Getting Off or Going Faster?

Reconsidering the Technological Treadmill Theory and Farmers' Responses in the Netherlands.

A Research Paper presented by:

Wooyoung Lee
(The Republic of Korea)

in partial fulfilment of the requirements for obtaining the degree of
MASTER OF ARTS IN DEVELOPMENT STUDIES

Major:

Agrarian, Food and Environmental Studies
(AFES)

Members of the Examining Committee:

Dr. Oane A. Visser
Dr. Julien-François Gerber

The Hague, The Netherlands
December 2018

Disclaimer:

This document represents part of the author's study programme while at the International Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

Inquiries:

International Institute of Social Studies
P.O. Box 29776
2502 LT The Hague
The Netherlands

t: +31 70 426 0460
e: info@iss.nl
w: www.iss.nl
fb: http://www.facebook.com/iss.nl
twitter: @issnl

Location:

Kortenaerkade 12
2518 AX The Hague
The Netherlands

Acknowledgement

First of all, I thank to god for planning all coincidences that brought me here.

Also I would like to thank to Dr. Visser and Dr. Gerber for support in the procedure. Dr. Geber's thesis on indebtedness and advice to study about Dutch farmers initiated the paper. Then, Dr. Visser's expertise in the Dutch agricultural sector and commitments led me to finish it.

I remember tons of meals and conversations with friends in ISS, we were happy about someone's good days and comforted for days that we wanted to hide. They made me feel that I am not alone in this grey city.

I want to appreciate Jangwon, a great father of two kids and my old friend in Korea who gave me a great emotional support

And my family, although putting few letters is not enough, I love you and thank you for all commitments they you made through all my life and

Studying in ISS was a beautiful time to find answers to questions that I had in Malawi. Although I did not find the perfect answer, I will carry the struggle to find it, hoping that would contribute to make the world a little better.

Contents

List of Tables

List of Figures

List of Acronyms

AF2000	Arable Farming 2000
CAP	Common Agricultural Policy
CBS	Centraal Bureau voor de Statistiek
	(Central Bureau of Statistics)
EEC	European Economic Community
EU	European Union
FADN	Farm Accountancy Data Network
FAO	Food and Agricultural Organisation
LTO	Land- en Tuinbouw Organisatie
	(Agriculture and Horticulture Organisation)
NFU	National Farmers Union in Canada
NIE	New Institutional Economics
OECD	Organisation for Economic Cooperation and Development
PBL	Planbureau voor de Leeformgeving
	(Planning Office for the Living Environment)
STT	Stichting Toekomstbeeld der Techiek
	(The Netherlands Study Centre for Technology Trends)
WFD	Water Framework Directive

Abstract

This paper explains changes in external factors around the Dutch agricultural sectors, suggests desirable types of farming by exploring various responses from Dutch Farmers and links their features with farm resilience. The Dutch agricultural sector has undergone the transition from the protective massive production to the neoliberal environmental preservation oriented regime and it increased burdens on the upstream side and decreased returns on the downstream side of Dutch farms which led a high level of farm debt. Dutch farmers showed various responses based on their tendency towards agricultural technologies and market which are reorganised by the author into four groups: Early Adopters, Average Farmers, Laggard Farmers 1 and Laggard Farmers 2. The paper found that Cochrane's theory of Technological Treadmill is manifested in a different way under the current context of the agricultural sector in the Netherlands with changes of external factors and suggested Laggard Farmers 1 as a desirable type of farming in the current context with its self-sufficient and flexible structures and a low level of debt as a result. This finding reveals multidimensional effects of indebtedness in the agrarian society with its reinforcing relation with technology and farm expansion, in turn, place debt in the centre of change in the face of the long dominating neoliberal discourse in the global food system.

Keywords

Dutch Agriculture, CAP, Technological Treadmills, Farm Debt, Styles of Farming, Farm Resilience

Chapter 1 Introduction

1.1 Background

The modernisation of agriculture has been an arena in which capital penetrates into agriculture (Bernstein 2010: Chapter 4) and this has been realised by states and corporation over different Food Regimes (McMichael 2013). Various problems have resulted from the procedure of modernisation in the agricultural sector; impoverishing and dispossessing farmers by the pressure of technological treadmills (Phillip 2009), environmental damages (Perfecto et al. 2009) and food-related disease (Winson and Choi 2017). Especially, farmers have been one of the most affected population with the constant and forcible adoption of agricultural technologies and ongoing enlargement of scale, that is, the phenomenon which Cochran (1979) termed the technological treadmill. Dynamic of market and technology development have become determining factors whether farmers could be large or small farmers and those between were forced to make a choice either way (Ploeg 2018: 504). Furthermore, main agricultural institution saw that small farmers are not competitive to contribute economic development thus, markets, policies of governments, tax regimes, and technological research and development institute favoured large expanding farms (Ibid: 514).

In the European context, this procedure was largely supported by CAP, the binding agricultural policy affecting its member states in Europe, in order to solve the food shortage and to achieve economic growth from agricultural sectors after the Second World War (European Commission 2012). While the adoption of technologies and scale enlargement became essential conditions to achieve modernisation of agriculture, farmers in Europe have experienced an increasing level of farm debt. According to FADN, the average of short and long-term farm debt in the first EEC member states[1] reached 276,805 Euro per farm in 2016 (European Commission 2018a). Gerber (2014) argued the debtors' thoughts and behaviours tend to increase their production to repay the debt in a timely manner. Furthermore, debt forces the indebted to focus on money term calculation of all resources and short-term benefits, in turn, sociocultural and ecological consideration become less important (2014: 738). Farmers in Canada also declared that debt forced them to adopt the short-term thinking (NFU 2010: 19-20). In short, modernisation of agriculture in Europe brought the necessity of ongoing technology adoption and scale enlargement while the level of farm debt has reached at the considerable amount during the procedure. In this situation, farmers have to produce the more agricultural commodity to repay debt and focus on short-term benefit in monetary term, rather than considering long-term benefit which comes from sustainable farming practice. One can see reinforcing features between farm debt and technological treadmill yet, there have been little studies on this issue.

I chose the Dutch agricultural sector as my research target since its frontrunner characteristic and the considerable level of farm debt make a suitable case for the study of the reinforcing relation between technology and debt. After the Second World War, the Dutch

[1] First ECC states are Belgium, France, Germany, Italy, Luxemburg and the Netherlands (European Commission 2016).

agricultural policy aimed three main goals; improving labour productivity in order to supply enough food for domestic consumption at low prices, increasing agricultural export to obtain a positive balance of payment and guaranteeing a reasonable living standard for people engaging in the agricultural sector. To achieve those goals, the Dutch agricultural sector went through the process of mechanisation, intensification, specialisation, rationalisation, and upscaling (Bieleman 2010: 239-248 and Hass 2013: 33-34). As a result, the Netherlands has become the world's second largest exporter of agricultural products with its character as highly intensive and specialised agricultural sector based on the high level of organisation and technological investment (European Commission 2016: 1). Although the modernisation of agriculture contributed to economic growth at the national level in the Netherlands, it did not improve the financial situation of its farmers. In the PBL report, Vink and Boezeman (2018) pointed that Dutch farmers' income has not been rising for years and it is less than that of average employees in other sectors (2018: 30 and 48). The reason for the low income of Dutch farmers could be explained by several reasons. Firstly, massive production stimulated by price support from CAP brought pressure on budget and environment, therefore, CAP had to go through several reforms. These reforms shifted its mechanism from the protective price support to direct payment which encourages competition in the free market by separating subsidies from specific commodities and, to use more eco-friendly farming practice by conditional requirement (European Commission 2017: 2-5 and Lovec 2016: 1-2). Especially, abolishment of CAP price support made Dutch farmers' income more unstable (Vink and Boezman 2018: 48). Secondly, farmers have experienced the squeeze since the price of main commodities such as milk and wheat has been kept low (Bileman 2010: 240) and, they had to keep adopting technology and enlarge their scales to maintain the same level of profit. Those factors significantly weakened farmers' financial situation and as a consequence, the average amount of debt in an individual Dutch farm has reached 798,869 in 2016 (European Commission 2018a). Under this situation, banks in the Netherlands hesitate to issue the loan since the level of farm debt is already high and unstable farm income made farming in the Netherlands no longer profitable (Drion 2018: 6). In this worrying situation, the Dutch government still places its farmers on the technological treadmill by encouraging more technological innovation believing it may mitigate environmental damages from farming activities and keep the Dutch agriculture competitive (Government of the Netherlands).

1.2 Problem Statement

In the early phase of modernisation of agriculture, Dutch farmers could obtain reasonable income by following the guideline from the government, which were the ongoing adoption of agricultural technologies and expansion of the farm size, while the government achieved economic growth. However, they are facing the significant financial problem due to the nature of the technological treadmill, downward pressure on agricultural commodity price and shifting agricultural policies pushed by growing concern of environmental damages from farming activities and EU budget for the farm subsidy. As a result, the amount of indebtedness in Dutch farms have reached a considerable level (European Commission 2018a). Despite the significance of credit relations in agricultural development in advanced societies, there were little studies on the subject (Marsden at al. 1990: 36). More generally, Gerber

(2013) pointed out that surprisingly few studies have attempted to understand the effect of indebtedness on the economic, social and environmental dimensions of indebted entities (2013: 840).

Since the penetration of capitalism into agriculture, most societies have undergone through Marxist industrial development model arguing that agriculture has to be on a few hands of capital-intensive farmers (Kautsky 1882: 12, Lenin 1982: 134-135, Marx 1976: Chapter 30), Neo-Classical model projecting individuals who have free choices will find the best way to allocate their resources efficiently and optimally in the perfect market to maximise their profits (North 1995: 21-26), NIE model which shares same logic with Neo-Classical model but emphasis more on the role of institution to minimise transaction cost in order to ensure market efficiency (Harris et al. 1995: 2) and the combination of neo-populist with neo-classical neoliberals which contains pro-market capitalist stance and pro-small-farmer bias (Oya 2009: 232), suggesting to increase the productivity of smallholders (World Bank 2007: 3) and bring markets to them (Ibid: 12).

The common idea that all models share is achieving a high level of productivity to meet the need for food consumption of the growing population with increasing investment in agricultural inputs and technologies. Under these models, utilising high-end agricultural technologies is encouraged by the government and farmers by themselves. However, adoption agricultural technologies should be reconsidered in the current situation which has been transited from the protective massive production to the neoliberal environmental preservation oriented regime.

However, farmers are not passive entities whose fate are decided by external factors (Ploeg 1994: 14 and Darnhofer et al. 2016: 115). Rather, they develop new responses and strategies to tackle an overwhelming marginalisation which Ploeg (1994) referred styles of farming. These styles vary greatly and were identified by various scholars (Dirksen et al. 2013, Oostindie et al. 2013 and Ploeg 1994, 2003 and 2008), yet there is a gap in studies on styles of farming in relation to debt and the technological treadmill.

1.3 Research Objectives

The objectives of this paper are to understand changes of external factors in the Dutch agricultural sector as a result of the shifting context from the massive production to the environmental regulatory regime and to suggest the resilient type of responses from Dutch farmers under this shifting context by exploring various strategies and feature of those responses. This attempt will provide a suggestion on which strategies should be pursued in a farm level in the current shifting context in the Netherlands.

1.4 Research Questions

The research focuses on answering the following research questions; "What are the features of resilient farming styles in the face of the current context of the technological treadmill in the Netherlands?" Especially, this paper attempt to answer following sub-research questions:

a. Research sub-question 1

How have external factors in the Dutch agricultural sector changed corresponding to the shifting political context from the protective massive production to the neoliberal environmental preservation oriented regime?

b. Research sub-question 2

How have farmers responded to the technological treadmill in the face of shifting context?

c. Research sub-question 3

Which responses were most resilient and what are the features of those responses?

1.5 Methodology

The research employs the methodology based on mainly theoretical literature reviews and partially on primary data collected from the interview via email. Data used in this paper consists of governmental reports and statistic and, academic and news articles. I already had articles for basic concepts of the technological treadmill and the effect of indebtedness from required reading of lectures in AFES. To find out more data, I used ISS online library, Google, Google Scholars, the Journal of Peasant Studies, the Agriculture and Human Value, and websites of Wageningen University & Research, CBS, and the Government of the Netherlands as search engines. Keywords were technological treadmills and debt relation, the technological treadmills in Europe, farm debt in Europe and in the Netherlands, technology adoption in Dutch farms, styles of farming, autonomous, farm debt and so on. There were increasingly little studies about the technological treadmill and farm debt in Europe and the Netherlands on search engines. Table. 1 displays the number of data that was available on the search engines.

Table. 1

The number of hits by keywords related to the research topics

Key words	Hits
Technological treadmills and debt relations	1
Technological treadmills in Europe	2
Farm debt in Europe	0
Farm debt in the Netherlands	0
Different styles of farming in the Netherlands	2
Autonomous and farm debt	1

Source: edited by the author

Due to the lack of data available on search engines, I employed other strategies, that is, searching relevant articles in reference lists of articles obtained from the previous search and seeking data related to the farm debt in northern America whose procedure of modernisation of agricultural sectors and its effect on farmers are relatively similar with that of Europe. Also, I used other keywords such as financialisation of agriculture in Europe or relation between farm and bank in Europe as my supervisor advised. These attempts allowed me to obtain more literature related to my interest directly or indirectly from their reference lists. Although more data was available in this way, little hit number by keywords implicitly shows that the issue of farm debt in relation to agricultural technology in Europe has not gained sufficient attention. Additionally, data given by my supervisor such as Dutch government publications, statistics, and articles by Dutch scholars about insecure income among Dutch farmers and farm debt in the Netherlands were also useful.

I also employed reports, publications and, statistics from EU, FAO and World Bank, and academic publication on history of agricultural policies in both CAP and national level in the Netherlands and on changes in external factors and structure of the Dutch agricultural sector to contextualise the shifting political context in the Netherlands from overproduction oriented support to environmental preservation oriented regulation. In addition, studies on different groups of Dutch farmers in relation to technologies and styles of farming were used to present Dutch farmers' various responses and their features. Moreover, I used statements of farmers' organisation in the Netherlands to see collective response regarding technologies and farm debt. I sent an email to eight organisations that I found on Google and ask their stance for those issues. Two organisation answered me; LTO, the organisation which represents around 50,000 agricultural entrepreneurs with its goal to effectively promote farmers interest at local, regional, national and international level (LTO), sent me a document reflects their stance on technologies; Toekomstboeren (Future Farmer), the organisation which aims to support new type of farming as an alternative to conventional farming (Toekomstboeren), did not have documents for regarding issues, yet answered about their perception of technologies and farm debt. Finally, I used articles on resilience to conceptualise farm resilience.

Although most data was written in English, there were a few Dutch reports and publication. I mainly used Google translator for those data and partially consulted with my supervisor to confirm for uncertain parts.

1.6 Research Paper Structure

This paper consists of 5 chapters to answer the research question. In chapter 2, essential theories and thesis on the technological treadmill, its relation to increasing level of indebtedness and effect on farmers, brief definition and description of styles of farming, and the notion of farm resilience are presented. The shifting policies on agriculture in Europe due to growing pressure on environment and EU budget resulted from overproduction encouraged by early CAP regime and ongoing pressure of technological treadmill under the current environmental regulatory regime with volatile market price will be explained in Chapter 3 Various responses of Dutch farmers in the face of those external changes and their features contributed to farm resilience will be discussed and highlighted in Chapter 4. Finally, in Chapter 5, the conclusion of finding and suggestion for further research will be presented.

