssons also sell some of their products direct to retailers.



The slaughterhouse is also integrated in the breeding organization Avelspoolen/Norsvin. Skövde is one of the fifteen non-cooperative owner companies of the breeding organization. .

Some producers are also owners of the slaughterhouse. The 25 % of the slaughterhouse that not is owned by the major owner belongs partly to farmers.

#### Transactions

All block arrows illustrate transactions with someone outside the company. Hiring of labor, buying of small pigs and fattening pigs are all transactions that are further analyzed in the text.

#### Control system

Spotted block arrows presents control systems in different places in the production system.

The Swedish Animal Health Welfare exercises control of producers. The control is obligatory only for producers that sell small pigs, and herds selling breeding material.

The purpose of the municipality control is to monitor animal welfare- and environmental aspects on the farm level. However, the control implies an indirect control of food safety on the production level.

NFA, (Livsmedelsverket) is responsible for the control of food production on the slaughterhouse level.

The various control systems are further discussed below.

### **5.1.2 Production (pigs)**

#### Small pigs

According to the extension advisor about sixty specialized piglet producers deliver animals to Skövde production system. The size of piglet producers varies between 20 and 500 sows with an average of eighty sows per producer.

For the coordination supply and demand between small pig breeders and fattening pig producers the slaughterhouse provides the pig transmitting service. A producer connected to the service has according to Skövde's delivery contract (2002) undertake the following conditions:

- The producer has to be connected to the Swedish Animal Health Service<sup>2</sup>, and the producer must inform the slaughterhouse if the health certificate is for some reason cancelled.
- There must be an assurance that animals are free from (scabies) skabb and ascarids (spolmask)
- Pigs delivered must have a satisfactory health status.
- Pigs must be marked in a correct way.

About twenty of the eighty small pig suppliers use the transmitting service. The service is based on the PigWin system. The PigWin program helps producers to observe important production variables. For example feed consumption and mortality rate of small pigs are variables important for a small pig producer. Local veterinarians conduct the food safety and disease control on the production level.

### Pig breeding

A total of seventy-five producers deliver animals to the slaughterhouse. Forty of the producers have integrated systems with an average of 3200 animals per producer. Thirty-five of the producers are specialized in fattening pig production with an average of 2600 animals per producer.

Skövde's producers are relatively large, and some come from distant regions like Uppland, Halland and the Western parts of Sweden. Many of the larger producers have earlier been delivering to the cooperative but switched to Skövde. Smaller producers are usually in the region close to Skövde in order to keep transportation costs at the satisfactory level. The larger producers in the region around Skövde still deliver to Swedish Meats in Skara.

Skövde slaughterhouse is involved in the breeding program called Svenska Avelspoolen. The program is further discussed in the section "other programs".

### Transport

The slaughterhouse coordinates all transports of small pigs and fattening pigs. The slaughterhouse buys the transports from private entrepreneurs who have their own vehicles. The communal authorities take care of the hygienic and disease control of transport vehicles.

### **5.1.3 The control system**

Official authorities control the food safety situation at the farm level. If the producer fulfils the criteria presented above it is enough for Skövde to allow a producer to deliver animals. Skövde slaughterhouse is satisfied with their producers and has not so far seen a need to develop a program parallel to the one of authorities. The slaughterhouse always has the possibility to exclude a producer if it fails to meet Skövde's requirements. Unlike the other cases in this study, Skövde does not feel the need for preventive measures in the area of food safety.

---

<sup>2</sup> According to the Swedish law all the pig producers must get the certificate from SvDHV to allow the production

Producers that sign the delivery contract with Skövde slaughterhouse for at least one year (almost all producers have signed one-year contracts), have the possibility for free production consultation. The consultation includes production and result reports. Small pig producers have an access to the production program "PigWin-sow". Soon the fattening pig producers shall have an access to the corresponding program, "PigWin- fattening pig". The slaughterhouse has hired one person to take care of the consultation.

Twelve of the piglet producers use the consultation service on the regular basis. According to the extension advisor some of the producers that do not use the service have already arranged a corresponding service on their own. Other reasons for not using the service may be the low motivation for that type of a service or do not wish to have others get knowledge about their business. The service is a result analysis, including economic and production reports. Included are a report and an analysis about animals' disease frequency (www.skovdeslakteri.se 2003).

#### Official control system

The official control consists of the control from community inspectors and veterinarians connected to the farms.

Producers delivering to Skövde slaughterhouse do not have to be members of the Swedish Animal Health Service (SvDhv), unless there is an obligation based on Swedish law. Since most of their producers are large, they are under the supervision of the SvDhv. There is also a fee paid to the SvDhv on all animals slaughtered, 3.5 SEK per fattening pig or sow. According to the national legislation all the producers that sell breeding material or small pigs must be connected to the SvDhv (Blackert 2002).

#### Other programs

Svenska Avelspoolen/Noorsvin is the breeding program developed and owned by the Swedish investor-owned slaughterhouses. Skövde slaughterhouse is one of the about fifteen members in the program. In the development of the breeding program Svenska Avelspoolen is cooperating with the Norwegian company Noorsvin.

The purpose of the program is to enhance and guarantee the quality of the genetic material to the breeders. According to Skövde's extension advisor the producers that use animals from Svenska Avelspoolen pay between five and six crowns per animal. There is no obligation for producers to use animals coming from the program.

### **5.1.4 Slaughtering**

Between 1996 and 1997 the slaughterhouse invested 7.5 million SEK into a new slaughterline for pigs. In 1999 additional investments in offices and cooling facilities for 6 milj SEK were made. The last investment increased storing capacity with 1000 pigs.

#### Pigs

The slaughterhouse has contracts with 67 pig producers who deliver animals to the site in Skövde. The slaughterhouse makes individual delivery contracts with their producers. There

is no standard contract. The volume of delivered animals is the major factor in the contract. Food safety aspects are not considered in the contract.

Most of the quality aspects are coordinated via the price, e.g. fat content and animal health aspects. The feed the producers give to their animals must have the fat composition that gives the slaughterhouse suitable end product characteristics. The slaughterhouse gives the specification about the contents verbally, not through the price.

### Work

Everyone that handles animals/meat is given training about the food safety system at site. There is also a yearly program for further training in food safety issues. Before people start working in the processing they are tested for infectious diseases. There are no economic incentives based on personnel's conduct concerning hygienic and food safety issues.

### Service

Service of the equipment and cleaning is conducted both by their own personnel and externally hired entrepreneurs. About twelve persons in total are hired for the services, six of them are their own personnel.

### Water

The water comes from Skövde's own well. In the case of problems with their own water, the slaughterhouse has the access to the community water system.

## **5.1.5 The control system**

Skövde slaughterhouse has produced a food safety plan based on the requirements of official authorities. The company doesn't apply any other quality programs besides those issued by authorities.

### **Own control**

An "own control plan" and a HACCP plan are established for the slaughterhouse. The "own control program" consists of 15 control points regarding the food safety in the slaughterhouse. The NFA has an outline for own control programs. This outline has been the base for the program developed by the personnel in slaughterhouse to fit its production processes.

1. Facilities, equipment
2. Personnel
3. Livestock management (hantering av levande djur)
4. Animal receiving
5. Slaughter operations (slakthantering)
6. Microbiological testing of blood
7. Disease registration
8. Water control
9. Temperature registering, fridge and freezer

10. Temperature of Carcasses
11. Delivery control
12. Cleaning control
13. Waste disposal
14. Vermin control (skadedjursbekämpning)
15. Trichina testing

In the following, some of the points in the program are highlighted.

1) Maintenance of facilities and equipment is implemented according to the program. The production chief, quality managers, maintenance chiefs and the chief veterinarian inspect the facilities and equipment every quarter of the year.

2) All employees are subject to the yearly health control. Detailed instructions about hygienic procedures in processing exist. All new recruited people are informed about the hygienic rules. The veterinarian, department and the company health care give yearly hygiene training to all the employees.

4) Because of traceability reasons animals received for slaughter must be identified and their origin must be known. The deliverer of animals must also give an assurance that animals delivered are eligible for slaughter.

5,6) Before the meat inspection carcasses go through the hygienic control where visible contaminations are cut away. Veterinary assistants register discarded pieces and report the results. The production chief makes a weekly evaluation of production results that are also presented for the employees involved with slaughtering. An outside firm, Elko Food, conducts microbiological blood tests. The results are reported to the slaughterhouse.

8) As mentioned above, the water comes from the company's own well. However, there is a possibility to use the municipal water if needed. The own water undergoes four microbiological tests and one chemical test per year.

9,10,11) Temperature in coolers and deep-freezers is automatically registered every thirty minutes. Carcass temperature control is regularly controlled and documented. The meat ready-for-delivery undergoes the same control.

12) Daily cleaning is conducted according to outlined routines in the plan. The slaughtering chief visually controls the cleaning every week. The cleanness is also controlled by taking ten microbiological samples per week.

The slaughterhouse has the HACCP plan for the detection and control of food safety hazards in the processes. The HACCP is further developed into working instructions. Most of the working instruction concerns the control of contamination and spreading of bacteria.

### **Official control**

Six persons in total are appointed by the NFA for the slaughterhouse. Two veterinarians and four assistants are hired for official duties. The expenses of the control are between five and seven million SEK per year.

The interviewed veterinarian, one of the two meat-inspecting veterinarians in Skövde slaughterhouse, has been working in the slaughterhouse for four years. Before the appointment as meat inspecting veterinarian to the slaughterhouse he worked as district veterinarian for twenty years.

According to the veterinarian, more people for official duties would be needed. However, it has been impossible convince the slaughterhouse management and the NFA about the need of additional personnel so far. The situation being like this the veterinarians have to prioritize among the tasks to be done. The documentation and control of inspections are tasks with a lower priority than meat inspection and sample taking. The first mentioned tasks often fall out when there is a lack of people for the official tasks.

The three major duties in the official control are the meat inspection (ante and post mortem), supervision and sample testing.

#### Ante mortem inspection

When the animals are delivered the producer provides a document, which confirms that the animals are in a satisfactory condition for slaughter. The confirmation is defined in national law and is required for all animals for slaughter. The veterinarian conducts the ante mortem inspection. According to the meat-inspecting veterinarian this procedure is working in a satisfactory way and is felt as justified.

#### Post mortem inspection

The necessity of post mortem inspection has been lately under debate. Some of the routines are questioned because they were developed for detection of diseases that at present hardly exist anymore. However, the present inspection procedure of cutting the carcasses guarantees a good control of internal safety hazards. If a more visual control to replace the cutting procedure would be introduced, it is more likely that something may not be found.

#### Sample testing

Salmonella, medical reminders and EHEC (manure contamination, e-koli 157) tests are taken on a random basis. Trichina tests are taken on all the animals. According to the inspecting veterinarian the sample taking procedure is justified. Even if the frequency of trichina findings is low the test is justified because of fatal effects if humans are infected.

The largest risks for food safety problems are connected to hygienic aspects. The crucial point is the cleanness of the slaughtering where all kinds of contaminations are possible. A well functioning cooling system is also important. With an efficient cooling chain and a high hygienic standard in the processing line, most food safety problems can be eliminated.

According to the veterinarian the today's high emphasis on economic aspects with high production volumes may increase the risk for diminishing attention on food safety issues. The two major ways of achieving the goals in the food safety are the training and careful control of processes. The time and resources spent on training of the personnel improve significantly the performance of the food safety system. The good economy of the slaughterhouse also becomes important in the activities towards improved food safety. In the Case of Skövde slaughterhouse, good economic results have made it possible to invest on improved food safety.



The slaughterhouse has the weekly meeting on processing issues where all the employees involved are present. In these meetings the meat inspectors have an opportunity to inform the management and the staff about the food safety situation and its eventual changes. Usually, if the veterinarian needs to change or correct something in the processing, he contacts the manager in charge of the processing (slaktmästaren). The manager then further informs the appropriate persons. If there is a need to correct something the veterinarian avoids the direct contact with slaughterhouse staff because he thinks that better results are achieved when letting the responsible manager to have that contact.

Documentation of errors becomes important when the veterinarian intends to correct something. If documentation is missing there is a bigger chance that errors are repeated. Missing documentation used to be a problem. Was the veterinarian only orally informed about the problems that did not lead to any changes? With the documentation of problems there is a better change that the errors are not repeated. If there would be a need for a juridical process the documentation of problems would act as strong proof in the process. The veterinarian always has the authority to stop production if he or she discovers an acute problem that could endanger the food safety.

Media plays an important role in the control of production. If information about poor conditions can be exposed in media, this can be an efficient way to press for immediate changes. Slaughterhouses usually respond quickly if media discovers undesirable conditions at a site. Skövde slaughterhouse feels the presence of media, who covers official reports from the veterinarians.

The personal characteristics of a veterinarian can be very important for the food safety situation in a company. In addition to the control, the veterinarian's ability to enforce his/her requests in the company becomes important. The job involves daily communication with company personnel. If this communication works insufficiently there is a risk that the food safety control becomes endangered. Managers responsible for food safety issues in the slaughterhouse must also have a certain authority (pondus) in order to enforce safety matters if needed. The veterinarian usually introduces changes through the managers. If they fail in the contact with the rest of the company this becomes a problem. With respect to food safety it would be positive if the veterinarian would have more than at present influence on the personnel in questions concerning food safety issues.

The interviewed veterinarian considers his contact with the staff as good. He though avoids engaging himself in matters that concern relations between the staff and the management. That is because that could be regarded as interference on a matter outside his duties. A good contact also implies that the impartiality of the veterinarian would not be questioned. Thus, good working relations also include a certain distance between the authorities and the company personnel. There are examples from earlier times when the impartiality could sometimes be questioned.

Even if there is no official revision concerning the veterinarian's performance in the slaughterhouse, there is an indirect control. The NFA team consisting of veterinarians and assistants control the meat inspection. If someone in the team fails in his or her job, this will be noted by other team members. So the team to a great extent controls itself. The periodic inspection mission by NFA to the slaughterhouse has the same effect. In this case the control comes from an authority outside the company. EU also has it's own inspections. Skövde slaughterhouse has been subject to such a EU-inspection. The interviewed veterinarian

regards the EU inspection as something very positive. This inspection made all people involved in food safety tasks more aware of the regulations and the food safety tasks in the company came more into focus than before. The support given by the NFA at a central level also increased. In the last two years the requirements and work put on the veterinarians have increased. Because of this, at the same time has the status of the work increased.

The veterinarian at site would like to have a better support from the NFA's central level. The support from the NFA is especially important if changes in the company need enforcement. In these situations the support from the NFA cannot always be counted on. Literal response from the NFA is not always sufficient, either. Meat inspection veterinarians at site often need NFA's clarification about rules and advise about the consistent exercise of authority. Among the meat inspection personnel there is also unawareness concerning technical details such as overtime payment and some other forms of compensation.

Larger companies such as SM have developed own food safety quality systems. An advantage of large operations is that they can allocate more resources to investigate and develop such programs. Besides the control and supervision system by the NFA the veterinarians in Skövde slaughterhouse have no other parallel quality system that engage them. It may be questioned if other quality systems would, in reality, contribute to the present situation concerning the food safety.

The attitude of companies in food safety matters is better now than before. The attitude change comes from the increased pressure from media and an improved control from NFA.

The production chief thinks that the official food safety system in general is considered as good and reliable. However, some of the control activities are not felt particularly meaningful and an updated with respect to the present food safety situation. He feels, for example, that the trichina is one of them because, on average, only one test in every ten years is found positive. One positive thing about an external organization controlling the meat is that farmers never question the slaughterhouse why a pig is discarded.

### **Question of traceability**

All animals delivered to Skövde slaughterhouse are identified at the arrival. The identification is obligatory for all animals. This makes it possible to trace them back to their herd of origin.

