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Food secure -
Farmers on their modes of production

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Master's thesis in Global Environmental History
Abstract


The thesis explores contradictions that farmers see between current mode of production, and how they imagine that modes of production would need to change if there were no fossil fuels. Based on qualitative interviews with farmers, the aim of the study is to contribute to a discussion on strategies to increase the farms’ capabilities to produce food without fossil fuels. This topic is relevant from both environmental and contingency perspectives.

I understand society of today as mainly driven by capitalist logic, meaning that the logics of capital are what most people perceive as the normal and rational way to organize society. The analysis is based on a theoretical framework that sees the dominant energy source as specific and conditional for the historical organization of different societies, focusing on the role of fossil fuels as specific to the current capitalist society. The analytical tools are derived from the concept mode of production, which puts focus on how the farm production is organized in regard to labor, skills, inputs and machines. By using a specific focus on how farmers describe contradictions between the current mode of production of farms and in the case of a sudden lack of fossil fuels, I elucidate features of current food production that are made logical and rational by using fossil fuels, but which seem less logical when there are no fossil fuels.

I argue that the threat to food security is not due to the fossil fuel dependency per se, but due to how fossil fuels have and are enabling 1) social relations where the purpose of food is to be a commodity rather than to be nutrition for people, 2) spatial concentrations of refineries, distribution and consumers, 3) social relations with dispossession of means of productions for consumers and concentration of ownership of land for producers, 4) technical relations which drive deskilling of knowledge on how to produce food.

For policymaking, this means that exchanging fossil fuels with other energy sources would not necessarily increase food security, as long as the above mentioned mechanisms are reproduced. To increase food security, agricultural policies need to aim at making food more than a commodity and decrease the distance between production and consumption, both in spatial terms but also in terms of knowledge and skills. These strategies are not necessarily compatible with the logics of the capitalist mode of production.

Keywords: fossil fuels, agriculture, food, mode of production, farmers, vulnerability, capitalism

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1. Introduction

In Sweden, there have not been any big interruptions in food supply and access to food since world war two, when import was limited for some years. Since then, both agricultural production and politics on contingency have gone through changes (read more in chapter 2). However, during the last years, the debate and politics on civil defense has changed, and the government is now taking action to rebuild the civil defense again. In the planning for the civil defense, food supply is one area that is given special attention. In this thesis, I will approach food supply from the perspective of the farm level. The study will explore how farmers perceive contradictions between the ways they are currently managing their farms and how they would want to manage them in case of a sudden lack of fossil fuel crisis. I have chosen to focus on fossil fuels, since fossil fuel is one of the biggest dependencies in agriculture (and in most parts of society). It is hard for us to imagine a society without fossil fuels and how logics of development, what resources are seen as valuable and what knowledge is needed might change in such a society. Throughout the past centuries, the prevalence of fossil fuels has been a key factor in societal development, and the use of fossil fuels has influenced everything in society – where we live, what we work with and what we learn in school. Fossil fuels are imported, and during the cold war contingency policies were focused on storing fossil fuels to be able to cope with interceptions. In a study on how a sudden lack of fossil fuels would affect the current Swedish society Baky (2013) show that a scenario with a lack of more than half of the fuel that is used today would lead to starvation (Baky, et al., 2013).

Globally, the use of fossil fuels in agriculture is still increasing (Arizpe, et al., 2011). Asking whether agriculture is dependent in fossil fuel would be superfluous – as dependency of fossil fuels in agriculture is a known fact. We also know that this is a problem that needs to be solved, mainly due to environmental reason. The easiest solution would be to exchange the fossil fuels for other sources of energy, in that way the same logics, knowledges, and machines could continue to be used. For Sweden, it would be possible to exchange the fossil fuels currently used in food production for bio-fuels, since there is enough land to sustain such a production (Ahlgren, et al., 2010). However, there are many problems that are yet to be solved concerning exchanging the fuels on a larger scale. For one, there are many other functions in society that are also dependent on fossil fuels, and the alternative fuels might not suffice to exchange all the fossil fuels that are being used today. Those kinds of priorities are yet to be made. There is also a question on the feasibility to use bio-fuels to exchange fossil fuels on a global scale, as the Swedish conditions are different from global availability to arable land. Hence, it is necessary to not only look at exchanging the fossil fuels, but also to focus on what kind of food production system that the use of fossil fuels has enabled. We need to ask ourselves if it serves its purpose to be capable to produce food for people.

More importantly for the thesis is whether exchanging fossil fuels for another fuel would necessarily increase food security. Fossil fuels have enabled a system where food is produced far away from where the consumers live in complex and spatially complex chain. Food is produced in specialized farms who also are consumers of the inputs they need to produce the agricultural product in their part of the complex chain that is the food system of today. So, more relevant for us to know is how agriculture is dependent in fossil fuels. How does transports and specialization relate to knowledges, skills and access to labor? Are there differences in the farms capabilities to produce food without fossil fuels?
Studying the role of fossil fuels in agriculture is a task which is hard to delimit. To have a situation to compare with, a society without fossil fuels, I would have to go back to pre-industrial times. But when it comes to food production in the preindustrial period it is difficult to separate the development of modern society and fossil fuel usage, as they are parallel processes. But with interviewees I have found that referring to a pre-fossil fuel past would not stir a conversation on vulnerability and solutions in relation to fossil fuels. The solution in this thesis is to use a fictive future fossil fuel crisis as a case, as a means to open up conversation with the farmers and elucidate the details of how the ‘logics of production’ of food might change on the farms if we suddenly take the fossil fuels away. I have interviewed farmers for this thesis, as they are the experts on how the food is produced on the farms. Going through the interview material it became clear to me that the farmers themselves saw contradictions between how the agricultural system works, and how it would need to work to be able to produce food even in a situation where fossil fuels would be scarcer than they are currently. I believe that it is in these very contradictions that there is valuable information on how food security could be increased, and therefore I have chosen to focus on them in this thesis.

1.1 Objective and research questions
The objective of this thesis is to understand the role of fossil fuels for food security by studying how farmers perceive contradictions between running their farms in the current market situation and the vulnerabilities of farms in a sudden lack of fossil fuels. By studying this I can gain insight into what kinds of methods and policies are needed to increase the farms capabilities to produce food without or with less fossil fuel. To reach the objective I focus on the question:

*How do the farmers describe contradictions between managing their farms in the way they do now, and how they would do it in case of a sudden lack of fossil fuels?*

I study contradictions by focusing on how the farmers describe the driving forces to how their modes of productions has developed and are developing, and how they describe the capabilities of their current labor, means of production and social relations to produce food in case of a sudden lack of fossil fuels. These are all interrelated, the relationship with consumers and refineries, price and availability of inputs, previous investments, existing machines etc. all impact the scale and type of production and what kind of food or commodity is eventually produced on the farm. I have chosen to structure the result part of the thesis in a seemingly chronological way in the three chapters; *To the farm, On the farm, From the farm*. The chronology of these should not be seen as a chain of impact, but rather as a way to narrate and follow the modes of production on the farms. In these chapters I study how the farmers describe their modes of production in present day, and the contradictions between this and in a current lack of fossil fuels.

1.2 Thesis disposition
In chapter 2, *Theory and research background*, the research background and the theoretical framework of the thesis is outlined. In this chapter I describe the historical theories that I base the study on, where the dominant source of energy is seen as conditional for societal development. In this chapter I also explain how I see the role of fossil fuels (the dominant source of energy) in the capitalist mode of production (our current society). Furthermore, I develop how the theory of the metabolic rift can be linked to what usually is perceived as vulnerability in food production and consumption. Finally, I describe how I will use the concepts contradictions and mode of production as an analytical tool to analyze the farms and their capabilities to produce food without fossil fuels, on the background.
Chapter 3, *Method of data collection*, describes the methodology of the collection of data. The data consists of semi-structured interviews with, in total, 27 farmers. The farms are all in the county of Västra Götaland in south of Sweden.

Chapter 4, *To the farm*, is centered on the role of fossil fuels for *transports of inputs* to the farm and how this is connected to commodification of food and the means needed to produce food.

Chapter 5, *On the farm*, focuses on the role of fossil fuels in *farm work*, and how this is connected to labor, skills, technical relations and the means of production.

Chapter 6, *From the farm*, is focusing on how fossil fuels enable *social relations to distributors, retailers and consumers* and how these are affected by a sudden lack of fossil fuels.

In chapter 7 I have a concluding discussion.

As the reader will find, the chapters are not strictly devoted to theme of its heading, and borrows aspects and themes from other chapters as well. I have written the different chapters as perspectives on the whole subject, but have chosen not to divide each theme too strictly, since I find it creates a skewed sense of the topic that I try to grasp in this thesis. Writing about the interrelations of different aspects of how materialities and social relations are constituted, negotiated and produced within a farm and in the landscape, aspects and themes from the perspective of several farmers will reoccur in different chapters. This form I have felt to be necessary in order to make sense of and to represent the interrelatedness of how fossil fuels are involved in the production of food.
2. Theory and research background

In this chapter I start by giving a background on how changes in agriculture and politics for contingency have changed during the past decades, to put the study in a relevant context. In the next section I describe how I understand vulnerability. In 2.3 I debate the importance of seeing energy as conditional for how society is organized, and in 2.4 I explain how I see the role of fossil fuels (the dominant source of energy) in the capitalist mode of production (our current society). Finally, I describe how I will use the concept mode of production and contradiction as analytical tools to analyze the farms and their capabilities to produce food without fossil fuels, on the background of the theoretical perspectives of energy as conditional for societal organization.

2.1 Policies on contingency and agriculture

To understand the societal context of the discussions on crisis with the farmers we need a short historical background on the policy areas that concern development of agriculture and of contingency politics. The last time there was a crisis of food in Sweden was during the Second World War. At that time, the contingency was good (famously illustrated by the quote “Vår beredskap är god” by prime minister of that time, Per Albin Hansson). From that time and until the 1990’s, the government was actively planning for contingency through for example storages of food, fuel and other things that would be useful in case the market stopped functioning. During the 1990’s this changed, and in 1995 the government bill “Totalförsvar i förnyelse” (National defense in renewal) (1995/96:12, 1995) used the argument that the membership in the European Union and the increased import/export that this would mean was a reason for lowering the preemptive storage of food in case of crisis. The 1995 government bill also argued that the responsibility for storing oil was taken over by the oil industry in 1994 after decision by the parliament. A few years later, in the 1998 government bill “Förändrad omvärld – omdanat försvar”, the storage of food in case of crisis was taken away completely. In the 1998 government bill the government argues that the storage of food as a method was obsolete, and could be replaced with other methods to ensure food security. The assumption was that the membership in WTO together with stable market patterns and a membership in EU would ensure continued trade far into a crisis; therefore no storage of food was needed. Agencies were encouraged to develop other methods for preparedness in case of crisis, but no further instructions were given (1998/99:74, 1998, p. 151). As the food storages were discontinued by the state there were also discussions on making agreements with the large wholesalers to take this role instead, but inquiries showed that this would probably not be necessary as mitigation (Krisberedskapsmyndigheten, 2007).

At the same time as the political organization of preparedness in case of crisis has changed, agriculture has and is still going through changes. For example, in 1951, almost 869 00 people were working in agriculture (Jordbruksverket, 2005). In 2016 only 170 400 people were working in agriculture (Jordbruksverket, 2017). During the same period the total population has increased with 3 million persons. The number and scale of farms has also changed, from many smaller farms to fewer and larger farms. Still, productivity has increased, and since the 1970’s the production of grain per hectare has gone up substantially (Jordbruksverket, 2005). The replacement of labor and bioenergy in favor of fossil fuels in agriculture cannot be entirely explained by efficiency gains and new technology. One important factor is the increased use of inputs, such as fertilizers, chemicals and machines. Especially the input of energy is important. While agricul-
tural productivity per worked hour is higher in industrial agriculture, the productivity per energy unit is lower in less industrialized agriculture (see for ex. (Giampietro & Pimentel, 1994).

During the last few years measures have been taken by the government to build up the societal contingency once again. In this planning, food is one of the prioritized areas. For example The Swedish Defense Commission (2017:66, 2017) state that the population needs to have access to sufficient food in wartime, even though the standard needs to be considerably lower than in peace time. In the debate on how to ensure an increased food security for society, a common assumption is that increased competitiveness of agriculture in itself also will ensure a higher degree of self-sufficiency of food and also lead to increased preparedness in event of crisis. This assumption is for example stated in the National food strategy for Sweden – more jobs and sustainable growth throughout the country:

“The overall objective of the food strategy is a competitive food supply chain that increases overall food production while achieving the relevant national environmental objectives, aiming to generate growth and employment and contribute to sustainable development throughout the country. The increase in production – of both conventional and organic food – should correspond to consumer demands. An increase in production of food could contribute to a higher level of self-sufficiency. Vulnerability in the food supply chain will be reduced” (2016/17:104, 2016).

If the crisis does not consist of a lack of already produced food, but instead of a lack of important inputs, like fossil fuels, to the agriculture, the plausibility of the assumption that increased competitiveness means increased preparedness for a sudden lack of fossil fuels could be questioned. We cannot assume that the same rationalities would apply to such a situation. As mentioned previously, a lack of fossil fuels would be fatal for food production (Baky, et al., 2013). The Swedish Defense Commission write in their report from 2017 (2017:66, 2017) that increased competitiveness can to some extent contribute to food contingency, but also say that it is not enough. The Swedish Defense Commission suggested 2017 that storages need to be reinstalled, which is a strategy that is very similar to the contingency planning before the 1990’s. However, considering the changes and restructuring of agriculture and food production since the 1990’s, there is reason to wonder whether the strategies from this time are appropriate today. Even though both agriculture and contingency politics have changed, studies on how these changes would impact food production and food supply for the citizens have not been done in a long time. During the 70’s and 80’s the research group ALA – The working group for agriculture and society conducted studies on the food contingency on farm level in event of crisis. Already at that time, concerns were expressed about the increasing dependency on imported inputs and its effects in crises (Andersson & Brorsson, 1991). Since then agriculture has become even more dependent on imported goods, but the exact implications of the import dependency is understudied, and there is a lack of knowledge on how society could handle such a situation. This thesis, as well as the research done by others connected to the research project Can we produce food in case of crisis?, can contribute to this discussion and give insights to how the capabilities to produce food on farm level can be strengthened, and what kind of strategies are needed in order to do so. Since the idea of contingency and preparedness has been of low interest during the past decades, these aspects have not had much, or any, influence on agricultural policy and rural development in Sweden.

2.2 Understanding vulnerability

Studying the role of fossil fuels for vulnerability in the production of food is a task that needs theoretical concepts that strive to encompass and explain complex and far-reaching structures.

Environmental History studies the interactions between human and nature over time. For this thesis I have chosen to use Marxist theory to do this (I will describe how in the coming sections). The basis of Marxist theory is, summarized by Holleman, committing to materialism, using a
dialectical approach, focusing on historical specificity and with the aim to contribute to socio-ecological change (Holleman, 2015). What drives development forward is changes in material conditions rather than values and ideas, and by studying these insights on how to create equality and stop environmental degradation can be gained.