Chapter 2 Theoretical Framework

In this chapter, theories and thesis which are relevant to research questions will be presented. Firstly, we explore views from different scholars on the nature of technology adoption termed 'technological treadmill' which requires a greater amount of same or other kinds of technologies. Secondly, studies on increasing farm debt in relation to the technological treadmill and its effects on farmers which dispossess farm property or impose short-term thinking and market logic will be discussed. Thirdly, I will briefly introduce various farm strategies, which Ploeg referred styles of farming. Finally, the concept of farm resilience will be introduced to explain which type of farming style are more likely to survive in turn, develop further by farmers choices in this changing context.

2.1 Technological Treadmill

Bernstein (2010) argued that the features of farming, which are the uncertain condition of the nature and time difference between labour and production, are obstacles for capital to penetrate into farming. To overcome these barriers, capitalist tried to control farming procedure with technological innovation. As a result, fertiliser, herbicide, pesticide and greenhouse became increasingly available for farmers (2010: 80-90). Grant and McNamara (1996) noted that agriculture transformed from a labour intensive production to capital-intensive production that is largely dependent on agricultural technologies throughout the post-war period. Under the transformation, smaller farmers have either gone out of business or reallocate their resources on off-farm activities while larger farmers have acquired land to realise economies of scale and to purchase sophisticated agricultural technologies (1996: 427).

Cochrane (1979) developed the theory of the technological treadmill to explain the situation, in which adoption of technologies becomes inevitable and pushes farmers into polarising groups. He distinguished those group as Early Adopters, Average Farmers and Laggard farmers according to their tendency toward adoption of technologies. According to his argument, Early Adopters find their unit cost decreases since the new technology allows them to yield a greater amount of outcome at the same cost thus, the adaptive action becomes profitable. The benefit attracts more farmers to adopt the technology which allows them to produce more commodities. In turn, the greater volume of the commodity is in the market and oversupply leads a fall in price. In other words, the advantage of Early Adopters decreases as more farmers utilise the same technology then, all farmers come back to the non-profitable situation. Thus farmers have to produce more commodity in order to maintain the same level of profit by adopting new technologies and enlargement of scale while some of Average Farmers and Laggard Farmers could not keep their business and gave up their land to other farmers who are still on the treadmill (1979: 427-429). After 17 years later, Levins and Cochrane (1996) applied the technological treadmill theory into the United States in which the land price had increased due to the high demand for farmland as the price support from the U.S. government that made farming more profitable. In this context, they argued that the technological treadmill applies to three groups, who were originally defined, in a

different way. Early Adopters either could use initial profit to buy more land and keep adopting new technologies, or retire as farmer and rent their land out to farmers who want to expand their farm; Average Farmers try to make profit but fail due to the high value of land; Laggard Farmers would be absentee landlords, letting someone else run on the treadmill. Thus, Early Adopters win as farmers and land speculators so do Laggard Farmers as land speculator yet, the majority of farmers, that is, Average Farmers always lose out (1996: 550-553).

Farmers ride on the technological treadmill not only due to the supply-demand relation but also changing conditions within the ecosystem. Increased application of pesticides, for instance, causes the reduction in the number of predators and reinforces resistance of the pest to the chemical, in turn, requires the greater amount in the application of the pesticide (Murray 1994 quoted in Phillip 2009: 1269). Also, utilising a specific technology could demand other technologies; high yield variety was designed to require the greater use of nitrogen fertiliser and irrigated water system which creates a suitable heritage for pest, in turn, require more use of pesticide (Perfecto et al. 2009: 48).

In sum, once a new technology is adopted, farmers could enjoy the temporal profit in the early phase yet, eventually experience this advantage is no longer valid due to decreasing price caused by oversupply and increased cost from the nature of technology which requires the greater use of the same or other kinds of technologies. Additionally, the effect of technological treadmill could vary depending on land ownership in where the land price is high.

2.2 Indebtedness

2.2.1 Increasing Level of Farm Debt in Relation to Technological Treadmill

According to Gerber (2015), people generally borrow money to buy food, input and technology, and to pay taxes and expenditure for life-cycle events such as weddings, funerals and sickness (2015: 414-415). Although it seems that farmers in developing countries put their feet on the swamp of debt to access to Green Revolution technology, farmers in Europe and the United States followed the similar path (Perfecto et al. 2009: 48). Marsden et al. (1990) argued that state intervention, especially guaranteeing prices and stimulation infrastructure development within the British agricultural sector, has established technological treadmills which expanded markets for both industrial and bank capital to exploit (1990: 46). Buckland (2004) also argued that the technological treadmill increased total production cost and required farmers to add debt to purchase technologies (2004: 154).

2.2.2 The Effect of Indebtedness on Farmers

In her study of the impact of farm crisis in the 1980s on the small village called Star Prairie in Minnesota, Dudley (2000) explained that relatively low interest rates for agricultural loans, increasing value of land and agricultural commodities in the U.S. and growing international demand due to export contract with the Soviet Union signalled the great incentive for farmers to invest in new equipment and farm expansion in order to enhance their productivities

in the 1970s. The study further showed that price in agricultural market started to drop as farmer in Europe and Asia became competitive in producing agricultural commodities while interest rates increased due to stricter finance policy from the government in the 1980s; average interest rate on agricultural loan had doubled from 1976(6.8%) to 1981(18.9%) (2000: 21-36). Farmer faced the burden of high production cost and requirement of the greater amount of collateral from banks due to the decline of land value and this led farmers with a high level of debt or bankruptcy (Ibid: 78-83).

Green also saw contrasting features of credit; one as an increasingly important resource for the producer to enjoy structural advantage and another as the contribution to structural changes in the social relation of production (quoted in Marsden et al 1990: 45). The influence of debt on farmer is one of those changes. Stichele (2015) noted farm debt affects farm operation, income and the right of farmers since debt repayment could legally be imposed as the highest priority of indebted farms (2015: 260). Gerber (2014) shared the same idea, arguing that credit-debt relation has been instrumental for social differentiation by control of land, labour and capital while foresting market discipline and generating pressures for economic growth, short-termism and innovation albeit its negative effect on traditional community bonds and nature. Thus, they have been shaping the way capitalism evaluated (2014: 729). He detailed that the interest-bearing and guarantee-based credit relation affect debtors though and behaviour toward producing more commodities, not for self-consumption but generating more income to repay the debt in a timely manner. Furthermore, the debtor focuses on money term calculation of all recourses and short-term benefits which make sociocultural and ecological consideration less important (Ibid: 738). His articulation is based on the finding from the fieldwork in Indonesia in which indebted farmers, although at different degree by their scales and capacities, had to work more hours in their farm, intensifying their production with agrochemical, diversifying income sources and started to calculate their expenditure to ensure repayment (Gerber 2013: 847). Ploeg's work (2008 and 2010) on Dutch dairy farms supported this idea, showing that the high level of indebtedness caused by scale enlargement corresponding to decreasing revenue due to high production cost per unit of end products, as a result of industrial practice, created a need to produce greater amount of milk (2008: 131 and 2010: 100).

Some scholars pointed that another effect of indebtedness is the increasing control of creditors which restricts farmers' choices. Mooney pointed that credit relation, in which banks issue the loan to only farms deemed profitable[2], stimulates farmers to produce more cash through scale enlargement and intensification (quoted in Marsden et al. 1990: 45). Therefore, banking capital deepened the commoditisation process and dependency of farmers on agricultural science (Ibid). Gerber (2013) also found this selection process by banks in his fieldwork in Indonesia; banks send agents to select bankable farmers, mainly larger farmers or smallholders with potential in the community. Furthermore, it was found that the borrowing bank monitored indebted farmers regularly and influenced their practices by recommending heavy use of agrochemicals (2013: 846). Hendrickson et al. (2005) pointed that

[2] Mooney explained creditors' selection process with the Weberian term that banks favour formally rational producer over substantively rational one thus, production transformed into a formally rationalised system via this selection. Substantively rational producers obtain credit sometime yet, their rationality might be compromised by the creditors' demand (quotes in Marsden et al. 1990: 46).

increasing the level of debt in the U.S. farm leads the situation in which creditors' requirement dictate farmers' decision. They found out that increasing use and price of agricultural inputs (e.g. patented seeds, chemicals, fertilisers and equipment) caused the growing level of farm debt and this made difficult for farmers to keep their farm with profit from small-scale and less intensive farming practice. Therefore, indebted farmers were forced to cultivate more marketable crops instead of others which are useful for rotation, and were integrated to contract farming where retailers and agro-business have increasing control on farm operation (2005: 281-292). The following declaration of NFU in Canada (2010) also shows how choices of farmers are restricted due to pressure on repayment of farm debt.

Debt repayment deadlines push farmers to make choice based on short-term cash flow, rather than on the need of the soil or the next generation. Farms have traditionally been places where long-term thinking and holistic decision-making prevailed. Debt forces farmers to adopt short-term thinking common to corporate boardroom, with predictable for the environment, fertility and the future (2010: 19-20).

To sum up, needs for the introduction of new technologies and the enlargement of farm size created the high demand for agricultural loan. The high level of farm debt granted bankers growing control on the way of farm operation through the credit rating procedure. Farmers started to have to embrace profit maximising mind-set and behaviour and be under pressure of overproduction not only to repay debt but also prove their profitability for a greater amount of agricultural loans. This makes difficult for farmers to develop their farm based on their value and belief.

2.3 Styles of Farming

Ploeg (1994) argued that farmers develop responses to deal with marginalisation imposed by external actors (1994: 14). To conceptualise these responses, he used Hofstee's (1985) concept of style of farming, that is, a complex but integrated set of notions, norms, knowledge element, experiences and etc. held by a group of farmers in a specific region that describes the way of farming should be carried out. It is a unity of discourse and practice of farming that organises farm labour, production and development process which can be expressed in scale, intensity, the interrelation between labour and capital, and the particular technic-productive aspects and relations. He added styles of farming have goal-oriented and socially mediated strategies thus, they are not static entities but consciously organised with the flow of activities interacting with economic, social, political, ecological and technological dimension over time and space (Ibid: 17-26). This definition was developed further to the notion, that is, the decision-making model shared by a larger number of farms which decides the mode of farm operation. The practice interacts not only with internal cultural repertories but also external factors such as the relation between market and technology supply, and governmental policy (Ploeg 2003: 111).

There have been attempts to identify different styles of farming. Ploeg (1994, 2003 and 2008) tried to define different types of farming groups through his works. In his early study, farmers were distinguished into three groups; Marginal Farmers who experience considerable

distance from technologies, Vanguard Farmers/Entrepreneur Farmers who actively adopt prevailing technologies and systematically integrate into market aiming ongoing scale enlargement and, Alternative Farmers/Peasant Farmers who keep distance from technologies and market based their own goals, pursuing ongoing interaction and mutual transformation of man and living nature, and construction of self- controlled resource base (Ploeg 1994: 10-15 and 2008: Chapter 1)[3]. Further, he detailed and distinguished Frisian dairy farmers into seven groups of farmers; Yntinsive boeren (Intensive Farmers) aiming maximum output per input, Grutte boeren (Large Farmers) believing there will be only few large farms in the future thus enlargement of scale is the only way to survive, Trekkerboeren (Machinemen) pursuing maximum output per labour input, Sunige boeren (Economical Farmers) keeping monetary costs as low as possible, Fokkers (Breeders) aiming more wide range of product with high quality, Koeminsken (Cowmen) aiming to enhancing yield by improving the quality of milk cows and Sjuchtwei boeren (Ordinary Farmers) who just follow a routine course without a clear project (Ploeg 2003: 105-123). Recently, there were similar attempts to categorise Dutch dairy farmers in to four styles of farming; the Cost Saver Type characterised with low cost and intensity of production, the Scale Enlarger type pursuing rapid growth, believing that growth would solve all problems, the Fine Regulator type whose farmers are more professional on farm operation aiming high intensity of production, and the Labour Saver type featured with high inputs per labour unit (Dirksen et al. 2013: 7-10 and Oostindie et al. 2013: 7-12). Details of these works will be presented in Section 4.2.

2.4 Farm Resilience

The concept of engineering resilience was originally suggested by Holling (1973) to evaluate ecosystem functions to absorb or accommodate disturbances without experiencing changes in the system (quoted in Scott 2013: 598). Folke et al. 2010 defined resilience as the capacity of a system to absorb disturbance and to reorganise while retaining essential function, structure and identity (2010: 3). Referring their definition, the concept of resilience could be divided with two capacities; the capacity to retain the features and return to the original state of the system during the disturbance, and the capacity to changes its features to adopt corresponding to the disturbance. These types of resilience were recognised differently by other scholars. Scott (2013) referred Holling's (1973) definition of engineering resilience as equilibrium resilience emphasising the capacity to resistance to disturbance and the returning speed of the system to the equilibrium (Davoudi 2012 quoted in Scott 2013: 599). Evolutionary resilience was given as a contrasting approach that highlights adaptability or evolutionary changes of the system which reject the notion of returning to the normal state as a single response to the shocking event (Ibid 599-600). In the Same vein, Rose (2009) introduced contrasting types of resilience in relation to economic activities. She defined static economic resilience as the ability of an entity or system to maintain function emphasising the importance of the capital asset to absorb shocks. In short-run, static resilience refers optimising inputs under the difficult situation. By contrast, she defined dynamic economic resilience, that is, the speed of which an entity of system recovers from a severe shock and achieve

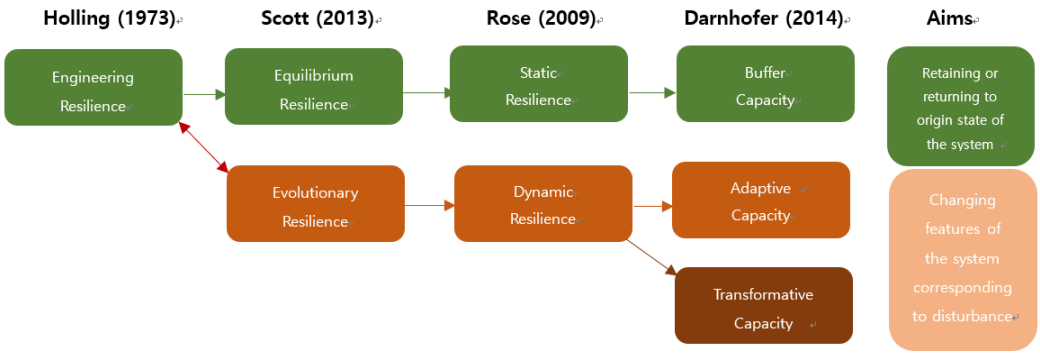
[3] In his early work in 1994, Ploeg used terms vanguard and alternative, yet these terms were replaced with entrepreneur farmers and peasant farmers in the later work in 2008.

the desired state involving a long-term investment for repair and reconstruction. While static economic resilience refers to making the best use of limited resources, dynamic resilience implies changing the availability of those resources by increasing productive capacity (2009: 8-10).