If the pork is minced it loses its identity. However, the system is still able to trace the meat back to the farm that the animal comes from.

### **5.1.6 Analysis**

All transactions are analyzed by using the model tool based on the transaction cost theory. The model focuses on four variables; specific investments, uncertainty, frequency and externalities, all affecting transaction costs in a transaction. The control of transactions is also analyzed.

## **Pigs**

### Specific assets

Both pig production and the slaughterhouse operation involve investments in specific assets. An animal producer makes specific investments in premises, buildings, animal material knowledge etc. The corresponding investments exist in a slaughterhouse operation. Specific investments mean that the holder of the specific asset must make sure that he/she can use these investments for their purpose or otherwise the value of the investments to a large extent can be lost, i.e. the alternative value of the investments, is low. The crucial factor for the producer, in order to safeguard his/hers investments, is that he/she has access to buyers of pigs. The slaughterhouse has the corresponding need concerning supply of animals. By writing long term contracts between producers and the slaughterhouse investments on both sides can be safeguarded.

The contract specifies volume and quality, and that animals sold must be free from certain diseases.

### Uncertainty

When the slaughterhouse receives pigs it must make sure that the animals fulfill certain food safety criteria. Slaughtered animal that don't fulfill these criteria can imply costs for producers, the slaughterhouse and consumers

The food safety aspects of the animals are more or less dependent on two matters; the genetics and the breeding of animals. In order to safeguard the quality of the animals these two matters are controlled. The breeding control in Skövde's case is in the hands of authorities. The Swedish Animal Health Welfare and community inspectors together with the farm veterinarians manage the control at the farm level. The genetic quality of the animals is partly controlled by Skövdes breeding program and the animal health programs managed by the Swedish Animal Health Welfare. Before the animals are slaughtered they are also controlled in the ante mortem inspection.

Compared to the other three larger slaughterhouses in this report, Skövde is the only one company that doesn't have it's own breeding control program at the farm level. Since Skövde slaughterhouse doesn't have an own control program they must have a good confidence in their producers and the official controlling authorities. Since the SvDHV controls most of their producers, this reduces the uncertainty and thereby demands for own control programs. Their smaller producers that not may be subject to any control programs besides the supervision from municipality animal health welfare inspector could be considered a risk group. The uncertainty connected with this group could be reduced by some control imposed by the slaughterhouse.

### Frequency

Contracts that are written between the slaughterhouse and producers specifies the number of times that animals should be delivered i.e. frequency of transaction with the slaughterhouse. Frequent transactions between the parts gives them the opportunity to learn about the needs from the other part and reduces the uncertainty about the other parts behaviour and products.

Out of a food safety perspective the slaughterhouse can gain experiences about the food safety status of animals from a producers and take actions according to this.

Frequent transactions also lower the risk for opportunistic behavior. Concerning food safety a producer must make sure that he delivers healthy pigs to the slaughterhouse. Otherwise it's likely that the slaughterhouse would cancel further transactions.

### Externalities

Many of their larger producers have earlier been delivering to the cooperative and therefore been subject to their control programs. Those programs are likely to have a long lasting positive effect on the general food safety situation. This may be considered as a positive external effect of Swedish Meats to Skövde.

### **Control/ Inspection**

#### Specific assets

The slaughterhouse has a food safety system based on the control from the NFA. This system can be seen as investment by the slaughterhouse to assure the quality of the pork from a food safety point of view.

The NFA makes specific investments in knowledge about food safety. The personnel is trained to and has special knowledge in the food safety area.

#### Uncertainty

The fact that the slaughterhouse does not have an own food safety system makes them dependent on the food safety programs by authorities. An own system could further reduce uncertainty. Contradictory is that the management at the slaughterhouse and the official veterinarian are out of the opinion that NFA's system enables a satisfactory food safety situation and the need for parallel systems would not be justified. Additional systems would increase the costs but not necessarily the benefits. The positive attitude from the management towards the present food safety system improves their confidence in the food safety in the slaughterhouse.

The veterinarian's presents the need for additional personnel is something where the slaughterhouse has a different opinion. The slaughterhouse doesn't think that the benefits from appointing additional personnel would be larger than the costs. Since the appointment of additional personnel cannot get support by the NFA at the central level, the situation remains unchanged. If there is a deficit in personnel this could increase negative affects in the food safety situation in the slaughterhouse. Thus, the uncertainty about the functioning of the control increases.

A good economy in the slaughterhouses allows investments positive for the food safety. Resources can easier be allocated to improve the food safety situation. In Skövde's case several investments have been made in the last years, for example, increased cooling capacities.

The veterinarian's comment about the insufficient support from the NFA at the central level is increases the uncertainty in the food safety control. The poor support weakens the official veterinarians' ability to maintain the satisfactory food safety situation.

Medias' increased presence in slaughterhouses is also a new situation and a force that affects the food safety situation. If official veterinarians report undesirable conditions it is likely that this is presented in the press with a direct effect on the reputation of the slaughterhouse. The officials can also enforce changes with the help of the media. High costs can be imposed on the slaughterhouse if the reputation among consumers is undermined. An increased attention by the media has a controlling effect on the slaughterhouse. An increased control will reduce the uncertainty concerning the food safety situation.

The procedure/possibilities for veterinarians to enforce changes differs from before. When introduced, the change have to be supported by legislation, and documentation is a necessity to proof that a condition needs to be changed. These two things were not important in the same way before when the management at slaughterhouses didn't question the actions by authorities in the same way than at present. The new situation is a reason for the authorities to create new procedures to control slaughterhouses in an efficient way.

#### Frequency

A high frequency of inspections opens possibilities for large-scale advantages. Compared to a smaller operation a larger one could consider integrating a corresponding service to NFA's in the company.

#### **Work, Slaughterhouse**

The performance of the staff in the slaughterhouse is very important for food safety. Many of the food safety hazards can be avoided if the slaughter is conducted in a correct way and avoiding contamination of meat.

#### Specific assets

The slaughterhouse gives their personnel training in cutting techniques and food safety knowledge. This could be regarded as specific investments in the staff. Through the training and the work at the slaughterhouse the staff gains experiences and skills that may be regarded as specific assets belonging to the staff.

The animals that the slaughterhouse processes may be regarded as specific investment. If the processing of animals is conducted in a bad way, e.g. contaminating the meat, the meat will decrease in value. In order to safeguard the value of the animals, people are trained to avoid such things from happening.

#### Uncertainty

One uncertainty concerning work is the performance of labour in food safety issues. Contamination of meat is a food safety hazard that can be difficult to detect. This type of food safety hazard is close connected to the performance of staff conducting the slaughter. Since the performance of the staff not is controlled all the time the performance becomes a source of

uncertainty for the food safety. Uncertainty regarding the performance of labor is lowered by control and education of staff for NFA's routines.

### Frequency

Using the same labor over the time gives the slaughterhouse a possibility to learn about the performance of the staff according to food safety issues i.e. reduces the uncertainty about labors performance. With experiences about the staffs performance factors affecting the behavior of people can be better monitored e.g. training and control.

### Externalities

Many of the food safety hazards are dependent on the performance of managers and staff at the slaughterhouse. If managers and staff are aware of the food safety risks connected with slaughter, and the slaughter is conducted according to the outlined food safety routines, the risk for food safety problems can be brought to a minimum.

Factors crucial for the food safety situation are those that affect the behavior of people. According to the national legislation all people working with slaughter have to pass a food safety education according to their tasks. The training is important for two reasons:

- It gives the person an ability to understand and evaluate the situation from a food safety point of view.
- It is a means to increase the motivation for food safety tasks; the persons see routines connected to food safety more meaningful.

At Skövde slaughterhouse both managers and staff get training in their tasks. It is important to ensure that the education gives an appropriate understanding and motivation for people to carry out their tasks. The amount of resources (time etc.) spent on education should be evaluated against the benefits from educating people.

*Control* of people is also important. If a person knows that his or her performance is controlled, this increases the motivation to fulfill the assignment. The National Food Agency is responsible for the external control at the site. According to national legislation managers at the site also have a controlling function and are responsible for the self-control. Since the manager is working as a link, between the veterinarians at the site and the staff, the manager's ability to handle relations becomes important for the food safety situation. The veterinarian's contact with managers also becomes important.

A centralized ownership could have positive effects on the food safety situation. A strong personal engagement motivates control of the job. A control that is positive for the performance of workers.

### **5.1.7 Conclusions**

The sources of uncertainty concerning the quality of animal material are somewhat different in Skövde's case compared to the companies Swedish Meats and Spånga Gårdsslakter.

The suppliers of animals to Skövde are not obliged to participate on the SvDHFV's animal health programs. This increases the uncertainty about the health status of animals delivered to the farm by non-connected suppliers. On the other hand does Skövde slaughterhouse have a relatively large group of large suppliers that are participants in SvDHFV's programs. This has the effect of reducing the uncertainty. It though remains that the few suppliers not connected to the animal health programs must be considered as a "higher risk group".

The fact that many of the larger producers earlier have been connected to Swedish Meats means that they have been subject to their producer programs concerning animal health. Even if these producers not are subject to these programs today, it's likely that there are positive effects still remaining from the time before. This could be regarded as an external effect from SM with positive consequences for Skövde.

Skövde slaughterhouses bonus system to their suppliers has partly the same effect on animal quality as Swedish Meats patronage refund. Their producers have received these bonuses when the benefit of the slaughterhouse operation has been good. There are though incentives for producers to deliver animals that favor the slaughterhouse i.e. satisfying out of a food safety perspective.

Concerning the slaughterhouse operation their food safety control is solely built up on NFA's standards and control. There are no additional systems in order to reduce uncertainty about the food safety situation even further.

The good economy of the slaughterhouse is an advantage when investments concerning food safety needs. The economic situation allows investments benefiting food safety, which has the effect of reducing the uncertainty in the food safety situation.

The slaughterhouse could be regarded as middle large operation. This gives them large-scale advantages in their food safety control from authorities. They are at the same time not large enough to build up an own food safety organization with own expertise that could be economically justified.

## **5.2 Swedish Meats ek. för., Uppsala**

### **5.2.1 Description of the marketing system**

Swedish Meats (SM) is one of the largest food processing companies in Sweden. It is the major slaughter company in the country and it is the market leader in meat cutting and processing. SM is a cooperative and owned by 24000 Swedish member-farmers. SM employs 4600 persons and had a turnover of 9.7 billion SEK in 2001.

The group of companies consists of the "mother company", the two processing companies, Scan Foods and Ellco Foods and a few specialized companies. SM is also a partial owner in other food-oriented companies. Some of them are Swedish but SM also owns a part of an international company, Daka (Denmark). Since 2000 the concern has gone through major organizational changes, including the merger of its owner associations and liquidation/closure of some of its activities. The new organization has been able to turn a few years' negative economic result into positive since the middle of the year 2000 ([www.swedishmeats.com](http://www.swedishmeats.com) 2002).

The cooperative's owners are suppliers for the production. The members/owners are located all over in Sweden. SM's member organization is divided into 26 regions from North to South. Trustees (förtroendevalda) representing those regions are elected into two central organizations, the general assembly (stämмоfullmäktige) and the supervisory board (förvaltningsråd). The general assembly is the highest decision making body and elects the board of the organization. The supervisory board works as link between the board and the members by giving the board advice and grass-root information for the base of the board's decisions (www.swedishmeats.com 2002).

According to the contract coordinator Swedish Meats's total processing of pigs in 2002 amounts to over 2 million. That is about 60 000 pigs less than in 2001. Since 2001 the number of producers has been reduced from 3160 to 2454 this year. The trend is obvious with fewer farmers but with larger units.

### **Slaughterhouse, Uppsala**

Swedish Meats' slaughterhouse in Uppsala was built in the late 1960ies. Hereafter several changes in buildings and premises have been made to meet the increasing volumes. Cows/calves, pigs and Sheep/lambs are slaughtered at the site. According to the production chief, the slaughterhouse has a slowly increasing volume in slaughtered pigs. 218 000 pigs were slaughtered in 2001, 228 000 in 2002 the forecast for this year is 230 000. The site is also slaughtered about 40 000 cows (5000 calves) and 20 000 Sheep/lambs in 2002.

According to the sales officer (slakteriexpeditör) about 80% of pork is delivered to Scan Foods (belonging to the company group) and the rest is delivered to about thirty large industrial customers mostly located in Stockholm.

The site in Uppsala can be divided in to five production departments and the delivery terminal. The five departments are the following: pig/sheep-slaughter, cow/calf-slaughter, pig/sheep cutting, cow/calf cutting and a department of meat processing. The meat-processing department processes three major products: minced meat, hamburgers and marinated meat. In the slaughterhouse there is also a service section with technicians and cleaning personnel.

The number of people working at the site varies during the year. At present there are 488 people employed (Helgesson 2002). According to the economy director nothing is sold at the site and therefore no turnover is counted. However, the costs for the production amount to 174 million Skr in 2002.

## **5.2.2 Production**

### Piglets

Table 2 presents the number of producers and volumes delivered from various regions to the Uppsala plant.



Table 2 Number of producers and volumes delivered to the site in Uppsala, year 2002

Region	Fattening pig producers	Pigs, (30 % integrated)	Small pig producers	Fattening pigs
Gävle-Dala	28	10 000	15	14 500
Uppl-Sthlm	85	82 000	85	88 000
Västmanlan	72	65 000	51	65 000
Other regions		40 000		
Tot	185	197 000	151	167 500
Sverige	2454	2 milj. pigs		

Source: Hullberg, T (2002)

Swedish Meats in Uppsala has about 185 fat-pigs delivering producers. The major part of the producers are located in three regions; Gävle-Dala, Uppland- Stockholm and Västmanland. About 151 small pig producers deliver their pigs to fattening pig producers. SM coordinates this activity. At the moment there is a surplus of piglets in the region. These animals are directed to fat-pig producers from other regions in the country.

#### Feed

Swedish Meats has the policy requiring that the feed used in production must comply with the rules of the Foundation of Veterinary Feed control (Stiftelsen Veterinär Foderkontroll, SVF). External feed has to be bought from retailers authorized by SVF. If a producer uses food from a “non authorized “ feed retailer, he/she must have a proof that the feed fulfills the criteria of SVF (see the BIS-program).

#### Water

Water used in the production must be analyzed and certified according to the quality requirements of the National Food Association. If new wells are utilized or there is a suspect concerning the water quality, new tests must be taken (Swedish Meats 2002 p. 5).

#### Work

Swedish Meats does not provide for their producers any general training in breeding. However, sometimes training in specific topics in pig production is given.

People visiting a farm are always a risk. Special attention must be paid on people who have recently been in contact with animals because there is a risk of transmitting diseases between different herds (see the BIS-program).

#### Premises

Premises have to be approved by the municipal authority. There are also special requirements in the BIS+ program (see BIS+).

Most of the farmers own their production premises or rent them. In some production forms shared ownership is common. Sow ring is an example where a few fattening pig producers have common premises for the sows.

According to the extension advisor the trend among farmers in SM is that the number of producers decline but at the same time the production increases among those staying in business. The trend towards larger units requires larger investments in premises. A larger proportion of financing must be raised outside the firm, which makes banks and outside investors more involved in the production. Swedish Meats has established a consulting firm, Maxima, who assist farmers in expanding their production.

### Other inputs

All kinds of medical treatments must be prescribed by a veterinarian and documented (see the BIS-program).