There is a debate on whether Marxist theories can be used for ecological research, or if they are unsuitable for a study of social-natural relations as there has been a history of simply focusing on humans, omitting nature altogether. This argument is among others made by Donald Worster when he uses the Marxist concept mode of production (Worster, 1990). Researchers that have coined themselves Ecological Marxists have however stressed that there was an ecological thought already in Marx’s own writings, and argue that the methodology does not need not be remade, in the sense that for example Worster suggests, by adding the element of nature since it is already there (Foster, 1999) Early writings by Marx, makes clear that the connection between humans and nature is fundamental to Marxist method and thought, or in Marx words: “Man lives from nature, i.e., nature is his body, and he must maintain a continuing dialogue with it if he is not to die. To say that man’s physical and mental life is linked to nature simply means that nature is linked to itself, for man is a part of nature.” (1974, p. 328) in Foster (1999). This quote describes what is meant by the concept social metabolism. Social metabolism is simply the exchange of nutrients, but in a social-natural relationship through exchange of nutrients humans can no longer be seen as separate from nature, but a part of it. Social metabolism then is a way to view the interactions between human and nature, which is the focus for Environmental History.

In this thesis I am in that sense studying the role of fossil fuels in the social metabolism of food and food production.

From the perspective of social metabolism, urbanization is seen as a separation of humans from the rest of nature, what Foster calls the metabolic rift (Foster, 1999) The metabolic rift refers to in a very material sense, the return or lack of return of nutrients to the arable land after food has been consumed in the city. As for the social organization, it encompasses the rift between production and consumption; the urban laborers became consumers of food that was produced elsewhere. The consumers do not have control of the means of production of food, which in itself is a vulnerability. In addition, and as written previously, the role of the consumer does not entitle right to buy a commodity just because the consumer needs it, the consumer’s entitlement to the commodity is essentially depending on the purchasing power.

This separation of consumption and production is a key factor to understand what we today usually talk about as vulnerability in the food system. From this perspective, the foundation of vulnerability is the separation of work, where fewer persons are involved in agriculture that needs to feed an increasing amount of people. An urban dweller is more exposed and sensitive to a sudden lack of fossil fuels, since they are not in control of the means of production, nor are they a part of the labor force that have knowledge about the means of production when it comes to producing food.

Vulnerability is essentially a matter of property relations and power. The non-producers are not in control of the means of production, and they do not have knowledge of how to control them. It is not the dependency of fossil fuels in itself that creates vulnerabilities, but rather the social relations of the capitalist mode of production which fossil fuels enable. The farmers are dependent on the machines to produce food, but the machines in turn are dependent on fossil fuels.

2.3 Energy sources as conditional for societal development

We can state that it has been known for a long time that there are negative sides with the dependence of fossil fuels, and also that fossil fuels are finite resources which means that at some point it will not be possible to use fossil fuels anymore. Many studies and projects on fossil free agriculture today are focusing on ways to exchange fossil fuels with other fuels; primarily biofuels
but also electricity. In this thesis, I will start from the standpoint that different energy sources are the perhaps most important factor to how societies are organized. This contrasts a somewhat more common view that energy is more to be seen as a catalyst to different organizations of societies, not a conditional factor. Using this perspective on energy, the question of how a fossil free society (and agriculture) would look like becomes more than a matter of what energy source to exchange it with, as we cannot take for granted that the same logics and rationales would dominate.

There are innumerable studies on the role of fossil fuels for society, and for agricultures from different disciplines. The American anthropologist Cottrell, gave an important contribution to the studies of the relations between culture, society and energy, when he argued that the energy available sets limits to what humans can do, and also influences what humans will do. Cottrell studied the relationship between society and energy through a comparison of energy used and cultural development from gatherer societies to modern, fossil fueled society (Cottrell, 1955). HT Odums developed this through a systems approach, arguing that what is viewed as progress and development is mainly due to the fact that the labor is subsidized by stored fossil fuels. In Odums’ book from 1971, he has a famous section called Potatoes made partly from oil, in which he shows how fossil fuels are necessary for agricultural production and distribution (Odum, 1971). Through energy analysis, Leach argued that the model of exchanging labor for fossil energy in the western world would not be possible to scale up globally, since the energy ratio is not positive (Leach, 1975).

Fischer-Kowalski and Schaffartzik argue that the dominant source of energy is conditional for societal change, rather than the technologies used to converse the energy (Fischer-Kowalski & Schaffartzik, 2015). They describe three different societies, or socio-metabolic regimes distinguished by Sieferle: the “passive solar energy utilization” (hunter-gatherer mode), “active solar utilization” (agrarian mode), and the fossil driven industrial mode. The living conditions, social norms and required knowledges for the inhabitants of these kinds of societies differ to a large extent, and the main difference between them is that they are driven by different energy sources. When seeing the role of energy from this perspective, it seems likely that whatever socio-metabolic regime that comes after the fossil fuel driven will be as different as hunter-gatherer societies are from agrarian societies, and as the industrial society is from agrarian societies. So far, the potential solutions to ending fossil fuel dependency, such as biofuels, are connected with probable new social and environmental problems in the future, mainly since they, unlike fossil fuels, are not a stored capital and compete with other resources for its production, such as land for food production, forest for timber and paper production and so on. The capacity of different energy mixes has not been proven able to substitute all the fossil fueled mechanisms that are involved in running society today.

To design new energy solutions to exchange fossil fuels, without acknowledging the likelihood that such a society will be much different, could mean that the new energy solutions create new problems in the future - or that problems are postponed to the future. Donald Worster explains this postponing of problems by arguing that society has built itself into an infrastructure trap (1994). In the case of fossil fuels it means that the logic of how society is organized is totally conditioned by input of (fossil) energy, and if there is no energy coming in, the organization of society becomes illogical. The embeddedness of this dependency, and its impact for the strategies used in society to abolish the use of fossil fuels, are also discussed by the technology historian Thomas Hughes, arguing that the flexibility of technology is diminished as society develops around a technological solution and builds and invests in this solution through new linked technologies (Hughes, 1983) in (Jones, 2010). Tainter writes along the same line and states that problems that occur in society are usually solved by either: 1) using more energy to create more complexity, 2) simplifying and losing complexity or 3) collapsing (Tainter, 2006). Tainter sees this as a matter of diminishing Energy Return On Investment (EROI), meaning that more and more
economic activity, research etc. is needed to acquire the energy that is needed to run society (Tainter, 1988).

When studying the future, as I attempt to do in this thesis, there is no way of really checking if the results are correct. However, my aspiration is to approach the question of the role of fossil fuels from a perspective that allows seeing contemporary society as something historically specific, and that the way it is organized is likely to change when we change energy sources.

2.4 Fossil fuels in capitalism

I have now debated an idea that is central to this thesis, that the dominant energy source is conditional for the organization of society. In the following section I will explain how I see the role of fossil fuels (the dominant source of energy) first for capitalism as a whole (eg. the organization of our current society), and then specifically for the organization of agriculture. I understand society of today as mainly driven by capitalist logic, meaning that most people perceive the logics of capital as the normal and rational way to organize society. Studying the role of fossil fuels in society is therefore a matter of studying the role of fossil fuels within the logics of capitalism. It is necessary to define what I mean by capitalism, as it is a commonly used concept but with many different notions on what it actually comprehends. A common misconception of what capitalism is, is that it is the same as a market economy. The difference is that capitalism denotes that means of productions and capital are owned by private owners, whereas market economy is when the price of commodities is set on a market based on supply and demand. For Wallerstein, capitalism is when capital is used in a specific way - to accumulate more capital (Wallerstein, 1983). In a way, this can be argued to have been the case even in earlier societies, with the difference that it seldom succeeded until labor force was more easily accessible etc. Sternberg (2015) defines capitalism as “an economic system characterized by comprehensive private property, free-market pricing, and the absence of coercion” (Sternberg, 2015). Sternberg argues that this definition of capitalism is the only valid one, discrediting those who accuse capitalism of causing environmental destruction, poverty etc. She goes so far as to argue that if capitalism was allowed to be exercised freely and in all sectors (eg without any type of regulation), these problems would not occur since they are mainly an effect of things separate from capitalism. However, Sternberg also argues that a free capitalism has never existed, other than as a theory. So, in Sternbergs way of seeing capitalism it seems to be something that operates on the side of the rest of society. In Marxist theory, capitalism is seen as a mode of production that builds on private ownership of the means of production, where most people are dependent on wage labor, where goods are sold mainly with the aim to render profit, usually by producing commodities or getting rent for example from housing. When I discuss capitalism in this thesis, it is in the understanding of capitalism as a mode of production.

Fossil fuels are regarded here as historically specific and as a social relation that has been and is enabling division of labor and capital in the capitalist mode of production. In this thesis I view fossil fuels as an internal and inseparable part of the capitalist mode of production (cpr Huber (2008). Energy in research is often treated as if it was exchangeable, counting the effect of the energy while disregarding the type of energy or treating it as interchangeable with any other energy. However, this government bill should be treated as hypotheses to be tested rather than a truth. The results of the engineers Giampietro and Sorman (2012) support Huber’s thesis that different kinds of energy should not be seen as interchangeable since they are very different. For example fossil fuels are stored for millions of years, whereas bio-fuels grow and take up land continuously. Therefore, I here will follow the line of Huber where oil not just as regarded as a means of production, but also as a social relation that fundamentally shapes society today.

In Marxist theory, the role of fossil fuels in the capitalist mode of production has been viewed in different ways. Marx saw fossil fuels as a gift of mature, or Gratisnaturkraft (Malm, 2016). Its
strength for industrialism and emerging capitalist economy was that it was mobile, compared to water power that is essentially local (as was already discussed above). Power from fossil fuels was also possible to control, while water is dependent on the water flows (Marx, 2013 (1867))

An important debate is on how the use of fossil fuels was adopted in the first place. Two different standpoints are 1) adoption explained by abundance and cheap price, 2) adoption explained by the logics of capital. The first standpoint declares that as long as fossil fuels are cheaper and abundant enough, humanity will keep using them until they are finished. Accepting this view would mean that there are no chances of reaching the climate goals or transit to a fossil free society. A second standpoint is proposed by Andreas Malm (2016) who argues that industrial revolution did not happen because of availability of a new energy base, or because fossil fuels, proved more efficient. The reason was rather because it was more moveable and hence made possible for the owners of the industries to gather market, labor and consumers at the same place, and thereby fulfilling capitalist logic of gaining control over the forces of production. From this perspective, the adoption of fossil fuels was not due to its ‘rationality’ as a power source in terms of efficiency, but because of its suitability to increase concentration of power over the means of production, and by extension in making people more dependent. Thus fossil fuels brought increased control of the productive forces, e.g. the means of production and the labor (Malm, 2016)

From a farmers perspective, we see that in a capitalist mode of production it is beneficial to own as much as possible of the land and technologies that is necessary for production, to get as high price as possible for your products on the free market, and to try to have as little coercion or intervention as possible - via laws and the state. Of course, there is no ‘pure’ capitalism as in Sternbergs definition, since agricultural production is much regulated through agricultural policies, market restrictions etc. But, as we shall see further on in the result chapters, the state is also involved in reproducing the capitalist mode of production. Studying farmers in the capitalist mode of production is often a question of what the farmers are in the mode of production, and who they will be allied with – the capitalists or the workers. This is the case in the classical debate of the agrarian question; compare for example Chayanov (1986). For this thesis, this is not what is interesting, but rather how the farmers perceive the mode of production and its contradictions through the organization of their farms.

2.5 Analytical tools: Contradictions in modes of production

To study the role of fossil fuels for production of food I first need to discuss conceptually what production is. Etymologically, the word production stems from the Latin words pro (forth, forward) and duce (bring, lead). To bring forward implies a direction or movement, from one state towards a preferred state. This means that there must be an actor, someone who decides what the preferred state, i.e. the purpose is. A materiality is also implied; something is to be brought forward. A study on the production of food should hence look at how the movement (bringing forward) is conducted and how purpose is negotiated and decided. A study of production also needs to look at what types of materialities are present in the production. In this thesis I will therefore explore materialities in terms of production tools and linked knowledges, their social interlinkages and their physical result in the landscape.

In this study I will do that through the concept of ‘mode of production’ which has already been discussed and used above in the historic overview. Mode of production as it will be used here encompasses the how, what and why of production.

There are many different ways of using the concept mode of production, but it can basically be described as a way to study how 1) the productive forces (labor and means of production) and 2) the social and technical relations of production produce and reproduce society. The concept mode of production is first mentioned by Marx (Marx, 2013 (1867)) where he identified different
modes of production such as kin-ordered, tributary, slave, capitalist, communist and socialist. Three of these; kin, tributary and capitalist, are the ones that have been used most in studies of current cultures, for example by Eric Wolf (Wolf, 1982). As Hindess and Hirst (1977) have argued, the concept should not be seen as a historical method primarily, but as an acknowledgement that society is constantly produced and reproduced with its productive forces and the social relations that are enabled by the productive forces. Mode of production does not imply that the development of society is predetermined (as is a common accusation of this theory) but that the future rests upon the past, or put in other words - that the current society is producing the future society. To me, using this theoretical framework is a way of acknowledging that the materialities of society – like fossil fuels – condition what we think, say and imagine. I am not arguing that ideas are not important in influencing society, but that we always need to put the ideas into a context.

As Wolf writes, the theoretical strength of the concept mode of production does not lie in classifying different modes of production, but rather as a tool to structure the complex task of studying how production is organized and reproduced (Wolf, 1982). By this structure, I can better elucidate how reproductions of the existing modes of production are formed, carried out and materialised, and how they are imagined to change in case of a fossil fuel crisis. Broadly, the productive forces in agricultural production are the labor itself; usually performed by the farmer, family members and different kinds of wage laborers, depending on the size and form of farm. Other means of production are all the things the laborers use to produce the product such as; tools, seeds, land, machines, fuels and the labor itself which will be explored in this thesis (Harvey, 2014). The means of production is sometimes separated into means of labor, eg. the machines or technology, and the subject of labor, which is the land or natural resources used in production. In this thesis I will only use the term means of production and by that refer to both machines and land. When I refer to productive forces I mean the means of production and the labor. In Marxist inspired analyses the social and technical relations of production define the organization around the production; forms of association, for instance how accumulation of capital is rendered and distributed, ownership of the means of production, relations between classes and the people involved in the production. It is also institutions such as the legal instruments (how laws are formulated), what government agencies that exist and what they do, as well as educational systems (Harvey, 2014). All of these aspects are relevant for the analyses presented here. However, to just compile a list of what is used on the farm to produce food will not help me elucidate how fossil fueled modes of production and its mechanisms actually relate to its capabilities in terms of producing food. Rather, as was explained in the introduction to this thesis what is of interest here are the contradictions that the farmers see between their current mode of production and an imagined mode of production, in case of a sudden lack of fossil fuels. These contradictions as I explained in the introduction help me elucidate how the fossil fuel dependent food production is reproduced. A main contradiction is the one between use-value and exchange value, i.e. when there is a contradiction between food as nourishment for people and between food as a commodity with the purpose of being sold on a market for rendering profit. In current society, these two values are not necessarily contradictory, or contradictions are not always evident. Food can be produced in order to be a commodity and render profit, and still fulfill the use-value of being nourishment for people. But by using the case of a sudden lack of fossil fuels, I elucidate how these values are contradictory in the very organization of food production. This approach provides a necessary conceptual tool to study the interaction between human and nature and the role of fossil fuels, in how it enables reproduction of the current mode of production.
3. Method of data collection

In this section the methods of designing, conducting and analyzing the study is outlined. The main source of empirical material for this study is semi-structured interviews with farmers. All of the interviews were conducted together with Camilla Eriksson who is a researcher at the Swedish University of Agricultural Sciences (and one of my supervisors) and with Sofia Sollén Norrlin who is a MSc student in Rural Development at the same university. Presented thesis is included in the research project Can we produce food in case of crisis? with Camilla Eriksson as a project leader and together we formed a project group. All decisions concerning selection of farmers, design of the interview template and interviewing were made together in the project group. We all had different angles but formulated the questions together combining the different aims. Formulation of research questions, the conceptual framework presented in previous chapter and analyses has been carried out independently by the author.