Darnhofer (2014) highlighted three different aspects of resilience to explain resilience at the farm level; buffer capability which is the ability of farmers to mobilise resource to maintain the farm under unfavourable situations (2014: 467-468); adaptive capability to adjust in the face of changing external drivers and internal process, therefore it allows development while staying within the current regime (Folke et al. 2010 quoted in Ibid: 468); transformative capability to implement radical changes and to create untried beginnings from which to evolve a new way of living (Walker et al. 2004 quoted in Ibid). Figure. 1 depicts how different definitions of resilience are categorised by contrasting aims.

Figure. 1

Categorisation of resilience by contrasting aims



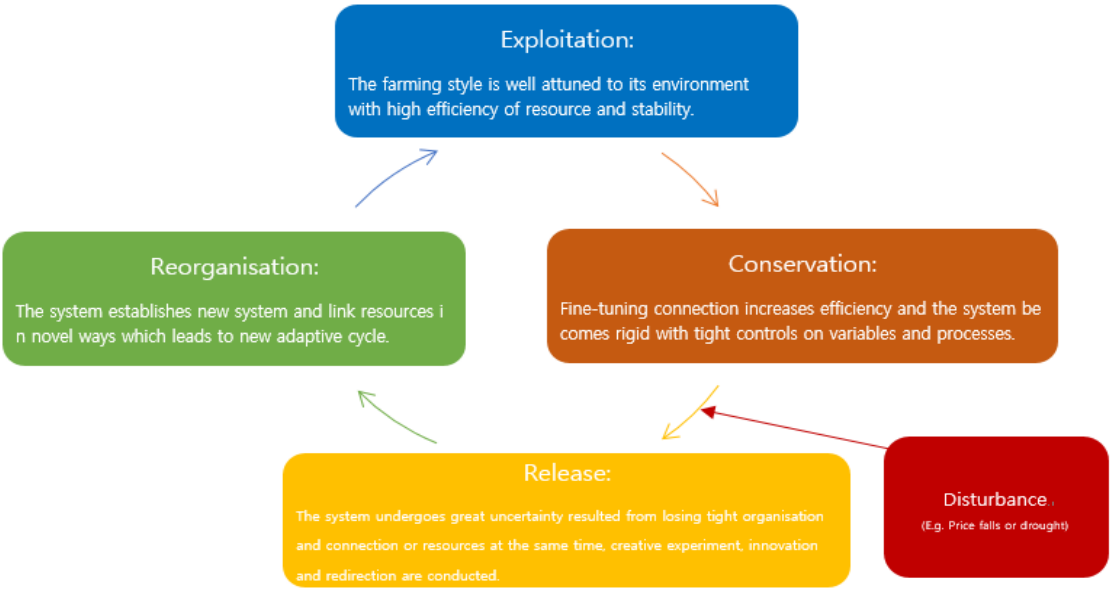
Source: Edited by the author based on Holling 1973 quoted in Scott 2013: 598, Ibid: 598-595, Rose 2009: 8-10 and Darnhofer 2014: 467-468

Darnhofer et al. (2016) pointed that a farm can be seen resilience when it is able to navigate the adaptive cycle[4] which is displayed in Figure. 2 (2016: 112). In this light, farm resilience is not such states or assets which can be obtained by farmers. Rather, it is capacities of the farm, in various relations between temporal and spatial contexts and, between social and ecological contexts, to transform the previous relation by creating a new context and redefining what is seen as working in order to take advantage from surprise or unexpected events (Ibid: 118-119).

[4] Darnhofer et al. (2016) saw changes always occur in ecological and social processes of farm even in the moment the farms might seem in a stable situation. Thus, it is emphasised to focus on change (e.g. navigating adaptive cycle), rather than maintaining states and avoiding thresholds.

Figure. 2

Adaptive Cycle in a Farm System



Source: Edited by the author based on Burkhard et al. 2011 quoted Darnhofer et al. 2016: 112)

In short, farm resilience is capacities and choices of the farm under the unfavourable situation to enlarge the ability to retain their function and structure to survive, to adapt while keeping their core logic (path-dependent) or to make dramatic changes to build up new strategies (path-creation).

Chapter 3 Shifts in External Factors in the Netherlands

In this chapter, Changes in the Dutch Agricultural sector at the macro level which was briefly discussed in Chapter 1. I will start with CAP reform which reflects changing the view on agriculture in Europe shifted from pursuing massive production by institutional support from CAP toward environmental preservation with stricter regulation and imposition of sustainable agriculture. Subsequently, the shift of agricultural policies in the Netherlands corresponding CAP reforms will be explained, then the ongoing pressure on technology adoption and commodity price fluctuation will be discussed as external factors that squeeze Dutch farmers. Finally, the explanation of changes in the strategy of Dutch banks within this shifting context will take the last part of this chapter.

3.1 Changing View on Agriculture and Corresponding CAP Reforms

The initial goal of CAP was restoring Europe's capacity to produce enough food to feed its population. Various policies (price support, export subsidies and various import levies) were employed to support farmers to improve labour productivity in turn, increase the volume of products (Burrell 2009: 272 and European Commission 2012: 3-4). Price support encouraged farmers to increase their output (World Bank 2007: 97); the amount of cereal produced in the first six EEC countries doubled from 1960 to 1990 (European Commission 2018b). Subsidies helped farmers to enhance labour productivity by investing in equipment, renovation of farm buildings and purchase technologically advanced input factors (European Commission 2012: 3-6); consumption of fertiliser and tractors in these countries[5] increased from 2,092,349 to 5,550,260 tonnes (Food and Agricultural Organisation 2018a) and from 2,106,133 to 4,619,484 units (Food and Agricultural Organisation 2018b) respectively over the same period.

During this time, however, the problem of overproduction on certain commodities had arisen and it put considerable pressures on the EU budget and environment (European Commission 2017: 2-5 and Lovec 2016: 1-2). The share of CAP expenditure in the EU budget has increased consistently and reached 73% in 1985 (European Commission 2018c). Furthermore, the concern of environmental damages resulted from agricultural activities started to grow. The ability of the intensive farming system to retain the soil fertility was increasingly questioned and inefficient and expensive use of natural resources and degradation of the countryside became important issues (Symes 1992: 199). The problem of surpluses started to appear in the 1950s and there was the first warning sign of negative side-effect of pesticide use in the 1960s. The report 'Limits to Growth' by the Club of Rome ushered in a new public and political awareness of the relation between humans and natural resources. The problem of overly produced agricultural commodities became an important topic in the 1970s and 1980s. Although the surplus problem was partially tackled during the 1980s and 1990s, more

[5] The statistic of Belgium and Luxemburg were not available in the database thus, it represents only the other four countries.

various types of environmental issues have emerged; ecosystem, animals and landscapes are seen as more than source of food; consumer started to demand a diverse agricultural product; the public started to see the broader value of the agricultural sector such as cultural-historical and landscape values, rather than focusing on only economic value (Haas 2013: 41-42).

These pressures on EU budget and the environment caused by overproduction brought necessity to reform of CAP. In 1992, the amount of price support was reduced and direct payment was introduced to compensate for the income loss of farmers. The Agenda 2000 reform divided CAP into two pillars; previous price and market support, and direct payment were allocated in Pillar 1 while funds for supporting the goal of rural development including protection of the environment and rural heritage were assigned to pillar 2. In turn, direct payment decoupled from specific agricultural products in 2003, encouraging farmer to compete in the free market. In CAP reform 2014-2020, EU emphasised more sustainable agriculture by three layers of funds. Cross compliance, the first funds, stipulates basic environmental requirement and obligation for farmers to receive full CAP funding. Green Direct Payment rewards farmers for maintaining permanent grassland, ecological focus areas and crop diversification. On top of theses compulsory funding, Rural Development supports farmers' voluntary measures that are beneficial for the environment and climate change. Through these CAP reforms, farmers in member states are encouraged to invest in their farm to be competitive in the global market while eco-friendly farming practices became necessary to obtain full direct payment thus, the dual role of farmer as producer of food and guardian of countryside is emphasised (European Commission 2013: 6-7. 2017: 2-5, Lovec 2016: 1-2 and Garzon 2006: 44-46).

3.2 Shifting Dutch Agricultural Policies

The agricultural policy in the Netherlands has been mostly consistent with the changes in CAP. Small-scale mixed farm with a few livestock and, production for self-consumption and locally trade from nutrient-poor sandy soils were features of Dutch agriculture at the beginning of the 20th century. The Netherlands was experiencing food shortage during the economic crisis of the 1930 and Second World War. Therefore, the government policy aimed to improve labour productivity in order to supply adequate foods at low prices, to increase agricultural export to obtain the positive balance of payment and to guarantee a reasonable living standard for those engaging in the agricultural sector (Bieleman 2010: 248). The government perceived small farmers, who work on small and fragmented plots, as a main obstacle to achieving high labour productivity thus small farmers were encouraged to scale up (Hass 2013: 53). Farmers were given opportunities to purchase tractors, milking machines and combine harvester at an affordable price with the help from the Marshall Fund. The greater quantity of fertiliser and pesticide uses, and specialised crop or products were encouraged instead of mixed cultivation. Also, the government conducted land consolidation under the plan Meerkarenplan voor riolverkaveling (long-term programme for land consolidation) with substantial subsidies to improve farm infrastructure and to enlarge individual plots for optimisation of machine application (Bieleman 2010: 240-243). A considerable amount of subsidies for both at EU and the national level, and the guarantee for bank loans from the government helped farmers to invest and enlarge their farms (Hass 2013: 53 and Van den

Ban and Bauwens 1988: 222). Dutch agriculture transformed from the labour intensive farming system to the highly specialised intensive farming system with high inputs of capital and labour.

Since the 1970s, however, sustainability had become an important topic after the rapid growth and the demand for the environmental preservation set the limit to further intensification of farming activities (Heide at al. 2011: 24-26). The first response of the Dutch government was Relatienota (relational memorandum) which was proposed by the cabinet in 1975. It aimed to include farmers in the management of nature during their farming activities (Haas 2013: 59 and Karel 2010: 16). Subsequently, the government introduced the Manure Act and milk quotas in 1984 to prevent farmers from expanding their herds of chicken and pigs and to limit milk production which reflects the intention of the Dutch government to tackle environmental damages by curbing agricultural production (Haas 2013: 60 and Samson et al. 2017: 2). The manure policy and milk quotas became the main instruments for the government to mitigate the negative environmental effect. Legal constraints that define the quantity of animal manual on land was implied in 2006; Dutch farms started to have to pay a fine for every kilogram of animal manure in excess. As a part of the 2003 CAP reform, it was decided to abolish milk quotas by 2015 since the shift from price support to direct payment already put dairy production under control. The abolishment of milk quotas pushed the Dutch government to imply the stricter manure policy to satisfy European environmental standards. From 2016 on, Dutch farms who overproduced animal manure are obliged to process the surplus by themselves. Furthermore, another constraint, in which farmers can only produce a greater volume of milk when they obtain more land, was implied in 2017. Finally, the Dutch Government introduced the system of phosphate right in which farmers are not allowed produce more phosphate than the number of rights that they obtained according to the size of livestock at the 2nd of July in 2015 (Samson et al. 2017: 1-3). In European level, the goal of Nitrates Directive is to decrease eutrophication of surface water and WFD aims to reduce the level of the national agricultural load by 40% for phosphorus and 20 % for nitrogen by 2027. Thus, the manure policy is expected to be sharpened in order to contribute to the achievement of the targets defined by the Nitrates Directive and WFD. The manure policy requires the additional production cost on individual farms. In a pig farm in the Netherlands, for instance, the annual cost of disposal of livestock manure amounted to 40,000 which accounts for 5% of its total production cost (Van Grisven and Bleeker 2017: 7-8). The cost is expected to grow as the government imposes stricter standards.

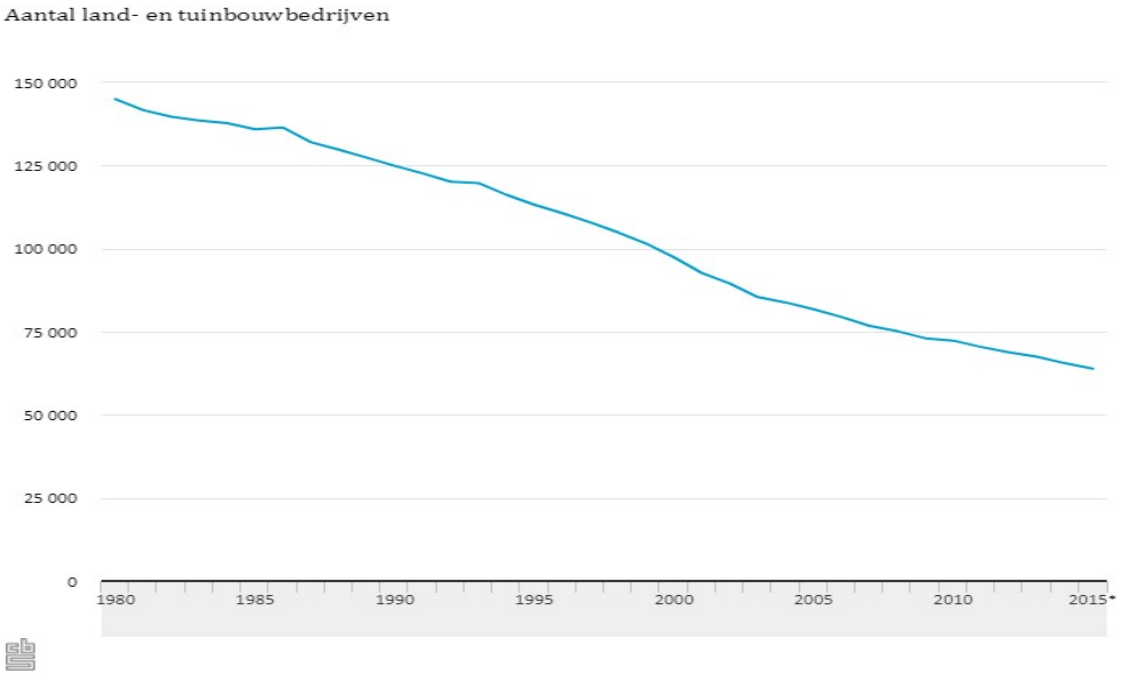
In short, the overall agricultural policy trend of CAP and the Netherlands shifted from protective support, which encouraged farmers to invest and to scale up for massive production, to more neo-liberal support with environmental regulation after experiencing the considerable environmental and budget pressure. I argue that this changes negatively affected the financial situation of the Dutch farmers. This is because the shift reduced the amount of monetary support while increasing production cost which has to be allocated to deal with environmental damages resulted from farming activities.

3.3 Ongoing Technological Treadmills and Fluctuating Market Condition

In this section, the downward in the number of farmers in the Netherlands, and the increasing level of farm debt will be explained in relation to ongoing pressure on technology adoption and price fluctuation in the agricultural market. Farmers in the Netherlands adopted agricultural technologies and enlarged scale corresponding to the protective policies in the early phase of agricultural development. However, there were not enough rooms for everybody; available lands were limited and the market became saturated. In turn, somebody had to quit farming while other kept scaling up (Hass 2013: 53-54). Figure. 3 shows that the number of farms became nearly a half over recent 35 years.