### Transports

Swedish Meats has central contracts with transporting companies conducting the animal transports. Swedish Meats, though, conducts the coordination of transports centrally from a central point in Sweden. Before they are engaged, all vehicles must have a proof that they follow the national regulations concerning animal transportation. This is controlled annually. Transport conditions of animals are defined in transport contracts. In the contract the transporter must assure that he/she follows the national regulations. According to SM's central quality manager, HACCP standards for the transport system are under development. As a means to avoid transmission of diseases to the next group of animals entering the transporting vehicle they must be cleaned after each animal transport. SM has its own cleaning facilities for that purpose. In a few cases farmers have arranged their own transportation through hiring private transport entrepreneurs.

### Pig breeding

The breeding systems vary among farms. There are three major breeding systems among SM's producers; specialized, external-integrated and integrated systems.

- The specialized system is most common counting for 50 per cent of the production. In this system specialized small pig producers deliver the pigs at a weight of about 26 kg to fattening pig producers who raise the pigs until they will be slaughtered.

SM helps in the coordination between small pig producers and fattening pig producers as well as in negotiations concerning the small pigs' prices. There is an official price notation on small pigs, but other factors such as volumes delivered and quality aspects are also taken into consideration before the final price is set.

- The semi-integrated system counts for about 20 per cent of the production. The system consists of specialized small pig and fattening pig producers. A special long-term contract is made between the two parts.
- The rest of the pigs (30 per cent) are raised in integrated systems. In the integrated system the pigs are born and raised by the same producer.

SM promotes the integrated systems, combination piggeries, for two reasons, the integrated production reduces the disease risk in the herds, and SM gets rid of the coordination of small pig and fattening pig producers.

According to the SM “contract coordinator piglets are divided into three classes: unclassified, BIS and BIS+. The classification is based on quality criteria. The unclassified small pig is least paid and the BIS+ pig is most paid. At the moment 90 per cent of the small pig producers are BIS certified and five per cent of those belong to the BIS+ class. The BIS-program will be further explained under “Other programs”.

### **5.2.3 The control system**

#### **Administrative control system**

The authority control at the farm level comes from the following three organizations:

- The communal animal health welfare: inspects the welfare of animals on farms.
- The Swedish Animal Health welfare: visits farms and establishes control programs for prevention of animal diseases.
- The county veterinarians exercise control when visiting farms (only if the producer calls for treatment of sic animals).

#### **Other programs**

##### BIS

Swedish Meats has its own quality program called BIS (Bäst in Sverige) and BIS+. The program includes breeding, animal health, and feed and production/management/hygiene matters. Producers belonging to the BIS-program are paid an extra 20 öre per kg. More than 95% of the slaughtered pigs are bred within this program. At present more than 90 per cent of producers belong to BIS. BIS+ is a higher-level program that aims to improve the health of pigs. A small pig costs 6-7 SEK more, but is estimated to give an at least 15 SEK premium when sold. This is because when following the BIS+ rules, less diseases and better growth are expected.

About 87 per cent of Uppsala slaughterhouse’s pig producers belong to BIS. According to the extension advisor producers outside the program are usually small and in the situation where needed investments for BIS –certification wouldn’t be profitable, e.g. because the farmer is intending to quit production in a few years.

The requirements for BIS –producers are the following:  
(Swedish Meats, 2002)

##### Breeding

The purpose of controlled breeding is the enhanced production efficiency, meat quality and animal health.

- Plan for procurement of animals following the regulations of the BIS program. The genetic quality of small pigs must be certified through the documentation of pigs, sows and boars.
- Documentation of the origin of animals must exist.
- The breed must be a 3-crossbreed, the sow a cross between Svensk Lantras and Swedish Yorkshire and the boar must be a Hampshire

#### Health

- The producer must have joined to the “Swedish Animal Health Welfare’s” (SvDHV) official pig health program, and a health plan must have been established.
- Control and documentation of animals and people getting in contact with the pigs must exist.
- Salmonella testing must be accomplished and results documented according to the SvDHV’s instructions.
- No use of hormones or growth promoters are allowed
- Documentation of outside visitors must be conducted. This is important for the control of diseases that outside visitors might bring.

#### Feed

- All feed, bought and of own production must have the quality guarantee. Facilities for feed storage must also fulfill the requirements of the BIS-program.
- Documentation of feed analysis must exist.
- Water for pigs must have been analyzed before use.
- No GMO feed is allowed

#### Production/Management/Hygiene

- Herd description with announcement animal facilities and production form must be created.
- Hygiene program must be established. The program includes routines for daily cleaning. It also includes the plan for more careful cleaning with water and disinfectants that must be carried out at least once a year.
- Documentation about the origin delivery destination of animals.

#### Auditing

The auditing is a control procedure making sure that the producer fulfils the criteria of the BIS program. It is a possibility for the producer to get help in their production problems. This contributes to the increase of trust among consumers.

Three persons employed by SM conduct the auditing. The auditing costs 2000 SEK. It is done before the producer is joined to the BIS program and thereafter every second year. If the producer fails to meet the standards, a new auditing is done three months later, costing another 2000 SEK. If a producer fails the re-auditing he/she will be disconnected from the program until non-compliances are corrected and the producer passes a new revision.

Maxima is the consultant and auditing bureau specialized on pig production. The bureau employs sixteen people. The bureau is established and owned by SM. However, in 2002 a major part of Maxima was sold to LRF, Swedish farmers’ organization. Only the auditing part remained within Swedish Meats.

## BIS+

The BIS+ program has the purpose of lowering the infection pressure resulting to the better growth

Pigs produced in the BIS+ program have to fulfill the following additional criteria:

### Premises

- Sections in the buildings, keeping pigs in different ages (stages of production) separated.
- All pigs in one section of the building must leave before new ones can enter.
- In order to avoid small pigs from several different breeders to be mixed, smallpigs must be delivered in groups of minimum 50 animals. That has the purpose of reducing the mix of diseases that pigs might bring.
- The producer must have gone through the hygiene program.

## KRAV

Swedish Meats sells organic produced meat as KRAV-certified. Demand on KRAV-certified meat has been lower than expected. Swedish Meats' goal has been about 40 000 animals per year in Sweden, but only 10 000 animals were slaughtered in 2002.

## Dalagrisen

Dalagrisen is the concept for pigs that are produced and sold in the certain region in Sweden. All the animals coming from the region Gävle-Dala are sold under this concept. From the year 2003 the producers in Dalarna will slaughter the production in the reopened slaughterhouse (Ickholmen) in the region.

### **5.2.4 Slaughtering**

The slaughterhouse is divided into two lines, one for pigs and sheep and one for cattle. Depending on the supply, the number of slaughtered pigs per day varies between 800 and 1100. Sheep are slaughtered in the same line with the speed of 200-350 animals per day. The cattle line slaughters about 850 animals /week. A total of 56 person's work in both lines, 27 in the pig line and 29 in the beef line (Andersson T. & Borgström 2002).

Swedish Meats has developed an Internet based information system that collects information from all processing plants. This system makes it possible for quality managers to get on-line information about the processing in the country at any time. The system includes information about volumes slaughtered and important quality variables. Food safety variables such as disease frequency among animals and results from bacteria samples are also available in the system (Lundell 2002).

### **Description of tasks and transactions**

#### Pigs

According to the contract coordinator SM has the system where the producer tells how much he intends to deliver every quarter of the year. This works as the base for the forecast for the

coming year. During the latest one-week before slaughter the producers announce that they have animals ready for the delivery. Based on this information, the slaughterhouse makes the forecast about the incoming pigs and responds to the producers about their pigs' collection date. All collection transportations of animals to Swedish Meats are coordinated from one organization center in the middle of Sweden.

The bonus and premium system is developed to favor efficient production. The system includes variables such as the way pigs are raised, volumes delivered, and the duration of delivery contracts.

The optimal coordination and use of the transport system is important for the economy of the business. Extra payments from 2 to 12 SEK/pig is paid for weekly deliveries of 35-250 pigs. A premium is also paid if the producer contracts the yearly production of at least 1000 pigs for 2 years. The premium varies between 3- 18.50 Sek/pig depending on volumes and the duration of the contract.

SM also promotes various breeding forms, the integrated form is most valued with a 40 öre extra payment/ kg. The integrated form has the advantage of less coordination and fewer transports, which lowers the expenses for Swedish Meats. As mentioned above, thirty per cent of the producers are integrated. Eighty percent of those not integrated are, are in a system called "semi-integration" (external-integrated). In this system SM have formed groups of producers with a matching number of small pig and fattening pig producers. A member of such group has the same premium as integrated producer.

### Work

According to the "work research technician" a new salary system is being developed in the plant. The salary has the fixed part depending on the competence and task of the employee. The variable part consists of volume based premium and the quality premium. The quality based part of the premium focuses on the cutting and the extraction of valuable parts from carcasses.

### Equipment

SM owns the premises in Uppsala. The equipment also belongs the company. SM's own service personnel, about five persons, handle the service of the equipment. Manufacturers of some of the slaughter equipment also have their own service personnel taking care of maintenance in the plant (Lundell 2002).

### Cleaning

Cleaning and sanitation are carried out following documented procedures. In some slaughterhouses external companies conduct the cleaning. However, in Uppsala plant the cleaning is conducted by them selves. According to the salary administrator twenty persons are hired for cleaning of production facilities, another eight persons conduct cleaning in common facilities.

## 5.2.5 The control system

### The official control system

The National Food Association charged for their services at the slaughterhouse in Uppsala 7-milj SEK in 2001.

The food safety activities in SM are divided into three major tasks (see general info about these tasks). The amounts of people appointed by NFA for each of these tasks are as follows:

Meat inspection:	2 veterinarians and 8 assistants
Sample testing:	1 assistant
Supervision:	0.5 veterinarians

The ante mortem inspection is the visual inspection of animals. In the inspection the veterinarian looks for diseases listed in the epizootic law and controls that the animals for slaughter are in a good condition. The post mortem inspection includes every carcass after the slaughter. The inspection is based on pathology and serves the purpose of sorting out animals with diseases. Contaminated meat will also be discarded.

Sample testing is conducted according to outlined routines in the slaughterhouse. All carcasses are tested for trichina. Random samples are also taken for detection of antibiotic residues, hormones or growth promoters as well as diseases listed by the NFA. Tests according to the national salmonella program are also taken.

NFA's supervision controls the whole production process. The supervision is based on the HACCP-plan, a plan that identifies the points that are "critical" in the production from a food safety's point of view. The supervision implies the following tasks for the veterinarian (Arenander 2002):

- Approval of the own-control
- Review of control reports
- Inspections by the veterinarian
- Participation in meetings regarding food safety aspects

According to the chief veterinarian the meat inspection and sample testing have a sufficient number of people for the completion of their duties. However, the supervision function is undermanned.

According to the chief veterinarian the general opinion is that the food safety tasks concerning pork production are justified. However, the old procedure for detection of heart valve infections (hjärtklaffsinflammation) needs to be changed. A new method reducing the risk for contamination of meat and work accidents is badly needed. The cutting and inspection of lymphatic nodes could also be changed because of the risk for contamination of meat. In the case of pig-meat a visual inspection would be introduced. Since the post-mortem inspection was developed a long time ago it was made to prevent problems of that time. Along the time the situation has changed, and therefore reconstruction of the control could be made to better meet the situation of today.

Once a week, people in the production are informed about the production results at the site. The chief veterinarian, production managers and the staff examine protocols about the process. The meeting informs the plant personnel about the performance in processing and eventual changes at the site.

One problem in the production is the gap that sometimes exists between managers at the plant and the staff. This can lead into a situation where the manager is not aware of the staffs' needs e.g. with respect to training.

Besides the people working at the site, Swedish Meats has quality managers at the central level in the cooperative. According to the chief veterinarian, there is a potential problem if the quality managers make decisions with managers without taking into account opinions of the people on the floor. The central quality managers are not present at the plant every day and therefore it is possible that information from the central level never reaches the floor level.

The chief veterinarian emphasizes that it is important that the relation to managers is correct and that the objectivity is obtained. Depending on the situation, the managers' attitude towards veterinarians varies. A veterinarian is sometimes seen as cost imposed by the NFA and in other situations as a co-worker in the company. An example when the veterinarian has the role of a consultant is when investments in buildings that affect food safety issues are done.

Knowledge about the legislation is a basic precondition for the accomplishment of the meat inspection task. In order to enforce changes that are expensive for the slaughterhouse, the veterinarian must have the support from the legislation. According to the chief veterinarian, an important factor for the motivation in the job is the opportunity to learn new things. Also the social character of the job is important. Something more uninspiring can be the routine part of the meat inspection.

The development in the sector goes towards more centralization and larger units. The time in the various slaughtering processes become shorter. Increasing unit sizes mean that more people are affected if a food safety problem in the process occurs.

Veterinary inspectors visit the site at least once a year. At this visit the process is evaluated according to the general food safety rules. Since the chief veterinarian is responsible for the food safety issues at the site, it could be appropriate to evaluate also veterinarian's conduct. However, this is so far not done. The continuity in the inspections by the authorities is also important for the standard of the food safety. If inspections are absent there is a risk that the food safety standard is lowered.

According to the chief veterinarian the advantage for the slaughterhouses to have state meat inspection is that the producers never question why meat has been discarded. This is a strong reason for the producers to keep the meat inspection in the hands of the state.

Looking the three tasks; meat inspection, sample testing and supervision, the most necessary for the NFA is the supervision. The largest food safety problems of today can be prevented through supervision. Most of the routines in the meat inspection are such that the slaughterhouses would have them even without the involvement of the state. The sample testing is also more self-settling than the supervision because it is in consumer's interest to have these tests. Thus consumers would push processors to have them.



According to the chief veterinarian the control is in the interest of the society and should therefore be financed by the state. If the companies finance the control, there is a risk that the processors' interests will affect the control

### **EU-inspections**

EU also has its own inspections. The slaughterhouse in Uppsala has had three EU-inspections so far. The purpose of inspections has been to evaluate the Swedish authorities control system with respect to the current EU-legislation. The central quality managers at SM supply the inspectors with the information. The official veterinarian appreciates EU-inspections because they act as a review of the control at the site and give information about the current legislation.

At the moment EU is the organization that leads the development in the food safety area. It can be regarded as positive that the reorganization of the control has started. On the other hand EU could be criticized for time it takes before changes take place.

### **Other programs**

The control programs vary very little between different production sites within the SM concern. According to the central quality manager the general thought is that the control should be as standardized as possible within the concern.

In order to make the system as efficient as possible, coordination of all those programs becomes important. In addition to Swedish authorities' food safety programs, a number of additional quality measures are used at Swedish Meats. The figure 8 presents the programs used at Swedish Meats.

- HACCP+ own control program (Own checks programs): According to the food law the own control program and the HACCP-plan is established for the slaughterhouse. The own control plan is a 15-point program, based on the HACCP-principles covering the demand of control from authorities. An inspection veterinarian, the management chief and quality coordinator establish the own control program. When the own control program is made the chief veterinarian approves it. Besides the own control program, a HACCP control plan is made as a complement. HACCP plan is a requirement for every slaughterhouse. According to the chief veterinarian the own control is a cheaper compared to a state control and therefore preferred by the companies. The central quality manager regards the own control as more efficient.
- A special nine-point control program (handbook) for animal care is prepared. The program covers the time from animal receiving until the animals are dead. After the animal care control program follows a 16-point program for slaughtering. The internal control program at the slaughterhouse is further developed than the obligatory own control program from SLV. Differences in control are the following:
- The control of the cooling process is enhanced. According to the food safety legislation the meat temperature should be registered when the meat arrives and when it leaves the slaughter. The increased control and registration of meat temperature has two effects; the control of bacteria growth is enhanced, and other meat quality aspects can be better controlled.