As support in designing the study we had a reference group consisting of Harald Svensson, Swedish Board of Agriculture; Therese Frisell, National Food Agency; Kerstin Borg, Swedish Civil Contingencies Agency; Fredrik Fogelberg, JTI – Swedish Institute of Agricultural and Environmental Engineering; Anders Drottja, The Federation of Swedish Farmers and Kjell Sjelin, Ekologiska Lantbrukarna. They were chosen as a reference group with regard to their knowledge in contingency planning for food in event of crisis. Before starting collecting the data we had a meeting with the reference group where we asked for feedback on different aspects of the study as well as on the proposed interview guide. But, the reference group has not been involved in the study and the analysis and conclusions in this thesis are my own. Camilla has been involved as one of my supervisors and Sofia has been involved in discussing the results after interviews and as a discussant while we were both writing our theses.

3.1 Selection of farmers

We were aiming to interview 20 farmers with farm sizes and situations that can be regarded as ‘average’ since we wished to say something about the situation for most farmers. But the selection of respondents was aimed to capture as wide a range of farms as possible in terms of production sector, size, organic or conventional and gender, rather than to be representative of all farmers in Västra Götaland. Farms were selected from a random sample of 200 farmers (out of 12000 in the county) from the Farm Register which we ordered from SCB (Statistics Sweden). The Swedish Board of Agriculture is responsible for the statistics in the Farm Register. The data for the register is collected from the administrative systems kept by the Swedish Board of Agriculture who also do some complementary surveys. Since 2010, the register include farms that possess either a minimum of 2.0 hectares of arable land or a minimum of 5.0 hectares of farmland or horticulture farms with production of at least 2 500 square meters in open air or 200 square meters in green house or farms with animal production of at least 10 cattle, 10 sows, 50 swines, 20 sheep or 1000 chickens. The smallest food producers are hence not in the register and were not included in our original group of interviewees. To have some perspectives from smaller food producers we contacted two of the farms outside of the random sample from the Farmer’s register, Torbjörn and Kajsa.

Interviews were carried out for three weeks during February and March 2016. The planning of the weeks was divided up in the project group and we contacted the farmers we had chosen from
the random sample. We called the person who was noted as the owner of the company, of which the majority was men, which explains the majority of men in the final selection. See appendix 1 for a complete list of all the farmers, the farm’s size and their production. The smallest farm is six hectares. In our first phone call we told farmers about the project, how they had been chosen and if they wanted to participate. Before the interview, farmers were sent a description of the study and of us who were going to come and interview them (see appendix 3). During the call, we explained that the study was going to be anonymous and that we wished to interview those on the farm who was responsible for the decisions and had insight in the production. In some cases we met more than one person, which could be an employee, a spouse or a co-owner (who were in all such cases relatives). In total, we interviewed 27 persons on 20 different farms, out of the 30 we contacted. The ones who turned down the interview were in most cases retired or about to retire, but in one case no reason was given for declining the interviews.

### 3.2 Interviews

Semi structured interviews were chosen as a method for two reasons primarily; 1) to provide situated and practice based insights to the local practice of the mode of production of food, 2) to approach farmers’ realities of the role of fossil fuels and how it affects their capabilities to produce food on the farm. Governmental policies, technological development and events on the global market influence the farmer’s decision, but the individual farmer is always the subject who acts and has insight of the local practices on farm level. The seemingly complex and global structures and flows of agriculture all meet at the farm, which becomes a nexus of the local and global. The farmers are also mainly the owners of the means of production of food (although many farmers have bank loans, which I will get back to in chapter 5 as well as the main conductors of labor in food production. The study is inductive and aims at elucidating the farmers’ capabilities to handle a changing mode of production as has been explained in previous chapters.

The study attempts to gain insights on the complexity of interactions between farmer’s knowledge, means of production and social relations that cannot be retrieved through calculations of the amount of fossil fuels used.

Interviews were semi-structured and generally lasted for two hours. In all cases interviews were carried out in the farmers homes, some took place in the farmers kitchens and some (mainly the larger farms with employees) at their office. During the interviews me, Camilla and Sofia took turns asking questions which we formulated in relation to the interview template with the different topics we were ticking off as they were discussed during the interview. We allowed the interviewee to expand their thoughts and comments and did not ask the questions in the exact order, nor in the exact way that they were formulated in our template. This method was chosen over a formal questionnaire since we wanted to follow the different farmers reasoning. Generally, we started by asking farmers to describe the organization of the farm in terms of who worked there, what they owned, what they rented and how it has developed over the past years. We moved on to ask them about what they think the consequences of a potential blockade, meaning a complete stop of import of agricultural inputs and fuel, and what consequences this might have at their farm. Finally, we asked them about strategies they would use in order to produce food in such a situation (see appendix 2 for the interview template used during interviews). After every interview we all made short summaries of the interviews which we shared in a common folder so that we all had access to read each other’s summaries. To maintain anonymity the farmers have been given anonymous names in the thesis. Farmers in the same type of production have here been given names starting with the same letter so that it would be easier to remember them and not mix them up.

Since the three of us conducting the interviews partly had different focuses, the interviews were not strictly about the topic of fossil fuels. Sofia Sollén-Norrlin carried out her on political trust and the relationship between farmers and the government regarding crisis management (Sollén-
Norrlin, 2016). Camilla Eriksson’s focus was on the preparedness of the farms in case of crisis in a broader sense than just a lack of fossil fuels. We did not divide the interviews strictly between us and have all been analyzing the same material but have directed our attentions to different aspects of the interviews when analyzing them.

3.3 Study area: Västra Götaland

All of the farms selected for the study are situated in the county Västra Götaland which was chosen for its varied conditions for agriculture in terms of land quality, infrastructure and population pressure. In Västra Götaland there are big farms of several hundred hectares as well as small farms. By focusing the study on only one county was a practical decision as it was possible to travel to the farms and plan the field work efficiently.

The area is not typical for Sweden and has better conditions for agriculture than most other areas concerning weather and fertility of the land. It is more densely populated than for example north of Sweden. Västra Götaland has the highest amount of people working in agriculture per capita compared to the rest of Sweden. In 2016, 31 900 persons were working in agriculture in Västra Götaland, in all of Sweden there were 171 400 (Jordbruksverket, 2017).

3.4 Analyzing the material

During the field work we conducted 1-3 interviews per day. Most of the days, we wrote a short summary of the interviews in the evening when we got back, as has already been mentioned. The summaries contained visual impressions from the interview, thoughts on things we might have missed or misunderstood and clarifications and notes on the preliminary important findings from the interview. Between the interviews we discussed the responses and possible ways of analyzing them, sharing our impressions and thoughts. When all of the interviews were conducted we all listened through them and transcribed the parts that were important for our own studies. Parts of the interview that I assessed as less important for my thesis I just summarized shortly. In some cases I have reassessed some of these parts, I initially treated summarily as my analysis has moved forward. I listened to the interviews again and transcribed quotes that I found important.

For the first months of the analysis, I began exploring results using (Actor-network theory) and specifically hybrid geography. However, I found that this framework was not helping me in structuring the analysis or shedding light on the questions I was posing. The results became messy and the links between farmers and the rest of society seemed more complex than I have reason to believe they actually were. I therefore decided to try to shift to a theoretical framework where I would be able to position and highlight the power relations and the driving forces in how agriculture is organized in our current society and the role of fossil fuels in that. After many hours of going through articles I kept returning to works by Matthew T Huber and John Bellamy Foster, both Marxist scholars, who I felt were giving me new ways of analyzing what was going on the farms. From there, I started building the analytical tools I needed to do the thesis as explained in the previous chapter. The change of theoretical framework probably caused med several months of delay in finishing the thesis, but has made me better able to analyses the results and to frame my study. I also feel that as the study now stands it is a better contribution to the interlinked fields of Agriculture and Rural Development (from where I have my Ba background) as well Environmental History.
3.5 Short introductions of the farmers

*Birgitta* is one of three broiler farmers in the study. The set-ups of the broiler farms are very similar; they all have two stables each with 90 000 chickens per stable at the time with 7-8 rounds of chickens per year. They deliver to Kronfågel, who has the only slaughter house in the area which can handle the quantities of chicken that the farmers deliver. The farmers grow fodder on 250-390 hectares, consisting mainly of wheat for the chickens. Birgitta’s production is organized in the same way as described for Bengt, but she also owns a lot of houses. The house business is not as big as the agricultural production, but it is growing. She bought the farm in the early 70’s, then it was 14 hectares and since then it has grown to almost 400 hectares. In the beginning they grew potatoes, like many of the farms around. She sees herself as an entrepreneur, and a good business person. Neighbors have recently invested in big broiler production, which makes her secure that the chicken industry is moving forward.

*Bengt* is the third of the three broiler producers in this study. He recently sold some land to pay some debts, which he is happy about. His plans for the future is not to increase the agriculture, he already thinks it is too big, but to do some construction work on the side.

*Benny* is the second broiler producer, but other than that he also has egg production grows some vegetables and potatoes. From the beginning they only had broilers, but after a bad year (economically) they decided to broaden the production with different products. The vegetable production they bought from a relative. They have a stable for raising chickens to laying hens. His plans for the future is to build more stables for chickens and will double the amount of land in a few years, through an inheritance.

*Gunnar* is focused on piglets and grows organic fodder for the pigs on 114 hectares. He started the pig production in 93 since it was not economically viable to only produce grains on the 60 hectares he had then. He plans to build stables so that he can keep the piglets until slaughter instead, since it is difficult to find organic producers who buy the piglets. Gunnar took over the farm in 1990 and started pig production in 1993. Before 1973 his father kept slaughter pigs on the farm, but from 73 and forward it was possible to live from just grain production because of the high world market prices. The reason he started the pig production was because he wanted to be a farmer and the 63 hectares he had back then was a too small scale to be able to live from just grains.

**Gustav** and his brothers own a large pig farm where they work 480 hectares, where they own around half of it and rent the rest.

Karin is a part of a cooperative who keeps pigs, sheep and chickens for eggs. They do not own any land, since they rent it at a sheep price from the municipality. The cooperative do not sell anything to people outside the group, and do the slaughtering by themselves. They buy all the fodder that they feed the animals.

**Kristoffer** has got cows for meat production on 30 hectares of grazing. runs a farm of totally 30 hectares including forest land, grazing and crop land. He rears suckler cows, which is cows where the calf eats its mother’s milk instead of taking it away for human consumption. Now he has 22 animals in total. He works a fulltime job on the side. He is thinking about the future, but has not decided on what to do. His alternatives are either to quit or to buy the neighboring farm and increase his production. He would rather do neither of it and only work with the size of farm he does.

**Magnus** is a milk farmer with around 380 cows and some sheep who are milked in carousel. He has one-two employees but does most of the work himself. He owns 75 hectares of land and
rents up to 600 hectares, mainly from neighbors who have quit their own agricultural production. When he started in the end of the 70’s there were no cows on the farm and he has built the whole production from scratch. The plans for the future were until recently to increase the amount of cows up to over 1500 cows in the long run, but since the price for milk is so low at the moment he has decided to wait and see and perhaps change. He delivers the milk to Arla, which is the largest of the dairy companies. Has thought of starting up a local dairy with other farmers nearby, but found it hard to cooperate and prefers to work alone.

Marko and Maaike bought the farm in 2006 when they moved to Sweden from the Netherlands. They were looking for farms in the Netherlands first, but could not find one and started to look for farms in other EU-countries. Now they have 125 cows and milking robots. They are planning to merge their business with a colleague in order to get a larger production unit. They would like to change dairy from Arla, but do not have an alternative where they live.

Mats has got 40 milking cows in a stable where they are tied and milked through a pipe milking system which he invested in in the 80’s. He owns and leases 90 hectares and have been working on the farm since the 70’s, when he took over from his grandparents. He would like to decrease the amount of cows, but says that it feels strange to do so. He is close to retirement and do not think that his children wants to take over the farm. His plan is to stay at the farm and lease the land to some other farmer, hoping that his grandchildren will take over one day.

Mikaela and Markus own a milk production with 120 cows on 200 hectares of arable land around the same amount of forest. The also rent a lot of land, and do not feel that there is a competition for land in their part of the region. They invested in two milking robots some years ago, and have soon paid the loans they took for that. They bought the farm at a good price from Markus’ father, and have bought neighbouring farms successively. They deliver the milk to a smaller dairy nearby.

Micke has got 250 milking cows, four milking robots and owns 40 hectares of land and leases almost 400 hectares. Started the milk production from scratch in 2002 and has grown a lot since then. He has made large investments over the past years and grown quickly. For the future, he is planning to become big enough to keep his own farm dairy and his own production of energy through biogas.

Torbjörn has a small farm of around five hectares where he produce vegetables using hand labor and draft horses. He has no employees but receive volunteers from time to time. He sells his production directly to consumers and stores.

Torgny and Tobias has a business with 10 employees, mainly inside the extended family. Their main product is potatoes and they own 450 hectares of land. They also own a packing central where they make the potatoes ready to be delivered directly to stores, wholesalers and restaurants.

Tina grows vegetables on 5 hectares and grains on her farm, and also around 70 hectares of grain. The interview was entirely about the vegetable production, as that is the focus of the farm. She hires labor for seasonal work, as there is a lot of work with the vegetables that cannot be done with machines, like much of the weeding and harvesting.

Vilhelm has got the largest farm in the study, with around 1000 hectares of farm land. The agriculture is focused on grain, but the main income is from the forestry and from the houses he let. He has got around ten employees who do the practical farm work, forestry and take care of the houses. The farm used to be mainly milk production, but is now producing grains. They own
most of the machines they need for the farm work. Plans for the future is to buy more land if possible, and perhaps build stables for broilers to “refine the grains” through to get a better economy. He says the land is actually better suited to have milking cows, but does not think that is a good idea at the moment, economically, even though he thinks it would suit the landscape aesthetically. Has invested in solar panels for electricity, but would like to see higher prices on electricity.

Verner is a grain producer working around 500 hectares of land. He also has some vegetables, mainly for the fun of it he says. He owns most of the land and rents some. He has had other kinds of production previously, both vegetables and animals, but has focused on grain over the last years. He started in the 70’s when he bought the farm from a relative. Back then it was much smaller, and he has successively bought neighboring farms. Some of them he has sold again, when he was able to sell at a high price.

Veikko and Vera grow grains, mainly wheat, on a farm of 114 hectares, which was originally the family farm of Veras late husband. They are both pats retirement age and were discussing to quit soon. They were unsure whether the children were willing to take over, they already had their lives and careers elsewhere. When they quit, they will lease the farm for some years and if the children do not want to take over they will sell it. Says that it is not possible to provide for a family on their kind of farm, and that some investments need to be made if the children will be able to take over. Either way, they are sure that the one who takes over will need to have another job on the side as well.