Figure. 3

The downward trend in the number of farms in the Netherlands



Source: CBS 2015

The downward trend could be explained by two related factors. As mentioned in Section 2.1, using a specific technology requires either the greater use of same or other technologies. Table. 2 lists the kind of technologies introduced in Dutch dairy farms over four decades from 1961 to 2000.

Table. 2
Development in dairy farming in the Netherlands (1960-2000)

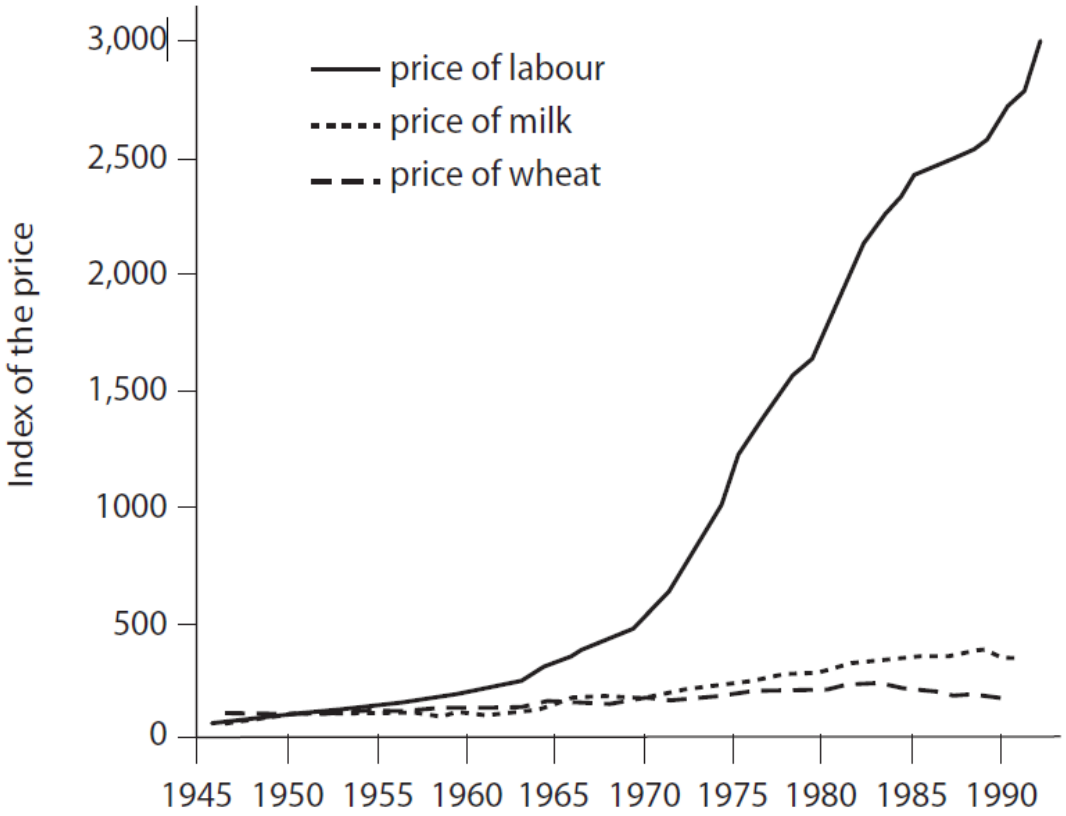
Period	New Technology Input
1961-1965	Wide-scale introduction of milking machines Artificial insemination
1966-1970	Higher fertilizer use on grassland Specialisation in dairy
1971-1975	Milk cooling tank From hay to grass-silage Loose housing system with cubicles
1976-1980	Maize feeding Higher concentrate feeding
1981-1985	Cow identification for individual feeding Wide-scale use USA Holstein-Friesian blood
1986-1990	Embryo transplantation
1991-1995	Environmental protection (e.g. manure injection)
1996-2000	Introduction milking robot

Source: van Horne and Prins (2002: 9 quoted in Heide at al. 2011: 25).

The innovation development and diffusion aimed to achieve high productivity during the post-war time yet, the focus moved to food security in harmony with nature. In this shift, more actors such as research institutes, farmers and agro-business have shaped a dynamic and complex system of innovation development while the government still has a vital role (OECD 2015: 139-141). The government promotes adoption of innovation by the introduction of new regulation that enforces to change current practices, funding and subsidising public and private research institutes, supporting training, extension and advisory services to farms and creating networks between various actors in agricultural innovation system (Ibid: 159-160). For instance, the greenhouses must be climate-neutral and produce zero carbon monoxide emission by 2020 with innovative technologies such as efficient lamps and generation of sustainable electricity (Government of the Netherlands). As various concerns on the environment have been added on existing food security issues, a range of technologies which applicable in the agricultural sector could be more diversified. STT introduced 20 high-end technologies which will have a great impact on the future of the Dutch agricultural sector ranged from 3D printing to weather modification (Wilde et al. 2016). This means farmers will be more exposed to technological markets and technological treadmills will go faster in the broad context of Dutch agriculture.

The recent price fluctuation in the Dutch agricultural market also can be considered as another factor. The Dutch government kept the price of agricultural product low in order to supply essential food to the domestic customer at cheap prices. Figure. 4 shows that the price of milk and wheat have barely changed from 1945 to 1993 in the Netherlands.

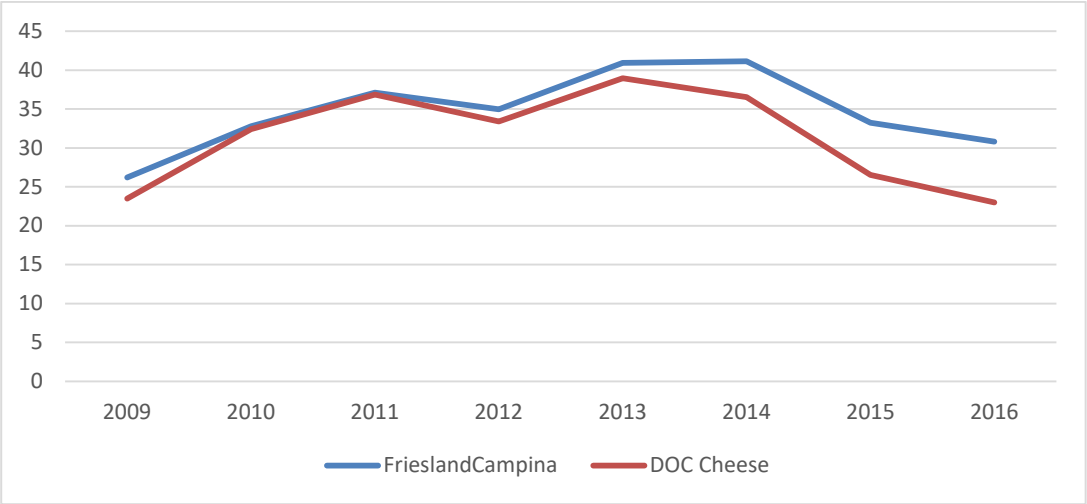
Figure. 4
Index of the price of labour and main commodities (1945-1992) Index: 1950=100



Source: LEI/CBS, 'Landbouwcijfers' (quoted in Bieleman 2010: 240).

Furthermore, the current price volatility worsened the market condition. The process of liberalisation of the global market and the rise of the new imperial or corporate food regime made price fluctuations increasingly frequent incidents (Ploeg 2003: 223 and Ploeg 2010: 99). As discussed in Sector 3.1, decoupling direct payment from commodities pushed European farmers to the international free market. Therefore, the disturbance to the global market directly affects the Dutch food market. For instance, the collapse of the Russian market and mad cow disease decreased the price of dairy farm products greatly between 1990 and 1997 (Ploeg 2003: 219), and Dutch dairy farms have been experiencing milk price fluctuation since the 2008 economic crisis (Dirksen et al. 2013 and Oostindie et al. 2013). Figure. 5 displays a change of milk price paid by two Dutch dairy companies from 2009 to 2016.

Figure. 5
Milk price in the Netherlands (2009 to 2016) Index Euro per 100 kg of standard milk
(Excluding VAT and including supplementary payments)



Source: LTO Nederland (2017)

The necessity of ongoing expansion and technology adoption and, fluctuating market condition which brings lower returns for farm outputs placed the Dutch farmers in simple reproduction squeeze which Bernstein (1979) referred the situation in which the cost of production increases while the return of labour decreases. According to his argument, rural development schemes encouraged of imposed more expensive input for production (improved seed, tool, fertiliser so on) with the uncertain return to offset the increased production cost. In this situation, he continued, the shortfall in income can draw farmers into the debt relation (1979: 427-428). Supporting his argument, the amount of debt in an individual Dutch farm has reached 765,500 Euro in 2012 (Berkhout et al. 2014: 141). Table. 3 shows the financing structure of Dutch arable and dairy farm by different sources.

Table. 3
The financing structure of Dutch arable and dairy farm

Type of Farm	Arable Farm		Dairy Farm	
Type of Finance Source	Euro	Percentage	Euro	Percentage
Total Capital	3,863,500	100%	3,069,900	100%
Equity	3,021,400	78.2%	2,027,000	66.0%
Bank Loan	636,100	16.5%	899,600	29.3%
Family Loan	99,000	2.6%	57,600	1.9%
Other source	107,000	2.8%	85,700	2.8%

Source: Edited by the author based on Van de Meulen and Van Asseldonk 2017a: 1)

Especially, the amount of average debt per cow in a Dutch fairy farm was reported 10,000 Euro which is three times greater than that of EU-27 average (Hogan 2018). It is expected that increasing demand for technology adoption due to stricter environmental regulation and fluctuating market conditions would place Dutch farmers in ever tightened

squeeze therefor, Dutch farmers' dependency on external financing capital would become stronger.

3.4 Changing Strategy of Banks Corresponding to Volatile Farm Income

In the 1970s, the combination of the interest of bankers in Europe to diversify their loan services into other fields and that of European farmers, who believed that moderate interest rate, introduction of high yielding technology and favourable market price would bring a greater profit, led increased the percentage of incurring bank loan by European farms[6]. However, EEC started proposing the wide application of co-responsible levies and some of European governments increased income and capital taxes in their agricultural sectors in the 1980s. The high level of taxes made farmers' income insecure thus, it became a great risk for bankers to issue agricultural loans. Responding to it, banks reduced the amount of loan available for farmers or increased the interest rates on agricultural loans. Falling income and high level of interest rate cause equity and solvency problem (Reid 1981: 265-273). Similarly, this kind of banks' cautious borrowing practice under risky circumstance was found after economic crisis 2008 when Basel III agreement was applied with stricter requirements that bank must hold a greater amount of equity and issue the lone only at low risks (Van de Meulen and Van Asseldonk 2017a: 1).

Marsden et al. (1990) argued that the growing amount of debt increased the power of British banks to determine who is deemed creditworthy. The criteria, which is termed credit character, involve the qualities of entrepreneurship, the level of self-exploitation that the farm may endure in order to repay and commitment of family members to farming (1990: 45-46). These criteria shifted from assessing the value of land as the asset to focusing on the level of value that farmers could generate from the land (Grant and McNamara 1996: 432) by using application of technologies (McIntosh and Zey-Ferrell 1986 quoted in Marsden et al. 1990: 46). In the study on the relation between public credit access and investment behaviour or credit-rationed farmers in Poland, Petrick (2004) also found the volume of land has a less significant in relation with credit rationing procedure. Rather, it was highlighted that previous lending history, which proves the reliability of borrowers for repaying loans, and gender ratio in the household, which indirectly reveals how many labours are available on productive activities over housework, were more important determinants for bankers to issue the loan (2004: 285-287).

In short, banks develop various strategies to control agricultural loan (e.g. imposing stricter criteria or higher interest rate) when they perceive that financing the agricultural sector is risky. I found that the Duct banks are employing similar tactics as they see that the Dutch agricultural sector is no longer profitable for the reason aforementioned in previous sections. Dutch banks reduced the amount of loan for farmers (Drion 2018: 6). The average interest rate on farm loan in the Netherlands increased at approximately 4% in 2015 (Van de

[6] Most member states in EEC experienced an upward trend in bank borrowing in the 1970s. Among them, the percentage of bank borrowing by Irish farmers increased by 1,102 % from 1970 to 1979 while the figure of Dutch farmer rose by 255 % over the same period (Reid 1981: 266).

Meulen and Van Asseldonk 2017b: 4) while average interest rate for the mortgage was 2.93 in the same year (Statista). An interview in PBL in which a farmer complained that he has to prepare a presentation for bankers to prove the profitability of his farm reflects the fact that Dutch banks not only look at the asset of the farm but also at their performance (Vink and Boezeman 2018: 44). In this way, farms will be forced to organise their farm in the way to maximise profit.

3.5 Conclusion

I presented changes of external factors in the Dutch agricultural sector in this chapter. The shift of political context from the protective massive production to the neoliberal environmental preservation oriented regime made reforms of agricultural policies at both CAP and the national level inevitable. As a consequence, the amount of subsidies decreased, a limitation was imposed on agricultural production (e.g. milk quota) and farmers became more responsible for environmental damages from farming activities (e.g. manure policy). Furthermore, this shift brought more arenas for technologies to penetrate into the agricultural sector as a solution to mitigate environmental damages and made agricultural market vulnerable to external shock (e.g. milk fluctuation after 2008 food crisis) due to tight integration with global free market. This placed a great uncertainty on the Dutch farms' income and difficulty to obtain agricultural credit from banks.

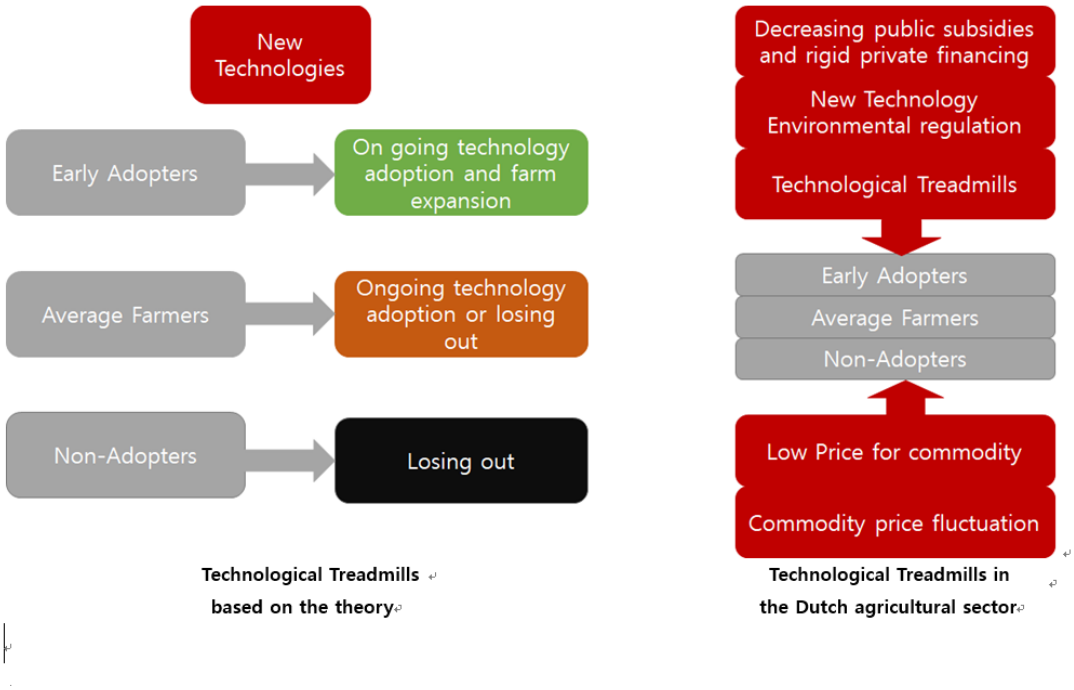
I see that Dutch farmers in the early phase of agricultural development were in the same situation with American agrarian society from the 1950s to 1970s to which Cochrane (1979) applied the technological treadmill theory. In the theory, Early Adopters keep the advantageous position by applying new technologies in order to produce the greater amount of commodities, in turn, to offset the price fall resulted from oversupply in the market. In Europe, there was government intervention to keep prices of agricultural commodities low yet, price support still offered the incentive for farmers to adopt new technologies in order to produce more commodities. With favourable support from the government and generous credit accessibility, the Dutch farmers rode on the technological treadmill[7].