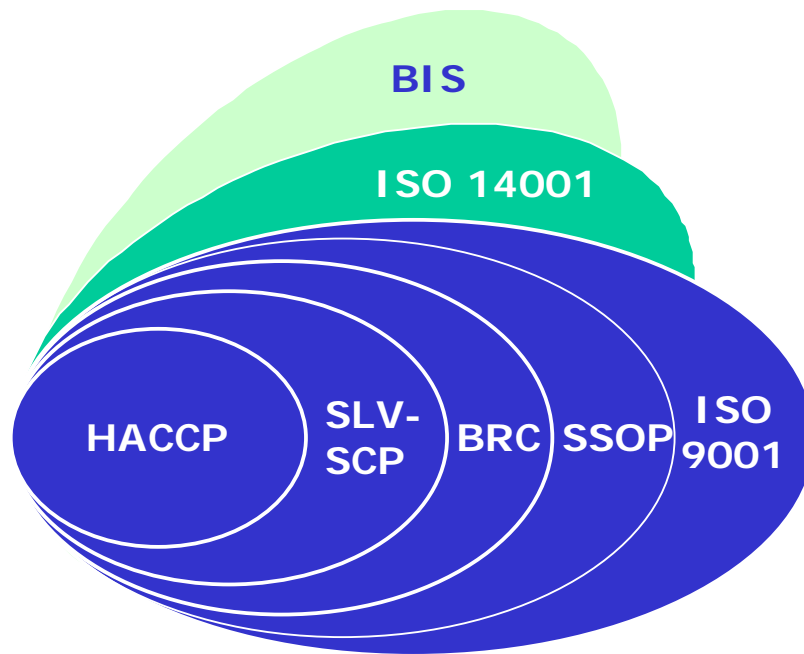


Figure 8. Quality management systems within Swedish Meats<sup>3</sup>

The frequency of sample testing of bacteria is higher than the requirements of authorities. Samples are taken on bacteria that are not considered in the legislated control e.g. Listeria and VETEC. According to the chief veterinarian VETEC have however not yet been found in pork.

- SSOP<sub>2</sub> (Standard Sanitary Operating Procedures) is the control system issued by USDA (United States Department of Agriculture). The standard specifies routines for processing sites exporting meat to the USA. The Slaughterhouse in Kristianstad is the only SM plant adapted to SSOP rules. According to the quality management chief in Kristianstad the SSOP standard represents some major changes and in the processing compared to the situation before. Higher demands on control of hygienic standard require investments in the equipment. Species verification of animals is required, which means that the breeds of all animals must be documented. Increased testing frequency for bacteria (E-coli) and an increased control by authorities are also major changes. The SSOP approval means higher expenses because of investments, more testing activities and increased control. The frequency of authority control increases from once per year to once per month. Of the inspections the Swedish Food Administration performs eleven and the officials from USA visit and control the processes once a year. USDA has its own controlling organization visiting the production sites concerned.
- BRC, British Retail Consortium, is a British standard developed by the British retailers reflecting the retailers' demands from their suppliers. The standard is applied by ICA and Axfood (from 2004) and some other food retailers in Sweden and is used as quality guarantee in two Swedish food chains. ICA and Axfood demand this quality standard only

<sup>3</sup> Figure 2. is a reconstruction of material from Swedish Meats

for products with their own label. The production site in Skara is the only one SM slaughterhouse applying BRC. In order to be BRC certified a third party (Det Norske Veritas/ Semko eller SIK), inspects the site and issues the certificate. This is the major cost for the having the BRC standard. According to the SM hygiene specialist a production site with a well functioning HACCP plan and an ISO 9001 already fulfills in most aspects the criteria of the BRC certificate. One way to reduce the expenses for different certificates is to make revision for both ISO 9001 and BRC at the same time.

- ISO 9001 is an international quality management standard. The ISO-system serves the purpose of improving internal operating procedures including the coordination of the other quality systems. Swedish Meats has established the certificate for the concern and it has been implemented in seven processing plants at so far. The plant in Uppsala is not yet certified. According to the central quality manager it takes about one and a half year to implement the standard in a plant of Uppsala's size. External costs for a certificate are about 50 000 Sek, and additional 25 000 for the yearly review of the certificate.
- ISO 14001 is a corresponding international standard to ISO 9001 focusing on environmental issues.

### **Experience about the control**

According to the central quality manager, larger production sites have the advantage of scale economy when introducing new controls. An advantage for smaller companies compared to SM is that new changes could be faster introduced if decision routes are quicker. Decisions seem to take a longer time in larger organizations.

It is important that there is a good communication relation among people in controlling authorities. An efficient control is decisive for the proper performance of the slaughterhouse. An insufficient control could cause major costs for the company.

It is important that new routines imposed in the production are made in a way that they suit the slaughterhouse processes as good as possible. Decisions taken far away from processing may not come out as well as if they would be taken closer to the reality.

The present own-control in slaughterhouses is considered more efficient than having a similar external (authority) control.

### **5.2.6 Question of traceability**

According to the national legislation, all animals delivered for slaughter must be identified. After slaughter and removal of hair the carcass gets an identification number. The identification is important because the producer is paid according to it. The ID is also important in tracing possible diseases back to the producer. After cutting the carcass the traceability of a specific animal is more or less lost.

After cutting the slaughterhouse ID follows the meat. A patch is attached to the meat. It tells the date of slaughter and where the meat has been cut. Even if the producer loses the animal identification it will be possible to trace the meat back to the slaughter day and producers who have delivered meat on a specific day. This information follows the meat all the way to

retailers. Different to pork, based on law, all pieces of cattle meat must be traceable on a detail level.

### **5.2.7 Analysis**

All transactions are analyzed by using the model tool based on the transaction cost theory. The model focuses on four variables; specific investments, uncertainty, frequency and externalities, all affecting transaction costs in a transaction. The control of transactions is also analyzed.

#### **Small Pigs**

##### Transaction specific assets

Breeding piglets are a transaction specific investment with low alternative value if the piglet can't be sold for fattening pig production. Once the small pig has reached an optimal age for selling, it is important for the efficiency of the production that there are interested buyers at the same time.

The fattening pig producer has corresponding needs for the efficiency of the operation; a certain number of small pigs of a certain quality are needed at the certain time. The coordination between small pig producers and fattening pig producers becomes essential for the economy of the system.

Producers on both sides make their own contracts, but SM has developed systems for the coordination of producers. SM's delivery contracts have the purpose matching the number of small pigs and the time for delivery to fattening pig producers. The quality from food safety's point of view is also coordinated in the BIS-program. A small pig producer makes specific investments to fulfill the BIS-criteria, at least the expenses for revision. These investments are only fully compensated if the small pigs are sold within the system.

If delivery contracts between the two parts are missing, reality has proven that small pig producers are more vulnerable to price fluctuations. In 1998 when the price of pork reached the bottom level, fattening pig producers decided to hold production until prices rose again and were high enough to cover the variable costs. In this situation small pig producers could not find buyers, which caused them considerable losses. The small pig producers didn't have the same opportunity to hold production, because the breeding material they had invested in caused considerable costs whether pigs were born or not.

There are incentives for a producer to avoid a situation where the transaction specific investments can be lost. This opens the change for opportunistic behavior towards the slaughterhouse. If a producer knows that there is a risk that the value of an animal could be reduced because of food safety reasons, the animal may still be sold to the slaughterhouse without losing value, if the slaughterhouse is not aware about eventual irregularities.

The transaction cost theory assumes the possibility for asymmetric information between sellers and buyers. The small pig producer has more information about the animals than the buyer. Some variables interesting for the buyer, e.g. protection against food safety hazards can

be almost impossible for the buyer to control. The situation gives the seller an opportunity to act opportunistically. The buyer must have safeguards against such a behavior.

### Uncertainty

According to the transaction cost theory, uncertainties regarding a good may imply costs for both the seller and the buyer. In pig production the health status of animals is an example about such that can be almost impossible to detect.

The genetic material and the health status are important factors for the further production. Some of these quality aspects of a small pig are almost impossible to verify at the time of purchase. The uncertainty about the quality can be reduced by control or testing, which becomes a cost in the transaction. If the transaction is brought out without reducing the uncertainty the buyer has a cost for a larger risk exposure. BIS, SM's quality system at the farm level is a means to reduce the uncertainty of genetic material and the breeding conditions of animals.

National animal breeding regulations and programs, e.g. national salmonella program also have the purpose of reducing uncertainty and assuring that animals are free from diseases. The BIS program also requires obligatory salmonella tests taken at all farms.

All the small pig producers in the BIS system are object to revision from SM's internal revision bureau. According to the transaction cost theory this control system is a means to decrease the uncertainty regarding animal quality in the transaction between small and fattening pig producers. Since all small pig transmitting farms in Sweden are under supervision of the SAHW, there is only a marginal reduction of transaction costs because of the internal control.

### Frequency

Usually a fattening pig producer buys his material from the same small pig producer from time to time. This has the effect of reducing the disease pressure among animals. Frequent transactions between same sellers and buyers have the effect of lowering transaction cost between these two parties. Both parties learn to know each other, which reduces the uncertainty.

The risk for opportunistic behavior can also be reduced in frequent transactions. Both parties must be sure to meet the other parties' demand or otherwise either party will pull back from further transactions.

SM introduced the semi-integrated production system where certain small pig producers are in a group with a matching number of fattening pig producers. Since the producers have frequent transactions with the same partners this gives the opportunity for producers to learn what other parties desire. This reduces uncertainty in transactions, and SM needs less resources for coordination.

## Externalities

Most of the food safety procedures by authorities and companies are made to prevent the end consumers from unwanted externalities. Salmonella and trichina are examples about externalities that could cause consumers illness and high costs.

## **Feed**

### Transaction specific assets

The producer has made specific investments in animals, premises, etc. The feed quality is of great importance because if the feed given for pigs has the negative effect on meat, there is a risk that the specific investments in animals might become lost or significantly reduced.

### Uncertainty

It is difficult for a producer to evaluate the quality of the feed. That is why SM requires that all feed their producers buy must come from producers certified by “Stiftelsen veterinär foderkontroll”. Certified feed retailers test the feed before the purchase to assure that the feed fulfils the food (feed) safety requirements. However, there always uncertainties regarding the feed remain because even if the feed is analyzed there is a risk that the feed might become contaminated at a later stage e.g. storing or transportation.

Feed will always be a source for food safety problems in the production. SM therefore controls the handling of feed in the revisions of farms connected to the BIS-program. Birds and rats are also sources for contamination of the feed. That has put a demand for producers to have a vermin control.

### Frequency

Producers usually have repeated feed purchases with the same feed retailer. Frequent transactions between the same partners reduce the uncertainty about goods and also are a means of reducing the risk for opportunistic behavior from either part.

## Externalities

A typical externality can be if humans are affected of eating pork that is bad because of the feed given to the pigs. The transaction between the feed retailer and the pig producer has in this case negative effects on the consumer, who may never become compensated for losses. The feed control according to the BIS-program reduces the risk for this type of food safety hazard.

## **Transportation**

### Specific assets

SM does not own the vehicles conducting their animal transports. SM contracts and own-controls the vehicles. That reduces the risk for opportunistic behavior of hired transporters. Some of the transports are, however, conducted by private entrepreneurs. The vehicle for

animal transports is specially equipped for the purpose. Before the vehicle can be used, official authorities must inspect and approve it.

### Uncertainty

If a disease is caught in a truck here is a risk that all animals transported could be useless as food. In order to preventing this from happening, transport instructions including cleaning routines have been developed.

The fact that Swedish Meats not owns its transportation organization increases uncertainty.

SM's implementation of an ISO-standard is also a means to enhance the qualitative control.

### Externalities

Transporting routines and the development of HACCP-plans for the transport system is a means to avoid negative externalities. Contaminated transport vehicles could easily spread diseases to other animals. The cleaning of transportation vehicles after each animal transport in SM's cleaning facilities is a means to reduce these externalities.

### **Pigs for slaughter**

#### Transaction specific assets

Both pig producers and slaughterhouses make transaction specific investments. Starting a cooperative was originally one way to safeguard these investments. For the efficiency of both producers and the slaughterhouse there is a need to coordinate the transaction of animals between the two parties. Today SM writes long time delivery contracts with their producers. They became necessary when the cooperative started to loose their producers to private entrepreneurs

The transaction cost theory assumes that people may act opportunistically, e.g. provide misleading information, brake promises etc. in the seeking of self-interest. This could be the situation when a producer sells animals to the slaughterhouse. In the seeking of self-interest the producer might choose to not provide information about eventually bad health status of animals, which could cause reduction of the price paid for the animals. The specific investments made by the farmer become a change for opportunistic behaviour.

There are incentives for a producer to avoid a situation where the transaction specific investments can be lost or significantly reduced. There is also a change for opportunistic behavior towards the slaughterhouse. The producer may know that the value of the animal will be reduced because of food safety reasons but is still able to sell the animal to the slaughterhouse without losing value if the slaughterhouse not is aware about eventual irregularities. The BIS-program together with the authority control is a means to decrease such opportunistic behavior.

The form of integration that the cooperative represents is a means to reduce transaction costs.

## Uncertainty

The uncertainty from the food safety's point of view has much to do with the health status of the animals. Some of the diseases transmittable to humans are almost impossible to detect at the time of purchase. This uncertainty either results in costs for reducing uncertainty or the cost of risk for the exposure to uncertainty.

The cooperative has relatively many small producers delivering animals. The variation in quality of production is larger among these small producers than among larger ones. This is a source for increased uncertainty, which Swedish Meats controls via their quality program (BIS).

The BIS-program together with the authority control has the purpose of reducing the uncertainty concerning animals. The BIS program reduces the control costs of animals on farms. If possible, it should be prevented that pigs not good for food ever reach the slaughterhouse. If they are discarded not earlier than in the meat inspection in the slaughterhouse they lose their total value or even imply costs for both producers and the slaughterhouse.

## Frequency

The long-term contracts between SM and their producers give the possibility to learn about the demand on both sides. The slaughterhouse gets information through the meat inspection about each producer. If the slaughterhouse finds specific problems on a farm, this information is given to the farmer so that he has a possibility to better meet the demands of the slaughterhouse in the future. The risk for opportunism is also reduced through frequent transactions. Both the slaughterhouse and the producer must meet the demands of the other party or further transactions are likely to end.

## Externalities

If bad animals are slaughtered, that causes food hazards for consumers. This can be regarded as an externality. The transaction between the farmer and the slaughterhouse does not consider costs imposed on the consumer (third party).

Indirectly the slaughterhouse pays some of the costs through their insurances against these types of problems. Usually it's the consumer affected and the state welfare system that pays the costs for the food safety hazard.

## **Work**

### Transaction specific assets

In order to process meat the slaughterhouse makes investments in labor conducting the slaughter. Personnel are educated in hygiene, cutting techniques and food safety knowledge.

Processed meat can be regarded as a specific investment for the slaughterhouse. The staff processing the meat is an investment by the slaughterhouse. If the processing makes the meat unsuitable for humans, most of its value is lost. Also if meat causing food problems is sold to



customers and it can be traced back to the slaughterhouse, this will also imply costs for the slaughterhouse.

The employee has an incentive to conduct the job in a proper way if he/she wants to keep the job. The employee also has specific knowledge concerning his/her assignment in the slaughterhouse.

### Uncertainty

According to the veterinarian the most important factor from the food safety's point of view is the clean slaughter. The clean slaughter means that the meat is separated from internal digestive organs without contaminating the meat. Since it can be almost impossible to visually detect the contamination, there is an uncertainty whether the slaughtering process has been conducted in a clean way or not.

Training and supervision of personnel according to the own control plan is a means to assure that the slaughter is conducted according to food safety requirements. Authorities' supervision and sample testing is also a means to reduce the uncertainty concerning the food safety status of the meat, which also is the control factor of the staffs performance.