Viola and Viktor have a farm of 25 hectares where they grow grains since late 70’s. They have both had other jobs on the side all of the time, but are now retired from them and now only work on the farm. They have been growing fodder for a fodder factory but are just about to change to grow older varieties and deliver them to a recent start-up in the region.
So let’s imagine then, that when we woke up this morning, something had happened during the night - a blockade of some sort. The blockade had the effect that there were suddenly no fossil fuels available. What would happen? For the individual farmers in this study, the first effect of a sudden lack of fossil fuels would be related to problems of transports of goods to the farms. The grain and vegetable farmers would not get their seeds or fertilizers; the dairy producer would not get any protein fodder; the broiler producer would not be able to acquire the day-old chicks they raise. In the following chapter I describe from the perspective of the farmers how a sudden lack of fossil fuels affects the production would affect the flow of input, e.g. resources and materials coming into the farm. Thus, the focus in this chapter is the effects of a sudden lack of fossil fuels on the inflows required for food production. I relate these effects to how the mode of production of food is reproduced now, and the mechanisms and logics that produces the specific social formation of food production in the related farms. A focus is also given to the contradictions the farmers see between the current production and the imagined case where there is a sudden lack of fossil fuels.

4.1 Specialization within broiler production

For those who have possibility to store the input they need, the immediate effect of a sudden lack of fossil fuels is less negative than for the ones who need deliveries more often. As an example I will introduce you to Verner, one of the grain farmers, who explains; “Right now I have all the input I will use for the year here in storage”. The interviews were made in February, so he had just gotten ready for the spring, earlier in the winter he did not have as much of required input stored. Even though all of the farmers, except for a few, say that they are very dependent on fossil fuels to get the input they need, very few of them has enough input, if any, stored on the farm. Most of the farmers say this lack of storage is because it is expensive and also as they are concerned about possibilities of theft. Basically all of the farms in the study are dependent on commodity relations and transports in some way, but the broiler producers are the ones who are perhaps most dependent on transports since they are very specialized and dependent on inputs for the production. Many of the other farms would be able to cope for some time with the fodder, seeds, animals that they have stored on the farm. However, for the broiler producers, the sudden lack of fossil fuels would be noticed as soon as the transports of fodder to the farm would stop. I will therefore begin with discussing the conditions of the broiler producers (three farms) in the study.

The production cycle on the broiler farms included in this study starts when one-day old chicks of 36-40 grams are delivered from the hatching company. They are then put in a stable of 4000 square meters which they share with 90 000 other chickens. They spend their next 30-35 days in this stable, where they grow to slaughter weight, around 2,5 kilos. When the chicks have reached slaughter weight, trucks come to fetch the chickens and drive them to the slaughterhouse. What has been described above is what chicken farmers call ‘circle of production’. Thus, for the broiler producers, even the main commodities that they produce – the chicks – are bought as commodities and transported to the farm. The breeding of chicken varieties is complicated and the process is owned and managed by a few companies. All of chicken farmers interviewed in this
study have the chicken breed Ross. Ross is one of three major broiler breeds of chicken in the world, owned by the multinational corporation Aviagen based in Edinburgh, UK. This kind of highly specialized breeding is entirely enabled and conditioned by the mobility provided by fossil fuels. But as explained here, this is not only because the fossil fuels are needed in the actual production (which I will discuss in chapter six) but also because of transport as explained here. All stages in the chain from egg to chicken are highly specialized, which has the effect that the chicken producers, if production have to be reorganized, would have little use for the existing means of production, the technologies, knowledges and skills that they have acquired from the way the chicken production is organized now. Bengt, one of the chicken broiler producers, described to us how the breeds of chickens they use need to get special fodder that is adapted for their age and how lack of transport would create problems in feeding the chicken:

“We could give them only wheat, but they would not feel good (get bad stomachs) but they would survive. It is worse when they are small, they cannot eat whole-wheat. They need to be at least 17-18 days.”

On Bengt’s farm they produce wheat and have stores to last throughout the year, but that is only 50 ton (per circle of production) out of the totally 30 tons of fodder per circle that the chickens eat. The rest, that is not wheat, is protein fodder that they buy and have delivered every day. The protein fodder needs to be fresh and also needs to be mixed in a certain way. Birgitta, one of the other broiler chicken producers, says that she knows some producers who mix the protein fodder themselves but also say that it is very difficult and necessitates a certain ‘interest’ as she phrases it, from the farmer who wants to do that. The ingredients for the protein fodder are still bought, but by mixing the protein fodder on the farm it can be stored for a longer time. On average, the fodder produced on the farm makes up a third of the total need of fodder for the older chickens, and less for the younger. Benny, another of the chicken broiler producers described how the specialization of the chicken breeds makes it more difficult to decrease the dependence on inputs that are bought:

“The small chicks cannot live on only wheat, they need to be at least two-three weeks old to be able to live on only that, they need the pellet” [...] “The way the chickens have been bred they are very sensitive in that they need specific fodders, otherwise the production decreases quickly”.

To breed more chickens he cannot simply use the chickens he has on the farm, because they need the specific fodder, but also because of the intricate system in which new chickens are bred. To breed chicken locally, he would need a total other means of production, and also other skills. The broiler chicken producers are highly specialized within the production chain, and there are many obstacles for them to be able to produce chicken in case there would be a sudden lack of fossil fuels. The specialization of broiler production can in this sense be understood as contributing to making the broiler production very vulnerable to a sudden lack of fossil fuels. However, the farms as a whole are not necessarily as vulnerable to a sudden lack of fossil fuels. The farms also have significant income from other farm-based activities like forestry, housing rental and crop production. Benny, for instance explained how on his farm:

We have several types of production, mainly to spread the risks. Once in a while we have a bad year, so after a year like that we wanted to have more “legs to stand on”.

The reference to many ‘legs to stand on’ shows how Benny see that there is a contradiction in being to specialized, even in the current production. When we discuss what he would do in a sudden lack of fossil fuels he has several ideas on how he could change production on the farm, for example increasing the vegetable production that he already has started and has got people working with, or venture into rabbit production or other types of production he sees as less reliant on transports. The other farmers, who also have other sources of income than the chickens, are not producing food. Therefore they see larger difficulties in changing production in order to be able to produce food with the productive forces that they have got on the farms.
4.2 A shorter production chain

On the other side of the spectrum of needing to buy inputs, we have Torbjörn, who has a farm which produces the majority of the means that are needed for production. He also tells us that he and his family have the ambition to live a life that is as sustainable as possible. The farm is six hectares and produces mainly vegetables that are refined on the farm and from there sold directly to customers or to the stores. The productive forces on the farm are three working horses that do all the working of the soil, and Torbjörn himself who drive, train and take care of the horses. Torbjörn also does the planning, harvesting, weeding etc. Some machines are used; a weeding machine and tools such as harrows and plows that the horses run. The use of fossil fuels is very limited; “I basically use one can of petrol per year, for the chainsaw and the weeding machine”, he says. Torbjörn is not entirely self-sufficient; seeds are one important resource that comes from outside the farm. Torbjörn comments that they could possibly reproduce seeds on the farm, but they do not do that today:

“I mean, it is quite a lot do anyway, we grow, we refine, we deliver. But in a crisis you would have to reprioritize (…) But it is hard to have the time. (do you know how to take your own seeds?) … Hmm, well I have tried some time but… Well, many (of the seeds) are hybrids today, so it would not work to take seeds from them, so you could not really grow the same things (…) And now we have found sorts that work for our climate, for these soils and for fermenting (…) And some of them happen to be hybrids. A negative thing is that you can’t take seeds from them yourself then” (Torbjörn)

For Torbjörn, lack of time is the main reason he does not take the seeds himself, but also the fact that his favorite crops are not always possible to take seeds from. That the crops are hybrids mean that the seeds you would take from the plant would not result in the same kind of plant when you sow it. Torbjörn’s farm resembles the way many of the older farmers talk about the farms they grew up on. Viktor is a grain farmer, and lives on the farm where he grew up. Victor contrasted the present with the past, saying:

“In a way it was better before, we produced all the food we ate, and sold timber from the forest when we needed to invest. We did not have much income, but on the other hand we hardly needed to buy anything either” – (Viktor)

Viktor is referring to ‘before’ and in his case this relates to his youth in the 1950’s. On the farm that Viktor describes, the purpose of producing food was not mainly to sell it as a commodity, but as nourishment for the people on the farm. Viktor refers to this time in contrast to present day. The past mode of production was possible since Viktor and his family at the time did not need so much money to buy what they needed as commodities, since they were in control of the means to produce most of what was needed themselves. Now he and Viola are retired, but are still running their farm. Before retirement they also had other jobs, but now they are only working on the farm. Viola and Viktor have recently started to produce older varieties of grain which they sell to a local company who has started to distribute these older varieties to stores in the region. Since the varieties are not world market commodities in the same way as wheat and oats sold from the other grain farms in the study, they are not as dependent of the world market prices. Two other grain farmers in the same age, Veikko and Vera, has a rather traditional way of choosing what to grow. Veikko and Vera, grow what they have grown previous years and sell it to the local retailer, who has also generally offered the best price. On a larger farm, Verner and Vilhelm, has expanded the farm over the years. Verner and Vilhelm focus on the crops that render the best prices, even though it can be hard to predict prices before the season. Over the last years Verner has focused on organic rapeseed and sold it to a company that makes rapeseed oil from it. The social relations also concern what they produce on the farm. For example, Viktor and Viola say that the reason they converted to organic production was because the large grain buyer who they used to sell their conventional grains quit its production. The reason for why they are now focusing on growing special, older varieties of grain was also driven by a retailer who contacted them with this government bill. They get all the seeds from the retailer as well.
4.3 Geographical separation of animals and crops

The possibilities to transport would be diminished in case of a sudden lack of fossil fuels, resulting in difficulties of getting means of production that are not stored or produced on the farm. For the grain farmers this means that all the means that are acquired through commodity relations; seeds, fertilizers, fuels and spare parts for machines would be hard to get. The extent of the impact of the crisis would also depend on the time of the year. The geographical separation of grain farms and animal farms would be tangible for the grain farmers, since there is a lack of manure in the vicinities of the grain farms, where there are fewer and fewer animal farms. The organic farms think that they would perhaps be a little better off when it comes to fertilizer, since they have established relations with the few animal farmers that do exist in the area, and also with other alternative sources of nutrients such as residues from ethanol production. Verner, one of the large scale grain farmers, has previously had animals that then provided manure, but he quit having animals due to difficulties with the authorities. Verner explains;

"I was going to get fined if I did not put up a wall there, and lights. And then the whole of my principle would fall. So I said thank you and goodbye, I do not have to do this (keeping animals). They have probably destroyed a lot of animal production, to be honest (the authorities). And now these grazing lands are invaded by shrubs, they are Natura 2000 and everything. So other parts of County Administrative Board are calling my neighbor and are concerned that we cannot keep the grazings open. But there are no animals. I could have 500 animals here, if I could keep them the way I wanted."

What Verner is giving an example of here is how not only the market and companies, but also the authorities, impact what kind of production takes place on the farms. Verner also describes a contradiction in the way the authorities are working, in that they with one hand make it impossible to keep animals, and on the other hand want the farmers to keep animals in order to conserve natural grazing and maintain a high biological diversity. Grazing animals are more independent of inputs than for example pig or broiler chicken production. Chickens and pigs also eat the same kind of food, grains and legumes, that humans can consume directly. From a use-value perspective and a food contingency perspective, if animals eat the grains and legumes directly would be a more efficient use of the nutrients. Grazing animals can live off of grass, and do not compete with other types of production on the former grazing lands that are being overgrown with bush.

In other parts of the county, there are more grazing animals than in the vicinities of Verners farm. The two producers in the study who only keep grazing animals keep cows or respectively sheep. Both of the farms are relatively small scale in terms of amount of animals and land usage. Since the farms are not as specialized the geographical separation does not pose a problem for them in the same way as it does for the grain farmers. Generally in Sweden this type of farming, where the animals graze extensively, is also smaller in scale than farming that is based on grain production for fodder or direct consumption. The farmers we interviewed for this study is Kristoffer who owns a farm where he keeps suckler cows, and a cooperative who keeps sheep on land owned by the municipality. They are both less dependent on buying inputs through commodity relations than many of the other farms, but the farm work on the other hand is not a big contribution to the livelihood of the farmers, nor do the farms give substantial amounts of food for consumption. The first farmer, Kristoffer, runs a farm of totally 30 hectares including forest land, grazing and crop land. He rears suckler cows, which are cows where the calf drinks its mother’s milk instead of taking the milk away for human consumption. Now he has 22 animals in total. Kristoffer is the only one working with the animals, except for some help from a retired neighbor, his father, wife and occasionally his children. Apart from working on the farm, he has a fulltime job elsewhere. Every day, he feeds the cows at five in the morning, works a full day at his job, goes to the cows again and is at home by 8 in the evening. Kristoffer mainly conducts the work himself, but he has some help from his two sons, his father and a neighboring retired farmer. The social relations to the labor is not based on ownership and employees, but rather on Kristoffer working himself with some help from others who have other relations to him than just
the wage-relation. The cooperative is similar; Karin keeps 14 sheep, 10 pigs and soon some chickens. They all have fulltime jobs elsewhere and the animals are more of a hobby than a livelihood. The animals are kept in free range on land they borrow from the municipality and some that they rent from neighbors. In total, the cooperative have seven families who own the animals and share all the work connected to it as well as the meat, eggs and wool from the animals. They do not have any formal arrangements at all such as contracts either with each other nor the municipality. Since they do not sell anything, they do not have to organize more than what they do now. The cooperative members do not own any means of production other than the animals and they do not have any loans. They members in the cooperative started the farm mainly because they would like to have animals, but thought it would be nicer to have them together with other to reduce the amount of work. The cooperative is popular, they both get requests from people who want to join as well as visits from other people who wish to start up something similar. They have turned down people who want to join since they feel that they then would have too little time for each member with the animals, i.e. too little time to work with them since they take turns in taking care of the animals.

Kristoffer also calls his farming a hobby, even though he puts a lot more time and money on his hobby than for example Karin and her cooperative does. The means of production on Kristoffer’s farm, other than the cows, land and two farm houses, are; the machine park, some oat fodder that he buys, fertilizer for the grass he takes for silage, and around 1.5-2 cubic meters of diesel. The machine park is around 10 years old and consists of two tractors and some tools. He borrows a lot of tools from other farmers in the vicinity, usually in exchange for some labor or lending of machine. Kristoffer updates his own machine park continuously, and then prioritizes to buy machines that do not have a lot of technology in them since that gives him opportunity to repair them himself if it is needed. Different from many of the other farmers we interviewed, he has tried to avoid borrowing money to make investments on the farm. Occasionally he has done it but then he has used the farm itself as security. This is a different ownership of the means of production than for many of the other farms, where loans often are higher part of the farm economy. For them the bank gets to have a say about the production, whereas in Kristoffer’s case the bank has no influence on production.

Karin and the cooperative do not own a tractor, but they have been discussing to get one. Karin personally does not want one, she says that they have muscles and are many and she does not see the need. Overall, she sees the multiplicity in the group as a strength since they have many different skills. Some of them can do slaughter, some of them do crafts with the wool, and some of them are well educated in the regulations and know how to get subsidies to build fences for example. The farm is not completely independent though, for example they need veterinaries and they need to buy fodder for the pigs and chickens. The cooperative are not to be seen as labor force, since there is no social division in the production. They own the same shares in the production and are not controlled by money in the production. However, the whole organization builds upon that they are in wage relations elsewhere, which poses a dependency that does not show itself in the production of food in itself.