As Figure. 6 describes, however, the squeeze on Dutch farmers has been heavily tightened and the application of the technological treadmill theory needs to be reconsidered. The abolition of price support to limit overproduction and recent market fluctuation make the advantageous position of Early Adopters in the early phase questionable. I expect Dutch farmers will be exposed more greatly to the technological market in order to mitigate environmental damages as the Dutch government imposes stricter regulation while expecting its farmers to remain competitive in the global market. As we saw in section 2.2, adoption technologies require the greater amount use of same or other kind technologies not only due

[7] Cochrane (1979) acknowledged that his logic is based on the fully free market, therefore it does not completely hold in the American agrarian society where the government offered a price-income support for the farming industry. He explained the support made farming more attractive and rose the value of land for farm expansion. Thus, Cochran argued that the land market treadmill replaced the product market treadmill (1979: 430-432). It can be assumed that profit from early adoption of technology and improved the volume of production allowed farm expansion in the Netherlands in spite of rising land value due to price support.

to market relation but also the ecological relation. For this reason, the squeeze on the upstream side will be more weighted with ongoing pressure to adopt technologies and Early Adopters are no exception from the squeeze. Therefore, the financial burden of all types of farmers will increase while price volatility makes their return on investment and labour uncertain. Moreover, Dutch banks see that financing farming in the Netherlands risky thus, stricter criteria or higher interest rates are applied to issuing agricultural loans.

Figure. 6
Technological treadmill in the Dutch agricultural sector



Source: Edited by the author based on Cochran 1974 for the first schema and factors described from Chapter 3 in this paper for the second schema.

To sum up, reduction of public subsidy for the farming population in the Netherlands and increased need to apply agricultural technologies under the market fluctuating market conditions imposed uncertainty on their income and it led private financing from banks more rigid. In this unfavourable situation, the Dutch farmers have to find new strategies rather than being Early Adopters.

Chapter 4 Responses of Dutch Farmers to Changing External Factors

In the previous chapter, I presented shifts in CAP and the Dutch agricultural policies, ongoing need to adopt agricultural technologies, fluctuating market condition and change in the strategies of banks in the Netherlands as factors shaped unfavourable situations for Dutch farmers.

However, these external changes have not shaped a linear way of farming in the Netherlands. Rather, Dutch farmers developed diverse strategies or styles of farming corresponding to this changing context (Dirksen et al. 2013, Oostindie et al. 2013, Ploeg 1994, 2003 and 2008). It is not only to say that they have come up with diverse responses to external changes, but also that there were some responses which showed stronger farm resilience. Furthermore, there were also factors which made these type of responses from farm resilient.

Therefore, I will briefly introduce different types of responses from Dutch farmers in section 4.1 then present another set of responses as farming styles which offer features to make comparison in section 4.2. Subsequently, I will highlight farming styles which showed stronger farm resilience by comparing their features in section 4.3.

4.1 Diverse Responses of Dutch Farmers

Farmers and other actors in the agricultural sector are required to adapt corresponding to various interacting factors that change over time such as shifting consumption patterns, new economic incentives, climate uncertainty or new regulation in order to shape specific farming systems. Farming systems change, morph or emerge as a result of internal dynamics and coevolution of the farming systems with this context. These changes are neither random nor deterministic, therefore, they can be identified in time and space transects. Within a given set of rules such as prices, policy or tradition, farming systems take the limited number of basic modes that can be the degree of diversity of farm activities, market-orientation or the degree of autonomy so on. Notably, whether the mode applied is appropriate or efficient is context-dependent; a mode can be considered as efficient one in one context yet, it can be seen as maladapted one under a different set of conditions (Schiere et al 2012: 343-345). There have been various modes of farming in the Netherlands over the time which can be considered farmers responses to various factors. We shall explore some of those responses since the era of modernisation of agriculture.

In relation to agricultural technology, Diederen et al. (2003) identified four different groups among 1,075 Dutch farmers from FADN based on the timing of the technology adoption. Innovator, the first group accounted for 3%, was the group of farmers who used a certain innovation for the first time. They characterised as young farmers who value external sources of information and prefer to develop innovation by them or in cooperation with others. Relatively younger farmers who belong to the first quarter of technology adoption and less value on external sources of information while preferring to buy technology from the market were grouped as Early Adopter that accounted 10% of the studied population.

Late Adopters consisted of farmers who did not belong to the first quarter of adoption and Laggard Farmers referred those who do not introduce any kind of new technologies. They share 24% and 63% of the population respectively and fewer characters were classified for these groups (2003: 35 and 45-46).

While technology is generally described in the work of Diederen et al (Ibid), Buck et al. (2001) wanted to present different types of response to organic farming practice as a specific type of technology. In this study, Organic Farmers are Early Adopters in Cochran's term (1979). They employ intensive manual labour process in farm practice to replace chemical agricultural inputs. This is the strategy to develop a distinct market as they believe the conventional way of farming will collapse due to over-production and growing awareness of consumers. The higher price for organic products compensate the lower yields and higher production costs of labour. Some farmers started to converse their farming practice into the organic way after they saw it could be economically and environmentally sustainable. Innovation Farmers are a group of those farmers who joined the IAFS Innovation Project that was initiated by the Ministry of Agriculture, Nature and Fisheries from 1990 to 1993. They preferred a distinct market in which they can charge mark-up for their products and had a strong motivation to work in a more sustainable manner. Another five hundred farmers who called AF 2000 Farmers participated in AF 2000, the followed project of IAFS, from 1993 to 1996. They were mostly attracted by the fact that they could have guideline and advice from extension officers for conversion of their farming practice which would reduce the cost of production. Both groups of farmers can be considered as Average Farmers yet, the distinguishable factor of AF 2000 Farmers comparing with Innovation Farmers is that they showed more diversity in motivation, interest and knowledge. The last group was Conventional Farmers or Laggard Farmers who keep the farming practice featured with the high external input system that has been carried out in the Netherlands since the 1960's. They kept their farming practice as they saw undesirable factors associated with organic farming that is, dependence on manual labour, the variability of yield and problem of marketing of the product which Organic Farmers perceived acceptable. Interestingly, authors found that Innovation, AF 2000 and Conventional Farmers do not differ that much when it comes to actual practice. When they face difficulty caused by their capacities, market and policy condition, they converged on a similar set of practice (2001: 153-165). In short, Farmers responded in different ways based on various interest in corresponds to changing the context of agricultural policies and market condition. They developed diverse sets of choices yet showed a tendency to return to conventional farming when experiencing not enough support from the government.

Ploeg (1994) tried to understand different responses of Dutch farmers in relation to market and technologies. He saw farming activity is the combination of two essential components; mobilisation and reproduction of resources; generation of use or exchange values by converting those resources to goods and services. The former component refers degree of farmers' integration into the market for acquiring resources. Some farmers mobilise the required resources (e.g. labour, capital and land) via various markets while others choose a historically-guaranteed way to reproduce those inputs within the farm production procedure. The latter component implies a specific technique or way of combining resources to generate the required amount of value. In the context of modernisation of agriculture, agrarian science

and agro-business design diffused new agricultural technologies by prescribing specific models for organisation of the labour and production process, in turn, conditioning and legitimising the demand for technology. Again, various patterns can be identified; some farmers would organise labour and production process along the line designed by those external actors while others reconstruct available elements of designs with previously existing elements to build the most optimal methods for conversion. In short, farmers can define and influence the way they operate the farm in relation to markets and technologies and this way is strategically reasoned based on local history, ecology and prevailing political-economic relations (1994: 7-9). These farmers' responses were categorised into three groups as Marginal, Vanguard and Alternative Farmers in Ploeg's early work (Ibid), and latter two positions were more elaborated as Entrepreneur and Peasant farming in the work in 2008. Marginal Position is featured with the considerable distance from technology adoption. This position refers those who existed before modernisation of agriculture and had limited access to technology and market. Vanguard/Entrepreneur Farmer is the group of farmers whose goals are ongoing expansion through scale enlargement, application of prevailing technologies and systemic and tightened integration to market. Their farming practice is embodied in credit, industrial inputs and technologies, and state intervention such as heavy subsidising has a decisive role. Contrastingly, Alternative/Peasant Farmers shows different logic on their farming practice. Their goals are to build up and maintain a self-controlled resource base which allows a relatively high autonomy. They employ the non-commoditized processes of reproduction and the technological model grounded on quality and quantity of farm labour rather than based on a straight-forward application of exogenous models. Thus their alienation of farm from markets and technology is more goal-oriented compared with Marginal Position (Ibid: 10-15 and Ploeg 2008: Chapter 1).

To sum up, Dutch Farmers showed various responses based on the timing of adoption of technology and relation to market and technologies in different contexts of technological changes, growing concern of environment and safe food from both the government and consumer sides, and pressure of external factors by the modernisation of agriculture.

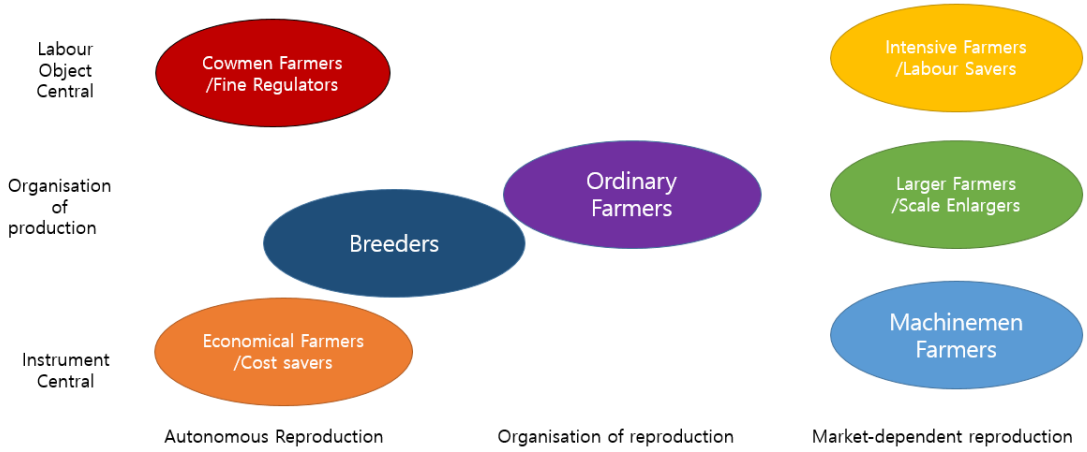
4.2 Styles of Farming in the Dutch Dairy Sector

Ploeg (2012) developed the notion of farming style to refuse the idea that farmers have followed a linear development model under modernisation of agriculture and present a wide range of mutually contrasting optima. Farming style is a specific way of farming which is distinguishable from others (2012: 429-431). It is decision-making model of farming practices vis-à-vis internal cultural repertories and, agricultural policies of market and technologies, which can be manifested as scale, intensity relation between labour and capital, and application of specific technologies on the farm (Ploeg 1994 and 2003). In corresponding to the shifting context from the era of massive production to current environmental regulation, Dutch farmers developed various farming styles.

This paper employs two available sets of categorisations in the Dutch dairy sector from different times and spaces; Frisian Dutch dairy farming styles categorised by Ploeg (2003) and the combination of works on Dutch dairy farmer in which he was involved with Driksen

et al. (2013) and Oostindie et al. (2013). This allows us to explore the features and performance of each farming styles under different market context. If the early work of Ploeg (1994) used to the degree of technologies and of integration to market as parameters to distinguish different farming styles (1994: 9), the latter one used the way of organising reproduction and production to do so (Ploeg 2003: 103). Figure. 7 illustrates how different farming styles can be positioned in relation to market and technology.

Figure. 7
Farming styles in the Dutch dairy sector



Source: Quoted and edited by the author based on Ploeg 2003: 103, Dirksen et al. 2013: 7-10 and Oostindie et al. 2013: 7-12

The vertical axis refers to two contrasting choices between enhancing output by focusing on labour objects (high yield per labour object), or labour productivity (high yield per labour). Horizontal axis refers to another set of choices between mobilisation of agricultural resources through the production process within the farm or through markets. Applying these two dimensions, we explore more details of each style. The first style is the Cowmen Farmers (Koweminsken). This detail was not given in this work, yet it can be assumed based on the figure. 7 that they operate the farm with resources acquired during the production process and enhance their yield though improvement the quality of labour objects. Especially they give excessive attention to cows since their finance indicator is margin per cow. Contrastingly, the Machinemen Farmers (Trekkenboeren) emphasise the orientation to the instrument to enhance labour productivity. Their strategy is summarised as 'the highest possible output with a little labour as possible'. Although the cowmen would say that the Machinemen Farmers do not take enough care or work properly, the Machinemen Farmers would not regard this as problematic. The Machinemen Farmers will argue that they work efficiently with technology applied in their farm and that excessive attention to cows is unnecessary. The farming style of the Intensive Farmers (Yntinsive Boeren) emerged from the rupture of the initially stable relation between dairy cows and grassland caused by the internationalisation of fodder production and trade which allowed tax-free for import of animal feed products. They attempted to secure a large number of labour object such as cattle and feed to achieve high production level per hectare. Another style of farming is the Large Farmers (Grutte Boeren) who believe only a few and larger farms will survive in the future. Therefore their strategy

on farm operation is ongoing expansion with resources obtained through market-dependent reproduction. This desired growth process subordinates actual production while the growth is a function of the production process in other styles of farming. New technologies, generous credit facilities and shifting cultural pattern in which expert system, advisory service and agro-business encourage overproduction per labour, support the accelerated enlargement. The Economical Farmers (Sunige Boeren) shows the opposite logic of the Large Farmers. Their principle is keeping monetary cost minimum both in growth and production process. The decision on investments made cautiously and balance between private and external capital is closely supervised. Instead of acquiring resources from direct market relation, they employ socially regulated exchanges and second-hand markets. Maintenance of fixed resources such as machine and building become essential to prevent depreciation as long as possible. They seek opportunities to replace other input with their own labour input thus it is labour intensive. While the Lager Farmers pursue rapid growth, the Economical Farmers develop their farms gradually with their own savings. Breeders (Fokkers) shows a similar approach with the Economical Farmers. They do not only aim milk and meat market, rather they diversify income sources ranged from on-farm activities such as producing organic milk and breeding robust stock to off-farm activities (e.g. agri-tourism). The last group is the Ordinary Farmers (Sljuchtwei Boeren). They do not show a specific identity and hesitate in making choices. Rather they just sail a routine course operating their farm (Ibid: 101-109).

