

What determines the flexibility of farming systems? A case-study of the bovine farming sector in Belgium

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Abstract: This paper reports on a qualitative study into the factors that determine the flexibility of bovine farming systems. Flexibility is defined as the room for change, or the size of the choice set that remains available in the future. Using in-depth interviews in three stages, we identified several factors that leave the farmers with limited scope for change. These factors relate to the triumvirate government, agro-industry and research. A great deal of the work and activities of these three entities is embedded in a belief that the agricultural system is most benefitted by increasing productivity, maximum biological control and technological optimization. As a result, they shape an environment in which farming systems that are managed from this point of view are favored at the expense of flexible farming systems. The factors that reduce farm flexibility relate to government regulations, the supply of advice and inputs from the agro-industry and the demand for output of the agro-industry as well as the knowledge produced by research stations and institutes.

Keywords: flexibility, resilience, farming systems, cattle farming

Introduction

Farming systems in North-Western countries are becoming increasingly modernized, with an emphasis on biological control, technological fine-tuning, optimization and improving eco-efficiency. Yet, this does not seem to contribute to a more robust agricultural sector nor prevent individual farms from experiencing economic and social difficulties. This is evident from, amongst others, the frequency with which economic crises hit individual farms and whole subsectors, the growing demand for counseling and advice for farming families in financial problems and the rapid decline in the number of farms. Several scholars, both inside and outside academia, advocate a shift in paradigm from one that is centered around optimization, control, technology and resistance to particular external shocks to one focused on resilience and adaptive capacity. Yet, research in this domain remains, save for a few exceptions, largely on a theoretical and conceptual level and practical implications for policy makers and farm managers are lacking.

Adaptive capacity refers to the degree to which the system can be adapted as a response to changes in its environment, and to the speed and ease of this adaptation. Managing a farm from an adaptive capacity point of view means maintaining flexibility and safeguarding degrees of freedom. Whereas flexibility is a concept that is well described in management science, in agriculture, literature remains mostly on a theoretical and conceptual level. Practical implications are often limited to statements such as “farming systems should be diversified in order to be flexible”. Knowledge on how to manage a farm and on how the research and policy environment should be designed in order to be stimulating for a flexible farm management approach remains scarce. There is a need to translate the – very interesting – theoretical and conceptual knowledge into practical knowledge. First and foremost, we need to understand what influences the flexibil-

ity of farming systems. There is a general intuition that farming systems in developed countries today are highly specialized and optimized, but with a limited degree of flexibility. We need to understand why this is the case, and what factors have driven farmers to organize their farm into a less flexible direction. This knowledge may provide useful insights for researchers and policy makers when they want to design the research and policy environment such that it is more supportive for a flexible farm management. Indeed, the fact that, according to general consensus, farming systems today are not flexible, suggests that the driving factors may not be supportive for managing a farm from the viewpoint of maintaining flexibility. The purpose of our study is to get a better understanding of the factors that support or counteract a flexible farm management. The results are expected to offer insights for researchers and policy makers into how they can support a more flexible farm management.

This paper is structured as follows. In the next section, we summarize the literature on flexibility and resilience, with a focus on agriculture. The next section presents the conceptual framework for flexibility that we apply in our study and the methodology. The fourth section presents the results, the next section provides a discussion and further implications. The last section concludes.

Conceptualizing flexibility and resilience

Flexibility is a concept that is already well-described and studied in management science (e.g., Aaker and Mascarenhas, 1986; Gerwin, 1993; Upton, 1994). In the agricultural domain, however, flexibility has yet to permeate research efforts, notwithstanding interesting research carried out in several research departments in Europe (e.g., Ingrand et al., 2007; Lemery et al., 2006; Hostiou and Dedieu, 2012; Darnhofer, 2009; Darnhofer et al., 2010a, b) and Australia (e.g., Kaine et al. 2010; Kaine and Cowan, 2011; Cowan et al., 2013).

In industrial economics and management science, flexibility is understood as the system's response to deal with uncertainty (Upton, 1994; Volberda, 1996) and as the ability of a system to respond, at a reasonable cost and appropriate speed, to planned and unanticipated changes in the environment in which the system is embedded (Slack, 1987). Many authors have indicated that there are different types of flexibility. This sometimes gives rise to semantic definitions. However, given that there is empirical evidence that there might exist negative relationships between different types of flexibility, it is important to define which kind of flexibility one is referring to.