SM's enhanced sample testing also reduces uncertainty. External food safety and quality systems that SM uses are means to reduce the uncertainty with respect to food safety issues.

The new salary system with both quantitative and qualitative measures has an effect on staff's performance. Food safety variables can either be promoted or counteracted. There is a conflicting interest between the volume and the quality.

Knowing the consequences that food safety hazards may imply to consumers, people working in the slaughterhouse are able to prevent the problems. Such behavioral practices are often deep rooted in most (all) cultures.

Swedish Meat's operation is relatively large with many persons involved in the production process. With many persons involved, coordination and control of operations is difficult. That will increase the uncertainty. On the other hand has a large operation like Swedish Meats daily access to expertise on food safety, which usually is not the situation in smaller operations. The better access to expertise reduces uncertainty.

### Frequency

Both the persons conducting the slaughter and the employer have the chance to learn from each other about the means of reducing the uncertainty concerning various parties' demand.

If the person wants to keep the job it should be conducted in a satisfying way from food safety's point of view.

### Externalities

Usually it's a third person who is affected by an unsatisfactory performance in the slaughter. The effect on the third part is not considered in the transaction between the slaughterhouse and the employee.

## **Control by NFA**

Swedish Meats in Uppsala pays about 7 Million SEK/year for NFA's food safety activities in the slaughterhouse. Although the costs of NFA's activities are imposed on Swedish Meats the activities can be seen as the service and considered as transaction between the NFA and Swedish Meats. The society may be regarded as seller of food safety programs. In return the slaughterhouse and the society receive an inspection that guarantees the safe food. Following transaction costs are related to the service.

### Transaction specific assets

A slaughterhouse has many specific investments in the production site. Meat in process is also a specific asset with a low alternative value if not sold for human consumption. The specific investments are open to opportunistic behavior towards the slaughterhouse and must therefore be safeguarded.

The NFA makes specific investments in knowledge in food safety. The personnel are trained for special knowledge in food safety issues.

### Uncertainty

An uncertainty can be whether Swedish Meats receives the most efficient food safety control for their expenses. There may be an uncertainty whether the NFA personnel makes correct judgments so that the company does not bear unjustified costs.

The veterinarian emphasizes the importance of knowledge of the legislation to maintain a proper food safety situation in the slaughterhouse. Lack of this knowledge reduces the uncertainty. This is even more important nowadays when the authorities (veterinarians) need more of support from the legislation to enforce changes expensive for the slaughterhouse.

A daily access to veterinarians at the site reduces the uncertainty in production. This is an advantage for larger scale slaughterhouses.

Swedish Meat's additional investments in food safety procedures and equipment reduce uncertainty.

### Frequency

A high frequency of inspections opens possibilities for large-scale advantages. Compared to smaller operations a larger one may consider integrating a corresponding service to NFA's in the company.

### Externalities

An externality in the control can be if the NFA demands investments that affect other parties in the processing. An investment in food safety may lead to other investments without food safety relation.

### Hierarchical decomposition

According to Williamson (1985), there should be a clear distinction between strategic planning and operational practices in an organization and in order to achieve effectiveness, decisions should be directed to persons with the best knowledge about a specific issue. Decisions regarding operational practices should be made by persons directly involved in operational activities and strategic decisions should be taken by managers involved in the strategic planning

With regard to Williamson, decisions concerning food safety should be made according to the principle of hierarchical decomposition. The question is where in an organization decisions and tasks concerning food safety should be directed. This also regards the allotment/distribution of tasks and decisions between the NFA and the slaughtering companies.

An example is the own control system where the personnel in the company develop the food safety plan. Instead of directing routines at the central level in the NFA, the people in the company assisted by veterinarians at the site develop the own control plan.

### **5.2.8 Conclusions**

The analysis of Swedish Meats illustrates various factors with influence on transaction costs related to food safety issues.

Transaction costs concerning food safety in the primary production- piglet and fat-pig breeding, is greatly dependent on the food safety status of animals. The food safety status concerns both zoonoses and animals content of harmful substances.

Swedish Meats' quality program in the primary production (BIS) has the effect of reducing transaction costs related to food safety. The BIS program concerns variables like control/analysis of input, hygiene education, breeding control etc. variables that have a positive effect on the food safety status of the production. The uncertainty about quality of the animal material that goes to slaughter can in this way be reduced. The fact that the BIS program involves visual inspections auditing at farms reduces the uncertainty about conditions of animal production and also motivates producers to meet the requirements in the program.

Advantages from this type of "controlling" programs are larger when the differences in quality among producers are large. Swedish Meats, which is the largest pork processing company in Sweden is likely to face this situation and therefore the benefits from these types of programs are greater compared to that if other companies would introduce similar programs. The trend in Swedish Meats with fewer but larger producers contributes to reduction of this uncertainty.

The fact that Swedish Meats is a cooperative where the producers are the owners of the slaughterhouse is a means to reduce opportunistic behavior in the transaction between producer and slaughterhouse. The cooperative ownership counteracts behavior where a producer would sell animals with a bad food safety status to the slaughterhouse without telling about these irregularities.

The integration of animal transports in the organization is positive out of an uncertainty perspective. Incentives for opportunistic behavior where a vehicle would be used for other purposes, with the chances of contaminating vehicles, are reduced. The establishment of cleaning facilities and the outlined cleaning routines also reduces the risk for contamination of vehicles.

The performance of staff during slaughter and further processing is very important out of a food safety perspective. Contamination of meat during slaughter is a great source for food safety problems in the production, partly because it's difficult to detect visually. Training, education, control and supervision of the staff become important factors in the prevention of food safety related problems.

Swedish Meats' own quality programs, including food safety variables, reduce the uncertainty about meat quality. The enhanced bacteria sample testing is an example where SM's requirement goes further than the once from authorities.

The large size of Swedish Meat's operation has both positive and negative effects on the food safety situation. A larger operation is usually more complicated to overview. With more people involved in the production the control is more difficulty.

An advantage of larger sites is though that there is access to own expertise in the food safety area. A larger site also has more resources to spend enhanced control. The size of the operation also admits that the personnel from the NFA are present at the site during work hours. These factors have the effect of reducing uncertainty.

The development of a new salary system that partly is based on volume might have adverse effects on the food safety situation. Uncertainty increases if the qualitative variables out of a food perspective come in the shade of volume production.

## **5.3 Spånga Gårdsslakteri, Glad Gris & Gris-To-Go**

### **5.3.1 Description of the marketing system**

Spånga Gårdsslakteri is a small-scale slaughterhouse in Fjärdhundra in the middle of Sweden. Two pig farmers, Stig Ericsson and Stefan Sellin invested in a "farm slaughter house" in 1992. They own the company. All the pork used by Spånga Gårdsslakteri is produced on these two farms. About 1000 pigs are slaughtered every year, 500 from each of the owners. The slaughterhouse also has a cooling facility and a cutting department for further processing of meat.

Both owners have their own companies with own brands. Stig Eriksson has a company called Glad Gris and Stefan Sellins business is called GRIS-To-Go, ([www.gris-to-go.se](http://www.gris-to-go.se) 2003). Stig and Stefan sell pigs on their respective farms under these brands. Their products are marketed as organic (not Krav) high quality pork from pigs living outside in a stress free environment, guaranteed free from hormones and antibiotics (<http://w1.171.telia.com/~u17102740/gris.htm> 2003). Both producers have their own product transport vehicles with cooling capacity.

80%, of Glad Gri's pork is sold to two large supermarkets, (ICA) in Västerås and Enköping. The business also includes catering where Glad Gris arranges barbecues for their customers.

About one hundred pigs are sold through the catering operation. Glad Gris has its own distribution system of products to their customers. People also come and buy pork direct on the farm. Both companies have their own home pages for marketing in the Internet.

GRIS-To-Go 's (Stefan) total production is about 600 animals/year. The major part of the production is sold to a restaurant wholesaler in Stockholm. Besides this there are also a few private customers that he supplies with his products. GRIS-To-Go also has a catering operation from which it sells about 20% of the animals. There is a plan to gradually change the farm into a "Bed and Breakfast" (Bo på lantgård) type operation. There also are plans about starting up a store on the farm to sell the products.

### **5.3.2 Production**

#### **Description of tasks and transactions**

##### Small pigs

*Stig's production:* Stig (Glad Gris) has an integrated system with 30 sows and own boars. The production is about approximately 500 piglets / year. The only animal inputs in the production are the gilts (gylta). Gilts are bought 5-6 times /year, always from the same producer. The contact with the producer is quite "informal". The producer lives about 15 km from Stig and he contacts the producer some days before he needs the gilts to be delivered. Since Stig's production is relatively small the gilt producer usually never has a problem to provide the few demanded animals.

*Stefan's production (GRIS-To-Go):* Stefan has a system specialized on fattening pig breeding. Last year's production was about 600 pigs. Small pigs for the production are bought once a month from two small pig producers nearby. Stefan's major supplier of piglets lives just nearby. He delivers about 450 animals / year, which he also transports to Stefan's farm. The small pig producer is also working in the slaughtering team in the Spånga Gårdsslakteri. Since the first producer has not been able to supply all the animals Stefan needs, he buys an additional 150 small pigs from another supplier. Stefan transports these animals himself to his farm. Stefan intends to have as few suppliers of small pigs as possible to keep the disease pressure as low as possible.

With respect to food safety there are no special contracts established with suppliers of small pigs. The supply of animals has been arranged by mutual agreements so far, but from next year Stefan intends to write contracts with both of his suppliers. Writing contracts is a means to assure the supply of small pigs to his production. Before Stefan had an integrated pig production system. However, he changed it into the specialized system because it is less time consuming and easier for him to manage alone.

##### Feed

*Stig's production (Glad Gris):* Silage (grovfoder) is produced on the own farm. To supplement the own silage, pellets are bought about from a feed retailer, Lantmännen, six times in a year. According to Stig the quality of the feed bought varies from time to time, and compared to 10 years ago the variation is larger today.

*Stefan's (GRIS-To-Go) feed:* Similar to Stig, Stefan produces his own silage and buys pellets from Lantmännen. Thirty tons of pellets are bought every third month.

#### Water

Both Stefan and Stig have their own wells. The water can be used without control. The water from Stig's well is used in the slaughterhouse and is therefore tested. Stefan is able to use the water from his well without having it tested.

#### Work

*Stig's farm:* Three persons in total work on the farm. They are Stig and his son, and one hired person. Three persons involved in the production is a sufficient workforce. During vacations or illness two persons can run the operation during shorter periods.

*Stefan's farm:* Stefan runs his operation alone. In case he needs to be away from the farm he asks a friend to take care of the farm.

#### Premises

Stig and Stefan own the premises for their production. The veterinarian on duty has the possibility to control the production every week, since he is the same veterinarian that conducts the weekly meat inspection in the slaughterhouse.

#### Transports

*Stig's farm:* The only transports of animals to the farm are the gilts that Stig buys. Stig manages the transports himself.

*Stefan's farm:* The larger piglet producer takes care of the transportation of small pigs to Stefan's farm. When Stefan buys small pigs from the smaller producer he arranges the transports by himself.

### **5.3.3 The control system**

#### Official control system

Both Stig's and Stefan's production are subject to two external control systems.

The communal animal welfare controls farms to make sure that production fulfils the animal welfare criteria based on legislation. Inspectors are supposed to visit of Stig's and Stefan's production sites every third year.

Stig and Stefan have an engagement with the same private veterinarian that conducts the animal inspection on the farm. The veterinarian is responsible for the control of epizootic diseases. The major task for the veterinarian on the farm is the treatment of ill animals. There are very few problems on both these farms. On Stig's farm the veterinarian has to treat sows about three times per year.

Stefan's piglets used for the production are also subject to control from the Swedish Animal Health Welfare (SAHW). The control is performed on the farm of the piglet supplier following the control program for animal diseases (see Swedish Animal Health welfare). There is no obligation based on legislation that fattening pig breeders have to be connected to the SvDHV's programs. Neither Stig nor Stefan is connected to the Swedish Animal Health Welfare. Farmers who apply SvDHV's salmonella control program are entitled a 70% state compensation of economic losses in case of Salmonella outbreak. Since neither one of the farms are connected they are admitted to a lower level of compensation from the state in the case of salmonella outbreak.

#### Other means of control

Both Stig and Stefan are insured against production breaks through an insurance company, Länsförsäkringar. The insurance covers losses in the case of disease outbreak etc. The insurance also covers animal transportation?

### **5.3.4 Slaughtering and cutting**

#### **Description of tasks and transactions**

One day before slaughter the animals are collected into special transport cages outside the slaughterhouse. After the ante mortem inspection by the veterinarian the slaughter can start in the following morning.

#### Pigs

The pigs slaughtered come solely from the owners of the slaughterhouse, Stig and Stefan. The volumes slaughtered each week depend on the number of pigs ordered by ICA and the restaurant wholesaler. In addition to this comes the pork for the catering operation. Usually between 20 and 26 pigs are slaughtered each week. Higher volumes are usually during the summer when the catering business is more intensified. Because of the limited cooling capacity in the refrigerator rooms, twenty-six animals is the maximum that can be slaughtered in one day.

#### Work

The slaughter is carried out once a week. In order to work in a satisfying way the operation needs five people to work together. The procedure has been developed for five persons working in the slaughterhouse: one person working outside the slaughterhouse, two persons in the "unclean department" and two persons in the "clean department".

Total of seven people, including Stig and Stefan, are working with slaughter at Spånga Gårdsslakteri the whole year around. With total seven people available Stig feels that he has access to enough people to keep the operation running all the year around. Stig and Stefan know well the people hired for slaughter and they all come from a region nearby. They have been engaged into the slaughter through the two owners' personal contacts. A neighbor to Stig, who had earlier experience as butcher, has trained slaughtering techniques for all the workers in Spånga Gårdsslakteri.

All persons working in slaughtering have been subject to a yearly health control and have also gone through hygienic training based on the current legislation. The basic hygienic training lasts eight hours and after that a four-hour training is conducted every year. Through private contacts at SLU (Swedish Agricultural University) it has been possible for Stig to arrange this training. In order to reduce the expenses for this training Stig has been able to raise money through EU funds for this purpose. The relation between the owners and the people working in Spånga Gårdsslakteri can be considered as close. The small size of the operation with only a few employees gives the owners a good control over most tasks.

### Equipment

Similar to the rest of the slaughter operation, Stig and Stefan have invested 50 per cent each in the needed equipment.

### Premises

Stig and Stefan have both invested 50 per cent in the slaughterhouse. Already when they decided to establish the slaughterhouse they had the plan to make use of the already existing facilities. The construction followed more or less their own idea and they did most of the work themselves.

### Water

Water comes from a well on the farm. Since the water comes from an own well, an authority tests it more frequently than if it had been water from the municipal water system. Municipal water is tested only once a year. At present the water is sent to the analysis four times / year costing 400 SEK each time.

The owners have invested in a special water cleaning equipment to make sure that the quality of water becomes more stabile. However, this has not reduced the authorities' number of tests/year.

### Transports

The pigs for slaughter are transported in special cages, in which the veterinarian is able to conduct the ante mortem inspection. Stig and Stefan transport the animals themselves.

## **5.3.5 The control system**

### **Official control system**

The meat inspection, supervision and test sampling are the three major tasks the veterinarian conducts in the slaughterhouse. The present official veterinarian (OV) in the slaughterhouse has worked with Spånga Gårdsslakteri since the start of the operation in 1992.

The total cost is 100 000 SEK/ year in veterinary services. The fee for the veterinary services is time based, which means that if it takes a long time for the veterinarian to reach the farm, this will increase the veterinary costs with a considerable amount. In addition to the veterinary expenses trichina tests are taken from each animal at a total cost of 25 000 SEK/year. This is



about 0,46 SEK/kg pork. Samples are taken for detection of antibiotics. 0.2 % of the animals are tested according to prescribed testing routines.