There are four more general farming styles of Dutch dairy farms which largely overlap with some of the aforementioned Frisian dairy farm styles. The Cost Savers is featured with low costs and intensity of production. The cheapest options are mostly chosen by them; they barely use contract workers and take a good care of machine and cows. These farmers share a culture that others cannot easily copy. Scale Enlargers have a relatively larger number of cows and hectares, or size of the milk quota. Economy of scale reduces the unit cost. They prefer rapid growth and tend to invest again when farm operation is under control, believing growth is the magic word to solve all problems. The third style is the Find Regulators. They aim high production per cow with professionalism and excessive cares for cattle. These farmers showed a fewer entrepreneur features such as profit maximisation yet, but more professional characteristic; they depend on own knowledge rather than advisory systems. Large scale development is avoided as it is considered to make the desired regulation on farm operation impossible. The Labour Savers are featured with a large number of inputs per labour force; the number of cows per labour is the highest. They employ labour out of the family, therefore try to minimise the labour cost with relatively less care on cattle without grazing (Dirksen et al. 2013: 7-10 and Oostindie et al. 2013: 7-12). I presented styles of farming in the dairy sector in the Netherlands. Each style shows very diverse principle and logic in relation to market and agricultural technologies which proves there is no universal model for development under modernisation of agriculture. In the next section, I will explain how the aforementioned feature of specific styles of farming contributed to farm resilience.

4.3 Styles of Farming with Farm Resilience

Various definitions of resilience by different authors were presented in section 2.4. Incorporating those definition of resilience into a concept to explain farm resilience, it is the capacity of farm to endure and maintain the farm in the face of unexpected external events or internal demands while attempting both continuous small changes for short-term and fundamental changes for long-term to make the favourable situation (Darnhofer 2010: 192 and 2014: 467-468). In other words, it is choices and possibilities of farmers to attempt various and continuous novel experiments to maintain or reorganise the farm based on his or her desire and value in response to shifting external and internal context. For Rose (2009), optimising and enlarging resource availability by improving productivity was the important factor for resilience (2009: 9). Darnhofer (2016) argued farm resilience is not a static state or asset which is measurable rather, it is the result of ever-changing patterns of material, social and cultural relations (2016: 118). Thus, I will explain farm resilience based on farmers' ability and choices to keep or reorganise his or her farm, depending on the features of their farming style. This will involve not only economic indicators but also embedded culture of farming styles.

Ploeg (2003) and Oostindie et al. (2013) provided financial data of each style of farming[8]. I do not intend to use financial data as an only indicator of farm resilience, rather, I will highlight patterns and features of farming styles that had more robustness and flexibility against disturbances based on their financial performance in different times in order to suggest farming styles with stronger farming resilience under the current context of technological treadmill squeezing grater with stricter environmental regulation and fluctuating market conditions. Ploeg (2003) argued that the degree of market dependency or self-sufficiency to agricultural inputs and finance capital is decisive in building capacity to resistance against adverse and unforeseen circumstance (2003: 217). In this regard, Economic Farmers showed their strength. They had the second highest net margin per 100kg milk[9] with 21.4 NLG which is very close to the highest figure of Large Farmers (24.5 NLG) in the year of 1990. Larger farmers could achieve the highest net margin by keeping both variable and overhead cost low due to economy of scale. Economic Famers spent less money on feed and fertiliser which made their variable cost low. Thus, high net margins realised for both styles of farming is attributed to less expenditure on the farm operation. Different strategies for low costs by two farming styles made notable consequence in 1997 when mad cow disease and the collapse of the Russian market caused a drastic fall in the price of dairy products. Economic Farmers were affected most adversely due to a drop in meat price; the amount of NLG decreased in output among Economic Farmers were two times greater than that of Larger

[8] Ploeg's work (2003) provided data in the year of 1990 and 1997 and the data from Oostindie et al. (2013) covers from 2007 to 2010. There were shocks which affected the price of milk and other dairy farm products greatly in two sets of timeline; the collapse of the Russian market and mad cow disease between 1990 and 1997 (Ploeg 2003: 219); the price fell greatly in the second half of 2008 and the first half of 2009 (Oostindie et al 2013: 5).

[9] Net margin per 100 kg milk is the amount of money available to reward labour and other assets, and to reinvest to develop the farm, that is, the capital remained for reproduction of farm. It is calculated from total output per 100 kg milk after subtracting variable and overhead costs per 100kg milk (Ploeg 2003: 219).

Farmers. However, Economic Farmers had flexible structures of production since most agricultural inputs were mobilised within their farms. For this reason, they could reduce production cost a lot more than other styles of farming; Economic Farmers reduced 6.8 NLG per 100kg milk from 1990 to 1997 while 1.4 NLG per 100kg were saved by Larger Farmers over the same period. Large Farmers could still obtain the highest net margin because of economies of scale and less impact on their output although they showed less flexibility in their production procedure. However, it was pointed out that two important indicators were not included in this analysis. Firstly, it was the amount of interest to be paid. Larger Farmers indeed had the highest liabilities with 10.4 NLG interest cost per 100kg milk while Economic Farmers had the lowest level of farm debt with 8 NLG interest cost per 100kg milk[10] in 1990. Secondly, depreciation cost among Economic Farmers (13.5 NLG per 100kg milk) was a lot less than that of Large Farmers (21.8 NLG per 100kg milk). Including those two those indicators into the analysis in the fiscal year 1997-1998[11], Economic Farmers obtained around 10 NLG higher than Large Farmers in terms of finance result per 100kg milk.

Oostindie et al. (2013) took a slightly different approach. Instead of analysing financial indicators by each farming styles like the work of Ploeg (2003), the statistics are presented by four groups divided according to fiscal result[12] in 2009[13] and linked with elements from farming styles that contributed better fiscal results. The gap of the fiscal result between two extreme groups in 2009 was 24.5 Euro per 100kg milk. Table. 4 shows the fiscal results of those groups from 2007 to 2010.

Table. 4

Fiscal result of two groups (2007-2010)

Years	Group with fiscal result far above average (Euro/100kg milk)	Group with fiscal result far below average (Euro/100kg milk)
2007	16.34	1.68
2008	16.62	-1.13
2009	14.55	-9.7
2010	14.77	-0.25

Source: edited by the author based on Oostindie et al. 2013: 18

The first group in the table showed a stable trend of fiscal result while the second one

[10] Although Large Farmers had the third highest amount of interest cost per milk yet, the sum of both short-term and long-term liabilities was highest with 1,637,100 NLG. Contrastingly, Economic Farmers had the lowest figure both in the sum of short-term and long-term liabilities, and interest cost per 100kg milk. The style of farming that had the highest interest cost per 100kg milk was Breeders with the third least amount of liabilities (Ploeg 2003: 221). This indirectly improves that banks in favour of Larger Farmer with better borrowing condition.

[11] It was assumed that financial position might be the same with that in 1990 therefore, same interest rates from the year of 1990 were applied into the calculation (Ibid: 224).

[12] Oostindie et al. (2013) used the fiscal result as a finance indicator. I assume it is calculated from total output per 100kg milk after subtracting variable, overhead cost and payment for interest and depreciation per 100kg milk and added supplementary income per 100kg milk.

[13] As presented in section 3.3, milk price in the Netherlands dropped significantly in 2009.

experienced a fluctuation and considerable drop, especially, in 2009. It was found that the fixed cost and other expenditure on interest payment and depreciation of farmers in the second group were higher than that of those in the first group; the differences in fixed cost between two group was not significant yet, the amount of money spent on interest and depreciation payment per 100kg milk by the second group was three times greater than that of the first group in 2009. This gab is attributed to massive investment by the second group. The amount for investment by the second group peaked at 30.44 Euro per 100kg in 2008 milk which was four times greater than that of the first group (7.42 Euro per 100kg milk). This figure, however, decreased considerably to 9.93 Euro per 100kg milk over the subsequent two years which was lower than that of the first group (10.97 Euro per 100kg milk). Authors argued features of Cost Savers and Fine Regulator styles contributed the low level of loan capital dependency, in turn, resulted in the better fiscal result. This shares the same idea of Ploeg's (2003) argument that emphasises on the self-sufficient and flexible structure of Economic Farmers which could reduce monetary cost in their production. Both styles had relatively small size of lands, tried to mobilse as much as possible input resources within farm production; feed was collected from grassland, faeces from cattle was used as manure thus no feed and fertiliser were bought from market; raised young cattle replaced old herds; labour requirement for farm work was met by family members; machinery was bought from the second-hand market and well maintained so that they do not need any services from mechanic; the capital resource for investment was mostly their own saving and balance between loan and equity capital was closely monitored (Oostindie et al. 2013: 16-23).

To sum up, I defined farm resilience as choices and possibilities of farmers to try diverse and ongoing creative trials to maintain or reorganise the farm as the best way that he or she believes in the face of changing external and internal context.

Ploeg (2003) and Oostindie et al. (2013) highlighted styles of farming, that is, Economic Farmers/Cost Savers and Fine Regulators as good farming styles, which could endure difficult times with strategies that contributed to modest expenditure on their farms. Their common strategies were avoiding the direct purchase of technologies and agricultural input from markets, and investment on farm based on loan capital. They tried to acquire required skills and knowledge (e.g. to maintain machinery) to build their own system for self-sufficiency and, to have a closer observation on their farm (e.g. monitoring the balance between loan and equity, and extra care for their cows). Those skills and knowledge can include traditional production skills that have become lost along with the deepening process of commoditisation (Bernstein 1979: 429). Thus what made those farming styles resilient was obtaining flexible and self-sufficient structures by maintaining and developing own skills and knowledge which can prevent farms from direct purchase of technologies and agricultural input, and using a loan capital. This brings choices and autonomy to run their farm based on their belief and value, which were controlled by external actors, back to farmers.

4.4 Conclusion

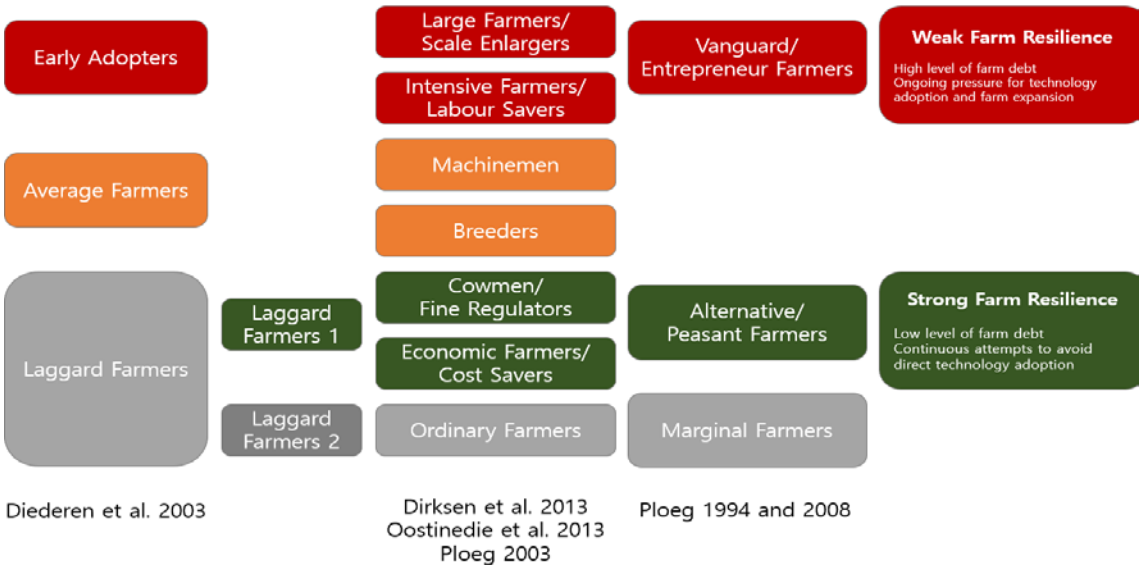
We have explored various farmers' responses to external changes in the Netherlands. There were Early Adopters, Average Farmers and Laggard Farmers[14] both in relation to innovative technologies (Diederen et al. 2003) and sustainable agricultural practice (Buck et al. 2001). Also, Ploeg's (1994 and 2008) categorisation of those responses as Marginal, Vanguard and Alternative Farmers were presented. As argued in Chapter 3, the theory of Technological Treadmill (Cochrane 1979) was applicable to the Dutch agricultural sector in the early phase of modernisation however, it is being manifested in a different way under the current context due to policy changes, uncertain market conditions, and rigid credit accessibility. Early Adopters in Diederen et al.'s work (2003) are featured with a greater size to spread risk of investment on new technologies, yet they had a lower solvency ratio due to increasing use of agricultural loan (2003: 45); Organic Farmers in Buck et al.'s work (2001) had an advantageous position by being Early Adopters, however, the merit was not resulted from increased productivity by adopting high-end technologies and farm expansion, but by charging mark-up price for commodity by enhanced value of organic product. A number of farmers were attracted to this merit and tried to convert their farming practice into organic ways yet, they could not endure temporal finance difficulty resulted from decreasing output due to reducing or cutting use of chemical inputs and longer duration to obtain organic certificate which allows farmers to charge the mark-up price (2001: 152-165). Additionally, Vanguard farmers fully integrated market relation and adopted prevailing technologies, but had a heavy farm debt (Ploeg 2008: Chapter 1). These findings support my argument that the promising position is not guaranteed for Early Adopters in the current Dutch agricultural sector.

We also looked into various farming styles in the Dutch dairy sector categorised according to the way to mobilise resources and to convert them into value. There were specific styles of farming such as Large Farmer/Scale Enlarger, Intensive Farmers/Labour Saver, Machinemen who were actively engaged in market relation to mobilise technologies or agricultural input. Contrastingly Economic Farmers/Cost Saver and Cowmen/Fine Regulator tried to avoid pressure on the technological treadmill and direct market relation by building and maintaining own knowledge and skills which were deemed to disappear along with the procedure of commoditisation (Bernstein 1979). The latter styles had flexible and self-sufficient structures and preferred gradual development based on own saving which led to a low level of farm debt. These features allowed those styles to reduce monetary cost under difficult times thus, they could maintain a relatively stable fiscal result compared with other styles of farming (Oostindie et al. 2013: 16-23). These are farming styles with stronger farm resilience.

I found that each farming styles have similarity with types of responses presented in section 4.1 and I re-categorised them on Figure 8.

[14] Originally, Diederen et al. (2003) categorised farmers into Innovators, Early Adopters, Late Adopters and Non-Adopters and they were re-categorised as Frontrunner (Innovators and Early Adopters) and Laggard (Late Adopters and Non-Adopters). To apply their categorisation into my framework, I consider Frontrunner as Early Adopters, Later Adopters as Average Farmers and Non-Adopter as Laggard.