The literature has also dealt with static versus dynamic flexibility. Static flexibility refers to the installation of possibilities to react to events that are more or less likely to happen. Firms that have this kind of flexibility have, for instance, overcapacities. This type of flexibility refers to situations that are more or less predictable. Dynamic flexibility is the capacity to manage the appropriateness of the firm to the environment. There are two sorts of dynamic flexibility. Reactive dynamic flexibility allows continuous reaction over time to a change in the environment. The firm reacts once the change is observed, and the flexibility relates the speed and ease with which this reaction can be performed. Pro-active dynamic flexibility consists in developing capacities for anticipation. This involves setting measures in place that allow practices, processes and products to be easily adapted before certain events occur.

Strategic, tactical and operational flexibility. Weiss (2001) distinguished between tactical flexibility or the degree to which a farm can adjust output levels and operational flexibility or the degree to which firms can switch between different outputs. His application on Austrian farms shows that there exists a negative relationship between both types of flexibility. By assessing both types of flexibility, however, he only assessed realized flexibility and not potential flexibility. Kaine et al. (2010) and Cowan et al. (2013) distinguish between strategic and tactical flexibility. They define tactical flexibility as flexibility arising from pre-programmed possibilities that do not alter the

structure of the farm. More specifically, in the case of flexibility with respect to changing input availability, they define tactical flexibility as the ability to substitute one input for another. Strategic flexibility is defined as flexibility that changes the structure of the farm. Yet, in their specific case, the degree of strategic flexibility is described as the degree to which the farmer is able to change the output mix of the farm. The latter corresponds to the concept of operational flexibility by Weiss (2000), who in turn uses another definition for tactical flexibility.

Another division of flexibility relates to the sources of flexibility in the farm household. Input flexibility is the degree to which a farmer can switch between different inputs without jeopardizing its productive and economic goals. In theory, input flexibility is dependent on the technical production process and on the marginal rate of substitution between different inputs. Technological flexibility is the degree to which the farmer can switch between different production method that transfer the same inputs into the same output. Output flexibility refers to the ease with which the farmer can switch between different outputs, using the same inputs and technology. Income flexibility, is a type of flexibility more at the household level, that refers to the degree to which the farm household can easily switch between different income sources.

Methods

Flexibility as a research framework

We define flexibility as the degree to which the system can be adapted without serious disruptions and at a reasonable speed. In this study, we delimit flexibility to flexibility of the farming system, thereby not taking into account flexibility of the farm household system. We acknowledge that flexibility at the household level, defined as the flexibility of the household to adapt its production and consumption activities in such a way that the household as a whole can continue to fulfill its main goals, can be important. However, the goal of our study is specifically to study farming system flexibility, and hence, we set the boundary to the farm.

We study flexibility as an important part of a farm's resilience. In our study, we define flexibility as the room for change, or the degrees of freedom. It is defined by Lev and Campbell (1987) as range of options, referring to size of the choice set which is available in future periods.

Procedure, case-study and data collection

The case-study was performed on the case-study of the Flemish bovine sector. This sector comprises dairy farms, cattle farm and farm combining both activities. The bovine sector was chosen as a case-study for a number of reasons. First, the bovine sector is, together with hog production, the most important animal production sector in Flanders. Second, it is known that the bovine sector is a sector with significantly more heterogeneity between farm and production systems, which makes this sector very relevant for our purpose. To obtain a sampling frame, we contacted CRV, which is an organization for bovine animal production owned by a Flemish and a Dutch cooperative. Its main activities are breeding and advisory. It is the biggest such organization in Flanders and the majority of cattle holders are member of this organization. We obtained their member database, which allowed us to randomly contact farmers and ask them whether they would be willing to be interviewed. The farmers were informed that the research was dealing with stress and shock that farmers perceive, with ways to deal with these changes, about how farmers cannot deal with these changes, why farmers make certain choices to the neglect of other choices and with how farmers plan to deal with changes in the future.