Kristoffer is more dependent on the food industry than the cooperative, but far less than many of the other farmers in the study are. One example of this dependency is that he and some other farmers have organized a group to negotiate the prices with the slaughterer, SCAN. They noticed that when they came together they could get 10 SEK more per kilo than they got before when they all negotiated separately. The organization makes it possible for the smaller cattle farmers to put pressure on the retailer and thereby impact the social relation. SCAN owns the means needed to slaughter and prepare the meat according to rules and regulations set by the authorities, in terms of buildings adapted for those purposes. They sell the meat further to retailers, who then sells it to the stores where it reaches the consumer. All of these actors profit in one way or another from the money that the consumer pays in the end. Kristoffer has been thinking about selling boxes of meat directly to consumers instead, it would be more satisfying for him and there have
been a lot of people asking if they could buy directly from him. But Kristoffer is cautious, as he says that there is a big difference in what people say and what they actually do in the end though. The uncertainty of the loyalty of the people asking to buy, and the difficulties in keeping the meat cold throughout the chain has made him keep the distributional relationship with SCAN. To change distribution would mean a relatively large investment, something he does not want to do now, especially since he is considering quitting the production altogether. Kristoffer says that in the 80’s, this size of farm would have been sufficient to provide for him and his family. Since then the prices he get as a farmer has remained at the same level, but the price of the inputs he buy has been raised. If he would be sure that the farm generated enough money, he would like to be a fulltime farmer which was the original goal when he started 20 years ago. Now he has learned to live with a fulltime pay, which makes him hesitant in becoming a fulltime farmer. Instead, he is considering quitting farming altogether. The reasons he mention is mainly due to a feeling that the authorities do not appreciate him as a small farmer, and that larger farms are premiered in favor of the smaller by the authorities. This year he had two controls already, and last year he had two controls, and along with these control the municipality makes some additional controls as well. The cooperative do not seem to have the same bad relation to the authorities, the municipality is even lending them land for free. However, they are very dependent on others to be able to produce since they do not own any land. Both of the farms would be able to reproduce their mode of production in case of a sudden fossil fuel crisis, but they would have to adapt to some extent. None of them have large loans from the bank which means that they are free to plan the production as they find appropriate considering the circumstances.

The cooperative buy all their fodder from a farmer some 20 kilometers away and if there were no fuels it would not be able to be transported to the farm. This means that they would probably not be able to feed the pigs, but the sheep could graze on the land all year round. They keep an older variety of pigs that is better at being outside than sheep that are more adapted to produce a lot of meat. With a fuel crises, Kristoffer could not produce fodder the way he does now. He buys grass seed, fertilizers and plastic for the silage bales in the spring. If he did not get that and did not know he was not going to get seeds beforehand there would be a problem. He would not be able to feed the animals the oats that he buy from a neighbor, since the neighbor would not be able to sow or harvest it. In addition, if the machines break he would have a hard time getting spare parts, but he could repair them himself if the damage is moderate. The cooperative could go on producing sheep meat as long as they have land, but the sheep they have are not enough to even suffice for the members in the cooperative themselves in case of lack of food. They could scale up the amount of animals in the area, there is a lot of land that the owner want them to keep animals on. However, they are not in control of the land, which is an essential mean of production in order for them to reproduce the mode of production and to be capable of producing food. Response to a crisis depends on what the landowners decide to do in that case. What the cooperative members do have is the skills and knowledges that they have developed by keeping animals. This makes them more capable of producing food than someone who does not have any knowledge on how to keep sheep. Kristoffer could reproduce the farms mode of production of food to a large extent, the animals can graze for a large part of the year. The feeding during winter would need to change, today he uses bales of silage which weigh around half a ton each. When he was young they dried the grass on hay fences instead of making silage. He knows how to do it but it requires so much manual labor. When they made hay, every relative came to help, he says. Thus as it is labor intensive Kristooffer would not want do it today. This is the same as for many of the other farmers’, they could produce food but would need a lot of manual labor. Another problem emerges in the distribution of the meat. Today Kristoffer delivers the meat to the slaughter house, which requires transports that would not be possible in case of a sudden fossil fuel crisis. He says he could slaughter the animals and sell the meat directly to people living in the vicinities, since he has the necessary skills. He says he takes diesel and fuel for granted, and if he knew that in a month it will be out he would store as much as he can. His strategy would be to keep the cattle, but maybe combine that with some sheep since they are good at
feeding themselves. He would try to get an animal variety that is better at feeding themselves than the variety he has now, maybe he would go for Hereford or Highland cattle. Then he would be surer that the animals would make it, but they would not produce as much meat per animal as the ones he keeps now. During the vegetation period he would focus on getting as much grass as possible and let that decide how many animals he could keep for the winter. He says that the local grocery store could maybe be an actor in coordinating food distribution in a crisis situation. Today, Kristoffer feels that it is quite a lot of hustle on case you want to sell food locally though. He hopes that the regulations would not be as thorough as they are today.
5. On the farm

Moving from discussions on the impact and contradictions of transports of inputs for the effects of a sudden lack of fossil fuels for the farm, I will now move on to the work on the farms and how that is affected by a sudden lack of fossil fuels, and what contradictions the farmers see between current production and in case of a sudden lack of fossil fuels.

The tractor and the machines to work the land are where most of the diesel is used. This is also generally the first thing that the farmers mention as a problem for their production. The majority of the farmers are clear on the point that the fields they work are too large to work on by any other means than the tractor, which they all run on diesel today. Even the ones who have relatively small areas of land assess them to be too large to work in another way than with a tractor. They also assess that this is due to the skills they have acquired by working on their farms in the way they have. For example, the older farmers often have some knowledge on how to work with a draft horse, but still do not see that exchanging tractors for horses would be a viable way to continue the farm work as usual. Those who see the least contradiction between their current mode of production and the imagined production in a sudden lack of fossil fuel, are the ones who have land that is suitable for vegetable production and who have knowledge themselves or staff who knows how to do this. The ones who have animals who can graze and give milk think that their production is able continue, with some adaptations but within their current mode of production. Many of the farmers store diesel on the farm, so in a short term perspective they could go on as usual, depending on what time of the year the crisis would happen.

The main contradictions is hence that in the current mode of production it is favorable to have few people who in a short time can work a large area of field, and whose main skills are to drive the machines. In the imagined scenario the farmers see that they would need more people working smaller areas of land, and that they would need other kind of skills, and grow other types of crops.

5.1 Scale and concentration of ownership of the land

“The larger farms are so highly mechanized, both in the farmhouse and in the machines, so they become highly sensitive. We, the smaller farms, can manage more on old technic (…) Sure, this whole rationalization process is probably good, but it has its downsides, massive downsides.” (Mats)

"The farms were really big before, so they split them up. And then, now we have these big farms again. We never learn. (Bengt)

The scale of farms has changed since the time before agriculture was dependent on fossil fuels, and they are now substantially bigger than they were before. It is an ongoing process that the farms grow. In 2016, 60 % of the arable land in Sweden was farmed by the 14 % of agricultural companies who own and rent at least 100 hectares of land. In 1990, only 24 % of the land was worked by companies who owned or rented more than 100 hectares (Jordbruksverket, 2017). Historically, increasing scale of farms have been political strategies enforced by agencies and the law, for example the great distributions of land holdings during the 19th century and the structural rationalization processes during the middle of 20th century (Myrdal, 2001) When examining the social relations in the reproduction of these processes in present day it is clear that it is not only a spontaneous process that keeps increasing the scales of the farms. For example, the larger
farmers who are increasing their scale say that it has been easy to get loans from banks to invest, and that it is easier to get loans for larger farms than for smaller or new farmers. The smaller farmers on the other hand perceive that they are being inspected more and are more controlled by the authorities and that they generally do not feel supported and appreciated from society. In this thesis I use the term scale in relation to how much labor is used to work the hectares of land, and how much land each farmer owns or rent. As Mats say in the quote above, the larger scale of the farms generally coincide with high mechanization and more technology. In a sudden lack of fossil fuels a large part of these machines and technologies would not be of any use, or at least not the same use as it was intended to. The different scales of the farms do not necessarily impact the possibilities to produce food, or at least we cannot draw conclusions that a small scale farm always is less vulnerable than a larger scale farm. For example, if the farm is large but also reproduces many of the inputs it needs to produce food, it would probably be better off in a fossil fuel crisis than a small farm that is more dependent on commodity relations to be able to produce. However, in this study the larger farms are also generally specialized, and to be able to produce from the whole area of land that they own or rent, they would need different skills, more labor, other crops and other machines. Some of them say that they would like to be more self-sufficient in that sense, but that it does not profitable. It is more profitable to do a lot of one thing that you are specialized in. In a sudden lack of fossil fuel, the farmers could not reproduce their current mode of production, which shows that the logics of scaling up – in the current mode of production – contradicts a mode of production that is capable of producing food even in a sudden lack of fossil fuels. It is also clear that there is a common attitude among the farmers that you are supposed to grow, or at least to let others grow. Mats has got 40 dairy cows in a stable where they are tied and milked through a pipe milking system which he invested in in the 80’s. He owns and leases 90 hectares and has been working on the farm since the 70’s, when he took over from his grandparents. He would like to decrease the amount of cows, but says that it feels strange to do so. He is close to retirement and do not think that his children wants to take over the farm. His plan is to stay at the farm and lease the land to some other farmer, hoping that his grandchildren will take over one day. When Mats tells us how he would like his children to take over the farm after him, even though they are not planning on becoming full time farmers, he comments:

"I guess that is a bit selfish considering the once who are committed to it (the farming) want to own land rather than renting it” (Mats)

In this perspective, it is interesting to focus on perspectives on drivers of the process of larger scales of farms. Birgitta is one of the more large scale farmers in the study:

"The acreage needs to increase all the time (…) to survive. It is not possible to have small farms anymore. But I don’t know where the max is, it’s not that.” (Birgitta)

Birgitta describes that the driving force to grow is in order to survive. To survive in this sense should be understood as to be able to continue running the farm and at the same time make a profit, or to be able to reproduce the current mode of production. She does not feel that it is possible to continue being a broiler chicken producer and not at the same time increase her possession of means of production in terms of land. She also implies that there should be some kind of limit to how much they can grow, but she does not really see it. In the next chapter I will get back to the broiler chicken producers and their relationship with the rest of the production chain, and there we will see that the preconditions for how they organize the production is highly controlled by the company that owns the rest of the production chain.

“We buy (land) as soon as we get the chance…. (question: Do you see any limits (to how much land he can buy)? No not really. I learned that in the US, they always said: The sky is the limit” (Verner)

Verner, a large scale grain producer, does not describe scaling up as something he does mainly to survive, but rather as something he does because he can. In case of a sudden lack of fossil fuels,
he has got storage of diesel on his farm so that it lasts for at least six months. He is convinced that he could continue even in case of a longer lack of fossil fuels since he could use the rapeseed that he grows as fuel by letting his friend, who has a rapeseed oil press, make fuel out of it. Hence, he does not see any contradictions between his current mode of production and how it would be in a sudden lack of fossil fuels. However, there are contradictions between how he runs his farm now, and what he would want to do with his agriculture:

"I would like to grow all that I need myself, but I haven’t really gotten to it. I usually buy potatoes (to sow) and a few other things. That is what I would like most, to have my own. But it is so cheap in the store.” (Verner)

When he says that the vegetables are so cheap in the store, he is comparing the price with the effort and cost it would mean for him to grow them himself. This implies a contradiction, he would like to grow more of his own vegetables, but he cannot legitimize that labor in comparison with how much money he would save on doing so.

"I think it is a driving force, to want to grow bigger” (Gustav)

Gustav is one of the most large scale farmer sin this study, in terms of scale of production (pigs), farmed land and number of employees. He expresses the want to grow bigger as something that comes from within, something he wants to do. I interpret his words as if he means it is something human to want to grow bigger, that it is natural. They are among the largest producers of pigs in Sweden and produce fodder for the pigs on the almost 500 hectares of arable land that they work. He successively buys and rents more land, which is possible since the bank supports them and gives them more loans when they need it. However, when we start talking about what he thinks would be reasonable to do in case of a sudden lack of fossil fuels; he does not see the size of the farm as a benefit for the farms’ capabilities to produce food.

"I think we would have fewer pigs. Because they demand a lot of work, energy and... well a lot. Then it would probably not be the most important thing to have good figures in the company, but rather to grow crops that does not take a lot of energy, and not so much chemicals. Oats for example, are easy to grow. And you can make porridge from oats. If the crisis would continue for more than five years there would be no ideas to continue keeping pigs…. I think you would have to adapt to a ‘suit that fits better”” (Gustav)

These farmers get loans from the bank, otherwise they could not have bought as much land, since they do not get that much profit from their production. Markus, one of the dairy producers, has a different view than Gustav and Verner on how scale is important. He has a large farm, but he does not seem to think that it is an inner drive to grow, nor that the sky is the limit.

"The winner is the one who has most cows when they die – that is how some people think, but that is not the way it works. The ones who have few loans and few employees are the ones who do best. The banks do not lend you money for dairy production today, only for buying land”

At Gunnar’s farm the production is organic; they produce 2400 piglets per year and deliver around 160 at the time to other farmers who breed them for slaughter. He has tried to rent more land, but since there is a competition for land where he lives it is hard to get something. Gunnar took over the farm in 1990 and started pig production in 1993. Before 1973 his father kept slaughter pigs on the farm, but from 73 and forward it was possible to live from just grain production because of the high world market prices. The reason he started the pig production again was because:

“I want to be a farmer, and one can’t live off of 63 hectares of crop production”

So both starting the pig production, and to become an organic farmer can be seen as alternative strategies to increasing the scale of hectares of land. However, even though Gunnar’s production is not as large scale as Gustav’s, it is still too large to be able to continue the current mode of production in a sudden lack of fossil fuels.
There are not a lot of farmers who actually can manage the same scale of agriculture as in their current mode of production. One example is Kajsa and her cooperative, where they only have a few pigs. But they do not produce any fodder themselves, so the pigs would soon run out of food. They also have sheep that are grazing a large part of the year, but the food from those sheep hardly suffices for the ones in the cooperative. However, she thinks that they could scale up in case it was necessary, for example in a crisis. Now they are mainly keeping the animals because it is fun, and none of them are depending on it for their income.

5.2 Machines and labor

Many of the more large scale farmers, like the chicken producers and some of the dairy farmers, think that it is impossible for them to scale up and produce more with their existing productive forces. Torbjörn on the other hand, is sure that with the means of production he has, i.e. the land, he could easily increase production of food with more labor.

"Yes, I would just need to add more human labor really, we could grow a lot more, we could have more vegetables in the rotation (…) We could have a lot more cabbage. (…) We have exchanged people with fossil fuels, so if we want to use less fossil we need more people”. (Torbjörn)

Torbjörn has a farm of six hectares with a main produce of cabbage and carrots. He refines these on the farm using spices such as chili, onion, dill and garlic which also grow in the farm. In total, he produces 10 000 jars of refined vegetables per year. Torbjörn does the planning, harvesting, weeding etc. Sometimes he has volunteers working on the farm, but not every season. Some machines are used; a weeding machine and tools such as harrows and plows that the horses run. In a sudden lack of fossil fuels, modes of production similar to Torbjörn’s need little change in order to be able to continue, or even increase the production. Yet, the impact for food security on a national level from the food that is produced on the six hectares is marginal, even if the production could increase. As I wrote in the beginning of the chapter, the scale of farms is increasing, although lately it is mainly medium sized farms that are bought and included in larger units, the farms who are as small as Torbjörn’s are not decreasing in number anymore (Jordbruksverket, 2017). However, it is likely to believe that most other farms in the same category mainly consist of people who live in the countryside but who are not farmers. But it is not size in itself that is crucial here in making Torbjörn’s farm less vulnerable in case of a sudden lack of fossil fuels, it is the totality of the mode of production, especially the means of production and labor. Torbjörn thinks that a sudden lack of fossil fuels would not necessarily impact the production, and that he could scale up to produce more. It is reasonable to think that there would be labor available to work the land in case of a sudden lack of fossil fuels, as people would prioritize food for other work.