Figure. 8
Re-categorisation of all types of responses



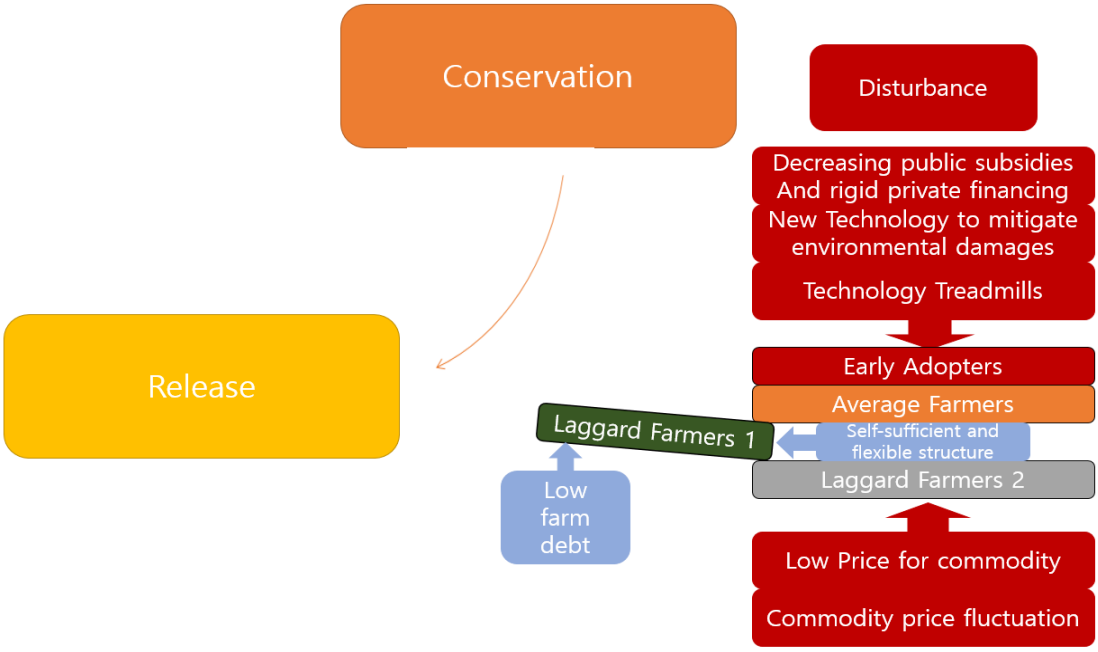
Source: Edited by the author based on Buck et al. 2001, Diederen et al. 2003, Dirksen et al. 2013 and, Ploeg 1994, 2003 and 2008

Large Farmers/Scale Enlarger and Intensive Farmers/Labour Savers shared many features with Early Adopters in Diederen et al. (2003) and Vanguard/Entrepreneur Farmers in Ploeg (1994 and 2008). They preferred quantity over quality of commodities in their production and had the ambition to increase the volume of products by employing prevailing technologies and farm expansion[15]. These types also had the highest level of farm debt in the each scholars' categorisation. Contrastingly, Economic Farmers/Cost Saver and Cowmen/Fine Regulator were similar with Alternative/Peasant Farmers in Ploeg (1994 and 2008). They did not apply prevailing technologies. Instead, they used intensive labour input to replace agrochemical thus, intentionally kept a distance from market and technologies. Actually, these styles partially share with the feature of Laggard Farmers in Diederen et al. (2003) who do not adopt technologies, but their alienation with technologies is not due to lack of opportunities rather, it is goal-oriented. Therefore, I will label them as Laggard Farmers 1 to make a distinction for those whom I labelled Laggard Farmers 2 who do not have capacity or agency to adopt technologies such as Marginal Farmers in Ploeg (1994) and Ordinary Farmers in Ploeg (2003)[16]. Machinmen and Breeder can belong to Average Farmers in Diederen et al. (2003) but I assume their direction of development goes different direction based on ways of resource mobilisation; the former one pursues to be Early Adopters by purchasing technologies from the market while the latter is oriented towards Laggard Farmers 1. In terms

[15] Large Farmers/Scale Enlarger had the largest farm size while Intensive Farmers/Labour Saver had the highest input per labour and hectare (Ploeg 2003: 122 and Dirksen et al. 2013: 9)
[16] Levins and Cochrane (1996) argued Laggard Farmer in the agrarian society where the land value is high would rent their land and enjoy the profit while other farmers run the treadmill (1996: 551), however, both Laggard Famers 1 and 2 did not become absentee landlords and Laggard Farmer 1 developed to own strategies to win on the treadmill with the self-sufficient and flexible farm structure.

of farm resilience, Laggard Farmers 1 have own knowledge and skill to build the self-sufficient and flexible structure by distancing from the technology and agricultural input market; Cost Savers and Fine Regulator had more professional characteristic and a specific culture which other styles cannot easily copy(Oostindie et al. 2013: 9-10). As a result of these strategies, Laggard Famers 1 have a lower level of farm debt therefore, they were affected less by a rise of the interest rate and pressure for overproduction in order to repay the debt. Also, this allows them to develop their farm based on their value and desire rather than external control; Both Cost Savers and Fine Regulator showed less ambitious to increase the volume of their product (Dirksen et al. 2013: 26-27). These features grant them capacities to navigate an adoptive cycle smoothly which is displayed in Figure. 9.

Figure. 9
Laggard Farmers 1 navigating the adaptive cycle



Source: edited by the author

For instance, they could convert the way of farming to organic way as the demand of the government and consumers for environment preservation and safe food grows while others could not endure temporal difficulty of conversion (Buck et al. 2001).

As argued in Chapter 3, squeeze on the Dutch agricultural sector will be tightened with reducing support from CAP, the growing pressure on technology adoption, volatile market condition and, decreasing availability of agricultural loans with greater interest rates. In this squeeze, being an Early Adopters who invest based on loan capital for expansion and adoption technologies are risky since it enhances control of external actors on the way that farm is operated, increase the financial burden and in turn, places them in the vulnerable position when unexpected shocks hit them. Laggard Farmers 1 showed strong farm resilience with choices and abilities to develop their farms in the ways they wanted due to the self-sufficient and flexible structure and a low level of farm debt. It is not to say agricultural technologies and farm debt itself have to be avoided yet, to say farms have to seek to best way to adopt

technologies (collective purchase (see Rissing 2016) or using second- hand market) or alternative sources to substitute direct adoption (e.g. the greater use of labour from family members to cut use of chemical) to reduce the dependency of loan capital as much as possible and keep farm flexible.

Chapter 5. Conclusion

This paper aimed to understand current structural changes of external factors in the Dutch agricultural sector, to explore different responses from Dutch farmers to these changes and to highlight farming styles with strong farm resilience to suggest the desirable way of farming in the time of uncertainty. Firstly, I presented the decreasing monetary support from the government, growing requirement of innovative technologies and fluctuating agricultural commodity prices resulted from policies changes along with the transition from the protective massive production to the neoliberal environmental preservation oriented regime, and the subsequent stricter credit rating procedure as factors that change the context of the technological treadmill in the Netherlands in Chapter 3.

As most European countries did after the Second World War, the Dutch government modernised the agricultural sector to supply affordable food to the domestic market and to achieve the economic growth by encouraging its farmers, with price support from CAP and guarantee for agricultural loans, to introduce agricultural technologies and to expand their size of land in order to optimise technologies, in turn, to enhance productivity. As a result, the Dutch agriculture successfully transited from the labour intensive farming system to the highly specialised capital intensive farming system and has become the second largest exporter in the global food market. In spite of the success at the national level, farmers' income did not grow and the level of farm debt increased considerably due to the squeeze with the path-dependent characteristic of the technological treadmill both in market and ecological relation, and a low return of their investment by the government intervention which increased burden from the upstream side and decreased the revenue from the downstream. The price support created a strong incentive for farmers to maximise their production and this eventually caused heavy pressures on the environment and EU budget which brought the necessity to reform agricultural policies both at the EU and national level. Introduction of direct payment and subsequence decoupling from commodity directly decreased the amount of monetary support and pushed farmers to the free market. The Dutch Government imposed environmental regulation which limited the level of production and made farmers responsible for environmental damages from own farming activities and, promoted innovative technologies in order to protect the environment and to keep their farmers competitive in the global food market. The agricultural commodity price has increasingly fluctuated under the highly liberalised new imperial or corporate food regime and the availability of credit capital has become rigid since Dutch banks see farming in the Netherlands no longer profitable.

The theory of technological treadmill was applicable to the early phase of Dutch agricultural development when overproduction was the prevailing discourse. With the farm subsidy based on the volume of production and the easy access to credit capital, Early Adopters who were able to carry continuous invests in new technologies and farm expansion earned a decent level of income thus, they were eager to run the treadmill without knowing their feet were drawn into the swarm of debt. However, changes in policies resulted from the transition from the protective massive production to the neoliberal environmental preservation

oriented regime, uncertain commodity price in the agricultural market and the rigid credit market made the position of Early Adopters no exception for the squeeze.

In Chapter4, I presented various responses and farming styles, developed along with the transition, and identified farming styles which showed stronger farm resilience by analysing their features which contributed the better financial results in difficult times. There were Early Adopters, Average Farmers and Laggards Farmers in relation to innovative technologies (Diederen et al. 2003) and sustainable farming practice (Buck et al. 2001). Early Adopters in Diederen et al. (2003) share similar aspects with Early Adopters in Cochrane (1979)'s definition yet, it was pointed that they had a low solvency as they use agricultural loans to invest in those technologies. The categorisation of Buck et al. (2001) is opposed with the former one. Early Adopters were Organic Farmers who converted their farming practice to labour intensive one which replaces the high use of agro-chemical. They adopted the sustainable farming practice as the way to put the high value on their products. In this sense, Laggard Farmers are Conventional Farmers who can be defined as Early Adopters in Cochrane's definition. There were also Vanguard/Entrepreneur Farmers, Alternative/Peasant Farmers and Marginal Farmers in relation to market and technology (Ploeg 1994 and 2008). In this categorisation, Vanguard/Entrepreneur who actively pursue market integration and the introduction of prevailing technologies have same features of Early Adopters while Alternative/Peasant Farmers and Marginal Farmers who keep distance with market and technologies are close to Laggard Farmers. Notably, alienation of Alternative/Peasant Farmers was goal-oriented. Subsequently, two sets of farming styles (Ploeg 2003, Dirksen et al. 2013 and Oostindie et al. 2013) grouped by the way to organise production (labour object or instrument central) and reproduction (within the farm or from markets) were followed. They were Large Farmers/ Scale Enlargers, Intensive Farmers/Labour Savers, Machinemen Farmers, Breeders, Cowmen/Fine Regulators, Economic Farmers/Cost Savers and Ordinary Farmers and had clearly distinctive features. It was Economic Farmers/Cost Savers and Cowmen/Fine Regulators who showed robust financial results in difficult times in 1997 and 2008. Their features, which pursue the gradual development based on own savings and attempt to build up own skills and knowledge to avoid or minimise the direct purchase of agricultural technologies and inputs from the market, allowed them to keep the level of farm debt relatively lower than other styles. I argued that these styles have strong farm resilience since they had the flexibility to reduce the monetary cost in difficult time (thus more probability to stay in the business than others) and had less pressure to produce extra for the redemption of farm debt. Therefore, they could develop their farm not based on profit-maximisation, but their own value and belief.

I notice that there were similar inclinations of responses and farming styles between categorisations and re-categorise them as Early Adopters, Non-Adopters, Laggard Farmers 1 and Laggard Farmers 2. Responses and farming styles belonged to Laggard Farmers 1 that is, Organic Farmers, Alternative/Peasant, Economic Farmers/Cost Savers and Cowmen and Fine Regulators showed the self-sufficient structure and a low level of farm debt which allowed them to get off the squeeze and navigate the adaptive cycle. Contrastingly Early Adopters did not have those capacities; they could not reduce the cost in difficult times; they could not endure the temporal difficulty when converting their farming practice to organic ways. When factors were stable, it was Early Adopters who were in the promising position;

they could enjoy the benefit with the low cost due to economy of scale and favourable public and private financing. However, agricultural sectors are being faced with increasingly growing uncertainty such as the 2008 food crisis. Neoliberal scholars do not admit that there is crisis or argue that more liberalisation of the global market and investment in productivity could solve the problem (Holt Gimenez and Shattuck 2011: 119); World Bank (2007) also prescribed productivity revolution, conversion to high-value product and integrate into the international agricultural market as solutions to overcome the current food crisis (2007: 1-2). In this light, price volatility is also seen as temporal disequilibria in the commodity market (Ploeg 2010: 98). However, Ploeg sees the combination of the industrialisation of agriculture, the liberalisation of food and the rise of food empires will make this crisis persistent and more widespread (Ibid 103); especially price volatility in the global markets will be frequent events under food imperial regime (Ibid: 93). I strongly believe that the latter stance is the case of the Dutch agricultural sector given its high dependency on the global market as the second largest food exporter in the world and neoliberal tendency in CAP which place farmers in the free market. We already learned the lesson from the experience of Green Revolution that technologies could not solve the hunger problem after the Second World War but have created the more negative effect on the farming population and the environment (Patel 2013 and Perfecto et al. 2009) thus, it made me doubt about prescriptions from neoliberal scholars. Therefore, I articulate, based on evidence from my finding, that Laggard Farmers1, who have the self-sufficient and flexible structure with a low level of farm debt, are the most suitable types of farming under the ever-tightening squeeze in the current Dutch agricultural sector.

This articulation shares the same vein with Ploeg's argument (2008) of Repesantisation, yet what makes my paper novel is its emphasis on debt. I already mentioned difficulty to collect literature regarding farm debt in the Netherlands. Furthermore, there were no clear statements regarding the growing farm debt from farmers' organisation in the Netherlands; the statement that LTO sent to me did not mention about debt (LTO 2018); the spokesperson of Toekomstboeren informed me about financing source of their farmers such as crowdfunding and donation from customer yet, did not have clear explanation why they try not to borrow agricultural loan from banks (Hofkamp, personal conversation via email, 26-27 October 2018). These facts apply that there was less attention regarding the issue both in academic and political arenas in spite of a considerable level of debt in the Dutch agricultural sector. Farming style studies included farm debt in their analysis but, it is simply seen as a factor that increased the monetary cost in the farm. However, this paper not only takes into account the economic dimension of farm debt but also the socio-cultural dimension; path-dependent pressure to produce more commodity shaped in its reinforcing relation with the technological treadmill; the imposed logic of profit maximisation by growing control of financial actors. This allows readers to see the multidimensional effect of farm debt on agrarian society that shapes static farm structure with the increased fixed cost, undermines farmers' autonomy with growing control of creditors and finally changing farmers' mind-set and behaviour which legitimate the logic of market imposed by the creditor. The suggestion of farming styles with farm resilience and identification of a low level of debt as the key factor place debt in the centre of resistance to current neoliberal agricultural discourse.

However, more empirical data would be needed to verify this articulation for the multidimensional negative effect of debt in the Dutch agricultural sector. There is an available date for shifting styles of Dutch dairy farmers from 2007 to 2010. The shifts occurred from all styles while some farms kept their styles (Oostindie et al. 2013: 15). One can carry further research to prove if indebtedness of farm had a decisive effect to enable or constrain farms to make changes. By doing so, one can obtain the rich evidence to prove how the high level of indebtedness constrain farm resilience by increasing financial burdens and by imposing the profit maximising logic of farm operation.