We used a three-stage procedure during our qualitative research results. In the first stage, we did a number of in-depth interview, after which we analyzed these interviews and produced preliminary results. In stage two, we again did a number of in-depth interviews, which were slightly

adapted, based on the findings after the first interview round. After this stage, we further analyzed the interviews and added results. In stage three, we applied a different interviewing technique, based on our findings from the previous stages, that was targeted towards our specific research question.

In the first stage, farmers were first asked to present their farm and the main activities. Next, they were asked to talk about the main changes they have experienced in the past. They were asked to describe the forces that induced them to adapt their farm or to think about adapting their farm. Then they were asked what actions they did to deal with this change. Next, they were asked which other options they did not choose and why this was at the time not a valid option for them. When the interview had reached the end about one particular change, the respondents were asked to think about other changes they have experienced, and then the whole interview process was repeated. Using this “go down the river model” (Rubin and Rubin, 2005), we repeated the whole process of a change, how they dealt with the change, which options to deal with the change they did not choose and why, several times in each interview. After this first stage, we performed the first data analysis (see next section), and based on these results, the second stage interviews were slightly adapted.

In the second stage, we applied roughly the same interviewing techniques, but the focus was more centered around the factors that influenced the size of their choice set, and not so much anymore on the ways they dealt with change nor on the type of change they experienced.

In the third stage, we applied an elicitation technique in order to identify more factors that influenced the choice set available to farmers. We presented the farmer with a whole series of situations that could be hypothetical to his specific farm, but were very plausible since these situations were, to a large extent, identified in the previous interview stages. These situations referred to changes that the farmer might experience, e.g., a summer drought, a shock in the availability of a certain input, a drop in the price of an output, a late frost, etc. Then we asked to list all the potential ways to react on this event they could imagine. Then we asked which of these potential response were more available than other and why. Further, we suggested several potential responses ourselves, and asked whether these would be a possibility and why (not).

Data analysis

Data analysis was performed using the NVIVO software. The interviews were listened and coded using the open coding technique. Important concept were very simply coded and categorized into three categories, being (1) shocks or stress that the farmers experienced; (2) ways to deal with shocks and stress and; (3) factors influencing the way they dealt with these change and inhibiting other ways to deal with these changes.

After stage 2, a series of interviews that were more targeted towards the latter two of the categories, we used open and axial coding to analyze the data. Open coding was used, mainly using the codes that were identified in stage 1, but adding new ones if the data made it necessary. Further, the codes were categorized in subcategories, relating to the main source of the factors that influenced the degrees of freedom for adaptation the farmers had, e.g., policy regulations, technology, suppliers. Axial coding was used to start drawing relationships between different codes.

After stage 3, a series of interviews that were focused on the most important subcategories of sources that influence the capacity to adapt, we used open and axial coding. Open coding was used to assign meaningful codes to the interviews, based on the codes and (sub-)categories identified in stages 1 and 2. Further, we use axial coding to complete relationships between codes and categories.

(Preliminary) results³⁰⁴

Shocks and stresses

Farmers apparently perceived much more stresses than shocks, or at least they were more concerned about stresses. Factors that induced them to change were more often of a stress nature, rather than a shock nature. A first important stress they described are ever changing demands from society, that are translated in changing government regulations and or private standards. The main influence, according to these standards, according to the farmers, is that these public and private regulations bring about higher costs. For the farmers, these costs are not really related to production as such.

A second category of stresses we identified is technology. Technology is ever changing and there is always something new that promises to work better than the technology they are currently using. Farmers often feel pushed to invest in this new technology. Many farmers are not eager to be the last one to adopt a new technology, but once there is some critical mass, they feel they cannot no longer compete without also investing in this new technology. Surprisingly, they do not describe a situation where direct production costs of their old technology are much higher than the new technology, but rather a situation where continuing farming with the old technology is no longer competitive due to indirect effects. Example of such indirect effects are: the fact that advisors become unfamiliar with the old technology; the fact that repairs and maintenance of the old technology is no longer available; and the fact that the new technology becomes the institutional norm due to public and/or private standards.

A third stress is the shrinking margin. The farmers describe a situation where they continue to invest in new technology, in order to keep up with the mass and/or because this become obligatory, by public and private standards, only to see the margin between expenses and receipts decrease.