### Supervision

The major part of the supervision in the slaughterhouse implies verification of the own control. These controls are conducted continuously and the results are reported to the NFA.

### Ante mortem inspection

The a.m. inspection takes about five minutes and is done in the evening or in the morning before slaughter.

- In the inspection the veterinarian looks for diseases listed in the epizootic law and controls that that animals for slaughter are in a good condition.

The inspection can be brought out in an efficient way, because the inspecting veterinarian, as responsible veterinarian on Stig's and Stefan's farms, already has useful information about animals and their eventual problems

### The procedure of post mortem inspection

The post mortem inspection takes about thirty minutes in total and is done after the slaughter in the same afternoon.

- The first test to be taken is the trichina test. A five-gram sample is cut out of each animal's diaphragm. The samples are sent to the laboratory in SVA the National Veterinary Institute (SVA), and results are received on the following next day at ten o'clock in the morning. So far no positive results (samples) have been found in Spånga Gårdsslakteri.
- An outer inspection of the animal's body is conducted; deviations to be cut away are marked. Compared to pigs living inside, outside living pigs have a bit higher frequency of contact injuries caused by contacts between animals. Deviations on joints and broken ribs are examples about injuries that are more frequent among pigs in Spånga Gårdsslakteri compared to animals brought up inside. Joint problem is the most common reason for discarding the meat.
- The next step is the inspection of lymphatic nodes; a cut in the node is made to detect infections.
- Inner organs such as lungs, liver, kidney and heart are inspected. Compared to animals living inside the frequency of lung problems is very small among Spånga Gårdsslakteris' animals
- The internal digestive organs are examined. This is done in a separate room because of the restrictions forbid the storing these organs together with the meat.
- After the inspection the report is sent to the NFA. The bodies are stamped to confirm that they have gone through the meat inspection.

### Comments about the official control

The total cost for NFA's services connected to slaughter sums at 2 Sek/kg meat. This is a large proportion of total expenses. Stig's opinion is that the authorities should help the small-scale producers to reduce inspection costs. That is urgent for the future existence of small-

scale operations. Stig thinks that this is the question of competition neutrality and the costs should be adjusted being on the same level for large and small producers.

According to Stig's opinion the trichina tests are less relevant. The number of positive tests is extremely low and only if meat is consumed raw it becomes a risk for human beings.

The OV, has the opinion that the relevance of some of the parts in the meat inspection could be questioned. The procedures of today are based on the food safety problems that were important seventy years ago. The problems are not the same today. In those days the TBC disease was a serious problem in the pig production, but is not so important today. The occurrence of trichina in pork is also extremely rare. Sweden has had a few cases in the last ten years.

The out-of-date procedures in meat inspection have been often discussed during the last twenty years. However, no changes in the situation have been taken place so far. There is a need for new suggestions about how to develop the inspection but so far there has been a lack of these kinds of initiatives.

Today the inspection should be harmonized within the EU, which demands that the development is driven on the central level in the EU.

The ante mortem inspection could also be improved to become more appropriate. Information about breeding circumstances and animal problems should be transferred from the farm-level veterinarian in duty to the OV conducting the ante mortem inspection. This information concerning animals is usually only in the possession of the veterinarian controlling the herd on the farm level. At Spånga Gårdsslakteri this is not a problem because the same veterinarian controls the primary production that also makes the ante mortem inspection.

In November 2001 EU's Food and Veterinary Office carried out a mission in Sweden to assess the official control over the production of fresh meat based on the current legislation (Food and Veterinary Office, 2002).

Concerning the independence of persons carrying out official duties, the representatives from the NFA (SLV) explained that " According to the Law on Official employment, an employee is not allowed to have any other employment or to be involved in any activities that could risk the confidence in his or any other employees' impartiality or that could damage the reputation of the authority." In the final report of the mission it was noticed that in most low-capacity slaughterhouses private veterinarians also carried out official tasks. As an example was given a private veterinarian who treats the animals as a private practitioner but also conducts ante and post mortem inspections of the same animals, (Food and Veterinary Office, 2002 p.9 report).

This is exactly the case at Spånga Gårdsslakteri where the veterinarian at farm level also is the official veterinarian conducting the meat inspection in the slaughterhouse. The question is if his independence as official veterinarian could be questioned. At the same time does the OV see an advantage in his situation, where he has information about the animals at the farm level that is useful in the meat inspection.

## **Own control**

Like all slaughterhouses in Sweden, NFA has developed a control plan for the slaughtering process. Inspectors visit the farm on a regular basis and control that the production follows the outlined plan. A major part of NFA's control program in the slaughterhouse is based on the own control program.

The 14-point own control program used in Spånga Gårdsslakteri is developed from a draft made by NFA. Stig and Stefan have never really been involved in the development of the plan. It has only been possible to make objections to the plan after the NFA has presented it.

In a comparison with own control plans between Spånga Gårdsslakteri and a larger slaughterhouses they look much the same, only some small differences because of the size of the production exist. A low-capacity slaughterhouse has an upper limit in the volume of animals slaughtered. The upper limit is 20 animal-units/week and 1000/year. Animal units for pigs are counted according to the following weight scale; 0-15 kg = 0,05 units, 15-100 kg=0.15 units and +100 kg = 0,2 units, (SLV:FS 1996:32). The requirements demanded by the NFA vary somewhat among low-capacity slaughterhouses compared to larger ones. However, the NFA requires that the food safety standard should be at the same level independent on the size of the slaughterhouse.

## **Other programs**

Insurances to protect "the third party" are according to the law compulsory and cost 500 SEK/year. The insurance company, Mars, has a monopoly in these types of insurances.

A special Salmonella insurance exists. It covers losses in the case of salmonella outbreak. This insurance costs 5000 SEK/year.

Vermin control is arranged through a contract with a private firm, Anticimex.

## **Question of traceability**

The traceability is easy to manage in a "closed" system such as Spånga Gårdsslakteri. Few people work in the production system and pigs only come from two suppliers. The production in Spånga Gårdsslakteri is small. The relation and reputation towards its customers are of great importance when selling products.

All animals have a code, tattooed on the back, tracing them back to the piglet breeder. This concerns animals produced by Stefan because small pigs come from an outside piglet breeder. In Stig's case the marking is not necessary because the piglets are born, brought up and slaughtered by the same person.

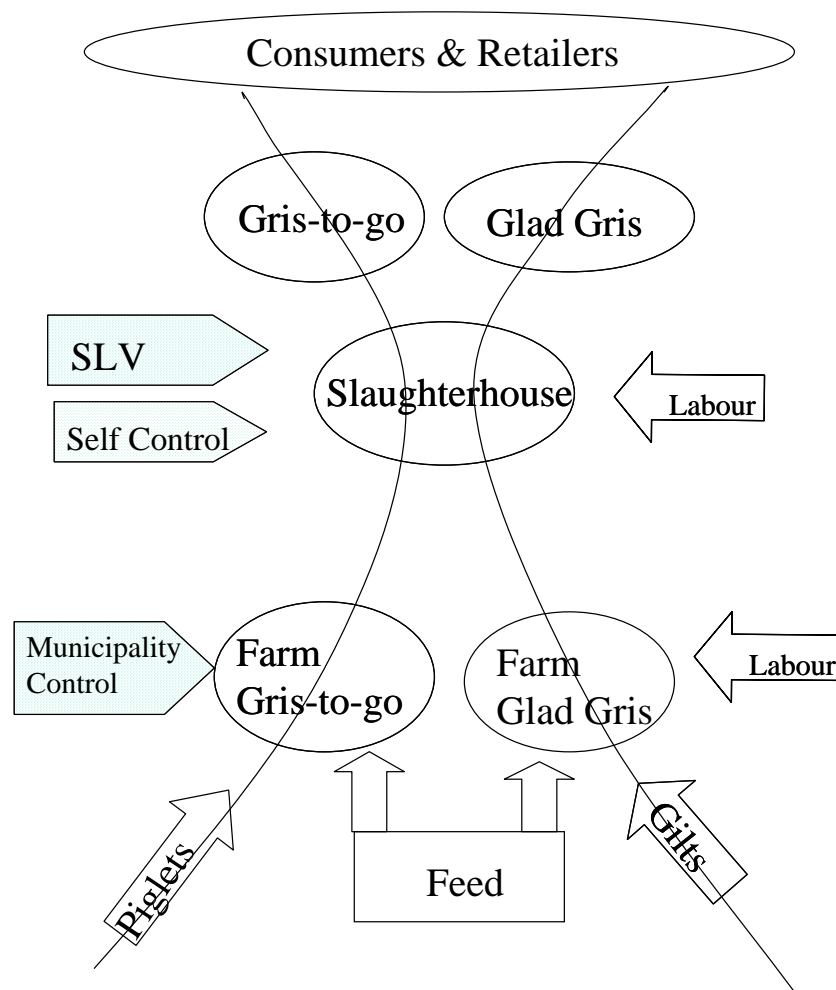
Before delivery all pork is attached with a code indicating the name of the slaughterhouse. Since Stig and Stefan sell their production under different brands, all products coming from the slaughterhouse can be traced back in the production chain. The relatively small size of the production system and close relation between persons involved in the production-processing chain give the possibility to have a good control over the production.

## Processing, Cutting

The NFA has established the control program for the cutting department that is connected to the slaughterhouse. The cutting facility has also an own control plan approved by the NFA. The plan prescribes Salmonella tests once a month and bacteria tests six times /year, which are sent to the laboratory for analysis. There are no fees on these tests. Tests are made by the personnel in Spånga Gårdsslakteri themselves.

## Key transactions with respect to food safety

Figure 9 presents the production system of Spånga Gårdsslakteri. The vertical (bowed) lines describe the integration between production, slaughter and further processing.



*All transactions marked with arrows are analyzed.*

Figure 9. The production system of Spånga Gårdsslakteri

## **Vertical integration into slaughterhouse**

Before Spånga Gårdsslakteri was established Stig and Stefan slaughtered their animals on their own farms and transported the carcasses to Swedish Meats in Uppsala for the post mortem inspection. After inspection they delivered the animals to their customers. At this time Stig and Stefan had no activities in common. Several changes after 1992 made it interesting to start up a slaughtering operation of their own. The changes were the following:

- The legislation concerning the ante mortem inspection of animals slaughtered on the farm changed, and also new requirements for the slaughtering facilities were launched.
- For a while Stig had his pigs slaughtered by Swedish Meats in Uppsala. The option to have the pigs slaughtered somewhere else was problematic. The separate handling of Stig's production was also problematic for SM to manage, which resulted in delayed deliveries to Stig's customers.

The idea to start the slaughterhouse came when one of Stig's customers suggested him to manage the slaughter and transportation himself to better control of deliveries. After contact with Stefan they both decided to invest in the slaughterhouse operation.

### **5.3.6 Analysis**

All transactions are analyzed by using the model tool based on the transaction cost theory. The model focuses on four variables; specific investments, uncertainty, frequency and externalities, all affecting transaction costs in a transaction. The control of transactions is also analyzed.

#### **Piglets/Gilts**

##### Transaction specific assets

Pigs grown on the farm can be regarded as transaction specific assets; if the animals for some reason can't be used in the production of pork the alternative value is very low. The production of pork also implies transaction specific investments in labor, premises and facilities. Investments are used for a specific purpose in order to have an efficient production.

*Stig's production:* In Stig's integrated system the sows and the boars are the only animal input that is bought for the production. Stig is less dependent on animal transactions compared to more specialized systems where piglets are bought. Stig needs a relatively small number of sows that makes his supply situation quite easy and low exposure to opportunism. The fact that the sow producer is large means that he has a well developed monitoring system that reduces the uncertainty in production. Animals bought outside though mean increased uncertainty regarding externalities. An advantage is that Stig does not need to make own investments in a sow production.

*Stefan's production:* Stefan's production is dependent on the supply of small pigs. Piglets must have qualities suited for Stefan's production and for an efficient use of production facilities the supply must be coordinated. The fact that the small pig supplier works in the slaughterhouse and that he has a close relation with Stefan reduces the risk for opportunism.

For the same reason he also has incentives to serve Stefan with animals that benefit the slaughterhouse operation.

Since Stefan is the only person working in the pig production, that gives him full control about breeding. Uncertainty connected to hired labor and in what way animals are raised is reduced to zero.

### Uncertainty

The uncertainty in relation to the animal material concerns the health status of the animals and coordination with suppliers. Close relation and contracts with suppliers are a means to reduce the risk for opportunism. A guarantee for the health of the animal material is provided through the Swedish Animal Health Welfare, with which the small pig supplier is connected to. The uncertainty in production is reduced by insurances that cover losses caused by an outbreak of diseases in the herd.

*Stefan's production:* Stefan needs small pigs on a continuous basis. This has been so far arranged through a mutual agreement with his piglet producers. Next year Stefan intends to write contracts with his suppliers. The contract is a means to reduce uncertainties regarding the supply of piglets but also imply costs for establishing a contract. Through his work in the slaughterhouse the piglet producer has an indirect interest to provide Stefan with animals that fulfill Stefan's quality criteria.

Compared to an integrated system, Stefan's specialized fattening operation means that he has to buy piglets from another person and another farm increases uncertainty.

*Stig's production* is integrated. Despite of possible uncertainty in getting sows he is independent what concerns the supply of small pigs.

There is also an uncertainty about the health status of bought animals, Stig must assure about the health status of the gilts and Stefan of the piglets. The suppliers' engagement in the Swedish Animal Health Welfare reduces the uncertainty concerning health status of animals.

### Frequency

Stefan has frequent transactions with his piglet producer, about once a month. This gives a chance for both parties to learn from each other, which also has the effect of reducing opportunism. Stig is a relatively small customer to his piglet producer. This makes it expensive for his supplier to make larger adjustments according to his needs, especially because Stig's transactions are not that frequent.

### Externalities

Diseases in the production are one type of externalities. If Stefan's and Stig's productions are compared, their situation is somewhat different. The integrated production means that less new animals are brought into the production. This reduces the spread of diseases among animals. Every time Stefan gets deliveries of small pigs he takes a risk of getting new diseases in his herd. The use of the same supplier he can reduce this risk.

Diseases transmitted from or through humans to animals can be characterized as externalities. These types of negative externalities are reduced in Stefan's case because he is the only one person working in the operation. Costs caused by this type of externalities are reduced by production insurances.

## **Work**

### Transaction specific assets

The labor hired for the slaughter can be considered as a transaction specific asset. Everyone who is working in the slaughter must have gone through a special hygienic training and the health control. Workers must also be aware of the needed slaughtering techniques. To find and engage the people that have these prerequisites can be considered as an investment for the slaughterhouse

The slaughterhouse has developed a slaughtering system that engages five persons in total. There are seven people with authorization available to conduct slaughter. This group forms a team that manages the slaughtering situation in an efficient way. If some one would leave the group the efficiency of the process might be reduced and new investments should be made to maintain the efficiency of the group.

With only a few persons involved, the relation between all people in the group becomes important for the outcome of the slaughter operation. A conflict within the group could affect the whole operation.

When the slaughtering process has begun it must be completed within a certain time in order to keep the pork's high food safety standard. The cooling procedure is an important part of the process determining the quality of the meat. In order to achieve the desired quality the owners must make sure that they have enough labor available during the whole slaughtering process

It is important for the slaughter process to proceed in an efficient way that the veterinarian conducting the meat inspection is available at certain times. If the veterinarian is delayed in his inspection, this will stop the slaughtering process. This in turn will delay the deliveries in the end and also have a negative effect on the quality of meat.

The close relation between the employer and employees reduces the risk for opportunism and hereby losing these investments.