Polanyi (2001) argued that capitalism forced people into commodity relations by eliminating social protections from the pre-capitalist society and by separating them from means of production (2001: 171-174). Capitalism gained its power to persist and prevail by placing people in insecure positions. We have been noticing how the penetration of capitalism into agricultural sectors with neoliberal ideology created destructive results in our societies. Although it is not investigated enough, Indebtedness is a very powerful instrument that has been underpinned this procedure. Therefore, the effect of indebtedness on agrarian society calls for further investigation and more attempts to reduce this effect should be carried in order to build the food system which is not only safe for farmers but also consumers and the environment.

References

Buck, A.J. de., I. van Rijn., N.G. Roling. and G.A.A. Wossink. (2001) 'Farmers' reasons for changing or not changing to more sustainable practices: An exploratory study of arable farming in the Netherlands', *The Journal of Agricultural Education and Extension* 7(3): 153-166.

Berkhout, P., Silvis, H. and Terluin, I. (2014) 'Landbouw-Economisch Bericht 2014'. Den Hagg: Wageningen Economic Research.

Bernstein, H. (2010) *Class Dynamics of Agrarian Change*. Halifax, N.S.; Sterling, VA: Fernwood Pub; Kumarian Press.

Bernstein, H. (1979) 'African Peasantries: A Theoretical Framework', *The Journal of Peasant Studies* 6(4): 421-443.

Bieleman, J. (2010) *Five Centuries of Farming: A Short History of Dutch Agriculture 1500-2000*. Vol. 8. The Netherlands: Wageningen Academic Publishers.

Buckland, J. (2004) *Ploughing Up the Farm: Neoliberalism, Modern Technology and the State of the World's Farmers*. Black Point, N.S; London; New York: Fernwood Pub.; Zed Books; Distributed in the United States by Palgrave.

Burrell, A. (2009) 'The CAP: Looking Back, Looking Ahead', *Journal of European Integration* 31(3): 271-289.

Centraal Bureau voor de Statistiek (2015) 'Steeds Grotere Landbouwbedrijven'. Accessed 19.May 2018 <https://www.cbs.nl/nl-nl/nieuws/2015/52/steeds-grotere-landbouwbedrijven>.

Cochrane, W.W. (1979) *The Development of American Agriculture: A Historical Analysis*. Minneapolis: University of Minnesota Press.

Darnhofer, I. (2014) 'Resilience and Why it Matters for Farm Management', *European Review of Agricultural Economics* 41(3) Special issue: Plenary papers of the 14th EAAE Congress, Ljubljana: 461-484.

Darnhofer, I., Lamine, C., Strauss, A. and Navarrete, M (2016) 'The Resilience of Family Farms: Towards a Relational Approach', *Journal of Rural Studies* 44: 111–122.

Darnhofer, I., Fairweather, J. and Moller, H (2010) 'Assessing a Farm's Sustainability: Insights from Resilience Thinking', *International Journal of Agricultural Sustainability* 8(3): 186–198.

Diederen, P. J. M., Meijl, H. van, Wolters, A. and Bijak, K. (2003) 'Innovation Adoption in Agriculture: Innovators, Early Adoptors and Laggards,' *Cahiers d'economie et sociologie rurales* 67 (2003):30-50.

Dirksen, H., Klever, M., Broekhuizen, R. E. van, Ploeg, J. D. van der and Oostindië H.A (2013) 'Bouwen aan een betere balans: een analyse van bedrijfsstijlen in de melkveehouderij'. Den Hagg: Wageningen Economic Research; Dirksen Management Support.

Drion, S. (2018) 'Financing Future Farming: an Exploration of Alternative Financing Constructions to Enhance Sustainability at Farm Level', MSc thesis. Wageningen: Wageningen University.

Dudley, K. M. (2000) *Debt and dispossession: farm loss in America's heartland*. Chicago: University of Chicago Press.

European Commission (2018a) 'Agriculture and Rural Development-Farm Accountancy Data Network' Accessed 19.August.2018 <http://ec.europa.eu/agriculture/rica/database/database_en.cfm>.

European Commission (2018b) 'Crop Production Historical Data (1955-1999)'. Accessed 24.June.2018<http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=apro_cpnh1_h&lang=en>.

European Commission (2018c) 'CAP Expenditure in total EU expenditure'. Accessed 24.September.2018<https://ec.europa.eu/agriculture/sites/agriculture/files/cap-post-2013/graphs/graph1_en.pdf>.

European Commission (2017) 'Cap Explained Direct Payments for Farmers 2015-2020', pp. 1-12. Brussel.

European Commission (2016) 'The CAP in Your Country': The Nethernalds', pp. 1-6. Brussel.

European Commission (2013) 'Overview of CAP Reform 2014-2020', pp. 1-10. Brussel.

European Commission (2012) 'The Common Agricultural Policy; a Story to be Continued', pp. 1-20. Luxembourg.

Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T. and Rockstrom, J. (2010) 'Resilience Thinking: Integrating Resilience, Adaptability and Transformability', *Ecology and Society* 15(4): 20.

Food and Agriculture Organization (2018a) 'Fertilizers Archive'. Accessed 22.June. 2018 <http://www.fao.org/faostat/en/#data/RA>.

Food and Agriculture Organization (2018b) 'Machinery'. Accessed 22.June.2018 <http://www.fao.org/faostat/en/#data/RM>.

Garzon, I. (2006) *Reforming the Common Agricultural Policy History of a Paradigm Change*. (1 edn) New York: Palgrave Macmillan.

Gerber, J.F. (2015) 'An Overview of Local Credit Systems and their Implications for Post-Growth', *Sustainability Science* 10(3): 413-423.

Gerber, J.F. (2014) 'The Role of Rural Indebtedness in the Evolution of Capitalism', *The Journal of Peasant Studies* 41(5): 729-747.

Gerber J.F. (2013) 'The Hidden Consequences of Credit: An Illustration from Rural Indonesia', *Development and Change* 44(4): 839–839.

Government of the Netherlands. 'Agriculture and Horticulture'. Accessed 12.May.2018 <https://www.government.nl/search?keyword=Agriculture+and+horticulture>.

Grant, W. and A. MacNamara (1996) 'The Relationship between Bankers and Farmers: An Analysis of Britain and Ireland', *Journal of Rural Studies* 12(4): 427-438.

Haas, M.A. de. (2013) *Two centuries of state involvement in the Dutch agro sector: An assessment of policy in a long-term historical perspective*. The Hague: WRR.

Harriss, J., J. Haapiseva-Hunter and C.M. Lewis (1995) *The New Institutional Economics and Third World Development*. London: Routledge.

Heide, C. M. van der, H.J. Silvisa and W.J.M. Heijman (2011) 'Agriculture in the Netherlands: Its Recent Past, Current State and Perspectives', *Applied Studies in Agribusiness and Commerce*: 23-28.

Hendrickson, M.K. and H.S.J. James (2005) 'The Ethics of Constrained Choice: How the Industrialization of Agriculture Impacts Farming and Farmer Behavior', *Journal of Agricultural and Environmental Ethics* (18): 269-291.

Hogan, L. (2017) 'Dairy Farm Debt Levels Averaging €850 Per Cow'. Accessed 24.March.2018 <http://edairynews.com/en/dairy-farm-debt-levels-averaging-e850-per-cow-53159/>.

Holt Gimenez, E. and Shattuck, A. (2011) 'Food Crises, Food Regimes and Food Movements: Rumblings of Reform or Tides of Transformation?', *The Journal of Peasant Studies*, 38(1): 109–144.

LTO Nederland 'About LTO Netherlands' Accessed 04.November.2018

< http://www.lto.nl/over-lto/lto-organisatie>

LTO Nederland (2017) 'LTO International Comparison of Producer Prices for Milk 2016'. The Hague.

LTO Nederland (2018) 'EU consultation "Horizon Europe"', Unpublished statement**.**

Karel, E. (2010) 'Modernization of the Dutch agriculture system 1950-2010', Paper presented at the International Rural History Conference 2010, Brighton, UK (13 September).

Kautsky, K. (1988) *The Agrarian Question*. London: Zwan.

Lenin, V.I. (1982). 'The class differentiation of the peasantry', in John Harriss (ed) *Rural Development: theories of peasant economy and agrarian change*, pp. 130-139 London: Routledge.

Levins, R.A. and W.W. Cochrane. (1996) 'The Treadmill Revisited', *Land Economics* 72(4): 550-553.

Lovec, M. (2016) *The European Union's Common Agricultural Policy Reforms: Towards a Critical Realist Approach*. (1 edn) London: Palgrave Macmillan.

Marsden, T., S. Whatmore and R. Munton (1990) 'The Role of Banking Capital and Credit Relations in British Food Production', in T. Marsden and J. Little (eds) *Political, Social and Economic Perspectives on the International Food System,* pp. 36-56 Aldershot: Avebury.

Marx, K. (1976) *The Capital: A Critique of Political Economy*. Vol.1. London: Penguin Books.

McMichael, P. (2013) *Food Regimes and Agrarian Questions*. Halifax: Fernwood Publishing.

National Farmers Union (NFU) (2010) 'Losing our Grip'. Accessed 20.May.2018 <http://www.nfu.ca/sites/www.nfu.ca/files/06-07-losing_grip.pdf>

North, D.C. (1995) 'The New Institutional Economics and Third World Development', in J. Harriss, J. Haapiseva-Hunter and C.M. Lewis (eds) *The New Institutional Economics and Third World Development*, pp. 17-26. London: Routledge.

OECD (2015) 'Innovation, Agricultural Productivity and Sustainability in the Netherlands', OECD Food and Agricultural Reviews: OECD publishing.

Oostindie, H., van der Ploeg, J.D., & van Broekhuizen, R. (2013) 'Buffercapaciteit: Bedrijfsstijlen in de melkveehouderij, volatiele markten en kengetallen'. Wageningen: Wagenigen University and Research.

Oya, Carlos. (2009) 'Introduction to a Symposium on the World Development Report 2008: Agriculture for Development?', *Journal of Agrarian Change*, 9(2): 231–234.

Patel, R. (2013) 'The Long Green Revolution', *Journal of peasant studies*, 40(1): 1-63

Perfecto, I., J. Vandermeer and A. Wright (2009) *Nature's Matrix; Linking Agriculture, Conservation and Food Sovereignty*. London: Earthscan.

Petrick, M. (2004) 'Farm Investment, Credit Rationing, and Governmentally Promoted Credit Access in Poland: A Cross-Sectional Analysis', *Food policy* 29(3): 275–275.

Philip H. Howard. (2009) 'Visualizing Consolidation in the Global Seed Industry: 1996-2008', *sustainability* 1(4): 1266-1287.

Ploeg, J.D.v.d. (2018) 'Differentiation: Old Controversies, New Insights,' *Journal of peasant studies*, 45(3): 489–524.

Ploeg, J. D.v.d. (2012) 'The genesis and further unfolding of farming styles research'. *Historische Anthropol* 20: 427–439.

Ploeg, J.D.v.d. (2010) 'The Food Crisis, Industrialized Farming and the Imperial Regime', *Journal of Agrarian Change* 10(1): 98-106.

Ploeg, J.D.v.d. (2008) *The New Peasantries: Struggles for Autonomy and Sustainability in an Era of Empire and Globalization*. London: Earthscan.

Ploeg, J.D.v.d. (2003) *The Virtual Farmer: Past, Present and Future of the Dutch Peasantry*. Assen: Van Gorcum.

Ploeg, J.D.v.d. (1994) 'Styles of farming: an introductory note on concepts and methodology', in Ploeg, J.D.v.d, and A. Long (eds), *Born from Within: practices and perspectives of endogenous development,* pp. 7-30. Assen: Van Gorcum.

Polanyi, K. (2001) *The Great Transformation: The Political and Economic Origins of our Time*. (2nd edn) Boston. MA: Beacon Press.

Reid, I.G. (1981) 'Farm Finance and Farm Indebtedness in the EEC', *Journal of Agricultural Economics* 32(3): 265-273.

Rissing, A. (2016) 'Alternative Economic Strategies and the Technology Treadmill: Beginning Vegetable Farmers in Iowa', *Economic Anthropology* 3(2): 304–314.

Rose, A. (2009) 'Economic Resilience to Disasters', CARRI Research Report No.8. Los Angeles, California: Community and Regional Resilience Institute.

Samson, G.S., J.H.H.P.d. Wesseler, C.D. Gardebroek and R.A.D. Jongeneel (2017) 'Agri-Environmental Policies and Dutch Dairy Farmers' Responses', PhD thesis. Wangeningen: Wageningen University.

Schiere, J. B., Darnhofer, I. and Duru, M. (2012) 'Dynamics in Farming Systems: Of Changes and Choices.' in: Darnhofer, I., D. Gibbon and B. Dedieu (eds) *Farming Systems Research into the 21st Century, the New Dynamic*, pp. 337-363. Dordrecht: Springer.

Scott, M. (2013) 'Resilience: A Conceptual Lens for Rural Studies?', *Geography Compass* 7(9): 597-610.

Statista. 'Average Interest Rate for New Mortgage in the Netherlands from 2006 to 2017'. Accessed 13.November.2018 <https://www.statista.com/statistics/596336/interest-rate-for-new-mortgages-in-the-netherlands/>

Stichele, M. v. (2015) 'How Financialization Influences the Dynamics of the Food Supply Chain', *Canadian Food Studies / La Revue canadienne des études sur l'alimentation* 2(2): 258–258.

Symes, D. G. (1992) 'Agriculture, the State and Rural Society in Europe: Trends and Issues', *Sociologia Ruralis* 32(2-3): 193–193.

Toekomstboeren 'Over Toekomstboeren' Accesses 04.November.2018 < http://toekomstboeren.nl/over/>

Van den Ban, A.W. and A.L.G.M. Bauwens (1988) 'Small farm development: Experiences in the Netherlands', *Quarterly Journal of International Agriculture* 27: 215-227.

Van der Meulen, H. A. B. and Van Asseldonk, M. A. P. M. (2017a) 'Bancaire financiering van landbouw onder druk'. Den Haag: Wageningen Economic Research.

Van der Meulen, H. A. B. and Van Asseldonk, M. A. P. M. (2017b) 'Mainstream and Alternative Source of Finance in the Dutch Agriculture', paper presented at the 21th International Farm Management Congress, The Hague, the Netherlands (2-7 July).

Van Grinsven, H.J.M. and Bleeker, A. (2017) 'Evaluation of the Manure and Fertilisers Act 2016: Synthesis Report'. The Hague: PBL Netherlands Environmental Assessment Agency.

Vink, M. and Boezeman, D. (2018) 'Naar een wenkend perspectief voor de nederlandse landbouw: voorwaarden voor verandering'. Den Haag: PBL Planbureau voor de Leefomgeving.

Wilde, S.d., E. Willemse, R. Blankestejin and K.D.v. Heel (2016) 'The Future of Technology in Agriculture', STT publication No.81. The Hague: STT Netherlands Study Centre for Technology Trends.

Winson, A. and J.Y. Choi. (2017) 'Dietary Regimes and the Nutrition Transition: Bridging Disciplinary Domains', *Agriculture and Human Value* 34(3): 559-572.

World Bank. (2007) 'Agriculture for Development', Washington, D.C.: World Bank and Oxford University Press.