Ways to deal with these changes

The farmers that we interviewed so far mostly adopted a go with the flow strategy. Most of them adopted new strategies, new technologies, had plans to expand. We know there are farmers who choose other pathways, such as diversification into other activities, organic farming, et. The farmers we interviewed so far often dealt with adverse effects of shocks and stresses at the household level. This includes strategies such as using off-farm income to cover for farm deficits, cutting private expenses and making appeal to family labour when necessary. Many farmers tried to maintain some flexibility in how they fulfilled their goals more from at a household level, which suggests that the scope for maintaining flexibility in the farming activity is limited and/or not beneficial.

Factors that influence how farmers choose and cannot choose to deal with changes

The preliminary results show a little paradox concerning the sources of the rather limited flexibility they adapt. On the one hand, farmers tend to blame most of this limited flexibility to the government, while they rather mention aspects that relate to the triumvirate government - research - agro-industry.

A first series of aspects relates to governmental regulations. Farmers express their feeling that often, these regulations tend to limit the room for freedom that they have to adapt something of their farm to better suit changing conditions. One example is the agri-environmental scheme for no-tillage, which requires that the same field is practiced no-till during several consecutive years, whereas during some very wet seasons, an adaptation towards using the moldboard plough would be more appropriate.

³⁰⁴ At the time of writing, we have completed interview stage 1. Hence, these results are very preliminary.

A second series of aspects relates to the agro-industry. Farmers are heavily dependent on the supply of the agro-industry in terms of knowledge, advice, inputs and on the demand from the agro-industry in terms of outputs. Very often, the conditions that are shaped by the agro-industry in these dimension reduce the degrees of freedom that a farmer had to make small adaptations to his farm. For instance, many inputs produced by the agro-industry and sold to the farmers have an increasing level of asset specificity. Machines become much more specialized and efficient in performing a specific task, but useless to perform another specific task. As such, when the farmer would want to adapt his farm by changing something to that specific tasks, these machines become obsolete.

A third series of aspects relates to the results that are produced by research station and institutes. These results are produced from a view to farming as being something that must be productive, efficient with a high degree of biological control and technological optimization. As a result, the knowledge and the innovation that are produced also fit within this paradigm. Our study identifies this knowledge and these innovations as a potential source of reduced flexibility. An example is breeding. Breeds have been genetically improved to maximize controllability and productivity. Yet, the plasticity of the dominant breeds being used in the bovine farming sector in Belgium is small. The animals are, for instance, sensitive to changes in the feed ration, and when feed rations are adapted, due to changing circumstance (e.g., availability, price), their productive level tends to vary a lot.

Discussion

Farmers appear to perceive limited degrees of freedom to adapt their farm to changing conditions. Often, they feel like they are pushed in a certain direction, a direction that afterwards leaves them with even less room for change. Most farmers that we interviewed so far express limited room for change and this limited flexibility. The reasons for this seems to be that maintaining a flexible farming system is disadvantageous compared to managing a farm from the concepts of efficiency, biological control and technological optimization not because it leads to inherently inferior farming systems, but due to the surrounding apparatus created by the government, the agro-industry and research. As a result, farming systems that would try to maintain flexibility become less competitive.

Further research should focus on (1) the link between flexibility of a farming system and its competitiveness in today's industry; (2) ways to create an environment which leaves more room for change; and (3) on the positive and negative effects of such an environment. If we want from our agricultural system that is produces safe, affordable and enough food in a sustainable way and in a way that provides enough income for the farmers that are producing the food, we must evaluate to what extent flexible farming systems can or cannot fulfill this objective. The results of our study suggest that the main reason why currently they cannot is more a matter of shaping the right environment than their inherent inferiority. Clearly, now, many stakeholders within the agro-industry, agriculture, government and research believe in modernization, efficiency, biological control and technological optimization as the means to ensure that our agricultural systems achieve fulfill their societal role. Doing that, they are shaping an environment that favor such systems, but leave limited scope for flexibility.

Conclusion

This paper reported the results of a qualitative study into the factors supporting and disproving the flexibility of farming systems. The preliminary results show that the policy environment and the agro-industry is such that it does not support a flexible farm management. Due to arrangements in the policy environment and agro-industrial complex, managing a farm with a view to

maintaining flexibility is disadvantageous. The institutional and agro-industrial environment is currently not favorable for a flexible farm management, mainly because a flexible farm management threatens the competitiveness of a farm.

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