### Uncertainty

The hiring of people in the slaughterhouse can be seen as a transaction. The employer pays someone to conduct the assignment in a certain way. After someone has been hired there is always an uncertainty whether the employed person will meet the employer's expectations. There is always an uncertainty connected with the qualitative performance of the hired staff. In the case of Spånga Gårdsslakteri the uncertainty is reduced because of following reasons:

- Compared to larger slaughterhouses there are a relatively small number of people involved in the process. This means that Stefan and Stig have the possibility to control the process in an easy way.

- All the people working in the slaughterhouse are neighbors and well known by Stig and Stefan. Tight relations between the people at the site also reduce the uncertainty.
- The traceability of problems in the system is good because of close contacts between people and a relatively small size of the system. It is easy to trace mistakes back to their sources.

The size and limited resources available at smaller slaughterhouses reduces the possibilities to engage professional. For example can't veterinarian be present at the slaughterhouse at all time. This could be regarded a factor increasing the uncertainty of food safety compared to bigger operations with more professionals hired. If the slaughterhouse had own personnel with professional knowledge about food safety this opens possibilities to resource consuming question routines by the NFA, without this competence the authorities control must be taken for granted.

### Frequency

The high frequency in a transaction has reduces the uncertainty. The fact that the same people are working in the slaughterhouse reduces the uncertainty caused by their performance. There is also a better possibility to correct workers' behavior from time to time.

### Externalities

An employee contaminating the meat causes externalities. This in turn may cause food safety problems for consumers. The slaughterhouse has an insurance against these types of externalities to a "third person". The small number of people efficiently prevents externalities from spreading.

### **Feed**

#### Transaction specific assets

The production of own feed is a transaction specific investment. If the feed cannot be given to the animals there is a risk that the alternative value is less and a part of investments are lost.

Both producers buy feed from Lantmännen, one of the two feed suppliers in Sweden. Buying feed on the market reduces the need for special equipment and knowledge.

#### Uncertainty

Compared to the situation where feed is produced on the farm where production circumstances are known. The use of large, certified, well known suppliers is a means to reduce the uncertainty. Uncertainty in this case is also reduced through the control of feed suppliers.

#### Frequency

Buying of feed is a repeated transaction. Frequent transactions have of reducing opportunistic behavior. If both parts intend to have repeated transactions, both parts have to meet the need of the other part. There are also large-scale advantages related to the frequent transactions.



The search cost and adaptation cost connected to establishing of contracts with a new partner can be “spread” over many transactions.

### Externalities

The feed retailer’s control of feed reduces the risk of consumers being affected by bad feed given to animals.

### **Control by the NFA**

#### Transaction specific assets

The personnel working for the NFA have made specific investments in skills. By working at the slaughterhouse the OV has gained specific knowledge about the production and processes at the site. The slaughterhouse also has made specific investments in the slaughterhouse for food safety purposes.

The fact that the veterinarian lives close to the slaughterhouse reduces the costs for the slaughterhouse, but it is also important for the economy of the processing. If the present OV veterinarian would stop working for the slaughterhouse and a new veterinarian is hired that lives further away from Spånga Gårdsslakteri it’s likely that the costs for the NFA services would increase if.

#### Uncertainty

An uncertainty with respect to the control by the NFA concerns whether the control is justified or not. Some of the routines, which the slaughterhouse operation still has to pay, are questioned today.

#### Frequency

If the same meat inspector controls the slaughter frequently, the inspector has a possibility to improve the control by the time. A frequent control by the same person gives a change to a more efficient control.

### **Hierarchical decomposition**

The transaction cost theory’s principle regarding hierarchical decomposition emphasizes that in order to promote effectiveness, decisions in an organization should be made by those who have the best knowledge about the situation. The own control program is a means to manage the control of the slaughter in slaughterhouses. In the case of Spånga Gårdsslakteri, the NFA seems to be the active part in the development of the own control program. The question can be raised whether the personnel in the slaughterhouse could be more active in the development of the control-plan since they are the ones with most knowledge in the slaughtering process.

## **Integration of production and slaughtering (Internal transaction)**

### Uncertainty

The integration of pig production and the slaughterhouse is a means of safeguarding transaction specific investments (e.g. pigs, equipment, people) in both the pig operation and the slaughterhouse. Both operations become less dependent on external transactions, which reduce the uncertainty.

When the transaction between pig producer and slaughterhouse is internalized, goals in both operations are harmonized. An earlier risk that either part would act opportunistically (e.g. not providing sufficient information) is reduced. Uncertainties in the production are thereby reduced.

### Externalities

The integration means that less people are involved, which works as protection against externalities such as diseases. The traceability in a small operation with a few people is also improved.

The integration of the two operations also has the effect that problems in one part of the either production or slaughterhouse are more easily transferred from one to the other. It is likely that both operations would be affected if salmonella was found in either slaughterhouse or pig breeding.

## **Own Control**

Compared to the authorities' controlling personnel (professional veterinarian) the persons who conduct the own control usually have a lower knowledge about the nature of food safety problems is a motivating factor to carrying out preventive actions. Therefore there is a higher risk to have unprofessional people conducting control.

An advantage with the own-control is that the persons working at the site and with most information about the operation conducts the control. The persons at the site might be more aware about present changes and weaknesses in the production.

There is a conflicting interest about resources if personnel from the company conduct control. This increases uncertainty in own-control compared to an external control.

The own control gives incentives for efficiency. If the control is planned and conducted by the company's own personnel this is done with respect to economic outcome of the whole operation.

## **Authority Control**

Advantages with authority control are that a professional conducts the control and that it is performed without conflict with the economy of the firm.

Persons outside the firm have less interest in reputation and out come of the firm. This is something that could lower the motivation in the control by authorities. The motivation to

behave constructive towards the firm is also lower. Eventually unjustified and for the firm expensive regulation/routines are not questioned in the same way.

### 5.3.7 Conclusions

The special characteristics of a small scale slaughterhouse like Spånga Gårdsslakteri combined with the fact that the suppliers of animals are owners of the slaughterhouse makes the operation somewhat different to larger operations out of a food safety perspective.

The form of integration that Spånga Gårdsslakteri represents where the owners of the pig operation are the owner of the slaughterhouse reduces incentives for opportunistic behavior. The supplier of gilts and boars to Stig's production is the only source of animal input where the integration fails, and thus opens possibilities for opportunistic behavior. The supplier of piglets to Stefan's production has a close relation to the owner of the slaughterhouse. This with the fact that he works in the slaughterhouse reduces the risk for opportunism in his transactions with Stefan. With a low level of incentives for opportunistic behavior it's unlikely that the suppliers of animals would transfer such animals that are bad from a food safety point of view (if known by this person).

Integration of production in the slaughterhouse has major implications on transaction costs. A major advantage of the integrated production is that all animals from the pig production are transferred within the same company. This has the effect of reducing uncertainty compared to selling pigs at a market. If the animals are sold in the market there are always uncertainties connected to the dependence on "outside" partners. Another advantage is that the pig production can be coordinated with the slaughterhouse operation, so no adjustments have to be done according to size, e.g. the capacity of the slaughterhouse is built to match the volumes of animals produced. The incentives for opportunistic behavior between pig producer and slaughterhouse operation are also eliminated. Uncertainty about animal quality is also reduced.

In an integrated system where the link between pig operation and slaughterhouse is strong there is a risk that negative performance in one unit might be transferred to the other. If, for example, a food hazard would break out in the slaughterhouse it's likely that this would affect the pig operation and vice versa.

The suitability of pork for human consumption from a food safety point of view depends partly on the quality of pigs. Diseases and other sources of contamination of animal e.g. heavy metals through feed can be difficult to detect and therefore implies an uncertainty. The uncertainty concerning animals supplied to the farms is reduced through control of animal suppliers. Both the piglet supplier to Stefan's farm and the hog and gilt suppliers to Stig's farm are connected to the SvDhv. Neither Stig nor Stefan is connected to the SvDhv, which means less control of the production at their respective farms.

The feed/food safety status of feed is important for the production of pigs. The problem to evaluate the feed quality at the time of purchase is a source of uncertainty. Contracts with large, well-known suppliers that are quality certified, reduces this uncertainty.

Both Stefan's and Stig's production systems are relatively closed. This reduces the chances for outside contamination. An integrated system like Stig's has the advantage of a low

exposure to new animals that could bring diseases in the system. With more people in contact with the animals the chances of contamination anyhow increase. Stefan who has two suppliers of animals means a larger disease pressure in his production. The fact that Stefan is operating the production on his own reduces the risk for contamination from humans.

Both producers have the production system where the animals are brought up outdoors. This means that the exposure to some diseases e.g. trichina is somewhat higher compared to indoors produced animals. Generally the health status of animals with respect to lung problems is better when animals live outside. A good health status has the effect of increasing resistance against other diseases.

In order to conduct the slaughter at Spånga Gårdsslakteri a “team” is established which performs the tasks needed. Building such team can be regarded as an investment. The results of the production are very much dependent on the coordination and cooperation in the team. An uncertainty combined with building such teams is that if the team fails to operate together it could be difficult to correct the team. A larger operation usually has an access to more people and with more specialized tasks and written instruction people are more easily replaced.

The food safety status of pork is very much dependent on the performance of staff conducting the slaughter. There is always an uncertainty about the performance of the staff according to food safety regulations. In the case of Spånga Gårdsslakteri the uncertainty regarding performance of people is efficiently reduced because of two reasons. First, a strong relation between owners and labor gives incentives to conduct the job in an appropriate way - a bad performance would risk the relation to other people in the operation. Second, in a relatively small operation (like Spånga) the control of work performance is easier to manage. At Spånga the owners of the operation work together with the staff at the floor, which means an almost continuous control of performance.

The traceability in a Spånga Gårdsslakteri’s system is also very high. With fewer factors involved (relative to larger operations) the trace ability is high which is positive out of a control perspective. Sources of failures can more easily be detected, which also counteracts behavior that could harm the food safety status of products.

The fact that consumers are geographically close also means that people have strong incentives to avoid actions that could harm people. This could harm the living atmosphere between neighbors.

Disadvantages of smaller scale operation like Spånga compared to larger operations are the following:

- Usually there are fewer resources to build up their own food safety systems. In a larger operation there is a possibility to build up control systems and testing routines that might not be economic feasible in a smaller system. The slaughterhouse can hire its own expertise regarding food safety.
- A large-scale advantage is the constant access to veterinarians in the slaughterhouse during working hours. The smaller slaughterhouse that only has access to the meat-inspecting veterinarian becomes more dependent on the timing of the control. If the timing of the control is bad there is a risk that the further processing and delivery of meat is delayed, which could cause losses to the slaughterhouse.

The legislated supervision and control (by NFA) at the slaughterhouse is a means to control the food safety situation. Two sources of uncertainties are related to the authority control. One uncertainty regards the central supervision by the NFA. This concerns approval of slaughter facilities/equipment and establishment of slaughter routines and self-control programs. The slaughterhouse makes investments in order to fulfill the authorities' requirements. An uncertainty regarding these investments is if they are justified or not. The fact that smaller slaughterhouse operation usually has less access to own food safety expertise can be a disadvantage compared to larger sites with own expertise. If the situation is that a smaller operation not can question regulations and routines by authorities this might imply "unjustified" and larger costs for smaller operations.

The other uncertainty regards the compulsory meat inspection by the official veterinarian. Also in this case, if a smaller operation does not have an access to its own expertise, it can be difficult to evaluate the performance of the veterinarian. An insufficient meat inspection that fails in preventing food safety hazards could cause the slaughterhouse seriously problems. Since the cost for the control is time based there is a desire from the slaughterhouse to have an efficient control as possible.

## 6 General conclusions

The three slaughterhouses in this study represent three different pork marketing systems within the Swedish pork sector. The companies vary according to size and ownership but there are also other differences that make their food safety situation different from each other. The analysis of each of these cases has proven major differences in transaction costs related to the companies' food safety situations.

### 6.1 Size

The size of a company has major influences on transaction costs related to food safety. Preventive food safety programs, control systems, traceability etc. are factors close related to the food safety situation at a company. The analysis of the three companies has proven that the size of an operation influences these factors and thereby is important for the food safety situation.

The overview and traceability of an operation is generally easier to manage with less factors involved. This is an advantage of smaller operations. With a growing size usually complexity increases, which makes the overview and traceability more complicated. Solutions to these kinds of problems are therefore different between smaller and larger operations. Control and control systems are also close related to the factors mentioned above and therefore also size dependent.

At the same time as complexity of an operation increases the size and produced volumes increase, which opens possibilities for large-scale advantages (economics of scale). The authorities' meat inspection is an example of control where economics of scale are obvious. The access to technical solutions on food safety problems is sometimes expensive and therefore also better at larger companies.

Larger slaughter operations also mean more of specialization. This concerns both specialization of working procedures as well as specific knowledge among people. In a smaller operation with less people involved the specialization is not possible in the same way and knowledge is therefore also more general. Economics of scale also makes it possible to have own expertise in the food safety area compared to smaller operations that usually become more dependent on external experts.

Development of own food safety programs both concerning production and slaughterhouse operation is usually expensive and demands expertise knowledge. Only the largest slaughterhouse (SM) has developed these types of own food safety systems. An explanation could be that operation must have reached a certain size before development of own "resource intensive" food safety system can be economically justified.

The fact that smaller operations have less access to own food safety expertise can be a disadvantage to larger sites with own expertise. If the situation is that a smaller operation not can question regulations and routines by authorities this might imply "unjustified" and larger costs for smaller operations.

Two cooperatives, Swedish Meats and KLS, count for about 75% of the slaughtered pigs in Sweden. As a major actor in the sector Swedish Meats usually is the first company to develop

and implement demands on slaughterhouses based on new food safety legislation (often based on EU directives). As the largest company Swedish Meats has access to the resources for development and implement of new changes. Once changes have been done other companies can benefit from using SMs developments. Concerning these kinds of issues Swedish Meats becomes important for the whole sector, and other companies can adjust to new legislation at a lower cost.

## 6.2 Ownership

One of the goals of this paper was to study the effect of ownership on the food safety situation. The companies in this study vary in their character according to ownership. Swedish Meats is a large cooperative where the owners are the suppliers to the slaughterhouse. Spånga Gårdsslakteri is a small-scale slaughterhouse owned by two pig-producers who are the only suppliers of animal material to the slaughterhouse. Skövde slaughterhouse is a relatively large IOF that is owned to 75 % by the major owner.

The cooperatives Swedish Meats and KLS who dominates the pork slaughter market in Sweden have contributed to a large extent to the food safety situation of today. As mentioned in the analysis of cooperatives there is a tradition of establishing different kinds of service programs, including food safety programs, for their producers/owners. With the cooperatives dominating position on the market their requirements have been standard setting for many other slaughterhouses.

To be mentioned is that these types of food safety programs are most valuable if the heterogeneity of pig suppliers with respect to quality is large. Comparing Swedish Meats with other slaughterhouses, it's the largest slaughterhouse and likely the one with the largest variations in quality among their producers.

The relatively large share (~75%) of cooperatives in the pig slaughter sector means that cooperatives have had major influence in the development of the pork markets food safety situation. The development of the food safety situation can be found in some of the characteristics of cooperatives.

Historically the cooperative has developed services for it's producers i.e. owners. This includes food safety programs on a producer level. Swedish Meats quality program (BIS) has the purpose of improving the quality of production including food safety matters among their producers. The suppliers with the lowest quality of production are also included in programs. By including these producers SM can control their production and thereby set a lowest level of production. The relative dominance of the cooperative has made them standard setting in producer programs and food safety issues in the sector.