The more large-scale farmers, who are more dependent on machines that run on fossil fuels than Torbjörn, have different ideas on how they could reorganize their farms in a sudden lack of fossil fuels. One suggestion that was proposed by some of the farmers was that they could rent out land lots were villagers without land could grow their own vegetables. These farmers were not interested in being landlords, but were proposing this as a way to help. This suggestion proposes exchanging the machines for manual labor. Clearly, labor is quite different to machines in the sense that it consists of people who need housing, food, rest etc. The type of work that is done manually is also quite different from the work done by machines. When the technical relations are changed, as in this situation, the deskilling of the farmer in other kinds of agriculture than the machine-driven one, and of the potential labor (now wage laborers in other sectors) is shown. Neither the farmer nor the people who are supposed to form the labor force are likely to have neither the skills to work with horses for example nor the physical strength to work manually in the fields for a whole day. Those who work in agriculture today have developed their skills to the current mode of production. For example, in current grain production, driving a tractor and man-
Aging the machines are important skills, and skills that are reproduced through the work. Skills are different in different types of production. Gustav describes that he needs a lot of skills to grow grains for the pigs:

“You need to have some feeling as well, you can’t just drive. A lot of knowledge.” (Gustav)

However, to be skilled in managing machines is a very different skill from managing the farm in a situation where the machines cannot run. Whichever kind of production the farmers are operating, they become good at that specific production, and not necessarily at other kinds of production. Some productions are similar, but others are totally different. To just look at how many “farms” or “farmers” there are does not give insight to how many people who actually have skills that they can use to produce food in a sudden lack of fossil fuels. Still, the farmers in this study probably have more skills to grow food than the general population who are not farmers.

Many of the large scale farmers do not see that they could adapt their mode of production to work without machines:

“Diesel is the most important, if I have that I can work the land. There is nothing I do with the tractor today that would be possible to do by hand. I can’t see it working at all” (Markus)

“We have built away so much of the manual labor. I think it would be hard to get hold of that much labor if it would become necessary in case of a crisis” (Gustav)

“I don’t think that this agriculture, the mechanical, would be possible to exchange with manual labor. We couldn’t start weeding by hand. It’s a difference if you have sugar beets or potatoes, but you can’t do it with grain. Thistles you could get rid of, but not the other (weeds). And there are no horses that people can draft. And there are no tools nowadays. I don’t think you could even harness them. And you would have to be able to draft them; I have done that when I was a child, so that would work.”

Neither Markus nor Gustav can imagine how their farms could exchange machines with labor. Markus has got 140 cows in a milking robot system, with a few employees. He works over 200 hectares of land which is used for grazing and fodder production. Gustav has more employees, but still have as few as possible. Mats is very skeptical on a larger scale, but think that he personally could drive a horse since he did that as a child. Tobias, a potato farmer, has thought about how many horses he would need to exchange the machines, but think it is so absurd that he makes a joke about it when he greets us when we are there for the interview:

“Hi! I have just been and fed the horses. The hay is almost finished. The first barn is empty. For 100 ardenner horses a lot is needed, you see. We have got three barns full of hay… No, I was just kidding! (…) I actually asked a girl who works here, who has got horses, if they could be of any use in case of crisis but she said that they would be totally useless. They are dressage horses. (Tobias)

Even though it was meant as a joke, Tobias’ companion Torgny, who is also at the interview, starts thinking of how he as a child used draft horses in the production:

“I grew up with (draft) horses (…) a nice horse; he knew what to do better than I did” (Torgny)

Torgny’s experience, as well as the employee who keeps dressage horses, tell us that it is not only the skills of humans, but also of the animals, which matter in case there is a need to change the mode of production. Torbjörn is the only one in the study who actually uses horses in his production currently. There are others, like Mats and Torgny, who has driven horses as children, but they have probably not developed those skills since then. Neither they nor Torbjörn think that it would be possible, in a short scale at least, to change production to use more draft horses in the production. It would be possible, but it would take many more working in the production.

“The important thing is that the knowledge exist, I imagine (…) When you work you build up something and learn. It feels like you develop and refine methods. Imagine if none of this would exist, then we would have been totally unprepared. And the whole horse thing, it is so minimal. If there would be a real crisis one day it is probably good that we exist, that there are someone with knowledge to learn from. But on a larger scale, it would take many years to breed, and to learn the horse to draft” (Torbjörn).
The question of skills and knowledge that Torbjörn speaks of in this quote raises important questions. He says that it is good that there still are a few that know how to produce food without fossil fuels, in other ways than with machines, so that they could teach others. But the question is if other farmers would be interested to learn, thinking of how unreasonable most of them imagine a horse driven agriculture to be. Many think it is more reasonable to think that new technology will solve the problem, than a mode of production with horses as a substantial part of the productive forces.

Some of the farmers have ideas on exchanging machines partly with manual labor, like Mats’ idea on how he would reorganize production in case of a sudden lack of fossil fuels:

"Then you would have to change so that it became totally self-sufficient. I would say to, let’s say 30 families, you can come here and help. We can live off of the farm, we won’t sell anything. Then we wouldn’t need to have so many cows either. That might work (…) It is more fun to work together in a group, easier and everything” (Mats)

What Mats describes is a completely different mode of production, where the purpose is to produce food for the ones working and not to render profit by selling the food as a commodity. We ask him if he would organize the work, but says he would not want to do that because that would make him just like an old nobleman, and that is not something he would like. He actually seems to think that a mode of production that he describes would be preferably, since he says it would be more fun. Many of the other older farmers talk about how much more lonely the farm work has become during their times as farmers. Most

The farmers who own their land have the opportunity to hire labor, as long as they can sell their produce. However, many of the farmers seem to think that being an employer is not really what they want to do. Many also say that it is hard to get hold off people who are good at working and know what to do. The ones who have many people working for them, are often the larger producers who are less specialized, like Benny who diversified since there had been one bad year with broiler chicken, who was the only thing they had back them.

"But then one thing after the other has come in (…) And you realize that it is also very good to have people around, because it is always something to do. If we had only had the cabbage for example, it would be really hard to have staff only for that. Last week we delivered 60-70 boxes, and this week only 7. When we have a lot of people here we can move them around to where they are needed (…) We try to make sure that everyone knows all the parts” (Benny)

As Benny describes, to get staff that knows the production is necessary, and also for him to learn how to organize the work so that the employee know what to do are important skills. Markus also has employees but says that he is a terrible employer “I am a control freak.” Probably, the farmers who already think that it is hard to find good employees would not be comfortable in letting people who had never set foot in a farm before come and work for them, even if labor was needed. And the amount of people who have no ideas on how farm work is organized is much higher today than it was a few decades ago.

5.3 Changing crops and type of production

The grain farmers Viola and Viktor have recently started to produce older varieties of grain which they sell to a local company who has started to distribute these older varieties to stores in the region. Since the varieties are not world market commodities in the same way as wheat and oats sold from the other farms, they are not as dependent of the world market prices. Verner focuses on the crops that render the best prices, even though it can be hard to know before the season. Over the last years he has focused on organic rapeseed and sold to a company that makes rapeseed oil from it.

The social relations also concern what they produce. For example, Viktor and Viola say that the reason they converted to organic production when the large grain buyer who they used to sell
their conventional grains quit production. The driver to why they are now focusing on growing special, older varieties of grain was also driven by a retailer who contacted them with this government bill. They get all the seeds from there as well. This is also connected to the means of production they have, meaning that the tractors, harvesters and land can be used to grow the older varieties as well.

"It is not so easy to just change type of production. We can make small changes (...) but big changes in production take a lot of time, investments and energy (...) once you’ve put the boat in the sea you will have to row it to land, so to speak.” (Viktor, grain farmer)

This quote by Viktor tells us that there are strong material aspects of his ability to produce other food than grain on his farm. His mode of producing food has developed through years of investing, learning and planning. For him, changing into growing vegetables for example is not a viable option, since it requires different buildings, tools, machines and skills than the ones he has got. For some of the farmers there is of course a connection between what they are producing and what they are interested in – they like cows, pigs etc. and therefore want to work with them.

The farmers who are more specialized on one end of the commodity chain are generally the ones that express that they feel more supported by the banks when it comes to obtaining loans for investing. At Gustav’s farm, the owners even seem to work more hours than the employees, and they do not take out as big wages as they could have. Instead they invest the money, even though they already have high loans at the bank. It seems the high indebtedness is a driving force in reproducing the social relations where the large farms keep investing, while smaller farms and young people who want to start farming have a hard time getting a loan.

"You need to dare to gamble and invest to be able to work in this line of business, you cannot be afraid to take loans. I tell that to all the young people that are here for internships – take a loan and invest, it is a fun type of production!” (Gustav)

They, as most of the other farmers, have loans for several millions and have never had any problems with the bank. When they were starting up this production a banker were there to look at their plans and ideas. The meeting ended with him saying “Ok boys, how much would you like to borrow?”

"But the bank would not lend a cent to someone who goes backwards. That we are staying on plus is only because we work more than full time (...) But we are in that position that they believe in us. If you are 25-30 and do not have anything special it is difficult. And today you can’t build and make it work economically”. (Gustav)

Even before we start talking about how the production would be affected in a sudden lack of fossil fuels, Gustav shows that he is not as sure about the advice he gives to young people who are doing internships at their farm. He also doubts the investment they have done, and are thinking that they should have done otherwise:

"We have said many times, what the hell did we build for? (...) We should have built for outdoor pigs, and not as big, because that is what the consumer wants today” (Gustav)

But when it comes to changing production, they do not describe the relationship to the bank in as positive words:

"(Question: What would you prioritize with the means of production you have (in case of a crisis?) I mean, money runs everything. If I knew I would get every pig sold, that’s one thing. But if you would give up the pigs and not have to pay interests and could cease the installments to the bank it would be nice to get rid of that. You would have to grow something that is easy to grow, where there is not so much need for nitrogen. Beans will not work, because nobody wants to eat beans. Field bean that is. Potatoes would probably work, but then you would have to get hold of seed potato.” (Gustav)

“Well, what are the alternatives (to producing broiler chickens)? The stables are down there, and you have to have something that generates a few kronor. Otherwise Mr. Bank director will be standing here knocking, and asking…” (Bengt)
The issue of becoming a farmer is connected to good relations to a bank that can provide you with a loan. Many of the large scale farmers proudly tell that they have found it easy getting loans from the bank; basically they have gotten it on ‘their names’. Many of the small scale farmers on the other hand have had a hard time getting loans, even for smaller things. The same smaller farmers also state that they seem to get more visits from control agencies as mentioned above. Kristoffer, one of the small scale cattle farmers makes one example:

“Suddenly you need permission to spread manure, but the municipality cannot really answer themselves. No, it feels like they want only a few, giant farms. The small ones are easier to control, I suppose”.

Still, farms like the one Kristoffer has got, could be important in case of a sudden lack of fossil fuels since the cows can rear themselves for quite a long time and can survive by eating fodder that is produced locally.
For food security, it is not only the amount of food that is produced on the farms that matters. The movement of food from the farms to where people live is important – it is in this movement where we can study the mechanisms in the social relations between the farms and the consumers. Since most of the farms are primary producers, meaning that the product they deliver needs to be refined in some way before reaching the consumer, the refineries: dairies, slaughterhouses and mills, are the intermediaries, or a required social relation, that the farmers currently are investing time and effort in. Only a few of the farmers are selling directly to consumers, or to local refineries. In this section I will focus on the relationship between the farms and refineries, and the farms and the consumers.

The possibilities to make decisions over the production vary between the farmers in the study, mainly depending on the relation to the refinery or intermediary they sell their production to, but also depending on what the farmers produce. This was already illustrated to some extend in chapter 4.1 and 4.2 by contrasting examples that can be considered as two extremes of this study, the broiler chicken producers and the small-scale vegetable producer Torbjörn. As has already been discussed in previous chapter, the farms who are more specialized are also less capable of adapting to a new situation, or to try something else.

6.1 Selling vegetables to wholesalers or directly to customers

We will start with Torbjörn since, as shown and discussed previously, his production has few contradictions between his current way of producing and how he imagines he would produce in a sudden lack of fossil fuels. He does not have a lot of loans, his production is already more intensive in labor than in energy, and he has made relatively few and cheap investments. Torbjörn does the refining on the farm and delivers the vegetables directly to the stores nearby, which sell them to customers. Some of the customers come to the farm and buy directly, but he thinks it is more energy efficient when he drives the products to the store in his biofuel car. In case there is a crisis, and he for some reason cannot deliver to the customers or they cannot come to him, the food would not be ruined. He has the possibility to store his refined vegetables on the farm for a relatively long period of time. However, his way of refining the vegetables is a kind of a niche product, which is not commonly consumed by a lot of people today, except for a small group of consumers. Currently he delivers to a large part of Västergötland, deliveries which would be hard to maintain if the transports were suspended in case of a sudden lack of fossil fuels. On the other hand, it is relatively easy for Torbjörn to refine the vegetables in another way, or sell them fresh during the season. It is not unreasonable to assume that consumers in general would be more prone to eat the food that is available in case of crisis and possible lack of food thus problem of sale would be countered by increased demand.