Compared to the market-based delivery to an investor-owned slaughterhouse, a member of a cooperative slaughterhouse could, in principle, have a better incentive to deliver high quality animals. This is because if there exists e.g. a food safety hazard, this would also affect the producer through its membership. Being shareowner and producer in an IOF would give similar incentives.

As a member of the cooperative the producers receives parts of the surplus from the slaughterhouse through the patronage refund. When the cooperatives have paid patronage

refunds to their members, Skövde slaughterhouse (an IOF) responded by paying bonuses to its producers. The bonus gives similar incentives as the patronage refund to deliver animals of high quality.

The cooperative represent an organization where producers have integrated forward into the slaughter operation. Such integration has the effect of lowering incentives for opportunism and as mentioned above also give incentives to producers to provide animals of high quality. Spånga Gårdsslakteri is similar but represents in this case a very strong form of integration. The integration means that there is no market like transaction between pig producers and the slaughterhouse. The uncertainty about animal quality and breeding conditions can in this case be minimized. Incentives for opportunistic behavior between producer and slaughterhouse are also eliminated. Close relation between the owners and workers in the slaughterhouse as well as deliverers of animal material to their production also reduces uncertainty. The fact that Spånga Gårdsslakteri is relatively small with few variables involved makes them a relatively closed system. The risk for outside contamination is reduced. Control of production and slaughter is also easier managed compared to larger operations.

### 6.3 Food Safety Control Systems

At the moment (2003) the food sector is undergoing changes concerning food safety matters. The authorities play a major role in the control of food items. At the same time as the NFA is undergoing a reorganization more of responsibility of the food control is given to the companies through the own-control. Besides national authorities control programs, voluntary international food safety standards have become more important. One purpose of this thesis was to examine how various institutions e.g. food safety programs affect the food safety situation. The following conclusion highlights External (authorities) control programs combined with companies own-control programs. Voluntary food safety programs and Standards are also emphasized.

#### **External control systems**

The authorities' control of production and slaughterhouses has been a guarantee of the level of food safety. An authority control means that the interest between control and the economy of the slaughterhouse can be separated compared to the control that companies do themselves. As mentioned by representatives from the Swedish Meat Industry's National Association (Köttbranschens Riksförbund), the expenses for the external control at slaughterhouses are a major cost and it is important that it is as efficient as possible. Since the authorities not are dependent on the economy of the slaughterhouse the incentives for efficiency are not present in the same way, which could cause "unjustified" higher costs for the authority control.

Even if the general thought among veterinarians at sites is that the control is justified out of a food safety perspective, some of the routines could be questioned. Some of the routines are mentioned as out of date because of a new food safety situation. This is an example of cost that is a problem and follows with the external control. A corresponding problem for the NFA's meat inspection teams at site has been the access to personnel for certain issues. The inspection team at the site negotiates with the slaughterhouse about appointment of personnel. The problem is that it is impossible to convince slaughterhouses and NFA at a central level that more resources are needed to accomplish the supervision task including control of own-control programs. Many of today's food safety problems are prevented by this supervision.



The latest years' emphasis from EU in food safety issues has put food safety issues more into focus on companies. The development concerning food safety is also lead from EU at a central level. The meat-inspection veterinarians think that this has led to a positive development of the food safety situation at companies. Central inspection from EU of the authorities' performance at slaughterhouses has also had an effect on the companies' attitude in food safety issues. One problem with decisions taken at a central position in EU is that they sometimes are taken with less consideration to the companies' situation, which can cause unnecessarily high costs

Concerning NFA's supervision in slaughterhouse the authorities' way of performing supervision (including control) is changing. More of the direct control will be directed from authorities to the companies' own-control programs. This gives the slaughterhouse more of responsibility and monitoring possibility of the control and the authorities get more of a position where they inspect the companies' results. As mentioned above the slaughterhouses though fear that the total expenses would increase for the legislated control. Authorities' fees are not reduced in proportion to the extent that the companies take over the actual control.

The relation between authority personal, (meat inspection veterinarians at site and senior veterinary inspectors from the NFA), and people at the company is an important factor for the food safety situation at slaughterhouse. A bad relation can cause a slaughterhouse major costs as well as problems for authorities to maintain a satisfying food safety standard. A correct relation is therefore decisive for the food safety situation at slaughterhouses.

As mentioned by authority personnel the general relation between authority personnel and companies have changed, which has effects on the authorities possibilities of exercising their job. Today when the respect for authorities is lower companies questions more of authorities' decisions. Instead of just verbally inform a company of changes that needs to be done the authority personnel also must prove the support in the legislation for changes before companies accept them. Thus juridical processes play a more important role today.

Both personnel from NFA centrally as well as personnel at sites therefore stresses the importance of knowledge in legislation for the accomplishment of their job. The support to veterinarians at slaughterhouses, with legal expertise from NFA at a central level, is something that the veterinarians at site emphasize.

Media's role also has an effect on the food safety situation. Slaughterhouses feel the increased presence from media, who pays much of attention to official reports concerning slaughterhouses performance in food safety issues. At the same time as medias examination can be very effective to cause quick changes in companies behavior, dealing with food safety issues in media can be very expensive for the slaughterhouses. If medias picture of companies not is objective, this can cause unjustified losses because of consumers lost confidence in a companies products. However media has an effect company's food safety job that can't be neglected.

### **Own-control**

The own-control that was introduced at slaughterhouses during the 90ies is a means from authorities to increase the awareness among companies in their food safety situation and also achieve a more efficient control. An advantage of having personnel at companies performing

control compared to external inspectors is that people at the site can be more up to date about present problems. Immediate actions can be taken and the control can be focused on actual problems. At the moment the NFA intends to direct more of the control from central level to the own-control programs and veterinarians at sites.

## References

- Allen, D.W. 1991, What are transaction costs?, *Research in Law and Economics*, Vol.14, PP 1-18.
- Andersson, H. & Hoffman, R. 1997, *The Swedish Meat Sector – An Overview of Structure and Quality Policy*. Working Paper Series 1997:3, Department of Economics, Swedish University of Agricultural Sciences, Uppsala, Sweden.
- Davis, J. B. 1998, *The Handbook of Economic Methodology*, Cheltenham : Edward Elgar
- European Commission 2002, Final report of a mission carried out in Sweden from 5 to 9 November 2001 in order to evaluate the operation of controls over the production of fresh meat (porcine). DG(SANCO)/3370/2001-MR Final. Dublin, February 2.  
([http://europa.eu.int/comm/food/fs/inspections/vi/reports/sweden/vi\\_rep\\_swed\\_3370-2001\\_en.pdf](http://europa.eu.int/comm/food/fs/inspections/vi/reports/sweden/vi_rep_swed_3370-2001_en.pdf))
- Halvorsen, K. 1989, Å forske på samfunnet (Svensk övers. Samhällsvetenskaplig metod Studentlitteratur, Lund1992), *Bedriftsøkonomens Forlag A/S*, Oslo,
- Hayami, Y. & Ruttan, V. 1988, *Economics of Agricultural Development*, John Hopkins University Press, Baltimore.
- Ollila, P. 1989, Coordination of Supply and Demand in the Dairy Marketing System-With special Emphasis on the Potential Role of Farmer Cooperatives as Coordinating Institution.” *Journal of Agricultural Science in Finland*, Vol 61
- North, D. C. 1992, *Transaction costs, institutions, and economic performance*, CS press, San Francisco.
- North, D. C. 1993, *Institutions, Institutionerna, tillväxten och välståndet, Institutional Change and Economic Performance*, Cambridge University Press.
- Person, M. 2003, Mer salmonellasmittat kött till Sverige, *Uppsala Nya Tidning*: 2003-03-15, Uppsala, Sweden.
- Rhodes, V.J. 1985, *Market Failure and the Role of Farmer Cooperatives*, *Farmer Cooperatives for the Future*, NCR 140, pp 44-49, West Lafayette, Indiana.
- Simon, H. A. 1961, *Administrative Behavior* 2d ed. Mac Millan, New York.
- Statistics Sweden (SCB), 2002, *Yearbook of Agricultural Statistics, Husbandry*, SCB, Stockholm.
- Swedish Board of Agriculture, 2003, *Godkänd slakt 2002*, Kontrollenheten, Swedish Board of Agriculture, Jönköping.
- Swedish Board of Agriculture, 2001. *Jordbruksverkets foderkontroll kontroller 1997-1999 Tillverkning, import och tillsyn1999. Rapport 2001:6*. Jönköping, Sweden.  
([www.sjv.se/download/SJV/trycksaker/Pdf\\_rapporter/ra01\\_6.pdf](http://www.sjv.se/download/SJV/trycksaker/Pdf_rapporter/ra01_6.pdf))
- Menard, C. 2000, *A New Approach To The Agro-Food Sector: New Institutions Economics, Chain Management in Agribusiness and the Food Industry*, Wageningen University, Wageningen Pers.
- Williamson, O. E. 1975, *Market and Hierarchies: Analysis and Antitrust Implications*, Free Press, New York.

Williamson, O. E. 1981, The Modern Corporation: Origins, Evolution, Attributes, Journal of Economic Literature, 19 (December): 1537-68

Williamson, O.E. 1985, The economic institutions of capitalism, New York, Free Press

#### Swedish regulations

SFS (1988:534) Djurskyddslag

SFS (1971:511) Livsmedelslag

SLV: FS (1996:32) Statens livsmedelsverks kungörelse med föreskrifter och allmänna råd om slakt av tamboskap och hägnat vilt

SLV FS (1990:10) Livsmedelsverkets föreskrifter och allmänna råd om livsmedelstillsyn m.m.

SFS (1988:538) Djurskyddsförordningen

#### Unpublished sources

Swedish Meats 2002, Swedish Meats djuromsorgs och kvalitetsprogram, Swedish Meats, Stockholm.

#### Internet

Delivery Contract, 2002, Skövde slaughterhouse, 2002-01-13

[http://www.skovdeslakteri.com/marknad/LEVERANSAVTAL\\_SMAGRIS.pdf](http://www.skovdeslakteri.com/marknad/LEVERANSAVTAL_SMAGRIS.pdf): Accessed 2002-01-13

Glad Gris

<http://w1.171.telia.com/~u17102740/gris.htm> 2002: Accessed 2002-08

Gris-To-Go

[www.gris-to-go.com](http://www.gris-to-go.com) 2002: Accessed 2002-03-10-2003-03-20

Livsmedelsverket

[www.slv.se](http://www.slv.se) 2002, <http://www.slv.se/engdefault.asp>: Accessed 2002-11-08

Skövde slakteri

[www.skovdeslakteri.se](http://www.skovdeslakteri.se) 2003: Accessed 2003-03-03

Skövde slakteri, Leveransavtal smågris

[www.skovdeslakteri.se](http://www.skovdeslakteri.se) 2003,

[http://www.skovdeslakteri.se/marknad/LEVERANSAVTAL\\_SMAGRIS.pdf](http://www.skovdeslakteri.se/marknad/LEVERANSAVTAL_SMAGRIS.pdf): Accessed 2003-02-08

Statens Veterinärmedicinska Anstalt

[www.sva.se](http://www.sva.se) 2003, <http://www.sva.se/dokument/stdmall.html?id=267&lang=e>: Accessed 2003-01-15

Svenska Djurhälsovården

[www.svdhv.org](http://www.svdhv.org) 2003, <http://www.svdhv.org/dhvhome.html>: Accessed 2003-03-31

Swedish Meats

[www.swedishmeats.com](http://www.swedishmeats.com) 2002: Accessed 2002-03-05-2003-03-28

Swedish Parliament (Sveriges Riksdag)

www.riksdagen.se 2002a, <http://www.riksdagen.se/eu/EUblad/06.html>: Accessed 2002-05-05

Swedish Parliament (Sveriges Riksdag)

<http://www.riksdagen.se> 2002b: Accessed 2002-08-08

The Encyclopaedia about Corporate Governance

www.encycogov.com 2002: Accessed 2002-05-11

### Personal messages, interviews

Andersson, Tomas, production chief, Slaughter-Pigs/Sheep/Lamb, Uppsala, Swedish Meats, 2002-09-18-2002-11-27

Arenander, Björn 2002, chief veterinarian, NFA, 2002-05-05-2003-03-28

Blackert, Jeanette 2002, extension advisor, Skövde Slakteri AB, 2002-11-12-2002-2002-11-15

Borgström, Göran 2002, production chief, Slaughter- Cows/Calves, Swedish Meats, 2002-11-27

Ehnvall, Rolf 2003, County Veterinarian Uppsala Län , 2003-01-22

Ericsson Stig 2002, Spånga Gårdsslakteri, Glad Gris, 2002-03-2003-03

Friis, Göran 2002, production chief, Skövde Slakteri AB, 2002-03-25-2002-11-21

Gålne, Gunilla 2002, Senior Veterinary inspector, The National Food Administration, 2002-08-10-2003-03-27

Håkansson, Mirjam 2002, Animal welfare inspector, Enköping municipality 2002-01-20

Helen, Folke 2002, salary administrator, Swedish Meats, 2002-09-16

Helgesson. Per-Åke 2002, sales officer, Uppsala, Swedish Meats 2002-11-26

Herbertsson, Jenny 2002, Animal welfare inspector, Katrineholm municipality 2002-01-15

Herland, Per Johan 2002, Secretary, Föreningen Veterinär Foderråvarukontroll, Association of veterinary raw materials control, 2003-03-26

Hullberg, Tomas 2002, contract coordinator, Swedish Meats, 2002-03-15-2003-03-15

Karlsson, Mikael 2002, production chief, Slaughter- Pigs/Sheep/Lamb, Swedish Meats, 2002-11-27

Kyhlstedt, Ulla 2002, Central administrator, Swedish Animal Health Service 2002-10-12-2003-03-20

Lagergren, Magnus 2002, general director, Skövde Slakteri AB, 2002-11-14

Larsson, Kjell 2002, Chairman, Stiftelsen Veterinär Foderkontroll, 2002-05-17

Larsson, Peter 2002, production chief, Cutting- Cows/Calves, Swedish Meats, 2002-11-27

Lindström, Ari 2002, work research technician (Arbetsstudietekniker), Swedish Meats, 2002-11-27

Ljungvall, Örjan 2002, official veterinarian, Spånga Gårdsslakteri, 2002-09-2003-03

Lundell, Annelie 2002, central quality manager, Swedish Meats, 2002-05-05-2003-03-28

Milanov, Alexander 2002, hygien specialist, Kävlinge, Swedish Meats  
Nilsson, Alf 2003, Federation of Swedish Farmers (LRF), 2003-03-15  
Nilsson, Jonas 2002, quality manager, Kristianstad, Swedish Meats, 2002-05-08  
Rosendahl, Mats 2002, economy director, Kävlinge, Swedish Meats, 2002-11-27  
Rutegård, Åke 2003, Director, Swedish Meat Trade Association (SMTA), 2003-03-03  
Sellin, Stefan 2002, Spånga Gårdsslakteri, Gris-To-Go, 2002-03 2003-03  
Sigurd, Anders 2002, extension advisor, Maxima, 2002-16-09  
Sundblad, Fredrik 2003, Swedish Meat Trade Association (SMTA), 2003-03-25  
Tilosius, Göran 2002, veterinarian, NFA, Skövde Slakteri AB, 2002-08-24-2002-09-09



Pris: 100:- (exkl moms)

Tryck: SLU, Institutionen för ekonomi, Uppsala, 2003

---

*Distribution:*

Sveriges lantbruksuniversitet  
Institutionen för ekonomi  
Box 7013  
750 07 Uppsala  
Tel 018-67 10 00

Swedish University of Agricultural Sciences  
Department of Economics  
P.O. Box 7013  
SE-750 07 Uppsala, Sweden  
Fax + 46 18 67 35 02