Another vegetable producer, Tina, mainly sells her vegetables to a cooperative of growers with around 40 members in three different counties. The growers cooperative then sell the vegetables to wholesalers and the industry. Even though Tina’s farm is affiliated with the farmers’ cooperative, she does not have any obligations to deliver to the cooperative. For example, she has recently started selling some vegetables at the local store which is working out quite well and this is something Tina wishes to develop. Still, the wholesalers have a large impact in the production, since they can choose between the growers. Tina explains that from the beginning of September
wholesalers buy imported vegetables and favors them over vegetables produced in Sweden. Currently Tina is specialized in selling freshly harvested herbs. The herbs need to be delivered and consumed soon after harvest, and she has a special high-humidity fridge to keep them fresh. Apart from the herbs, she also produces other kinds of vegetables, because she thinks it interesting to try new things. Tina can store the vegetables a few days after harvest, and she also packages the vegetables directly on the farm, which makes it possible to deliver to others than the wholesalers. In case of a sudden lack of fossil fuels, her products would need to reach consumers as soon as possible; otherwise they will get ruined and cannot be eaten. In that case, she thinks it would be better to sell directly to the store, instead of going through the wholesalers. But even now, without a fossil fuel crisis, she finds the organization of the wholesalers illogical, and she considers delivering to local stores as the better option,

“It (the vegetables) could be driven all the way down to Kungälv, and then back to the local store here. And that took several days. That is insane, that a product can be driven so far. And it is the same with all the big ones now (wholesalers), they have built their big centrals, where everything has to go. And then they drive long distances in all directions. From an economic point of view it is right for them. But I thought that… And then I contacted them (the local stores) and asked them if they were interested (in buying vegetables directly), and they were, so that was no problem.” (Tina)

Here, Tina describes a contradiction which is that the wholesalers drive the products around instead of delivering them directly to the stores. The argument that this is economical for them is something she seems to accept, e.g. that the economy is what decides what the wholesalers do, even if it does not seem logical. However, it is necessary to note that she makes a difference between what is economical for them, not necessarily being economical for her. It is clear that the quality of her products is what she see as something very important in running her business. When she talks about selling in the local store, the possibility for her to deliver higher quality, i.e. fresher vegetables, is what she values most:

“It feels really good. I can go shopping without seeing my vegetables laying there going bad (…) I want to be able to sell as locally as possible. And be able to go to my grocery store and feel proud about that product. You win or you lose. If you send bad greens for a while you are basically gone, because there are so many competing so you need to be the best one. There are too many vegetable farmers (…) I have a bottom line price, and I never agree to sell anything cheaper than that. And they are constantly trying to push prices. But since I am known for delivering high-quality, I usually get the price I ask for. (Tina)

When Tina delivers the vegetables to the local store, she is also reproducing social relations that allow her to be closer to consumers, than when she delivers to the wholesaler. She also mentions the competition aspect, when she says that there are too many vegetable growers. From a contingency and food security perspective, it is good if there are many growers. But for the individual grower, this means that prices become too low, unless they have something special to compete with. The contradiction between her current mode of production and the mode of production with a sudden lack of fossil fuels is less when she sells to the local store than to the wholesaler. Even though she already prefers to deliver to the local store, she still delivers most of her production to the wholesaler. On the question on how much she delivers to the local store Tina explains:

"Not so much now, it is a small store. And the wholesaler is not very keen on me selling directly to the store. But now it is becoming a little bit easier…. (the retailer) has previously been strict on only buying from the wholesalers, but they have changed that so now more people are selling directly to them. If you are a member of a quality control organization (name left out) they know that you know what you are doing, and then it is no problem. But I guess, that if you only have a few square meters it is not so easy. They are pains-taking that the products they buy are good, since they are responsible in case something happens.” (Tina)

6.2 Getting the broilers to the consumers

As I wrote in chapter 5.1, to be as large scale as the broiler producers it is not necessarily negative when it comes to contingency. Even if they are specialized within the broiler production
chain, those who also are producing other things and have more people around on the farm have
got a clearer picture of how they could organize their labor around the other means of production
such as land and tools to still be able to produce food. However, the possibilities to produce the
actual broiler chickens is quite low with a fuel crises, since all the means of productions to do so
are adapted to very specific conditions, all enabled by cheap transports and large machines who
works big acreages. The broiler chicken production is growing, in Sweden, 99 million chickens
were slaughtered in 2016, which was 20 percent more than the previous years (Öberg, 2017).
From a contingency point of view, it would probably be better to develop modes of production of
food that were less vulnerable to crisis. In this section I will look into how the farmers’ perceive
this contradiction, and how they describe the development of the broiler chicken production.

The broiler chicken farmers in this study all started their production on farms that were previous-
ly producing potatoes or dairy, and they all shifted to broiler production sometime during the
period 1998 to 2005. During these years a lot of effort in terms of investment and propaganda
towards consumers was put in the chicken industry by the farmers’ organizations, in order to
build up an industry that would be able to compete on the European market (Mannerheim, 2018).

“There were no chicken producers here before, so when Lantmännen and Kronfågel invested in a slaughte-
house in Skara they were looking for suitable farmers with enough hectares (to feed the chicken on) and who
were interested”. (Birgitta)

Birgitta is happy with being a broiler producer, even though the slaughterhouse in Skara now has
closed down. Birgitta also explains further:

“I only know anything about the next round (of chicks). They do not have any foresight whatsoever. (How
many can you keep at the most?) It is no good as it is now, with only 4-5 days of downtime, because of dis-
eases. The stables do not have time to dry out properly, and that is not good. We would need 7-8 days for it to
have time to dry. It has always been like that before (…). But prices have gone down so we have to have more
rounds (of chickens). That is no good, but you have to do as they tell you if you want to be a part. (What
happens if you say that you only want to have seven rounds?). No, you do not have anything to… But so far
we still have an association that negotiates the price. We have had to hire lawyers against Kronfågel. Unfor-
tunately we are against each other, when we should work together (…) They want to divide us, by giving us
different prices. (Have you talked about starting your own slaughter house?) Yes, we said that we should
have bought the one they shut down in Skara.

In this quote, Birgitta shows how little power the broiler producers have over the production on
their farms, even in the current mode of production. She identifies contradictions in the produc-
tion, and say that the broiler producers would prefer to run the slaughter hose themselves. It
seems her main reason is that she wants the organizations to work together. She is otherwise
happy with being specialized, but do not like the powerlessness that comes with it.

Benny, one of the other producers, also started his production connected to the start of the
slaughterhouse in Skara. He wanted to start pig production first, but the prices were too low at
that time. The third of the broiler chicken producers, Bengt, tells us why he started with broiler
production:

“The slaughter house in Skara, it was close to here, which meant that I could get the manure back. But then it
was closed down (…) now we drive everything up to Katrineholm (…) today I would not have started chick-
en production because a British risk capital corporation owns Kronfågel. I don’t know what one can do as a
primary producer.” (Bengt)

Bengt expresses how he thinks that close is something good and something to strive for. The
slaughterhouse was sold to a company who import broiler chicken from other countries. He
started producing broiler chicken when the farmer’s organization initiated a farmers’ cooperative
company that was supposed to be able to compete on the European market. But the farmers’ or-
ganization ended up losing a lot of money on the affair and sold the company to Lantmännen
(Mannerheim, 2018). Some years later, Lantmännen sold the majority share (52 %) to a private
equity firm, CapVest, whose business idea can be described as “identifying and managing in-
vestments in companies supplying essential goods and services” (Lantmännen, 2013-04-03). The
role of private equity firms for the development of food production is interesting, but unfortunately there is not enough space in this thesis to go into that in more detail. Bengt himself is not happy with the current ownership of the production chain. He is frustrated over the loss of influence and power over the production. Bengt says that if it weren’t for all the money he had now invested in broiler production, he would rather shift production to something else. Upon the question on an alternative social relation, where he would do more of the refining on the farm, he says:

“Well, it is few who have the privilege to live that close to the big city. It is hard to answer that question. We are looking at all options to get some reasonable basis to live off of agriculture. It seems to be difficult. And yet, the land and these properties are so expensive. I don’t understand… But of course, Swedish agriculture is so small-scale so it is impossible to get any efficiency in anything. And of course, then it is not possible to keep the same prices as we face outside of the nation borders. It is… I mean Skara. There were really fine set-ups for cows, pigs and birds. All is gone today. And Arla (the dairy) is also gone, in Skövde. They made cottage cheese of really high quality, but it is gone. I do not know if it is cheaper to drive on the road or with boat or transport in some other way than to produce in the local area. And then, when we realize this, it will be too late. Then we have nothing, and we have to start building it all up again. Tear this apart. Like it started once upon a time, when the associations started. There is a risk that we will come back to that.

Bengt explains that he has a goal to be able to live off of agriculture, but that it does not work. When he talks about how quality and good work does not seem to matter when it comes to being able to reach the goal of living from agriculture, he questions the narrative of the free market being able to ensure that the ‘best’ products and companies win. Bengt does not see himself as a winner, and he does not seem to trust the private equity firm as the rightful winner on the market either. Again, to me Bengt’s concern relates to an inherent contradiction, this time of scale. In Bengt’s view himself and other farms have done everything by the book, but it still did not work. However, for him he does not think that the problems would be solved by Swedish production becoming more small-scale, but rather the opposite, actors need to be bigger to be able to gain more efficiency in the total production.

6.3 Dairy production

Another case is the dairy producers who are also dependent on their refineries, the dairies. Dairy producers are less in a lock in compared to broiler production as they have more dairies to choose from and also have the possibility to have a farm dairy (even though no farmers in this study have farm dairies at present).

We will now look into the dairy production and the social relations in it. I have interviewed six dairy farmers in the study. Two of them have smaller farms than the average dairy farmers with less than fifty cows. Three of them are large, with around 100 cows or more. The smaller ones do the milking using pipe milking systems, the larger ones use milking robots. To elucidate the modes of production on the farms I have chosen to focus on two of the farms; Mats and Micke. Mats has got the smallest farm of these two with 40 dairy cows and 90 hectares (of which he owns 66 hectares himself), including also 20 hectares of natural grazing. Mats has owned the farm since the 70’s. The farm has been organic since 1996 and now delivers to the more local Falköpings Mejeri (eg Falköpings dairy). Mats does all the labor on the farm, with some help from his wife. Mars tells us that his children are not interested in taking over the farm, but they live nearby.

Micke has a large dairy production with four employees, 250 cows and four robots. Right now, he delivers all the milk to Arla but he has tried to negotiate with Falköpings Mejeri to deliver to them. His wish is to sell more locally, but so far he has been unsuccessful with Falköpings mejeri as he, in his own words, “hasn’t got the foot in”. Micke has also tried to change to organic production of milk, but was rejected several times by Arla.
“I wanted to start delivering organic milk to Arla, but they said that it was a waiting list of years before I could deliver to them. That kind of regulation should not be allowed, everyone should be allowed to deliver organic milk if they wanted to. The consumers can’t understand it either; they would also want more farmers to deliver organic milk since the price would decrease for them”.

This is an example of how the social relationship between consumers and producers is controlled by the interests of the refineries rather than the producers or consumers. Mickes experience is somewhat contrary to the understanding that consumers are the ones who decide what is on the market, through demand and supply. Micke finds it contradictory; he thinks that it is reasonable to deliver more organic milk if the consumers want more organic milk. When Micke’s plans for organic milk production were rejected by Arla he instead opted to increase the number of cows, in order to increase profitability. Some years later Arla changed their attitudes towards organic milk producers, and were able to let him deliver organic milk. But, as Micke had increased the number of cows, he was no longer able to convert to organic agriculture, since he lacked the amount of grazing land that would be necessary to fulfill the requirements. This is an example of how the social relations between producer and buyer affect the production of the farmer. Arla’s decisions impact the investments in means of production by the farmer, and once the decisions and investments have been made it is hard to change. Micke’s approach to the low milk price is that it is his responsibility as a farmer to adapt the production to the prices of the world market, if he gets 2.60 per liter he has to make sure that the production costs are no more than that. According to Micke, whether he succeeds or not is dependent on how good he is at running his business. His strategies to cope with the low milk price have been to minimize the amount of labor by focusing on the tasks that increase production.

Micke wants to build his own dairy on the farm. When speaking about this he refers to the small scale farm dairies that are already on the market, basically they are set up in moveable containers with all equipment necessary for a small farm dairy. As soon as Micke has the funding and time to start a farm dairy, he will, since he does not see that continuing selling the milk to Arla a viable alternative in the long-run because of the low prices. From Micke’s perspective, farmers would prefer to keep as much of the reproduction of the means of production on the farm. As he explains, the current mode of production is more vulnerable than the desired mode of production, where he would do more of the refining on the farm itself:

“If I had had it now (the on-farm dairy)... I would have gotten the whole price for myself instead of letting it go to the middle-hand. Soon every farmer will be doing it like that... To produce as much as possible you should have your own slaughterhouse as well. If I am big enough. If you are too small you want get over the threshold.”

For Micke, the scale is related to the possibility to have a more local production chain on the farm (which makes its less vulnerable to a sudden lack of fossil fuels). At the same time he sees a contradiction between decreasing vulnerability and growing bigger, where the most important obstacle to growing bigger which is the lack of land in the vicinities. Micke’s farm is situated on farm land which is very fertile and also expensive.
The objective of this thesis is to understand the role of fossil fuels for food security, by studying how farmers perceive contradictions between running their farms in the current market situation and the vulnerabilities of farms in a sudden lack of fossil fuels. By studying this I have been aiming to gain insight into what kinds of methods and policies are needed to increase the farms capabilities to produce food without or with less fossil fuel. The research question for this thesis is:

*How do the farmers describe contradictions between running their farm in the way they do now, and how they would do it in case of a sudden lack of fossil fuels?*

The results have been described in chapters 4, 5 and 6. Based on these results, I argue that the threat to food security is not due to the fossil fuel dependency per se, but due to how fossil fuels have and are enabling 1) social relations where the purpose of food is to be a commodity rather than to be nutrition for people, 2) spatial concentrations of refineries, distribution and consumers, 3) social relations with dispossession of means of productions for consumers and concentration of ownership of land for producers, 4) technical relations which drive deskilling of knowledge on how to produce food. These mechanisms are contradictory since in farmer’s realities they are encouraged to reproduce these mechanisms, at the same time as the mechanisms decrease the farms capabilities to produce food without fossil fuels.

Most of the farmers can still produce some food even without fossil fuels, even though they cannot use all of their means of production and some of their knowledges are obsolete without fossil fuels. They still have the land and their labor and skills. The farms who see their capabilities to produce the most food are the ones who have land that is suitable for vegetable production and who have knowledge themselves, or staff who knows how to do this. The farms that have animals that can graze and give milk are also better off than others in a possible crisis. But it is not only the amount of food that is produced that matters for the capability of the farms to ensure food production in times of a fuel crises; the distribution from the farms to where people live is important. The concentration of the population away from farmland, and the concentration of preservation pose problems for the distribution.

The less vulnerable farms have in common that they use less input to produce, they can exchange diesel driven machines with labor, and they have less middle hands between them and the consumer. The farms most directly exposed to a possible fossil fuel crisis are the large chicken, pig and grain producers, as they in turn are dependent on grain production that has a high dependency on fossil fuels. The farmers we have interviewed claim that it would be impossible to produce in the same way with a fossil fuel crises unless they had an alternative fuel. When asked how they would solve a possible fuel crisis, many of the respondents say that they would shift to produce as much food as possible for human consumption and sell the grain directly, instead of feeding it to the animals. Dairy producers are also dependent on fodder, but the cows can also feed from grass even though that would mean that the production of milk goes down. Dairy producers are also vulnerable as they are affected by the short shelf-life of fresh milk and its need for transportation to dairies. Farmers producing vegetables and potatoes could keep reproducing their mode of production to a greater extent, but they would need more labor than they have currently. Mutton and beef production are least affected by a fossil fuel crisis, as long as the farmers have the skills necessary to slaughter on the farm.
7.1 Food as a commodity for consumers or as nutrition for citizens

A contradiction between current society, and a situation with a sudden shortage of fossil fuels is that the consumer (which encompasses most of us, including most of the farmers) by definition is vulnerable to a sudden lack of food. Hence, a society with less consumers and more producers is less vulnerable to a sudden lack of fossil fuels, but the logics of the capitalist mode of production is to ensure that as many people as possible are consumers, since that is fundamental in order to render profit.

Regarding the farms’ as companies, the food production becomes production of a commodity to be sold in the market for consumers. The state on the other hand has a responsibility to fulfill the needs of its citizens. The consumers and the citizens are to a great extent the same individuals, but with different rights and responsibilities. A consumer is a part of an economic relationship, which is based on having money to pay for the commodity. The rights of the consumers are connected with their purchasing power. If you have money you can demand what is available at the market, but you do not have a specific entitlement or right to buy anything from a producer. (However, the producer is supposed to have an interest in an exchange to take place since such transactions are the base for the company’s existence). A citizen on the other hand, has a right to cover her basic needs, even though she does not have money. In a report on dependency analysis, MSB writes that in case of crisis, there might be a need to abandon the principle where market forces are the only mechanisms to secure food supplies. Otherwise society would have a hard time ensuring peoples life and health, society’s functionality and democratic rights (Fylkner, 2009).

Several of the farmers interviewed in this study expressed the opinion that they want to produce food, but that food production also has to provide enough income for the company. For a farmer this is a rather obvious statement, and none of the interviewed farmers could perceive the situation differently if the aim for them was to continue to be business owners. The only farmer who might see it in another way was the cooperative rearing cattle, but they did not render their living from the production. For them, it was not intrinsically the use-value of food that drove them to organize themselves in the food cooperative; they did it rather as a hobby.

When the farmers talk about other citizens in this study, they are mostly referred to in the social relation of consumer. The role of the consumer for the development of food production is often discussed both by the farmers in this study and in society in general. One of the most important mechanisms in capitalism is markets to sell commodities to consumers. To have a market, there must be consumers, and if people would produce their own food they are not interested in buying food. Hence, the logic of capitalism is to create more consumers, since selling more commodities means more profit, which means more accumulation of capital. The human body is very adaptive and can survive on many different diets. As long as food is somehow produced and distributed to us we can survive. However, in many countries, Sweden among them, few people are involved directly in food production, since it is diffused both spatially and in terms of knowledge. Food is something that is bought in the supermarket, just as any other commodity.

The purpose of food production for the farmers is thus not aimed at producing food, i.e. ensure the social metabolism, but rather to produce a commodity that can be sold on a market. This is perhaps the foundational contradiction of farming, the one between use-value (food) and exchange-value (the product). This relates back to Foster and Moore and how they view the commodification of agriculture and food as an ongoing process that increases the metabolic rift (Foster, 1999; Moore, 2000). This also means that they do not plan according to what produces the most food in calories or nutritional value, but according to what generates the highest revenues on the market. For food security, there is a difference whether knowledge and technical development enhances the social metabolism between humans and nature or if it increases the metabolic rift. From a food security perspective, this is a fundamental contradiction inherent in contemporary capitalist food production.
As long as the social relations remain, with consumers who have sufficient wages to buy food, and the food prices are low, this does not affect the social metabolism between humans and nature – in the sense that there is enough production for people to still have enough food. In this sense, I conclude that the reproduction of the metabolic rift between human and nature is enabled by fossil fuels, both in the sense that has enabled dispossession of land (c.f Friedmann & Philip McMichael, 1989) and in the sense that it enables a spatial structure where food is produced in one place and consumed in another place (c.f Huber, 2008) If this would be disturbed, such as by a sudden shortage of fossil fuels, the dispossession of control of means of production of food would surface.

Some of the farmers suggest that one way they could handle a sudden lack of fossil fuels would be to allow people to grow their own food on the farm. In this scenario, the farmers lend means of productions (land) to people to work themselves, not as wage laborers. The farmers who suggested this thought that it would be a good idea, as they saw that they could not possibly uphold the production themselves. This can be seen as a way to dissolve the currently separated roles of either producer of a commodity or consumer of a commodity. It also shows that the farmers in this sense rather see people as citizens, and not only as consumers.

7.2 Spatial concentrations and specialization

Commodification of food is connected to a spatial structure that requires and is facilitated by mobility. The value of a commodity is decided by what markets it can reach. Mobility makes it possible for the commodity to reach a larger market.

The spatial concentration of refineries, distributers and of consumers (in cities) as well as the specialization on the different farms are contradictory, as it decreases the capabilities to produce food on the farms without fossil fuels, and at the same time is favored in the current economic system. What we can see is that changing fossil fuels for other energy sources would not decrease vulnerability in food production as long as the farms are developing along capitalist logics with increased specialization, where transports are needed and the flexibility in using the means of production for other kinds of food is increased.

As shown in the result chapters, many of the farms, as they are organized today, are dependent on retailers to reach consumers on the market. Some foods need special transport to stay fresh, like dairy and fresh vegetables. Farmers growing vegetables could use their knowledge, skills and some means of production to produce the same food even without fossil fuels. Possibilities for pig and chicken producers are more limited, since they only control a small part of the production chain. Creating relations takes time and those food producers whose consumers are closer geographically, are overall less vulnerable to a sudden lack of fossil fuels.

On the broiler chicken farms, the specialization and spatial concentration is perhaps most obvious. In the timely schedule for the production circle the broiler chicken farms are just one stop on the way to the consumers. The production ins streamlines as much as possible, which gives little room for adaption. With just a few days over time, the chickens grow out of the stables and need to be slaughtered quickly. The amounts of chickens do not stand in proportion to the amount of consumers who are close enough to be able to consume the chickens, meaning that large amounts of potential nutrition from the chickens would go lost in a sudden lack of fossil fuels. The logics of capitalism is increased mobility of commodities (and capital), this contradicts with the logics of agriculture, which is essentially place-dependent, weather dependent and seasonal. However, it seems that the less weather dependent agriculture is, the better it fits into logics of capitalism, for example chicken: “I like chicken production better than the potato production we did before, it is not as weather dependent and easier to plan”, says one of the chicken producers. As described previously, there are only a few broiler chicken farmers in Sweden,
but they provide large quantities of chicken for consumers. There are only a few slaughter houses where all of these chickens are slaughtered.

Other refineries are not as concentrated spatially as the chicken production, but they are increasingly concentrating. There are also counter trends, such as starting on-farm dairies, like Micke is intending to do. His reason for that was to be able to control more of the production than he can do now with one big costumer (the large dairy company). From a food security perspective, more dairies closer to citizens would be preferable. It is becoming more common, but is more of a niche product and not something that most of the consumers buy. None of the farmers in this study were operating a farm dairy at the moment. They are all in debt with the bank, which means that the decision to start a dairy on the farm is made by the bank.

7.3 Social relations with dispossession of means of productions for consumers and concentration of ownership of land for producers

Only a few of the farmers are producing food that is meant to be eaten by people nearby or even by the family. The farm activities are not connected to the provision of food for the household; rather it was a separate business. Some kept gardens were they grew some potatoes, but not to a larger extent than you would expect from non-farmers with an interest in gardening and access to a garden or a piece of land to grow.

None of the farms would be completely unaffected by a sudden lack of fossil fuels, but there are differences between the ones who can adapt to a new mode of production by simplifying and still use their knowledge and means of production, and the ones whose means of production and knowledges become obsolete without fuels, and a possible collapse of the farm (cfr Tainter, 2006). The ones who more easily can adapt to a sudden fossil fuel crisis also hold valuable keys to the production of a post-fossil mode of production. The farmers’ possibilities to increase their capabilities to produce food seem to depend on how well they can transit to a different mode of production.

For most of the farmers (except for the most small scale ones) a sudden lack of fossil fuels would mean that they could not use all of the land they are now working, owned or rented. The process of enlarging scale in agriculture is both a matter of dispossession and a matter of labor being exchanged with machines. Most of the dispossession of means of production in agriculture took place many decades ago in Sweden, in the beginning of urbanization. During some decades, the state regulated who could buy farms, encouraging neighbors to buy farms in order to make them larger. Today, the role of the state and legislative system is not as obvious. The farmers in this study points at other mechanisms, for example the role of the banks. If a farm is for sale, the farmers perceive that it is easier to get a loan to buy it for a farmer that is already running business, than for a new farmer who wants to start a business. This is in part a way of dispospossing people from means of production to produce food, since it forces the potential farmer who did not get a loan to either engage in wage relations on another farm or in another sector, or adapt to the type of production the bank wants to see. The generational shift of a farm is especially sensitive, since many in the younger generation have a hard time taking over the farm. For one, if one sibling need to compensate the other siblings economically according to the market price of the farm, it can be hard to afford it. The value of the farms does often not stand in relation to the prospected income and profitability from the farm production, which means that for many in the younger generation it seems more reasonable to engage in wage labor elsewhere, and sell the farm to a neighbor instead, or keep the house and let the land to a neighboring farmer.

Dispossession of people from land to urban areas has been an important part of reproduction of capitalism, in that it increases the private property and the market (cfr Harvey, 1996). This is also visible in the dispospossessing of current day land. Usually it does not occur to the farmers as dispossession, since the actions are voluntary and seem legitimate. If the police came and violently
evicted the farmers, the dispossession process would be more evident. That the bank has the power to decide who to lend money, and that price of farm land can rise even though profitability of farm production goes down is not something we question. These are seen as natural processes, but are at the same time features and logics of the capitalist mode of production that are contradictory to a food production system that is capable of producing food without fossil fuels, since it decreases the amount of people who can choose to become farmers.

7.4 Technical relations which drive deskilling of knowledge on how to produce food.

As the farmers involved in this study themselves stress, it is hard to change production sector, since change needs time, investment and energy. Rephrased, in another way this means that, since each sector reproduces and encourages a specific set of skills, means of production and social and technical relations the production of one type of food cannot easily be changed into another type of food. Just looking from the perspective of securing sufficient calories, exchanging potatoes for rice may have little difference to the palate or nutrients, but the mode of production between the two differs a lot.

For everyone, what you do every day is what you become good at. Hence, if you spend a lot of your time running a machine, that is what you are going to be an expert in. For the younger farmers, or the ones who have always been specialized, they do not have any relation to a kind of agriculture who was not entirely driven by fossil fuels. But even the older farmers, who perhaps used draft horses in their youth, do not necessarily still have the skills to start using draft horses again, even if they could find one to work with. In some of the production types, the knowledge and skills that are needed to work without fossil fuels are not totally different, more like a boost. This could be the case for some of the vegetable production for example. They use machines to some extent, but since there are certain elements that need to be done by hand, there are still a lot of people working in the production.

7.5 Lastly

With this example of how fossil fuels is enabling continued reproduction of capitalist logics in food production, and the vulnerabilities that poses for people, I have shown how we can understand vulnerabilities in food production. I have also shown how we can understand the local practices and actions that we are familiar with, and how farmers (and others) can act upon these in order to create and develop a food production that fills its original purpose of providing healthy food for everyone.

For policy making, this means that exchanging fossil fuels with other energy sources would not necessarily increase food security, as long as the above mentioned mechanisms are reproduced. To increase food security, agricultural policies need to aim at making food more than a commodity and decrease the distance between production and consumption, both in spatial terms but also in terms of knowledge and skills. These strategies are not necessarily compatible with the logics of the capitalist mode of production, which means that a choice needs to be made.
References


## Appendices

### 1. List of interviewed farmers

<table>
<thead>
<tr>
<th>Name</th>
<th>Arable land, hectares (owned and rented)</th>
<th>Type of food production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veikko and Vera</td>
<td>100-100</td>
<td>Grain</td>
</tr>
<tr>
<td>Verner</td>
<td>400-500</td>
<td>Grain</td>
</tr>
<tr>
<td>Vilhelm</td>
<td>500-</td>
<td>Grain</td>
</tr>
<tr>
<td>Viola and Viktor</td>
<td>20-30</td>
<td>Grain</td>
</tr>
<tr>
<td>Bengt</td>
<td>200-300</td>
<td>Broiler, grain</td>
</tr>
<tr>
<td>Benny</td>
<td>200-300</td>
<td>Broiler, egg, horticulture, grain</td>
</tr>
<tr>
<td>Birgitta</td>
<td>300-400</td>
<td>Broiler, grain</td>
</tr>
<tr>
<td>Gunnar</td>
<td>100-200</td>
<td>Pig, grain</td>
</tr>
<tr>
<td>Gustav</td>
<td>400-500</td>
<td>Pig, grain</td>
</tr>
<tr>
<td>Karin, Kalle, Kajsa</td>
<td>0-5</td>
<td>Sheep, pig, chicken</td>
</tr>
<tr>
<td>Kristoffer</td>
<td>20-30</td>
<td>Beef</td>
</tr>
<tr>
<td>Magnus</td>
<td>500-</td>
<td>Dairy</td>
</tr>
<tr>
<td>Malin</td>
<td>5-10</td>
<td>Dairy</td>
</tr>
<tr>
<td>Marko och Maaike</td>
<td>100-200</td>
<td>Dairy</td>
</tr>
<tr>
<td>Mats</td>
<td>50-100</td>
<td>Dairy</td>
</tr>
<tr>
<td>Micke</td>
<td>300-400</td>
<td>Dairy, grain</td>
</tr>
<tr>
<td>Mikaela and Markus</td>
<td>100-200</td>
<td>Dairy</td>
</tr>
<tr>
<td>Tina</td>
<td>50-100</td>
<td>Horticulture, grain</td>
</tr>
<tr>
<td>Torbjörn</td>
<td>5-10</td>
<td>Horticulture</td>
</tr>
<tr>
<td>Torgny and Tobias</td>
<td>400-500</td>
<td>Potato, grain</td>
</tr>
</tbody>
</table>
2. Interview template

Section 1: Current farm production
- Production type and size, revenue, labor, ownership etc.
- Economy, inputs and outputs on the farm
- Farm history on the development on the farm for the past 30 years
- Current goals and plans for the farm

Section 2: Dependencies
- Inputs in terms of fodder, fertilizers, fuels, seeds
- Machinery used, amount of fuels used per year
- Infrastructure needed in terms of water, heat, technology, ventilation
- Immaterial dependencies such as knowledges, contracts and network

Section 3: Sudden disturbance, short term crisis
- Factors that would change in case of crisis
- Previous experiences of crisis
- Differences in the type of crisis; electricity, fossil fuels, input shortage
- Relevance of time of the year for the crisis
- Impact on animals if applicable

Section 4: Food supply and security
- Perceived importance of producing food
- Capabilities to produce food for consumption in case of crisis using existing knowledges and material assets.
- Perceived role for society’s food security in case of crisis.

Section 5: Network
- Inspirational sources for development of the farm
- Decision making process
- Relations to the neighbourhood and local community
- Society’s perception of agriculture and farming
- Relations to national and local authorities and administration

Section 6: Transition and long term crisis
- Possible strategies and capabilities to produce food in a long term crisis perspective.
- Possibilities to take measures to prevent impact of crisis
- Perception of own responsibilities versus society’s responsibilities for food security in case of crisis.
3. Information for participants in the research project

**Information till deltagare i forskningsprojektet:**

**Kan vi producera mat i händelse av kris?**

Sårbarhet och resiliens på gärdsnivå i svenskt lantbruk

Hur ser lantbrukare på sin möjlighet att hantera en större kris idag? Kan de upprätthålla sin produktion om olika insatsmodell inte går att få tag på under en långvarig kris? Finns det något annat som de kan producera i stället?

Dessa frågor ska belysas i en intervjuundersökning som genomförs vid Sveriges lantbruksuniversitetet, SLU i Uppsala.

I undersökningen ska vi intervjuas cirka 20 lantbrukare i Västra Götalands län, på deras gårdar. Du har valt ut att ingå i denna grupp.

**Syftet med projektet** är att undersöka hur lantbruket skulle påverkas av olika slag av förändringar, som bränslekrise, olajfråga eller energipolitik.

**Urvalet av deltagare** har gått till så att uppgifter om 200 slumpmässigt utvalda lantbrukare i Västra Götalands län först har beställts ur Lantbruksregistret vid SCB. Där ingick namn, adress, födelsedatum, produktionsinriktning och storlek mått i areal. Ur den lista har 20 lantbrukare valts ut för att intervjuas, där ambitionen har varit att ge en så stor spridning som möjligt i länet, i produktionsinriktning, storlek på gården samt kön på gårdsägaren.

**Vi tackar dig** för din tid och medverkan! Din medverkan är avgörande för att vi ska få en tillräckligt bred bild av lantbruksbekant. Vi har stöttar ett tillräckligt namn och uppgifter om platsen kommer att sättas bort. Utskrifter av intervjuerna kommer sedan enligt lag att förvaras i universitetets arkiv i minst tio år för forskningsändamål, men personuppgifter kommer alltså inte att lagras tillsammans med intervjuutskrifterna.

**Frågor om studien** kan ställas direkt till Camilla Eriksson.

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**PROJEKTID**  
Augusti 2016 – januari 2018

**PROJEKTWEBBSIDA**  
www.slu.se/Resilience

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